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Development of Adult Japanese Voxel Phantoms and Their Application to Evaluation of Radiation Exposure Doses

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At the Japan Atomic Energy Agency (JAEA), two male (JM and JM2) and a female (JF) voxel phantoms, which were based on computed tomography (CT) images of adult Japanese, have been developed to study the effects of postures and body sizes on dose assessment. The three high-resolution JAEA voxel phantoms (JM, JM2 and JF) consist of about 1 mm^3 size voxels, and the shapes and masses of organs, even for small or thin organs such as thyroid and stomach, are more realistically reproduced. The two male voxel phantoms were constructed from the CT images of an identical person taken in supine for JM and in upright for JM2. Therefore, it is possible to clarify the impact of posture on dose assessment by comparing directly organ doses between JM and JM2. The present report describes (1) the construction and characteristics of the high-resolution JAEA voxel phantoms, (2) the effects of postures on the organ doses due to internal photon emitters, and (3) the effects of body sizes on the dose conversion coefficients against external photon exposures. The present study provides valuable information to understand the effects of posture and body size on dose assessment in adapting dose coefficients and dose conversion coefficients calculated using the reference voxel phantoms by the International Commission on Radiological Protection (ICRP).

Keywords: Japanese Voxel Phantoms, Dosimetry, Organ Dose, Body Size, Posture, External Exposure, Internal Exposure, Monte Carlo Code, EGS4, PHITS

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日本人成人ボクセルファントムの開発と放射線被ばく線量評価への適用

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日本原子力研究開発機構（原子力機構）では、体格及び姿勢が線量評価に及ぼす影響を明らかにするため、成人日本人のコンピューター断層（CT）画像に基づいた男性2 体（JM、JM2）及び女性1 体（JF）のボクセルファントムを開発した。これら3体の高解像度原子力機構ファントム（JM、JM2、JF)は、約1 mm^3サイズのボクセルによって構築されているため、甲状腺、胃等の小さく、薄い臓器についてもその形状及び重量を正確に再現している。男性2 体のファントムは、同一人物の被験者から得られた、臥位（JM）と立位（JM2）のCT 画像を基に開発されているため、両者の臓器線量を比較することによって、姿勢が臓器線量に及ぼす影響を明らかにすることが可能である。本報告書では、(1)高解像度原子力機構ボクセルファントムの開発及びその特徴、(2)姿勢が光子放出核種による臓器線量に及ぼす影響、(3)体格が光子外部照射に対する線量換算係数に及ぼす影響について述べる。本研究の成果は、今後、国際放射線防護委員会（ICRP）が導入するレファレンスボクセルファントムを用いて計算した線量係数及び線量換算係数の適用において、体格及び姿勢が線量評価に及ぼす影響を理解する上で有用なものである。

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1. Introduction

The International Commission on Radiological Protection (ICRP) adopts some dosimetric quantities for dose assessments from radiation exposures. Among them, the dose averaged over an organ or a tissue volume (hereinafter, organ dose) is defined as a fundamental quantity to derive the equivalent dose and the effective dose, which are introduced to consider a radiation risk from a radiation exposure. Since the organ dose cannot be directly measured in a living person from its definition, organ doses have been evaluated by using a combination of computed human models and radiation transport codes. The dose conversion coefficients[1,2] and dose coefficients[3-7] recommended by ICRP were calculated by using the mathematical phantom,[8] in which inner and outer configurations of human body were described by equations such as elliptical cone, ellipsoid, cylinder and so on. The recommended dose conversion coefficients and dose coefficients are practical for the purpose of radiation protection. However, the body characteristics such as body sizes and postures are different from each individual. The differences in the body characteristics influence organ doses. Therefore, it is necessary to clarify the variations of organ doses due to the difference in the body characteristics in order to use the dose conversion coefficients and dose coefficients for the persons, which have various body characteristics.

The construction techniques of more realistic phantom are developed on the basis of image processing and medical image techniques.[9] The new type human model are represented by the aggregate of small rectangular block units called "voxel" (volume pixel). Thus, the phantom consisting of voxels is called a "voxel phantom". The voxel phantom enables us to evaluate the effects of anatomical structures on the dose assessment more precisely than the mathematical phantom. Therefore, several voxel phantoms have been developed to clarify the effects of body sizes, ages, races and sexes on the dose assessment.[10-18] The first voxel phantoms (BABY and CHILD) for the radiation protection were developed by the National Research Center for Environment and Health (GSF, now the German Research Center for Environmental Health) in the late of 1980s.[10,11] The computed tomography (CT) scan for a 8-week-old baby just after death was performed to construct BABY. The CT images of CHILD were obtained from a 7-year-old child with leukemia. Irene, Helga and Donna were Caucasian adult female voxel phantoms derived from the CT images.[17] The NORMAN, Golem and VIP-Man phantoms were constructed on the basis of MR images, CT images and photographs of Caucasian adult males,[12-14] respectively. These voxel phantoms were used to calculate the dose conversion coefficients[17,19-23] for external radiation fields and the specific absorbed fractions (SAFs) [24-28] for the intake of radionuclides.

Most voxel phantoms developed for the purpose of radiation protection were derived from the Caucasoid, which have large size body compared with Mongolian populations containing Japanese. Therefore, it was impossible to systematically compare the organ doses of Japanese with those of Caucasoid. Saito et al. developed the first Japanese voxel phantoms named Otoko[29] and Onago[30] on the basis of the CT images of Japanese adult male and female, respectively. The voxel size of the two Japanese phantoms is $0.98\times0.98\times10$ mm^3. The organ doses due to external photon and electron exposures were calculated by using Otoko and Onago, and were compared with those of mathematical

phantoms and Caucasian phantoms.[30] Otoko and Onago were also used for the internal dosimetry. Kinase et al. reported that the masses of target organs have significant effect on the photon self-absorbed fractions for selected organs[31] and the S values to bladder wall.[32]

ICRP approved the fundamental recommendations[33] on the radiation protection of man and environment against ionizing radiation on March, 2007. In the fundamental recommendations, ICRP decided to use the reference voxel phantoms[34] adjusted to the physiological and anatomical data[35] of adult Caucasian male and female for evaluations of equivalent doses and effective doses. The posture of the reference voxel phantoms is supine. The reference voxel phantoms will be used to calculate absorbed doses in organs for the evaluations of dose conversion coefficients for external radiation fields and dose coefficients for the intake of radionuclides.

The membranous organs such as gastrointestinal tracts and bladder have thickness of several millimeters. Their shapes and positions are markedly varied by the changes in posture and intake of foods. Therefore, high resolution voxel phantoms were needed to represent the shapes of complicated or thin organs and tissues. Furthermore, radiation exposures of workers and the public occur when they are in various postures. It is obvious that the position and shape of organs change depending on the posture. These changes might influence the organ doses. Therefore, it is importance to confirm that the dose conversion coefficients and dose coefficients can reasonably represent the exposures in various body sizes and postures. However, the posture of the previously developed voxel phantoms was supine only because of conditions to take medical images.

Thus, the authors developed the Japanese adult male (JM)[36] and female (JF)[37] voxel phantoms in supine whose voxel size is $0.98\times0.98\times1$ mm^3. Organ shapes of these phantoms are more realistically represented than those of Otoko and Onago. The small size voxel enables us to accurately calculate the organ doses, because the voxel size of JM and JF is smaller than mean free path (1.8 mm) of 0.01 MeV photons in the ICRU soft tissues.[38] The effects of organ masses and organ distances on the photon SAFs were analyzed by using JM and JF.[36,37] To elucidate the effects of posture on organ doses, we developed a Japanese adult male voxel phantom with upright (JM2) using the CT images of upright subjects.[39] The voxel size of JM2 is also $0.98\times0.98\times1$ mm^3. The CT images for the JM2 phantom were obtained from the subject whose supine CT images were previously taken for the JM phantom. Therefore, it is possible to accurately evaluate the differences in positions and shapes of organs and tissues by posture changes, and to directly compare the organ doses of both phantoms.

At the Japan Atomic Energy Agency (JAEA), dose assessment user codes[29-31,40-43] were developed to calculate radiation doses from external and internal exposures by the Otoko and Onago phantoms. In these codes, radiation transports in a human body are simulated with the electromagnetic cascade Monte Carlo code, EGS4 (Electron Gamma Shower Version 4).[44] These dose calculation systems can represent the marrow distribution in bone tissues by considering the density of material in each voxel, according to a grey value in an image.[10,11] The JM, JM2 and JF phantoms (the high-resolution JAEA voxel phantoms) could be also incorporated to the dose assessment codes. In order to clarify the effects of posture on organ doses, SAFs of JM2 and JM were calculated. Their SAFs were used to evaluate the organ doses due to the intake of eight internal photon emitters.[45] In addition, organ doses due to external photon irradiation were calculated by using JM, JF, Otoko and

Onago, and were compared with those of several Caucasian phantoms.[46] These calculation systems require two phantom data such as the organ segmented data and the bone density data to calculate the absorbed doses in bone marrow. Therefore, a new bone model, which enables us to calculate the absorbed doses separately in bone marrow and hard bone without separation of bone marrow and hard bone in the simulation model, was developed for the application of the high-resolution JAEA voxel phantoms to other general purpose radiation transport codes. The new bone model consists of only the organ segmented data. This report describes the construction and characteristics of the high-resolution JAEA voxel phantoms. In the report, the effects of posture on organ doses due to the intake of photon emitters[45] and the effects of body size on organ doses by external photon exposures[46] are also discussed.

2. Overview of the high-resolution JAEA voxel phantoms

2.1 Volunteers and CT scans for the high-resolution JAEA voxel phantoms

Healthy Japanese adult male and female subjects were recruited to take CT images in supine and upright postures to construct the three high-resolution JAEA voxel phantoms shown in Figure 2-1. All CT scans were performed after the approvals for the plans and objectives by the Ethics Committee of the Fujita Health University Hospital and each subject. To obtain distinct CT images of gall bladder and urinary bladder, the volunteers had no food intake and urination for several hours before the scanning. They drank 250 ml of warm green tea just before the scans so as to meet the conditions of the stomach content with the ICRP reference value.[35] They held their breath and closed the eyes and mouth during the scans. The CT image data were stored on digital audio tapes. The CT images were medically checked by the radiologist of the hospital. It was ensured that the anatomies were normal in the volunteers. The resolution (512×512 pixels with 1 mm slice) of CT images was determined on the basis of the mean free path (1.8 mm) of 0.01 MeV photons in the ICRU soft tissue.[38] Then, the resolution gives a voxel size of $0.98\times0.98\times1$ mm^3.

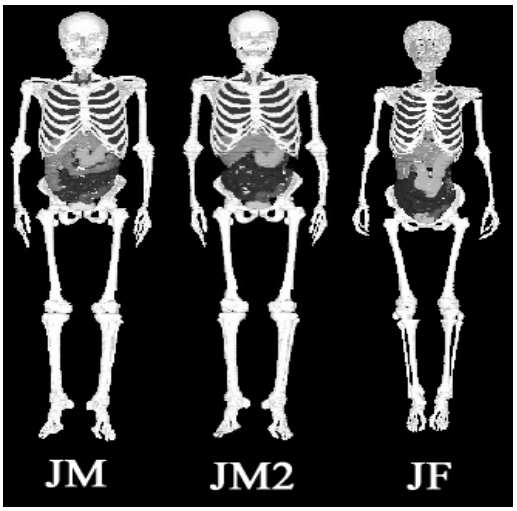

Figure 2-1 Three dimensional views of the high-resolution JAEA voxel phantoms.

The CT images for the construction of a male and a female phantoms were taken in supine posture using a helical CT scanner (Toshiba Medical Systems Co. Ltd.). The age of the subjects was 54-year-old for both of the two phantoms. Raw CT images were taken from two partial body regions (from the head to the knees and from the knees to the toes) of male and female volunteers. Later, the two regions were conjoined to produce whole body voxel phantoms. The male and the female phantoms are called as 'JM phantom' and 'JF phantom', respectively.

The subject for JM phantom was selected as a volunteer again to obtain the CT data for a phantom in an upright posture at different time. The age of the subject was 55-year-old at that time. The CT scans in upright posture were carried out using a cone-beam CT scanner (Hitachi Ltd.) to

obtain the CT images (512×512 pixels with 1 mm slice) (Figure 2-2). The view fields of the cone-beam CT scanner were limited to a spherical field with a diameter of 25 cm. The four regions with different heights were scanned in order to cover the trunk area of the volunteer. A data set of the CT images of the trunk was prepared by conjoining the four regions, according to the position of vertebral column each other. The cone beam CT scanner cannot scan the adipose, bone, muscle and skin located in the periphery of trunk area, because of a spherical scan field. The trunk area without scanning was therefore complemented by using the segmented images for the JM phantom. The parts of arms, head and legs of JM were used to construct the whole body of JM2 after the completion of trunk area. The male phantom in the upright posture is called as 'JM2 phantom'.

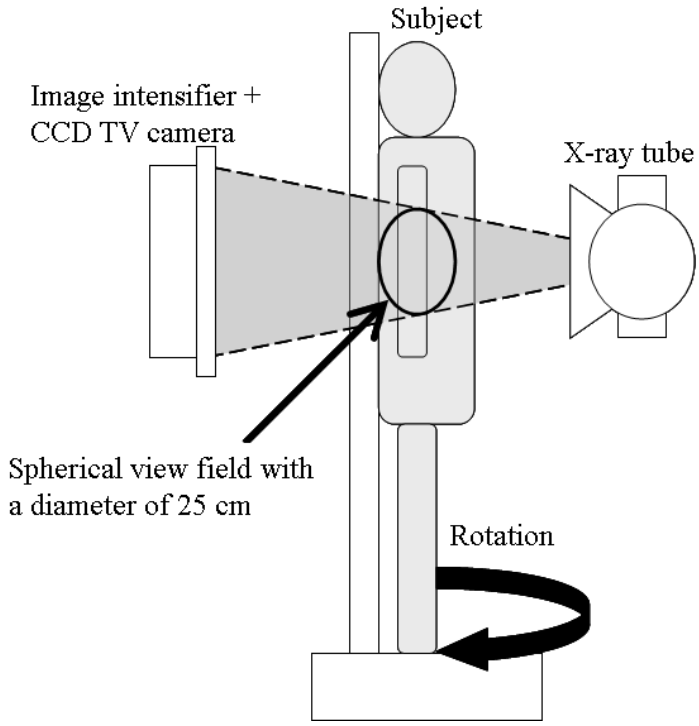

Figure 2-2 Schematic diagram of CT scans in upright posture.

2.2 Construction methods of the high-resolution JAEA voxel phantoms

The construction procedures for the high-resolution JAEA voxel phantoms have been described in detail elsewhere.[36,37,39] Thirty eight regions, including air regions in gastrointestinal and respiratory tracts, were segmented from the CT images to construct the high-resolution JAEA voxel phantoms. These segmented regions contain all of the organs and tissues with the tissue weighting factors in ICRP Publication 60.[47]

These phantoms have been constructed by using a method, which had been originally developed at the GSF[10,11,13] and modified by Saito et al.[29,30] The image processing were performed to construct the voxel phantoms with commercial imaging software, Visilog4 (Noesis Vision Inc) and Adobe Photoshop 5.5 for Windows (Adobe Systems Incorporated). The former software and latter

software were operated with SGI O2 workstation (Silicon Graphics Inc) and DELL PowerEdge 600SC (DELL Inc), respectively. The grey value in each voxel closely relates to the materials and densities of organs and tissues. Air, soft tissues, lungs, adipose and bone, which had different densities, could be automatically segmented by using the grey value thresholds of each tissue. On the other hand, most organs were unable to be automatically segmented in the same way, because the grey values were near each other for most organs with soft tissues. Thus, the soft tissues were manually segmented on the basis of the image processing techniques such as erosion, dilation and filling holes, and anatomical information.

The skin and bone tissue could not be also segmented, because of its small and thin anatomical structures. The segmentations of these tissues were performed according to the methods in the previous studies. [29,30] The skin tissue of the high-resolution JAEA voxel phantoms was assumed to be one voxel (about 1mm thickness) at the outermost layer over the whole body. As a result of the segmentation, the skin thickness in three phantoms was about 1 mm, which was close to ICRP reference value (1.3 mm).[35] It was very difficult to accurately model the lattice structures of trabecular bone by using about 1 mm^3 size voxel, because the width of the cavity of trabecular bone ranged from 0.2 to 1.7 mm[48] and was very small. Therefore, the bone tissue was considered as a composite tissue, which consisted of hard bone and bone marrow. In addition, the skeletal system was anatomically divided into 20 regions from the head (cranium) to the feet (ankle and foot bones) over the whole body.

Finally, the identification numbers corresponding to 192 regions for JM and JM2, and to 194 regions for JF were assigned to each voxel, respectively. The numbers of voxels of JM, JM2 and JF are about 10,900,000, 10,400,000 and 6,700,000, respectively. The data including segmentation of configuration of organs and tissues were stored as ASCII text data. The organ segmented data were converted to the compressed format developed by GSF[10,11] and modified by Saito et al.[29,30] The GSF compressed format type voxel phantoms can be used by matching with EGS4[44] and a series of EGS4 user codes.[29-31,40], which can simulate the transport of photon and electron in the voxel phantoms developed at JAEA (the three high-resolution JAEA voxel phantoms, and Otoko and Onago phantoms) to calculate the organ doses and SAFs due to external and internal exposures.

2.3 Physical characteristics of the high-resolution JAEA voxel phantoms

Tables 2-1 and 2-2 show the physical characteristics of some adult male[13,22,29,36,39,49] and female[17,30,37,49] voxel phantoms, along with the heights and weights in average adult Japanese[50] and the ICRP reference person.[35] The heights and weights of JM, JM2 and Otoko are close to those[50] of the average Japanese adult male. The body size of JF is smaller than the Japanese average values,[50] while Onago has larger body size comparing to the average values. Among the phantoms, the two phantoms of Rex and Regina,[49] which were developed at GSF, have the same value for the body characteristics as the reference values in ICRP Publication 89. On the other hand, the heights and weights of JM, JM2, JF, Otoko and Onago are smaller than the values in ICRP Publication 89.[35]

Table 2-1 Physical characteristics of adult male voxel phantoms[13,22,29,36,39,49] and average adult Japanese male,[50] and ICRP reference height and weight of adult male.[35]

Phantom	Race	Gender	Height (cm)	Weight (kg)	Posture
JM	Japanese	Male	171	65	Supine
JM2	Japanese	Male	171	65	Upright
Otoko	Japanese	Male	170	65	Supine
Rex	Caucasoid	Male	176	73	Supine
Golem	Caucasoid	Male	176	69	Supine
VIP-Man	Caucasoid	Male	186	104	Supine
Adult Japanese average	Japanese	Male	170	64	-
ICRP reference value	Caucasoid	Male	176	73	-

Table 2-2 Physical characteristics of adult female voxel phantoms[17,30,37,49] and average adult Japanese male,[50] and ICRP reference height and weight of adult female.[35]

Phantom	Race	Gender	Height (cm)	Weight (kg)	Posture
JF	Japanese	Female	152	44	Supine
Onago	Japanese	Female	161	57	Supine
Regina	Caucasoid	Female	163	60	Supine
Donna	Caucasoid	Female	176	79	Supine
Helga	Caucasoid	Female	170	81	Supine
Irene	Caucasoid	Female	163	51	Supine
Adult Japanese average	Japanese	Female	155	52	-
ICRP reference value	Caucasoid	Female	163	60	-

Table 2-3 summarizes the organ masses of the high-resolution JAEA voxel phantoms,[36,37,39] along with the average[50] of Japanese adult male and female. Since JM and JM2 were developed from CT images of the identical person, the masses of most organs in both phantoms are consistent within 5 %. However, larger differences in the masses exist in the adrenals, breast, bronchi, heart and liver between the two phantoms. Among the organs in above, the maximum difference of 18 % can be found in the bronchi. The reasons for these differences are attributed mainly to the organ size and to subjective judgments of the phantom developers in the determination of the anatomical boundary of organs and tissues. The organ masses of JM and JM2 phantoms agreed with the Japanese averages[50] within 30 %, except for the adipose, bronchi, hard bone, small intestine and upper large intestine. The skeleton tissue is determined in different ways between the two voxel phantoms and the Japanese average. The skeleton tissue in the voxel phantoms was automatically segmented by using the grey values relating to the tissue density. On the other hand, the average masses of adult Japanese were

obtained from the autopsy, in which the skeleton tissues in whole body were dissected into the hard bone, marrow, cartilage and peripheral connective tissue. These procedures have relatively large measurement error because of the manual procedures. Similarly to the case of hard bone, the masses of adipose tissue were also derived from the differences in tissue identification methods between the voxel phantoms and Japanese average.[50] The Japanese average of adipose mass was anatomically obtained from the autopsy. In the autopsy, the adipose tissues were distinguished from the tendons and fasciae. These tissues in the voxel phantoms were unable to be segment, since the densities of these tissues were similar to that of the adipose tissue.

There are small differences (< 5%) in masses of brain and skin between JF and average Japanese.[50] Most organs of the JF phantom, however, are smaller than the averages of Japanese adult female. Especially, the masses of the adrenals, the spleen and the thyroid in JF phantom are less than half of the averages of Japanese adult female. The JF phantom has not lean or fat body compared with the average Japanese adult female, since the mass ratios of adipose or muscle to whole body in JF are almost the same as those of Japanese averages, respectively. The masses of organs and tissues containing adipose and muscle of JF are generally small, corresponding to its body size.

Tables 2-4 and 2-5 show the elemental compositions of organs and tissues assigned to the adult male (JM and JM2) and the female (JF) voxel phantoms, respectively. Except for the bone tissue, the composition data are obtained from the data for adult given in the ICRP Publication 89[35] and the ICRU Report 44.[38] Except for the bone tissues and teeth, the densities are referred to the ICRU Report 46.[51] The teeth density by Schlattl et al.[49] was adopted for that in the high-resolution JAEA voxel phantoms. The materials for skeleton tissue, which consists of hard bone and bone marrow containing active and inactive marrows, are refereed to the elemental compositions and densities by Veit et al.[11]

Table 2-3 Organ masses of three high-resolution JAEA voxel phantoms[36,37,39] and the averages of Japanese adult male and female.[50]

Organ and organ content	Mass (kg)				
	JM	JM2	JF	Japanese average	
				Male	Female
Adipose	18.734	18.885	11.074	11.000	13.000
Adrenals	0.012	0.011	0.006	0.014	0.013
Bladder content	0.117	0.110	0.061	0.100	0.085
Bladder	0.037	0.036	0.020	0.040	0.030
Bone marrow	3.732	3.730	2.740	3.900	3.000
Brain	1.688	1.686	1.342	1.470	1.320
Breast	0.090	0.099	0.581	—	—
Bronchi	0.009	0.011	0.014	0.026	0.020
Esophagus	0.036	0.035	0.049	0.040	0.030
Eyes	0.014	0.014	0.015	0.015	0.012
Eye lenses	0.0004	0.0004	0.0008	0.0004	0.0003
Gall bladder content	0.010	0.011	0.002	0.050	0.038
Gall bladder	0.007	0.007	0.004	0.008	0.006
Hard bone	7.320	7.318	4.639	4.500	3.400
Heart content	0.417	0.344	0.369	0.400	0.300
Heart	0.529	0.501	0.280	0.380	0.320
Kidneys	0.265	0.263	0.213	0.320	0.280
Liver	1.305	1.400	1.179	1.600	1.400
Lower large intestine content	0.244	0.221	0.237	0.140	0.110
Lower large intestine	0.116	0.117	0.113	0.150	0.120
Lungs	1.361	1.408	1.093	1.200	0.910
Muscle	26.178	26.494	17.830	25.000	20.000
Ovaries	—	—	0.007	—	0.011
Pancreas	0.118	0.117	0.095	0.130	0.110
Skin	2.225	2.219	1.730	2.400	1.800
Small intestine content	0.330	0.202	0.169	0.350	0.270
Small intestine	0.423	0.417	0.373	0.590	0.450
Spleen	0.139	0.141	0.056	0.140	0.120
Stomach content	0.383	0.336	0.411	0.240	0.180
Stomach	0.122	0.120	0.104	0.140	0.110
Testes	0.036	0.037	—	0.037	—
Thymus	0.031	0.031	0.019	0.030	0.029
Thyroid	0.022	0.022	0.007	0.019	0.017
Trachea	0.010	0.010	0.017	0.009	0.007
Upper large intestine content	0.347	0.268	0.265	0.220	0.170
Upper large intestine	0.132	0.135	0.119	0.180	0.140
Uterus	—	—	0.046	—	0.070

Table 2-4 List of materials, their elemental compositions (percentage by mass) and densities for the JM and JM2 phantoms.

Material	ID	H	C	N	O	Na	Mg	P	S	Cl	K	Ca	Fe	I	Ar	Density (g/cm^3)
Bulk soft tissues	m31	10.5	25.6	2.7	60.2	0.1		0.2	0.3	0.2	0.2					1.03
Muscle	m32	10.2	14.3	3.4	71.0	0.1		0.2	0.3	0.1	0.4					1.05
Skin	m33	10.0	20.4	4.2	64.5	0.2		0.1	0.2	0.3	0.1					1.09
Adipose	m34	11.4	59.8	0.7	27.8	0.1			0.1	0.1						0.95
Breast	m35	11.4	59.8	0.7	27.8	0.1			0.1	0.1						0.95
Lungs	m36	10.3	10.5	3.1	74.9	0.2		0.2	0.3	0.3	0.2					0.26
Teeth	m37	2.2	9.5	2.9	42.1		0.7	13.7				28.9				2.75
Bladder	m41	10.5	9.6	2.6	76.1	0.2		0.2	0.2	0.3	0.3					1.04
Brain	m42	10.7	14.5	2.2	71.2	0.2		0.4	0.2	0.3	0.3					1.04
Eyes	m43	9.6	19.5	5.7	64.6	0.1		0.1	0.3	0.1						1.07
Heart	m44	10.4	13.9	2.9	71.8	0.1		0.2	0.2	0.2	0.3					1.05
Kidneys	m45	10.3	13.2	3.0	72.4	0.2		0.2	0.2	0.2	0.2	0.1				1.05
Liver	m46	10.3	18.6	2.8	67.1	0.2		0.2	0.3	0.2	0.3					1.05
Pancreas	m47	10.6	16.9	2.2	69.4	0.2		0.2	0.1	0.2	0.2					1.04
Spleen	m48	10.3	11.3	3.2	74.1	0.1		0.3	0.2	0.2	0.3					1.06
GI-tract	m49	10.6	11.5	2.2	75.1	0.1		0.1	0.1	0.2	0.1					1.03
Thyroid	m50	10.4	11.9	2.4	74.5	0.2		0.1	0.1	0.2	0.1			0.1		1.05
Blood (heart content)	m51	10.2	11.0	3.3	74.5	0.1		0.1	0.2	0.3	0.2		0.1			1.06
Testes	m52	10.6	9.9	2.0	76.6	0.2		0.1	0.2	0.2	0.2					1.04
Bone01 (marrow-70wt%)	m11	9.0	41.0	2.8	37.4	0.1	0.1	3.2	0.1			6.3	0.001			1.12
Bone02 (marrow-54wt%)	m12	8.1	34.9	3.1	39.1	0.1	0.1	4.9	0.2			9.7	0.001			1.25
Bone03 (marrow-45wt%)	m13	7.5	31.5	3.3	40.0	0.1	0.1	5.8	0.2			11.5				1.32
Bone04 (marrow-36wt%)	m14	6.9	28.1	3.5	40.9	0.1	0.1	6.7	0.2			13.4				1.39
Bone05 (marrow-24wt%)	m15	6.2	23.5	3.7	42.1	0.05	0.2	8.0	0.2			16.0				1.49
Bone06 (marrow-10wt%)	m16	5.3	18.2	4.0	43.6	0.02	0.2	9.5	0.3			18.9				1.64
Bone07 (marrow:00wt%)	m17	4.7	14.4	4.2	44.6		0.2	10.5	0.3			21.0				1.77
Air	m99		0.01	75.5	23.2										1.3	1.204E-3

The composition data are referred to the data for adult given in the ICRP Publication 89,[35] the ICRU Report 44[38] and the Veit et al.[11]

Table 2-5 List of materials, their elemental compositions (percentage by mass) and densities for the JF phantom.

Material	ID	H	C	N	O	Na	Mg	P	S	Cl	K	Ca	Fe	I	Ar	Density (g/cm^3)
Bulk soft tissues	m31	10.5	25.6	2.7	60.2	0.1		0.2	0.3	0.2	0.2					1.03
Muscle	m32	10.2	14.3	3.4	71.0	0.1		0.2	0.3	0.1	0.4					1.05
Skin	m33	10.0	20.4	4.2	64.5	0.2		0.1	0.2	0.3	0.1					1.09
Adipose	m34	11.4	59.8	0.7	27.8	0.1			0.1	0.1						0.95
Breast	m35	11.6	51.9		36.5											0.94
Lungs	m36	10.3	10.5	3.1	74.9	0.2		0.2	0.3	0.3	0.2					0.26
Teeth	m37	2.2	9.5	2.9	42.1		0.7	13.7				28.9				2.75
Bladder	m41	10.5	9.6	2.6	76.1	0.2		0.2	0.2	0.3	0.3					1.04
Brain	m42	10.7	14.5	2.2	71.2	0.2		0.4	0.2	0.3	0.3					1.04
Eyes	m43	9.6	19.5	5.7	64.6	0.1		0.1	0.3	0.1						1.07
Heart	m44	10.4	13.9	2.9	71.8	0.1		0.2	0.2	0.2	0.3					1.05
Kidneys	m45	10.3	13.2	3.0	72.4	0.2		0.2	0.2	0.2	0.2	0.1				1.05
Liver	m46	10.3	18.6	2.8	67.1	0.2		0.2	0.3	0.2	0.3					1.05
Pancreas	m47	10.6	16.9	2.2	69.4	0.2		0.2	0.1	0.2	0.2					1.04
Spleen	m48	10.3	11.3	3.2	74.1	0.1		0.3	0.2	0.2	0.3					1.06
GI-tract	m49	10.6	11.5	2.2	75.1	0.1		0.1	0.1	0.2	0.1					1.03
Thyroid	m50	10.4	11.9	2.4	74.5	0.2		0.1	0.1	0.2	0.1			0.1		1.05
Blood (heart content)	m51	10.2	11.0	3.3	74.5	0.1		0.1	0.2	0.3	0.2		0.1			1.06
Ovaries	m52	10.5	9.3	2.4	76.8	0.2		0.2	0.2	0.2	0.2					1.05
Uterus	m53	10.6	31.5	2.4	54.7	0.1		0.2	0.2	0.1	0.2					1.02
Bone01 (marrow-70wt%)	m11	9.0	41.0	2.8	37.4	0.1	0.1	3.2	0.1			6.3	0.001			1.16
Bone02 (marrow-53wt%)	m12	8.0	34.5	3.1	39.2	0.1	0.1	5.0	0.2			9.9	0.001			1.26
Bone03 (marrow-45wt%)	m13	7.5	31.5	3.3	40.0	0.1	0.1	5.8	0.2			11.5				1.32
Bone04 (marrow-36wt%)	m14	6.9	28.1	3.5	40.9	0.1	0.1	6.7	0.2			13.4				1.39
Bone05 (marrow-25wt%)	m15	6.3	23.9	3.7	42.0	0.1	0.2	7.9	0.2			15.7				1.49
Bone06 (marrow-10wt%)	m16	5.3	18.2	4.0	43.6	0.02	0.2	9.5	0.3			18.9				1.64
Bone07 (marrow-00wt%)	m17	4.7	14.4	4.2	44.6		0.2	10.5	0.3			21.0				1.77
Air	m99		0.01	75.5	23.2										1.3	1.204E-3

The composition data are referred to the data for adult given in the ICRP Publication 89,[35] the ICRU Report 44[38] and the Veit et al.[11]

2.4 Bone marrow distribution models

As described in Section 2.2, the skeletal system consists of the composite tissue. In the phantoms at GSF, Otoko and Onago, the mass fractions of hard bone and bone marrow were quantified in all voxels of the bone tissue by referring to their grey values, which reflected the densities in the voxels. It was assumed that 1) voxels with grey values below 800 are bone marrow only, 2) voxels with grey values between 800 and 2040 consist of a mixture of bone marrow and hard bone, and 3) voxels with grey values higher than 2040 are regarded as hard bone only.[10,11,13,29,30] This bone model is called as 'the GSF-distribution model' hereinafter. These grey value thresholds were decided so that the bone marrow masses of the high-resolution JAEA voxel phantoms coincided with the average mass[50] of adult Japanese. As a result of the interpolation from original grey values, the total masses of bone marrow of JM, JM2 and JF agreed with the Japanese average values[50] within 10%. The data of bone density referring to the grey value were stored as ASCII text data (hereinafter 'bone density data'), such as the organ segmented data in section 2.2. The EGS4-based dose calculation user codes,[40-43] which were developed at JAEA, can derive absorbed doses to the bone tissue by using the bone density data combined with the organ segmented data.

In addition, a new bone model was developed to calculate energy deposition separately in bone marrow and hard bone with only the organ segmented data. The new model is called as 'the Approx-distribution model'. The bone tissue of the high-resolution JAEA voxel phantoms was divided into seven materials, according to the grey values. Tables 2-4 and 2-5 list the mass fraction of bone marrow and density for each material. The total skeleton has slightly different densities between the male (1.41g/cm^3) and the female phantoms (1.38g/cm^3) due to the mass fraction of bone marrow. The density data agreed well with the Japanese averages (male: 1.40 g/cm^3, female: 1.37 g/cm^3).[50] Then, the skeletal was segmented into 140 regions (7 materials x 20 anatomical regions) over the whole body in the Approx-distribution model, as listed in the tables in Appendix C.

Tables 2-6, 2-7 and 2-8 show the masses of active and inactive marrows in twenty anatomical bone regions, which were calculated with the data in ICRP Publication 89.[35] At first, the total bone marrow mass was allocated to active and inactive marrows over the whole skeleton system, according to the data of bone composition. The active marrow mass in each bone region was defined from the percentage of active marrow over the whole body for an adult. The total masses of bone marrow and hard bone agreed well between the Approx-distribution model and the GSF distribution model for the same phantoms, as listed in Tables 2-6, 2-7 and 2-8.

Table 2-6 Masses of bone tissues in the JM phantom.

Bone	Mass (g)			
	Active marrow	Inactive marrow	Hard bone	Total
Cranium	92	173	1082	1347
Mandible	9	24	132	165
Cervical vertebrae	46	15	146	207
Thoracic vertebrae	188	74	392	654
Lumbar vertebrae	144	104	338	585
Sacrum	116	7	143	265
Clavicles	10	22	80	112
Scapulae	34	63	213	310
Sternum	37	11	60	107
Ribs	188	207	551	945
Os coxae	222	190	646	1057
Humeri, upper half	29	86	193	307
Humeri, lower half	0	78	211	289
Ulnae and radii	0	100	263	363
Wrist and hand bones	0	70	153	224
Femora, upper half	85	138	503	726
Femora, lower half	0	324	603	927
Tibiae, fibiae, patellae	0	536	1045	1581
Ankle and foot bones	0	315	565	880
Os hyoideum	0	1	3	4
Total	1196	2536	7322	11054
Total (GSF-distribution)[46]	(total marrow)	3734	7318	11052

Table 2-7 Masses of bone tissues in the JM2 phantom.

Bone	Mass (g)			
	Active marrow	Inactive marrow	Hard bone	Total
Cranium	92	173	1082	1347
Mandible	9	24	132	165
Cervical vertebrae	45	15	146	207
Thoracic vertebrae	188	74	392	654
Lumbar vertebrae	144	104	338	585
Sacrum	116	7	143	265
Clavicles	10	22	80	112
Scapulae	34	63	213	310
Sternum	37	11	60	107
Ribs	187	207	551	945
Os coxae	221	190	646	1057
Humeri, upper half	29	86	193	307
Humeri, lower half	0	78	211	289
Ulnae and radii	0	100	261	361
Wrist and hand bones	0	70	154	224
Femora, upper half	84	139	503	726
Femora, lower half	0	324	603	927
Tibiae, fibiae, patellae	0	534	1044	1578
Ankle and foot bones	0	314	565	878
Os hyoideum	0	1	3	4
Total	1195	2534	7318	11047
Total (GSF-distribution)[46]	(total marrow)	3728	7320	11048

Table 2-8 Masses of bone tissues in the JF phantom.

Bone	Mass (g)			
	Active marrow	Inactive marrow	Hard bone	Total
Cranium	70	161	822	1053
Mandible	7	11	92	110
Cervical vertebrae	35	9	87	130
Thoracic vertebrae	144	58	262	464
Lumbar vertebrae	110	95	252	457
Sacrum	88	39	113	241
Clavicles	7	15	47	69
Scapulae	26	41	127	194
Sternum	28	6	29	62
Ribs	143	99	308	550
Os coxae	169	130	448	748
Humeri, upper half	22	55	114	192
Humeri, lower half	0	38	97	135
Ulnae and radii	0	82	162	243
Wrist and hand bones	0	74	99	173
Femora, upper half	65	90	316	471
Femora, lower half	0	225	351	576
Tibiae, fibiae, patellae	0	388	612	1000
Ankle and foot bones	0	211	297	508
Os hyoideum	1	1	2	4
Total	913	1827	4639	7379
Total (GSF-distribution)[46]	(total marrow)	2731	4658	7389

2.5 Organ movement by the changes in posture

Figure 2-3 depicts the views of the organs in the trunks of JM2 and JM. It is found that several organs such as the liver, stomach and small intestine of JM2 move toward the legs due to gravity in upright posture. On the other hand, the positions of the bladder, lower large intestine and upper large intestine are not changed by posture, since these organs are supported by the pelvis at the bottom of the torso.

Table 2-9 shows the differences in the distances between the centers of gravity of selected organs (referred to as organ distance) between the JM2 and JM phantoms. The values shown in the table are calculated by subtracting the organ distances of JM from those of JM2. For example, the minus value means that the distance between two organs is shortened by changing the posture from supine to upright. The organ distances between most organs are varied by changes in posture. The relatively large variations were found in the gall bladder, kidneys and stomach, since theses organs are joined to the surrounding organs by the connective tissues. The largest difference can be seen in kidneys (23.2mm for ‘testes-kidneys’, 23.1mm for ’esophagus-kidneys’). If the position of the brain is set as the reference point, the adrenals, gall bladder, kidneys, liver, small intestine and stomach are more than 10 mm further away to the leg direction in JM2 than in JM. On the other hand, the movement distances are relatively short (less than 5 mm) for bladder, esophagus, lower large intestine, lungs, pancreas, spleen, testes, thymus, thyroid and upper large intestine, because these organs are

connected with the surrounding organs, and are supported by bone tissues such as rib, spine, sacrum and os coxae. Table 2-10 shows the movement of the centers of gravity of each organ. In front-back axis, the minus value means that an organ moves toward the front direction. In left-right axis, the movement distance is expressed with a minus value, when an organ moves toward the left direction. This result indicates that the spine above the waist in JM2 is bent compared with that of JM to keep body balance. In particular, the large movement distances toward the front direction reflect the body shape that the JM2 is a backward-bent posture.

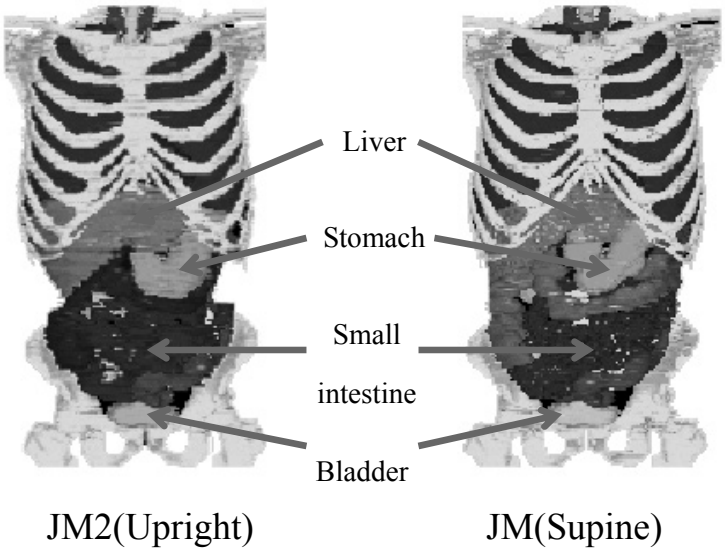

Figure 2-3 Views of organs in the trunks of JM2 and JM.[45)]

Table 2-9 Variations in the distances between the centers of gravity of selected organs in the JM and JM2 phantoms.

Organs	Difference in organ distances (JM2-JM) (mm)																	
	Adrenals	BLW*[1]	Brain	Esophagus	GBW*[2]	Heart	Kidneys	Liver	LLIW*[3]	Lungs	Pancreas	SIW*[4]	Spleen	STW*[5]	Testes	Thymus	Thyroid	ULIW*[6]
Adrenals	–	-11.3	10.0	15.1	-4.5	6.6	7.2	-12.4	-5.5	11.5	-0.1	1.9	3.6	14.3	-11.3	8.7	8.9	-13.0
BLW*[1]	-11.3	–	0.0	4.0	-16.1	-7.3	-22.3	-9.1	-4.9	0.9	-5.0	-10.5	-7.9	14.1	0.0	-0.4	-0.2	-2.4
Brain	10.0	0.0	–	-4.6	19.2	7.9	18.9	10.4	2.4	-3.3	4.9	12.1	-1.2	-10.4	1.0	1.8	0.3	3.1
Esophagus	15.1	4.0	-4.6	–	22.5	22.3	23.1	12.6	-12.7	11.2	10.5	16.9	2.2	20.6	4.8	3.0	-5.0	6.4
GBW*[2]	-4.5	-16.1	19.2	22.5	–	7.4	-1.0	10.3	7.1	1.4	-12.6	-1.0	-6.2	5.1	-18.5	15.4	18.2	-13.7
Heart wall	6.6	-7.3	7.9	22.3	7.4	–	12.1	-0.2	-3.3	15.7	-3.5	3.6	-3.7	5.8	-8.2	-0.2	6.7	-7.6
Kidneys	7.2	-22.3	18.9	23.1	-1.0	12.1	–	4.4	-18.8	18.9	-2.0	-13.2	-0.5	-1.5	-23.2	15.5	17.3	-18.5
Liver	-12.4	-9.1	10.4	12.6	10.3	-0.2	4.4	–	-6.7	-0.7	-12.9	0.5	-11.2	7.0	-10.0	7.1	9.1	-5.8
LLIW*[3]	-5.5	-4.9	2.4	7.1	-12.7	-3.3	-18.8	-6.7	–	6.6	0.6	-4.9	-2.6	-8.1	-3.0	2.5	2.4	-2.6
Lungs	11.5	0.9	-3.3	1.4	11.2	15.7	18.9	-0.7	6.6	–	8.0	14.0	10.2	22.1	1.5	-4.6	-5.9	-0.7
Pancreas	-0.1	-5.0	4.9	10.5	-12.6	-3.5	-2.0	-12.9	0.6	8.0	–	6.5	1.5	15.6	-5.2	3.2	4.4	-12.0
SIW*[4]	1.9	-10.5	12.1	16.9	-1.0	3.6	-13.2	0.5	-4.9	14.0	6.5	–	2.9	1.8	-11.7	11.0	12.0	0.5
Spleen	3.6	-7.9	-1.2	2.2	-6.2	-3.7	-0.5	-11.2	-2.6	10.2	1.5	2.9	–	-7.5	-6.2	-2.7	-2.7	-12.9
STW*[5]	14.3	-10.4	14.1	20.6	5.1	5.8	-1.5	7.0	-8.1	22.1	15.6	1.8	-7.5	–	-10.8	14.4	15.0	-6.4
Testes	-11.3	0.0	1.0	4.8	-18.5	-8.2	-23.2	-10.0	-3.0	1.5	-5.2	-11.7	-6.2	-10.8	–	0.0	0.8	-3.5
Thymus	8.7	-0.4	1.8	3.0	15.4	-0.2	15.5	7.1	2.5	-4.6	3.2	11.0	-2.7	14.4	0.0	–	2.6	0.8
Thyroid	8.9	-0.2	0.3	-5.0	18.2	6.7	17.3	9.1	2.4	-5.9	4.4	12.0	-2.7	15.0	0.8	2.6	–	2.4
ULIW*[6]	-13.0	-2.4	3.1	6.4	-13.7	-7.6	-18.5	-5.8	-2.6	-0.7	-12.0	0.5	-12.9	-6.4	-3.5	0.8	2.4	–

*[1]BLW: Bladder wall.; *[2]GBW: Gall bladder wall.; *[3]LLIW: Lower large intestine wall.; *[4]SIW: Small intestine wall.; *[5]STW: Stomach wall.; *[6]ULIW: Upper large intestine

Table 2-10 Movement of the centers of gravity of each organ, when the location of brain is considered as reference point.

Organ	Movement distance (JM2-JM) (mm)	
	Front-back axis	Left-right axis
Adrenals	-22.0	-4.8
Bladder wall	-18.9	19.0
Brain	0.0	0.0
Esophagus	-9.6	0.9
Gall bladder wall	-30.0	13.4
Heart wall	-31.4	3.3
Kidneys	-33.2	14.3
Liver	-22.5	11.0
Lower large intestine wall	-19.2	13.9
Lungs	-16.1	-19.9
Pancreas	-24.0	-0.3
Small intestine wall	-23.7	12.2
Spleen	-22.5	-0.4
Stomach	-20.6	18.9
Testis	-18.9	18.1
Thymus	-15.0	2.1
Thyroid	-5.0	0.7
Upper large intestine wall	-23.5	20.2

3. Impact of posture on internal dose assessment

ICRP will present a new data set of dose coefficients, which are calculated using the SAFs obtained from the reference voxel phantoms constructed from supine CT images of Caucasian adult male and female.[33] The organ doses are influenced by posture, since the changes of posture cause the changes of the locations and shapes of organs and tissues. In particular, the effects of posture will be more sensitive in internal exposures, because the SAF is affected by the positions and shapes of both source and target organs. Therefore, it is of importance to clarify the variation in organ doses caused by the posture changes to use the dose coefficients, which will be presented by ICRP.

The SAF is calculated by dividing the absorbed fraction (AF) by the unit mass (kg) of the target organ. AF is defined as the fraction of energy absorbed by a target as a result of nuclear transformation of radionuclides in a source organ. Therefore, systematic analysis of SAFs and organ doses are needed to clarify the effects of posture on internal dose assessment. This chapter describes the impact of posture on internal dose assessment clarified by using JM2 and JM.[45]

3.1 Code system and calculation conditions of SAFs

The SAFs for monoenergetic photons were calculated using a SAF calculation system, which consists of EGS4[44] and an EGS4 user code, UCSAF.[31] The EGS4 is a general-purpose package for the coupled transport of photons and electrons in an arbitrary geometry for particles with energies from a few keV up to several TeV. The UCSAF is used for modeling complicated geometries of voxel phantoms by an extended FORTRAN language named MORTRAN. The code system was installed on the Kansai ITBL super computer system, PRIMEPOWER (Fujitsu Limited, Japan) of JAEA. The computer system, which consists of 128 processor elements, was used to reduce the CPU time for calculation of SAFs for low energy photons by parallel processing.

In the photon transport, photoelectric effect, coherent scattering, Compton scattering and pair production were considered. The primary and secondary photons were followed until their energy fell to 1 keV. The mean free path of 1 keV photons in the ICRU soft tissue[38] is 0.0025 mm, and is extremely short compared with the voxel size ($0.98 \times 0.98 \times 1$ mm^3) of the high-resolution JAEA voxel phantoms. The cross-section data for photons were obtained from PHOTX.[52,53] Mϕller scattering, Bhabha scattering, bremsstrahlung emission and elastic multiple scattering were taken into account for the electron transport. The primary and secondary electrons produced from photon interactions were tracked until their kinetic energy fell to 5 keV; the kerma approximation was not applied. The Parameter Reduced Electron-Step Transport Algorithm (PRESTA) was adopted to optimize the step size of the electron transport model. The stopping power of electrons was taken from the ICRU Report 37.[54] The cross-section data for photons and the stopping power of electrons were calculated by using the EGS4 preprocessor named PEGS4, respectively.

Monoenergetic photon or electron sources were assumed to be distributed uniformly in the source region. The number of primary photons or electrons was set to achieve fraction standard deviations of less than 5% in the deposited energy of each target organ. The calculations of SAFs

containing the self-specific absorbed fractions (Self-SAFs) for photons or electrons were performed for 12 energies from 0.01 to 4 MeV and for combinations of 25 target and 33 source organs. In Appendix-E, some calculated photon SAFs are tabulated for selected combinations of source and target organs.

The GSF-distribution model (see, Section 2.4)[10,11,13,29,30] was used for the radiation transport in the bone tissues. The radiation transport simulation in bone tissues was made by sampling the material data for each voxel calculated by using mass fractions of bone marrow and hard bone.

3.2 Photon emitters used for the calculation of organ doses

3.2.1 Posture effects to Self-SAFs by exposure to internal electron sources

Figure 3-1 shows the energy dependence of the Self-SAFs for photons and electrons in some organs of the JM and JM2 phantoms. In all calculated energies, the Self-SAFs for electrons are significantly higher than those for photons. Generally, the contributions of the Self-SAFs to organ doses are relatively large compared with those of the SAFs, where a source organ is not identical with a target organ. Especially, most electrons emitted from the radionuclides are absorbed in a source region due to its short range, while little energy can be deposited to other organs. In addition, the electron Self-SAFs are strongly dependent on the organ masses (Figure 3-2). The organ masses are almost the same between the JM and the JM2 phantoms, because rhe two phantoms were constructed from the same subject. Thus, the electron Self-SAFs in JM agreed well with those in JM2 within 5% (Figures 3-1 and 3-2). These results indicate that the posture changes do not significantly influence the organ doses from internal electron sources.

3.2.2 Characteristics of photon emitters

For the clarification of the posture effects on internal dosimetry, it has only to investigate the posture effects to organ doses by photons in this study. Then, the organ doses by only photons emitted from the radionuclides were considered. Table 3-1 shows the characteristics of 8 radionuclides used for organ dose calculation. The eight radionuclides were selected in view of their biokinetic behaviors and decay characteristics, as described below. Barium and cesium are distributed to soft tissues of the whole body, while tungsten is mainly distributed to kidneys, liver and spleen, which are located in the middle part of the torso, and to the skeleton. It was expected that the effects of posture on organ doses could be clarified by comparing the organ doses of these elements with different biokinetic behaviors.

The mean energy of photons in Table 3-1 is obtained by dividing the total emitted energy of gamma-rays, X-rays and annihilation photons by their total yield per nuclear transformation. The maximum energy denotes the maximum energy of the emitted photons from the nuclide. The energy spectra of photons emitted from the 8 radionuclides were taken from a nuclear decay database DECDC2 (Figure 3-3).[55] ^{126}Ba decays with electron capture and β^+, and transfers to the ground state of ^{126}Cs via many excited states of ^{126}Cs with a total branching of 69%. Gamma-rays are emitted in the transitions from the excited states. Thus, the intensities of gamma-rays in the range from 0.1 to 1.293 MeV are significant compared with those of X-rays which are less than 0.035 MeV, produced from electron capture and internal conversion processes. Similar photon spectra, which produce more

intense gamma-rays emitted from the excited states of daughter nuclides than X-rays, are found in ^{133}Ba, ^{130}Cs and ^{190}W. On the other hand, X-rays are dominant in ^{128}Ba, ^{131}Cs, ^{178}W and ^{179}W, since these nuclides mainly transform directly to the ground state of daughter nuclides, emitting X-rays by the electron capture process. The variation in the organ doses by posture change can be discussed by analyzing the organ doses based on photon spectra of Figure 3-3 and the posture-dependent SAFs.

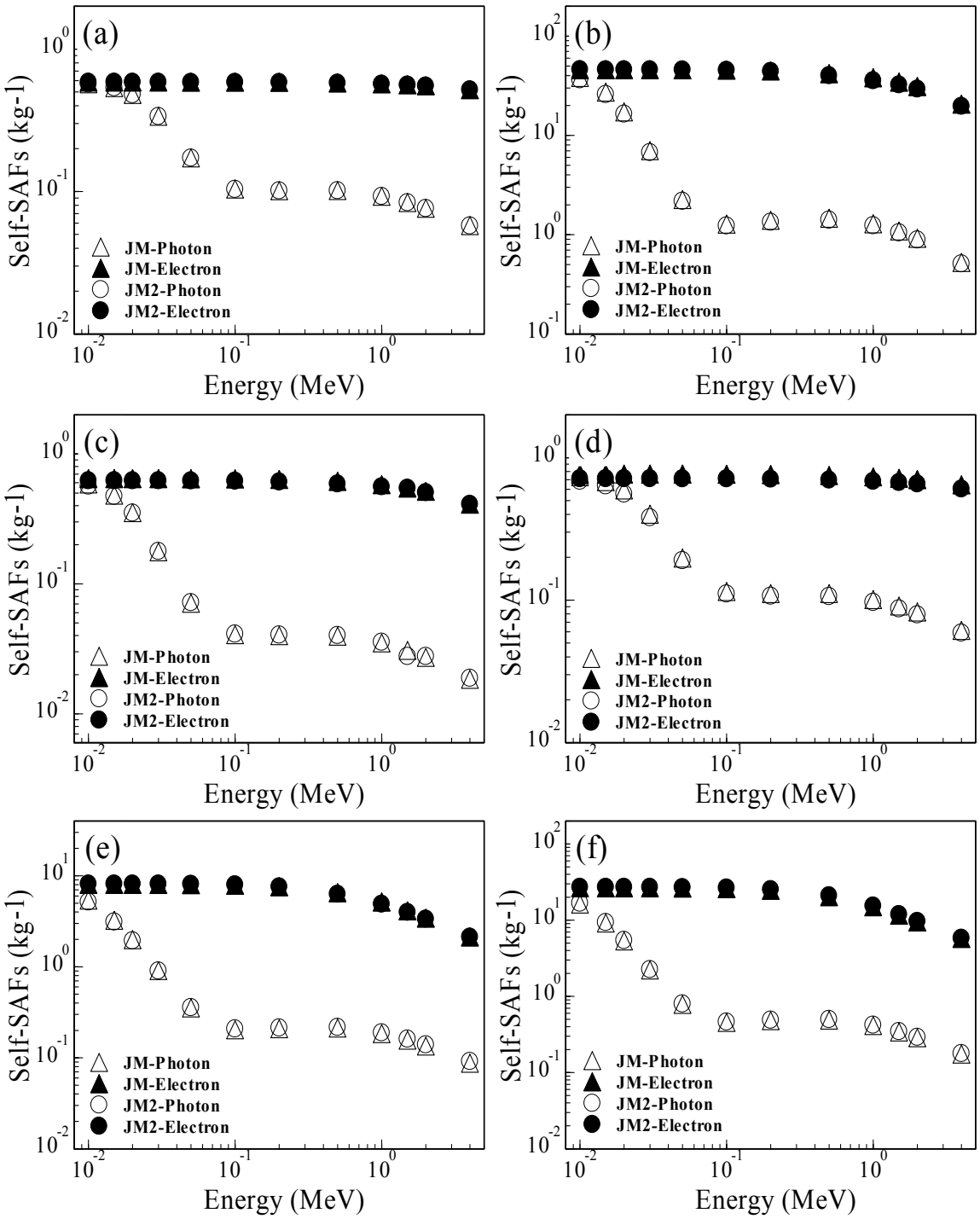

Figure 3-1 Self-SAFs for photons or electrons in selected organs of the JM and JM2 phantoms. (a) Brain, (b) Thyroid, (c) Lung, (d) Liver, (e) Stomach and (f) Bladder.

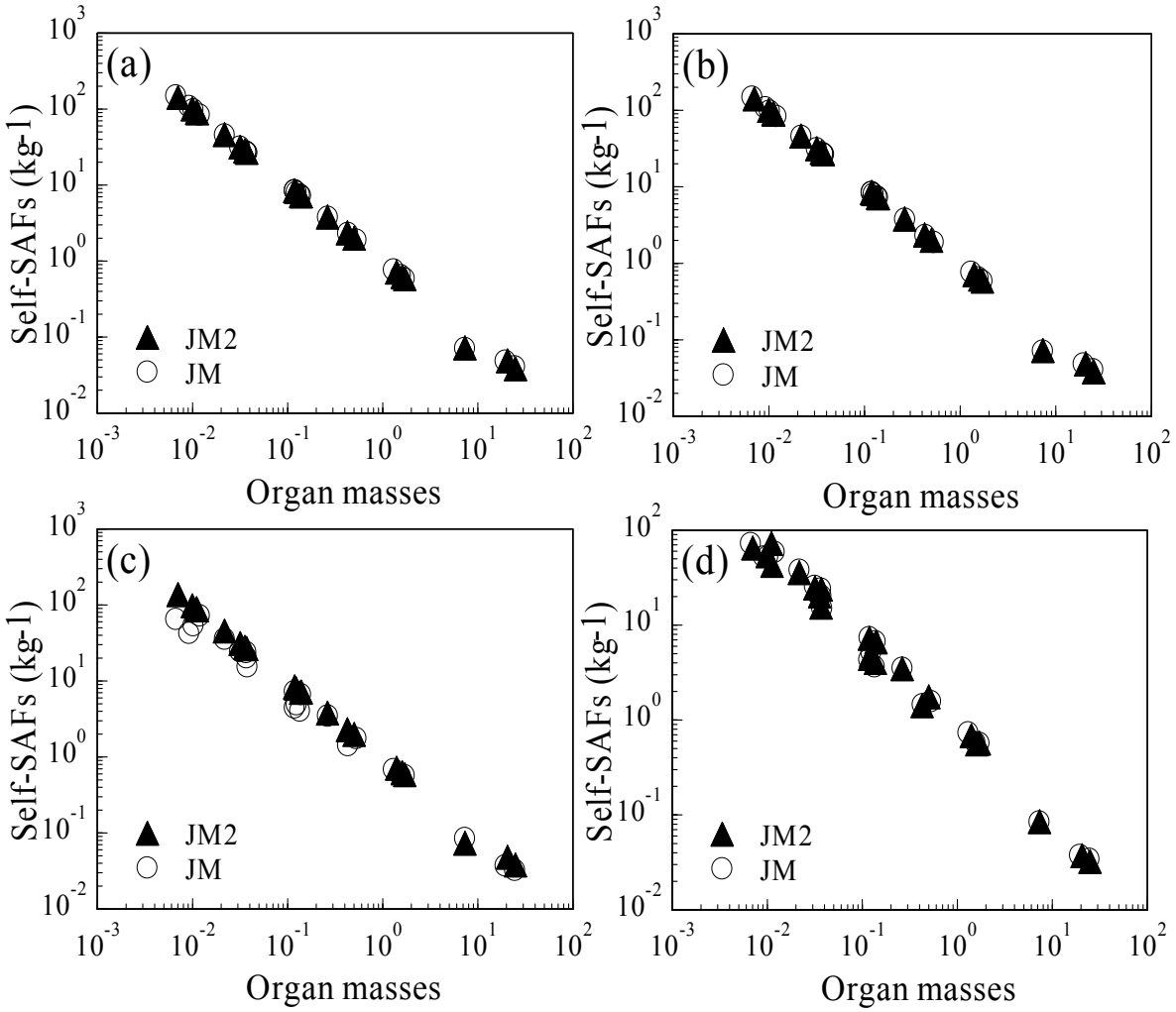

Figure 3-2 Relationship between electron Self-SAFs and organ masses in 23 organs of the JM2 and JM phantoms. (a) 0.01MeV, (b) 0.03MeV, (c) 0.1MeV and (d) 1MeV.

Table 3-1 Characteristics of 8 radionuclides used for organ dose calculation.

Radionuclide	Decay mode	Half-life	Photon energy (MeV)		Deposited tissue in body
			Mean energy	Maximum energy	
^{126}Ba	EC+β^+	100 m	4.148E-2	1.293E+0	Soft tissues (whole body)
^{128}Ba	EC	2.43 d	5.236E-3	3.750E-1	
^{133}Ba	EC	10.52 y	1.701E-2	3.839E-1	
^{130}Cs	EC+β^+, β^-	29.21 m	6.360E-2	2.504E+0	
^{131}Cs	EC	9.689 d	1.824E-3	3.455E-2	
^{178}W	EC	21.6 d	1.641E-3	6.756E-2	Kidneys, liver, spleen and skeleton
^{179}W	EC	37.05 m	3.248E-3	1.339E-1	
^{190}W	β^-	30 m	1.088E-2	1.621E-1	

The decay characteristics were taken from DECDC2.[55)]

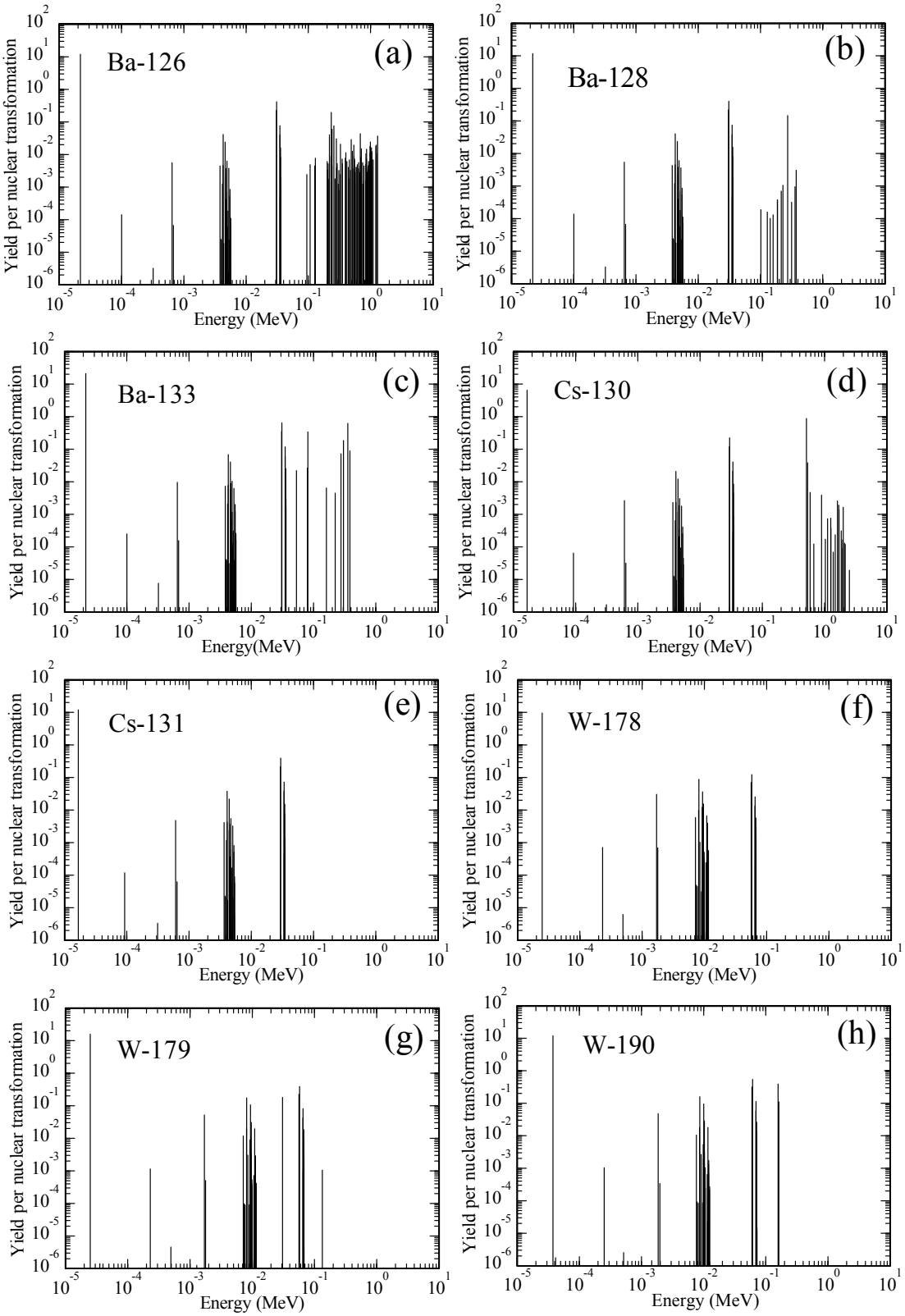

Figure 3-3 Energy spectra of photons emitted from (a) ^{126}Ba, (b) ^{128}Ba, (c) ^{133}Ba, (d) ^{130}Cs, (e) ^{131}Cs, (f) ^{178}W, (g) ^{179}W and (h) ^{190}W. The photon spectra were taken from DECDC2.[55)]

3.3 Calculation of organ doses due to the intake of selected radionuclides

The organ doses caused by the intake of unit activity of radionuclides, $D_{\text{T-intake}}$ (Gy Bq^{-1}), were calculated with following equation.

$$D_{\text{T-intake}} = \sum_{S} \left\{ 1.602 \times 10^{-13} \times \sum_{i} E_i Y_i SAF(T \leftarrow S)_i \times U_{50}(S) \right\}$$

where 1.602×10^{-13} is a constant which converts unit of MeV to unit of J, E_i is the mean energy (MeV) of gamma-ray or X-ray i, Y_i is the yield of gamma-ray or X-ray i per nuclear transformation, $SAF(T\leftarrow S)_i$ is defined as the fraction of energy of gamma-ray or X-ray i emitted by nuclear transformation of radionuclide in a source region S which is absorbed by 1 kg of a target organ T. The photons of energy below 0.01 MeV were assumed to be absorbed entirely by the source organ. The E_i and Y_i of each radionuclide are shown in Figure 3-3.[55] $U_{50}(S)$ is the total number of nuclear transformations caused by the intake of unit activity over 50 years in a source region S.

For a particular energy of gamma-ray or X-ray emitted from radionuclides, SAFs were calculated by log-log interpolating between adjacent two points of 12 energies, which were defined to calculate the SAFs (see, Appendix E).

The $U_{50}(S)$ is based on the half-life values and biokinetic models of radionuclides. The $U_{50}(S)$ of each radionuclide was calculated by using the DCAL System[56] developed at Oak Ridge National Laboratory.

The following ten organs and regions as source were chosen to calculate the $D_{\text{T-intake}}$ after consideration of biokinetics models of Ba, Cs and W: bladder content, kidneys, liver, lower large intestine content, muscle, pancreas, small intestine content, spleen, stomach content and upper large intestine content.

3.4 Analysis of effects of posture on photon SAFs

Figure 3-4 shows the energy dependences of SAFs for the combinations of (a) the kidneys and (b) gall bladder wall as the target organs, and the liver as the source organ in JM2 and JM. As shown in Figure 3-4 (a), the SAFs for kidneys in JM2 were smaller than those of JM in the entire energy range. The differences were 12-16% in the SAFs of the two phantoms in the energy range from 0.05 to 4 MeV. However, the difference in SAF significantly increased with decrease in the photon energy below 0.03 MeV. The SAF for kidneys in JM2 was about 6% of that in JM at 0.01 MeV. As shown in Table 2-9, the organ distance between kidneys and liver of JM2 is longer than that of JM about 4.4 mm. In the low energy, the difference in organ distance directly affects the energy deposited in a target organ, since the mean free paths of photons in the energy range from 0.01 to 0.015MeV are 1.8–5.6 mm.

On the other hand, as shown in Figure 3-4 (b), the differences in the SAF for the gall bladder wall of JM2 and JM were within 5% at energies of more than 0.02 MeV. The maximum difference was about 23% at 0.01 MeV. This result is inconsistent with the difference in SAFs expected from the

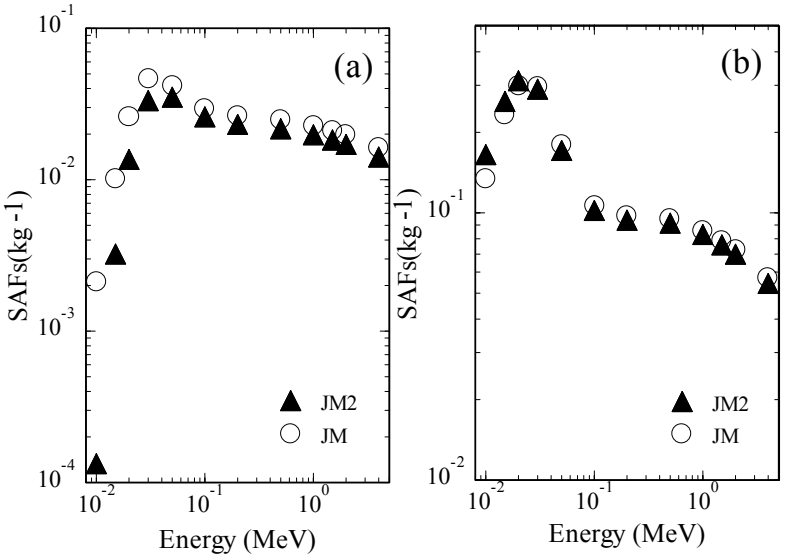

Figure 3-4 SAFs calculated using JM2 (upright posture) and JM (supine posture) for source in liver and for target in (a) kidneys and (b) gall bladder wall.[45)]

differences in organ distance (10.3 mm) given in Table 2-9. This is due to the following reasons. Although the positions of gall bladder wall and liver were moved by changes in posture, the liver of JM2 and JM directly contacts with the gall bladder wall, because of connection via bile duct to liver. Therefore, there are no significant differences in the SAFs.

Table 3-2 shows the maximum and minimum ratios of the SAFs of JM2 to those of JM for the combinations of 25 target organs and 33 source regions. These ratios depend on both the combination of source and target organs and the primary photon energy. The difference in SAF increased with decrease in photon energy. The SAFs for the adrenals, liver, small intestine wall and stomach wall of JM2 at energies below 0.015 MeV were about three orders of magnitude lower than those of JM. This significant difference lies in the change of organ distance, more 10 mm (Table 2-9). This value is several times of the mean free path of photons, 1.8–5.6 mm, in this energy range.

A large variation was found in the SAFs for the gall bladder wall and small intestine wall in the energy range from 0.02 to 0.03 MeV between the JM2 and JM phantoms. The SAFs in JM2 were 3-386% of those in JM, although no significant difference was found in the distances from the small intestine wall to the gall bladder wall in the two phantoms (Table 2-9). This can be explained by the changes in the organ sizes, which resulted from the reduction of the mass of the organ content. It was found from the CT images that the shape of the small intestine wall of JM2 was different from that of JM. The mass of small intestine content in JM2 is about 65 % of that in JM. The small intestine wall can be more easily transformed in JM2, because of its content with a smaller mass. In this case, the effective distance between the gall bladder and the small intestine wall is longer in JM2 than in JM. Then, the SAFs for these organs decreased in JM2. These results indicate that the mass of an organ content also affects the SAFs.

With energy above 0.05MeV, the differences in the SAFs between JM2 and JM decreased with increase in the photon energy. The SAF ratios of both phantoms were less than 2 in most cases.

The mean free paths of photons increased with the photon energy, e.g. 4.2 cm at 0.05 MeV and 13.5 cm at 1 MeV in the ICRU soft tissue, and the SAFs therefore become less sensitive to the change in the organ distance.

Adipose tissue, muscle, bone marrow, hard bone and skin are distributed in the whole body. As shown in Table 3-2, the ratios of the SAFs for adipose tissue of JM2 and JM below 0.02 MeV were small, while these values were relatively large in muscle, bone marrow, hard bone and skin. The maximum ratio was found to be 757 in skin at 0.015 MeV. The contact area of adipose tissue with many other organs is relatively large compared with muscle, bone marrow, hard bone and skin, so that the difference in SAF for adipose tissue was small.

Figure 3-5 shows the distributions of the ratios of the SAFs of JM2 to those of JM for 0.03 MeV photons. The SAFs were evaluated for the combinations of 3 target organs, bladder wall, esophagus and adipose, and for 33 source organs. The target organs were selected in view of their position and distribution in body. The first case is for the bladder wall, where the organ position is not changed by the posture. Many organs in the body descend in the leg direction due to gravity when changing posture from supine to upright, but the bladder wall does not change its position. This causes reduction of the organ distances between bladder wall and other organs. The reduction of organ distances tends to increase the SAFs for the bladder wall. The second case is for the esophagus. The position of esophagus is not changed with posture, so that the organ distances between the esophagus and other organs in upright are greater than those in supine; this results in the decrease in the ratio of SAFs. The third case is that of adipose tissue. Adipose tissue is widely distributed throughout the whole body. The organ distances between adipose tissue and other organs do not depend on the posture. Therefore, significant changes are not found in the SAFs for the adipose tissue of JM2 and JM. From the above results, it is concluded that the SAFs are dependent on the organ distance and the shape of organ, which are changed by posture, and the difference in the SAFs of the two postures increases with decrease in the photon energy.

Table 3-2 Range of ratios of photon SAF between JM2 and JM for the combinations of 25 target organs and 33 source regions. [45)]

Target organ	Ratios (JM2/JM) of SAFs							
	0.01MeV		0.015MeV		0.02MeV		0.03MeV	
	Min	Max	Min	Max	Min	Max	Min	Max
Adipose	2.47E-1	3.07E+0	3.41E-1	1.75E+0	4.83E-1	1.54E+0	6.94E-1	1.31E+0
Adrenal	8.19E-4	1.20E+0	4.59E-2	3.94E+0	1.46E-1	2.22E+0	3.01E-1	1.49E+0
Bladder	7.75E-1	1.25E+0	8.82E-1	3.35E+0	2.59E-1	1.71E+0	7.42E-1	2.91E+0
Bone marrow	6.66E-2	5.60E+2	3.75E-1	6.01E+0	5.83E-1	1.87E+0	7.59E-1	1.40E+0
Brain	9.68E-1	1.23E+0	9.67E-1	1.29E+0	8.42E-1	1.14E+0	8.78E-1	1.25E+0
Bronchi	9.95E-2	3.63E+0	3.61E-1	2.45E+1	5.17E-1	3.44E+0	6.72E-1	1.51E+0
Esophagus	3.21E-2	2.15E+0	5.54E-2	1.77E+0	1.20E-1	1.79E+0	2.01E-1	1.36E+0
Gall bladder	8.25E-2	8.63E+0	1.53E-1	9.08E+0	2.82E-2	3.86E+0	2.42E-1	2.19E+0
Hard bone	1.14E-1	3.90E+2	4.49E-1	4.11E+0	6.10E-1	2.11E+0	7.19E-1	1.42E+0
Heart	1.90E-1	2.58E+0	6.16E-2	4.10E+0	2.58E-1	2.22E+0	4.71E-1	1.60E+0
Kidney	9.80E-3	2.92E+1	1.59E-1	1.21E+1	2.24E-1	2.78E+0	2.98E-1	1.05E+1
Liver	2.28E-4	1.56E+0	2.97E-2	1.72E+0	2.00E-1	3.00E+0	3.64E-1	1.77E+0
Lower large intestine	1.87E-1	2.87E+1	3.70E-1	5.23E+0	4.10E-1	2.83E+0	6.09E-1	1.92E+0
Lung	6.86E-3	3.75E+1	5.37E-2	2.50E+0	2.30E-1	1.85E+0	3.94E-1	1.40E+0
Muscle	2.79E-3	1.70E+1	2.29E-2	5.14E+0	1.04E-1	2.93E+0	3.96E-1	1.90E+0
Pancreas	1.20E-2	1.02E+1	2.09E-1	9.05E+0	1.05E-1	3.87E+0	3.12E-1	2.18E+0
Skin	1.15E-1	3.38E+0	3.69E-1	7.57E+2	5.71E-1	1.14E+1	7.12E-1	1.51E+0
Small intestine	4.97E-1	5.81E+1	9.46E-4	3.31E+0	2.79E-2	1.74E+0	1.80E-1	1.42E+0
Spleen	9.89E-3	2.21E+0	1.90E-1	3.04E+0	3.65E-1	3.28E+0	5.50E-1	1.86E+0
Stomach	6.52E-4	1.19E+1	4.21E-2	6.01E+0	1.42E-1	2.84E+0	3.26E-1	2.00E+0
Testes	3.85E-1	3.32E+0	5.68E-1	1.77E+0	6.46E-1	1.42E+0	7.06E-1	1.44E+0
Thymus	3.46E-1	2.48E+0	3.07E-1	5.93E+0	6.14E-1	2.55E+0	5.04E-1	1.62E+0
Thyroid	6.79E-1	2.85E+0	7.40E-1	2.46E+1	5.57E-1	3.55E+0	6.89E-1	1.46E+0
Trachea	5.02E-1	1.92E+0	6.66E-1	1.71E+0	7.12E-1	1.40E+0	8.13E-1	1.38E+0
Upper large intestine	3.27E-1	1.01E+1	8.69E-1	5.28E+0	9.07E-1	3.21E+0	5.04E-1	1.92E+0

Table 3-2 (Continued).

Target organ	Ratios (JM2/JM) of SAFs							
	0.05MeV		0.5MeV		1MeV		4MeV	
	Min	Max	Min	Max	Min	Max	Min	Max
Adipose	8.18E-1	1.22E+0	8.51E-1	1.20E+0	8.56E-1	1.19E+0	8.66E-1	1.16E+0
Adrenal	4.46E-1	1.33E+0	5.45E-1	1.31E+0	5.50E-1	1.33E+0	5.67E-1	1.33E+0
Bladder	8.23E-1	2.01E+0	8.76E-1	3.83E+0	8.74E-1	2.54E+0	8.72E-1	1.41E+0
Bone marrow	8.55E-1	1.13E+0	8.43E-1	1.18E+0	8.69E-1	1.13E+0	7.96E-1	1.21E+0
Brain	7.14E-1	1.25E+0	7.04E-1	1.33E+0	7.04E-1	1.30E+0	8.83E-1	1.09E+0
Bronchi	3.33E-1	1.17E+0	5.54E-1	1.16E+0	5.66E-1	1.16E+0	7.25E-1	1.18E+0
Esophagus	4.34E-1	1.71E+0	5.81E-1	1.72E+0	6.02E-1	1.73E+0	5.79E-1	1.14E+0
Gall bladder	6.64E-1	1.39E+0	7.02E-1	1.34E+0	7.00E-1	1.35E+0	6.47E-1	1.69E+0
Hard bone	8.23E-1	1.19E+0	8.91E-1	1.22E+0	8.93E-1	1.22E+0	9.00E-1	1.24E+0
Heart	4.56E-1	2.03E+0	5.93E-1	1.54E+0	6.14E-1	1.53E+0	7.25E-1	1.35E+0
Kidney	5.07E-1	1.41E+0	5.71E-1	1.35E+0	5.73E-1	1.34E+0	6.34E-1	1.50E+0
Liver	7.12E-1	1.55E+0	7.73E-1	1.47E+0	7.86E-1	1.45E+0	5.93E-1	1.33E+0
Lower large intestine	6.04E-1	1.20E+0	7.56E-1	1.21E+0	7.69E-1	1.21E+0	8.23E-1	1.41E+0
Lung	6.82E-1	1.48E+0	7.61E-1	1.16E+0	7.84E-1	1.16E+0	7.85E-1	1.15E+0
Muscle	4.81E-1	1.70E+0	5.88E-1	1.72E+0	6.02E-1	1.73E+0	8.61E-1	1.16E+0
Pancreas	8.43E-1	1.26E+0	7.97E-1	1.27E+0	8.11E-1	1.25E+0	6.18E-1	1.70E+0
Skin	7.65E-1	1.14E+0	7.94E-1	1.07E+0	7.95E-1	1.07E+0	8.17E-1	1.06E+0
Small intestine	3.54E-1	1.33E+0	5.58E-1	1.27E+0	5.92E-1	1.27E+0	6.45E-1	1.25E+0
Spleen	7.22E-1	1.48E+0	7.59E-1	1.33E+0	7.53E-1	1.30E+0	7.69E-1	1.28E+0
Stomach	5.17E-1	1.56E+0	5.44E-1	1.47E+0	5.44E-1	1.46E+0	5.67E-1	1.44E+0
Testes	7.73E-1	1.34E+0	7.60E-1	1.47E+0	7.89E-1	1.32E+0	7.98E-1	1.26E+0
Thymus	6.70E-1	1.36E+0	7.64E-1	1.40E+0	7.69E-1	1.33E+0	8.15E-1	1.31E+0
Thyroid	6.95E-1	1.20E+0	8.14E-1	3.63E+0	7.45E-1	2.34E+0	8.44E-1	1.44E+0
Trachea	8.07E-1	1.18E+0	8.02E-1	1.15E+0	8.03E-1	1.16E+0	8.31E-1	1.30E+0
Upper large intestine	6.52E-1	1.54E+0	7.66E-1	1.49E+0	7.87E-1	1.49E+0	8.23E-1	1.46E+0

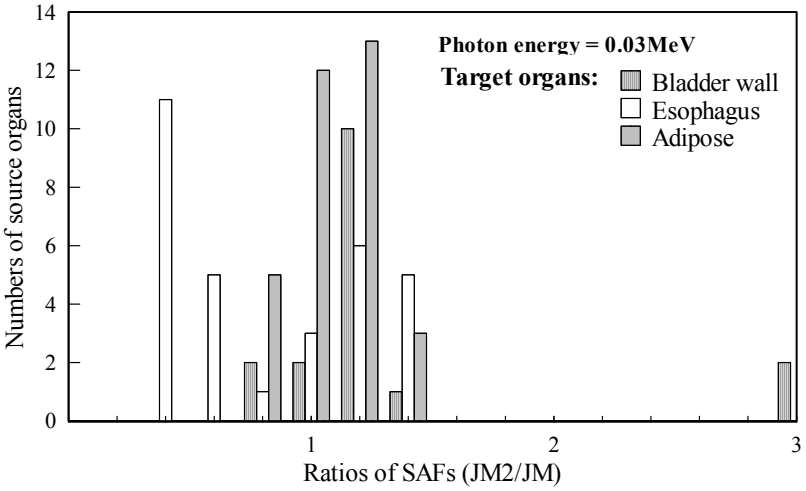

Figure 3-5 Distribution of the ratios of the SAFs for bladder wall, esophagus and adipose of JM2 (upright posture) to those of JM (supine posture) and for 33 source regions.[45)]

3.5 Analysis of effects of posture on organ doses

Table 3-3 shows the ratios of $D_{\text{T-intake}}$ in the target organs of JM2 to those of JM, which were calculated by considering biokinetic models as well as the photon spectra and half-life values of the radionuclides. It is obvious that the $D_{\text{T-intake}}$ of JM2 are similar to those of JM. Since the effects of posture on photon SAFs were remarkable in the low energy (< 0.05 MeV) compared with higher energy (Figure 3-4 and Table 3-2), the most significant difference in $D_{\text{T-intake}}$ is expected for ^{131}Cs which emits low energy X-rays. However, the ratio of $D_{\text{T-intake}}$ of JM2 and JM varied merely from 0.91 to 1.17 in the case of ^{131}Cs. The effects of posture on the $D_{\text{T-intake}}$ due to the intake of ^{131}Cs are small. In addition, there are not also significant differences in $D_{\text{T-intake}}$ due to the intake of ^{126}Ba, ^{128}Ba and ^{133}Ba between JM2 and JM. Cesium and barium spread through the entire body. Therefore, $D_{\text{T-intake}}$ due to the intake of these radionuclides might reflect the characteristics that the effects of posture on the SAFs for whole body distribution tissues were relatively small (see, Section 3.4). The $D_{\text{T-intake}}$ ratios (JM2/JM) due to the intake of ^{178}W, ^{179}W and ^{190}W are not significantly different from each other, although the tungsten distributed into the live and kidneys in the middle part of trunk. The ratios of $D_{\text{T-intake}}$ in ^{178}W, ^{179}W and ^{190}W are also not significantly different from to those in ^{126}Ba, ^{128}Ba, ^{133}Ba, ^{130}Cs and ^{131}Cs. These results do not directly reflect the posture effects to SAFs. The energy spectra and the biokinetic behavior of radionuclide also affects on organ doses. Photons with higher energy can more strongly contribute to SAFs than lower energy photons. Thus, the posture effects were not strongly seen in the organ doses by the intake of radionuclide with photon energy distributions. In addition, the radionuclide can be distributed over plural organs or tissues due to its biokinetic behavior. The SAFs for low energy photons are significantly varied by the differences in the organ distances due to posture change (Figures 3-4 and 3-5, and Table 3-2). In such a case, the organ doses cannot be directly affected by the changes in posture, because the effects of posture on the SAFs are cancelled

out by the geometry conditions of source and target organs.

The differences in the $D_{\text{T-intake}}$ in bone marrow, the lower large intestine wall (colon), the lungs and the stomach wall, which have the highest tissue weighting factor (0.12) in the new ICRP recommendations,[33] of the two postures, were within 10% in most cases. Considering the variation in $D_{\text{T-intake}}$ in these organs, it can be concluded that the effects of posture on effective dose from internal photon emitters are limited. This conclusion indicates that there is no practical problem in using reference voxel phantoms, which have been developed from CT images obtained in the supine posture for the calculation of dosimetric quantities in radiation protection.

Table 3-3 Ratios of organ doses by intake of unit activity.

Target organs	Ratios of $D_{\text{T-intake}}$ (JM2/JM)							
	^{126}Ba	^{128}Ba	^{133}Ba	^{130}Cs	^{131}Cs	^{178}W	^{179}W	^{190}W
Adipose	0.96	0.94	0.99	0.99	0.97	0.95	0.99	0.99
Adrenal	0.70	0.84	1.17	0.59	0.91	0.86	0.54	0.60
Bladder	0.96	0.99	1.01	1.03	1.00	1.02	0.88	0.92
Bone marrow	1.00	1.00	1.01	0.99	0.97	1.00	0.98	1.00
Brain	1.06	1.05	1.01	1.05	1.17	1.01	1.20	1.07
Esophagus	0.95	1.05	0.96	0.88	0.97	1.07	0.87	0.90
Gall bladder	0.96	0.93	0.94	0.98	1.13	0.90	0.95	0.94
Hard bone	1.28	1.31	1.10	0.98	0.98	1.18	1.23	1.19
Heart	1.01	0.95	0.98	0.96	0.98	0.97	0.98	0.99
Kidney	0.96	1.03	1.03	1.08	1.03	1.03	0.96	0.99
Liver	0.94	0.90	1.02	0.97	1.00	0.86	0.96	0.95
Lower large intestine	1.03	1.06	1.07	1.03	0.96	1.06	0.99	0.99
Lung	0.96	1.01	1.02	0.83	1.01	0.98	0.88	0.89
Muscle	1.01	1.03	1.01	0.99	0.99	1.03	0.98	0.99
Pancreas	1.00	1.02	1.00	0.99	0.99	1.02	0.97	0.98
Skin	1.00	0.95	0.97	1.02	0.98	0.95	1.02	1.02
Small Intestine	1.11	1.15	1.07	1.05	1.12	1.16	1.12	1.11
Spleen	0.97	0.88	1.01	0.97	1.00	0.92	0.96	0.97
Stomach	1.13	1.07	1.01	1.08	1.01	1.02	1.11	1.11
Testes	1.04	1.06	1.02	1.04	1.01	1.05	1.00	1.02
Thymus	0.92	0.96	1.00	0.97	1.02	0.95	0.89	0.90
Thyroid	0.97	0.99	1.00	1.00	0.99	1.00	1.05	1.04
Trachea	0.98	0.99	1.00	1.02	1.05	1.02	1.05	1.02
Upper large intestine	1.16	1.12	1.08	1.27	1.03	1.13	1.24	1.24

Ratios of organ doses were calculated by using the data reported by Sato and Endo.[45]

4. Impact of body sizes on the organ doses due to external exposures

ICRP will present the new dose conversion coefficients, which are calculated by using the adult male and female reference voxel phantoms.[33] The body sizes of the reference phantoms are referred to Caucasoid, which is larger than Japanese.[35] Therefore, it is important to confirm whether the body size influences the dose conversion coefficients or not. Sato et al. analyzed the effects of differences in body sizes between Japanese and Caucasoid on the dose conversion coefficients against external photon exposures.[46]

4.1 Code system and irradiation conditions

A system, UCPIXEL,[29,30] was an EGS4 user code developed to calculate organ doses due to external photon and electron exposures. Users can combine the GSF format type phantoms into the radiation transport calculation by the EGS4 code without the description of the complicated geometries of voxel phantoms. The radiation transports in bone tissue are performed with consideration of the mass fraction of bone marrow and hard bone. The bone density data, which compress the grey values in all voxels of bone tissue, are referred in UCPIXEL. The transports of photon and electron were simulated without the application of the kerma approximation, as the calculation of SAFs in Section 3.1. The primary and secondary photons were followed until their energy fell to 1 keV. The secondary electrons produced from these photon interactions were tracked until their kinetic energy fell to 5 keV. The cross-section data for photons and the stopping power of electrons were obtained from PHOTX[52,53] and the ICRU Report 37,[54] respectively.

Calculations of organ doses are carried out by assuming whole body irradiation to uniform parallel photon beam under the idealized six irradiation geometries (Figure 4-1).[1] They are anterior to posterior (AP), posterior to anterior (PA), left lateral (LLAT), right lateral (RLAT), rotational (ROT) and isotropic (ISO) irradiation geometries. Organ doses were calculated for 25 incident photon energies ranging from 0.01 to 10 MeV, and were normalized to air-kerma free-in-air. The number of produced primary photons in the EGS4 calculation was set to obtain fraction standard deviations of less than 5 % in the deposited energy of each target organ.

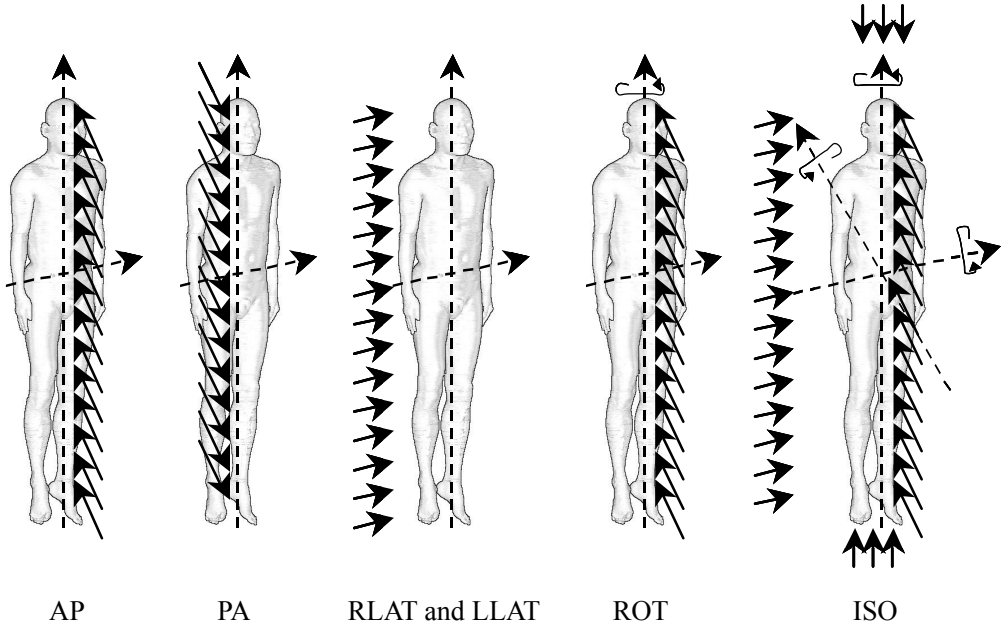

Figure 4-1 Irradiation geometries of the voxel phantoms.[46)]

4.2 Analysis of effects of body sizes on organ doses

This section describes the effects of the differences in body sizes between Japanese and Caucasoid on organ doses. The calculated organ doses of the Japanese voxel phantoms (JM, Otoko, JF and Onago)[46] were compared with those[17,22,29,49] of the Caucasian voxel phantoms (Rex, Golem, VIP-Man, Regina, Donna, Helga and Irene). Tables 2-1 and 2-2 summarize the physiques of these phantoms. The several organs (brain, thyroid, lungs, liver, stomach and bladder), which are located in head, neck, chest, and upper and lower abdominal parts, are selected to discuss the effects of the body size on the organ doses here.

Figure 4-2 depicts the dependences of the absorbed doses to the selected organs in the different voxel phantoms on incident photon energies for AP geometry. The differences are generally within 20 % for all of the organs between the phantoms at energies with more than 0.1 MeV. At 0.05 MeV, the absorbed doses of the bladder (Figure 4-2(f)) range from 0.816 to 1.092 Gy Gy^{-1} in the Japanese voxel phantoms. The bladder doses range from 0.780 to 1.468 Gy Gy^{-1} among the Caucasian phantoms. Then, the difference in the bladder dose is larger among the Caucasian phantoms .The bladder dose of the JF phantom is lower than those of most phantoms, as shown in Figure 4-2(f), although the body size of JF is the smallest among them (Tables 2-1 and 2-2). It is considered that the results of the bladder doses obtained from the Japanese and Caucasian voxel phantoms reflect the difference in the organ geometry attributed to individual anatomy. The stomach dose of Otoko is lower than that of JM in the entire energy range (Figure 4-2(e)), although the body sizes of JM are almost the same as those of Otoko (Table 2-1). These results are inconsistent with the previous finding that the dose conversion coefficients increase generally with decreasing the body size.[1] The tendency is found in the entire energy range and in the other organs, such as brain, thyroid, lung, and liver.

Figure 4-3 shows the absorbed doses of the Japanese and Caucasian voxel phantoms in PA geometry. The bladder doses in the Japanese phantoms are higher than those in the Caucasian phantoms (Figure 4-3(f)). It is considered that the thickness of subcutaneous fat around lower back and buttocks of Japanese is less than that of Caucasoid. At energies of less than 0.05 MeV, the doses of bladder, liver and stomach of Otoko are different from those of JM about 20%, though the body sizes of JM and Otoko are close to each other (Table 2-1). The mass of adipose tissue of JM is 19.490 kg, and is heavier than that (14.149 kg) of Otoko (Table 2-3). In particular, the adipose tissue located in the trunk directly affects the positions and shapes of organs. Therefore, these results might be caused by the differences in masses and distributions of adipose tissue in body between JM and Otoko. The variation of organ doses can be attributable to the individual anatomy, such as the position, size, shape and distribution of internal organs.

Figure 4-4 shows the results in ROT geometry. In ROT geometry, the phantoms were irradiated with 360º rotating plane parallel beam from a direction orthogonal to the long axis of the body. Therefore, the dependence of the organ doses on the incident direction of photons is relatively small in this irradiation geometry. Similarly to the cases of AP and PA geometries (Figures 4-2 and 4-3), the absorbed doses in the selected six organs of the Japanese phantoms are within the variation of the organ doses of the Caucasian phantoms in most cases.

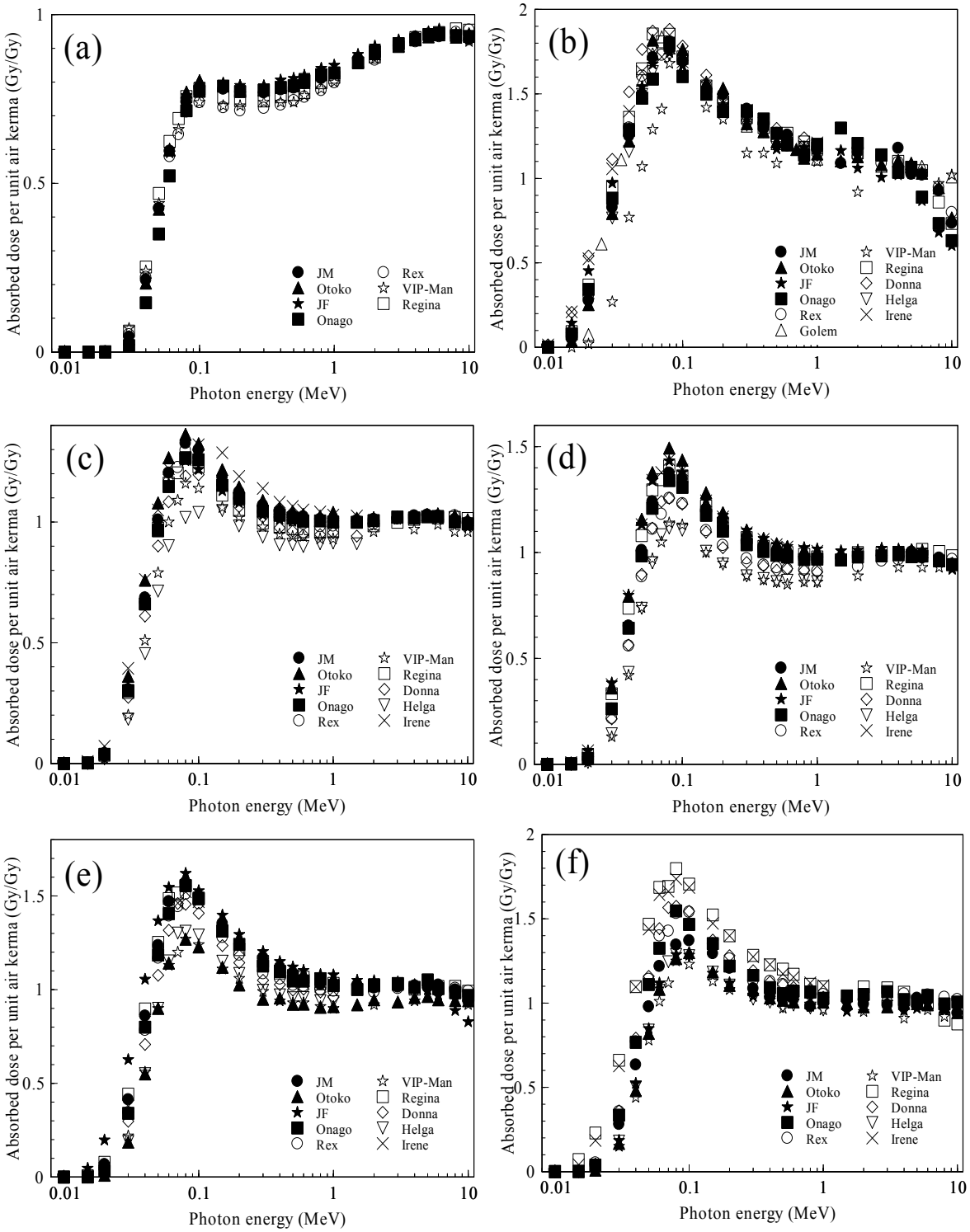

Figure 4-2 Absorbed doses in selected organs of the Japanese and Caucasian voxel phantoms in AP geometry.[46] (a) Brain, (b) Thyroid, (c) Lung, (d) Liver, (e) Stomach and (f) Bladder.

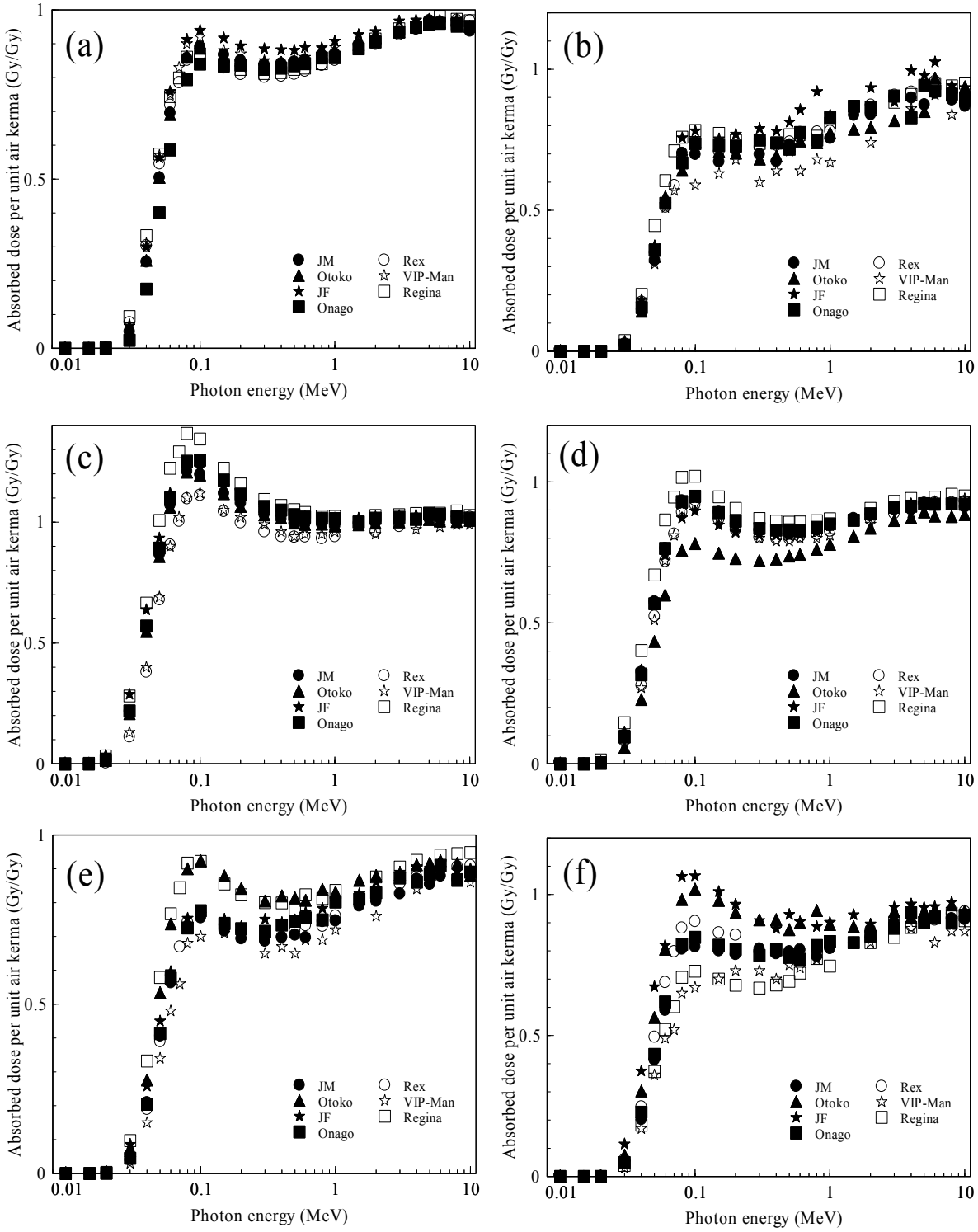

Figure 4-3 Absorbed doses in selected organs of the Japanese and Caucasian voxel phantoms in PA geometry.[46] (a) Brain, (b) Thyroid, (c) Lung, (d) Liver, (e) Stomach and (f) Bladder.

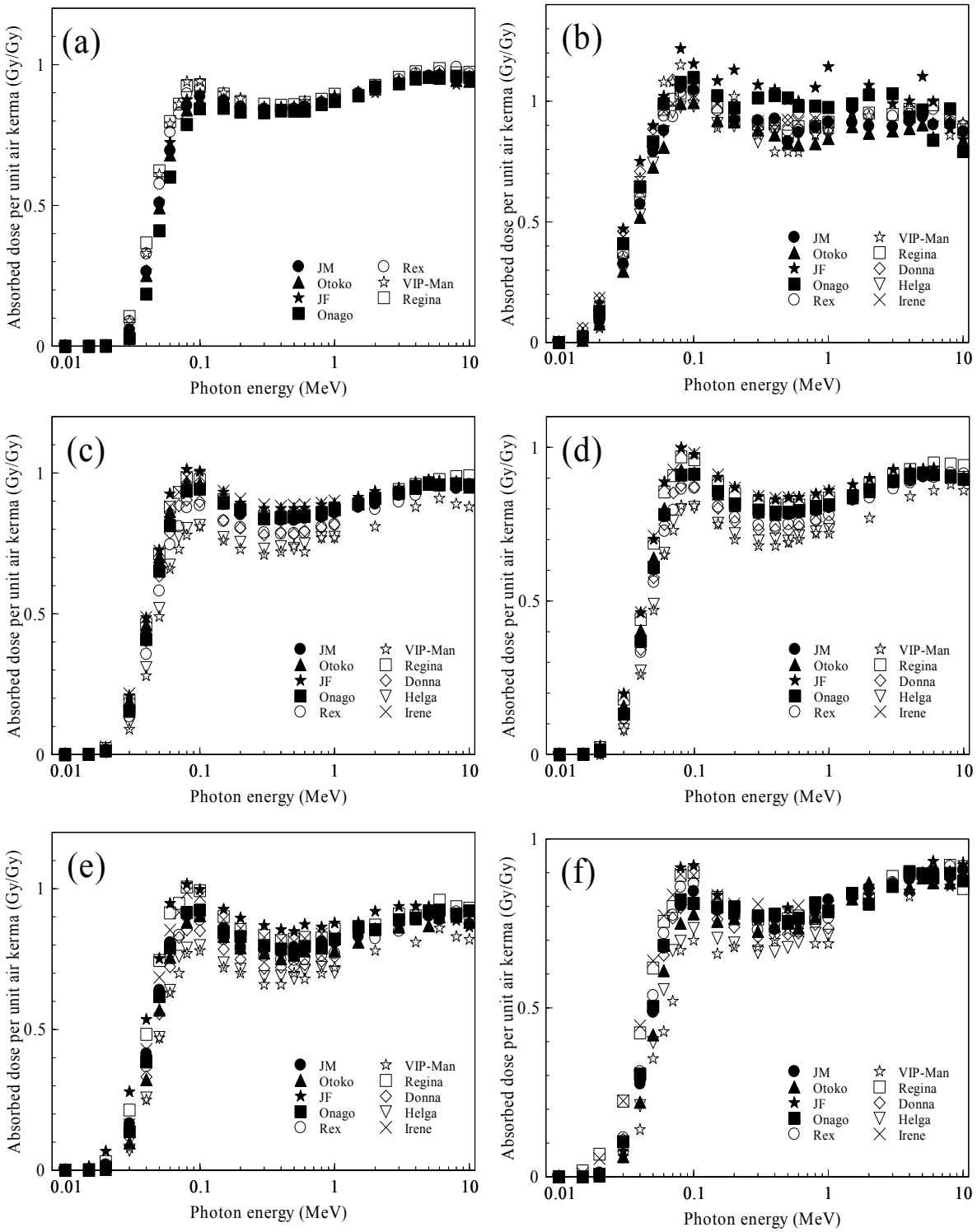

Figure 4-4 Absorbed doses in selected organs of the Japanese and Caucasian voxel phantoms in ROT geometry.[46] (a) Brain, (b) Thyroid, (c) Lung, (d) Liver, (e) Stomach and (f) Bladder.

Figure 4-5 shows the ratios of organ doses in JM phantom to those in Rex versus incident photon energies for all of the irradiation geometries. At energies of above 0.1 MeV, the differences are within 5% in most organ doses for all of irradiation geometries. The brain doses at 0.02 MeV in six geometries of JM range from 16 to 61% of those of Rex, as shown in Figure 4-5 (a). These results are inconsistent with previous report.[1)] The differences in brain masses and head size between two phantoms might cause the differences in brain doses. Although the body size of Rex is larger than JM, the brain mass of Rex (1450 g) is smaller than that of JM (1688 g). Similar results were found in the doses of thyroid, lung, liver and stomach (Figure 4-5 (b)-(e)). About these organs, the doses are generally larger in JM than in Rex, especially low energy region at less than 0.1MeV. The results in lateral irradiation geometries (RLAT and LLAT) also imply that the stomach and the liver in JM are located nearer to the center for the horizontal plane in the trunk than those in Rex. The bladder doses are smaller in JM phantom than in Rex in AP, PA, ROT and ISO geometries at energies of less than 0.1 MeV. In the two lateral irradiation geometries (LLAT and RLAT geometries), the bladder doses in JM phantom are about 144% and 400% of those of Rex at the energy of 0.03MeV. If the body sizes simply affect the organ doses, the JM phantom give larger bladder dose than Rex in all irradiation geometries. Thus, the results imply that the organ doses are more influenced by other causes, such as the irradiation geometry and individual anatomy than body size. Figure 4-6 shows energy dependences of the ratio of organ doses in JF phantom to those in Regina for the six irradiation geometries. Except for the thyroid and stomach, the variations in dose ratios of JF and Regina are not significantly different from those of JM and Rex, although the differences in body sizes between JF and Regina are larger than the differences between of the JM phantom and Rex.

At energies of less than 0.1MeV, the doses of thyroid and stomach of JF are higher than those of Regina (Figure 4-6 (b) and (e)). The elevations of the doses to these organs in JF are found at low energy in all of the irradiation geometries. Especially, as shown in Figure 4-6 (b), the large variations in the dose ratios of thyroid are found in LLAT and RLAT geometries. At 0.02 MeV, the thyroid doses in LLAT and RLAT geometries of JF are about 3678% and 790% of Regina, respectively. Sato et al. reported that the differences in thyroid doses in LLAT and RLAT geometries were strongly dependent on individual anatomical structures, e.g. the vertical position of thyroid.[46)] Therefore, individual anatomy might significantly influence the thyroid doses. The result may be due to also the extremely small mass of the thyroid in JF phantom (see, Table 2-3).

Figure 4-6 (e) shows the ratios of stomach doses of JF to those of Regina. The maximum difference of stomach doses between JF and Regina is found in ISO geometry at energy of 0.015 MeV, and is about 718%. At energy of 0.015 MeV, large differences in stomach doses are also found in AP and ROT geometries. The stomach doses in ISO, ROT and AP geometries are affected by the differences in the thickness of subcutaneous tissues in abdomen and body sizes between JF and Regina, since stomach is located in front part of upper abdomen. As described in above, the JF phantom is not lean or fat body compared with even the average Japanese adult female.

This study showed that the variation in organ doses of the Japanese voxel phantoms was similar to those of the Caucasian voxel phantom. The differences in organ doses among the phantoms are mainly caused by the individual differences in anatomical structures than the body size. Fill et al.

pointed out that the organ geometry has an influence to organ doses and are more important than the external body dimensions.[17] The results obtained from this study support the conclusion by Fill et al. Then, it can be concluded that the body size in adult is not a significant influential factor for the organ doses due to external photon exposures. This conclusion suggests that there is no practical problem in using new dose conversion coefficients for the dose assessment of adult Japanese with small size body.

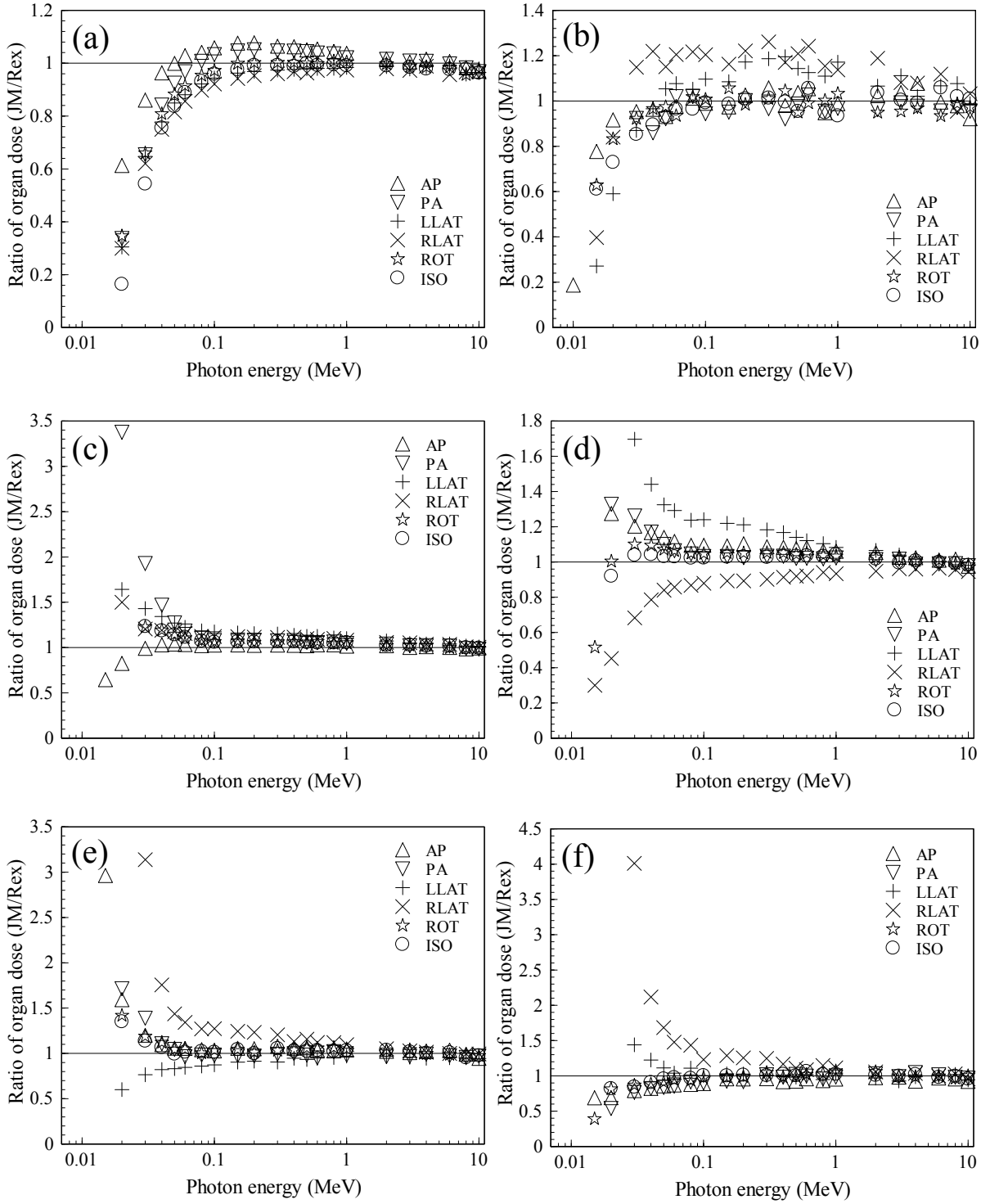

Figure 4-5 Energy dependence of the ratios of absorbed doses of JM[46] and Rex[49] in six geometries. (a) Brain, (b) Thyroid, (c) Lung, (d) Liver, (e) Stomach and (f) Bladder.

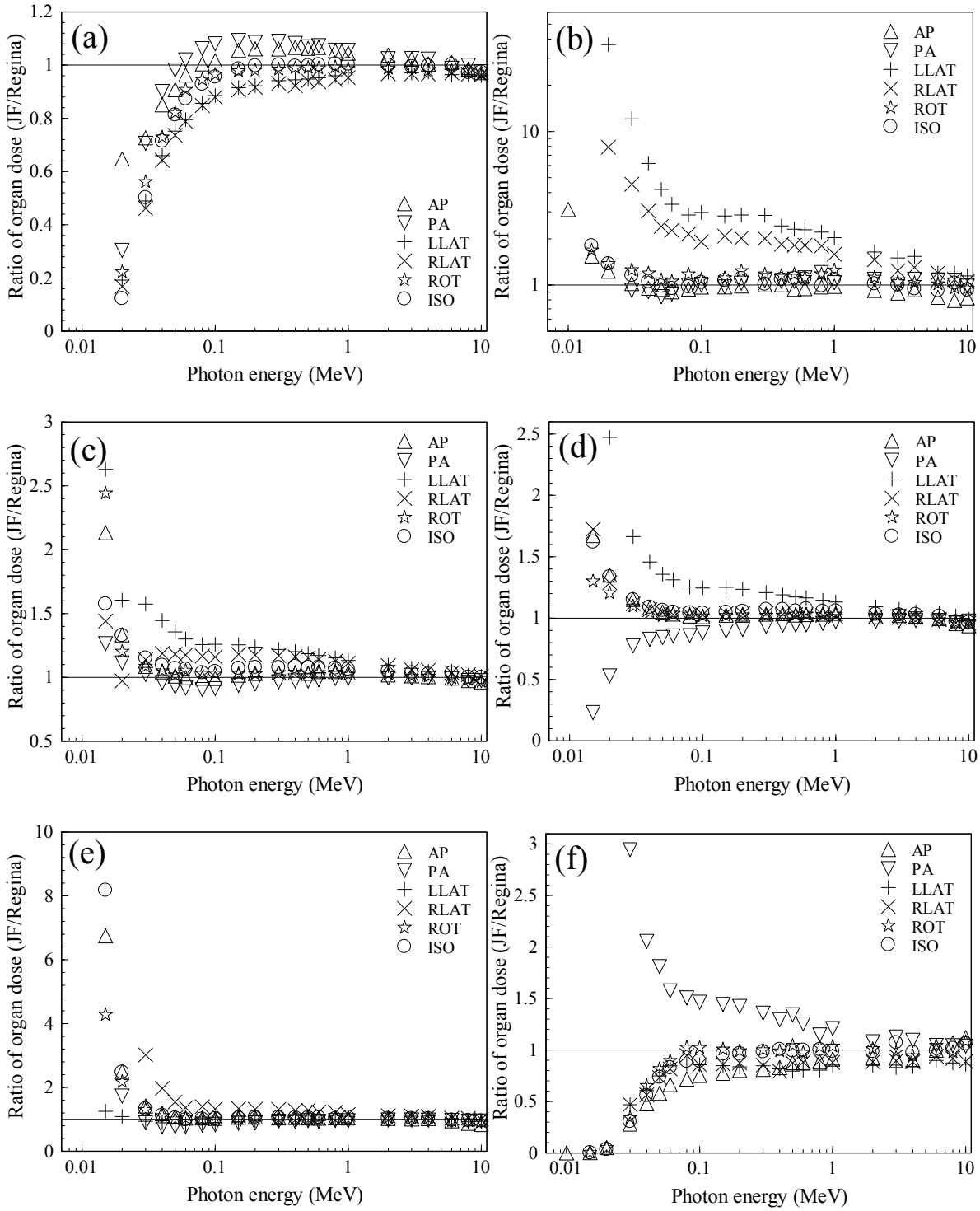

Figure 4-6 Energy dependence of the ratios of absorbed doses of JF[46] and Regina[49] in six geometries. (a) Brain, (b) Thyroid, (c) Lung, (d) Liver, (e) Stomach and (f) Bladder.

4.3 Validation of new model of bone marrow distribution

The doses to bone marrow were calculated for some external photon exposure conditions by the JM and JF phantoms with the Approx-distribution model ('JM-Approx' and 'JF-Approx'). The phantoms were incorporated into PHITS code.[57] The calculated doses of total marrow were compared with the values,[46] which were calculated by using the JM and JF phantoms with the GSF-distribution model ('JM-GSF' and 'JF-GSF') and the EGS4 user code named UCPIXEL. The cross sectional data for photons and electrons were taken from MCPLIB04[58] and EL03,[59] respectively. The cut off energies for transport were set at 1 keV for photons and 10 keV for electrons, respectively. The radiation transport calculation could derive the energy deposited to each region of bone tissue b, ED_b. The number of bone regions was 140, as described in Section 2.4.

The absorbed doses in active marrow were calculated with the energy deposited in bone tissue, $ED_{b\text{-}rbm}$ by the following equation.

$$ED_{\mathrm{b-rbm}} = \sum_{i}^{N} r_{\mathrm{b\text{-}rbm}} \times ED(E_i)_b \times \frac{KCF(E_i)_{\mathrm{rbm}}}{KCF(E_i)_{\mathrm{b}}}$$

where ED_b is the energy (pGy cm^2) deposited from photons with energy of Ei in anatomical bone tissue b (obtained with a radiation transport calculation), $r_{\mathrm{b\text{-}rbm}}$ is the mass ratio of active marrow to total bone tissue in anatomical bone tissue b (the data in Appendix-D), the $KCF(Ei)_{\mathrm{rbm}}$ and $KCF(Ei)_{\mathrm{b}}$ are the kerma coefficients of active marrow and total bone tissue at energy of Ei, respectively. The energy deposited in active marrow was obtained by summing the energy over the whole energy range, which was divided into N bins.

Figure 4-7 compares the total marrow doses in JM-Approx and JF-Approx with those in JM-GSF and JF-GSF. Although there are differences in the marrow distribution, materials of bone tissues and radiation transport code, the doses of total marrow agreed within 30%. In particular, the differences in marrow doses were within 10% at the energies of above 0.06 MeV. These results indicate that the Approx-distribution model can calculate the bone marrow doses equivalent to the GSF-distribution model.[10,11,13]

Figure 4-8 shows the ratios of the marrow doses (total and active only) in AP geometry to those in PA geometries for JM and JF phantoms with Approx-distribution model. The absorbed doses of total marrow of JM in the AP geometry are almost the same as those in PA geometry (Figure 4-8). Only at the energy of 0.03MeV, the total marrow dose was about 20% larger in the AP geometry than in the PA geometry, because the bones of the frontal side (e.g., sternum) exist at shallow position in the trunk tissue. On the other hand, the doses of active marrow in AP geometry are generally smaller than those in PA geometry. Similar dependences of active marrow doses on the irradiation geometries were also found in the results of organ dose calculation, which were performed with Rex and Regina at GSF.[49] These results might be supported by the fact that the bones in back of body (Vertebrae, sacrum and os coxae) contain about 60wt % of total active marrow in human body. The tendencies of active marrow doses are accordance with the active marrow distribution in the human body. Therefore, it can be concluded that there is no problem for using the Approx-distribution model for dose

calculation of active marrow.

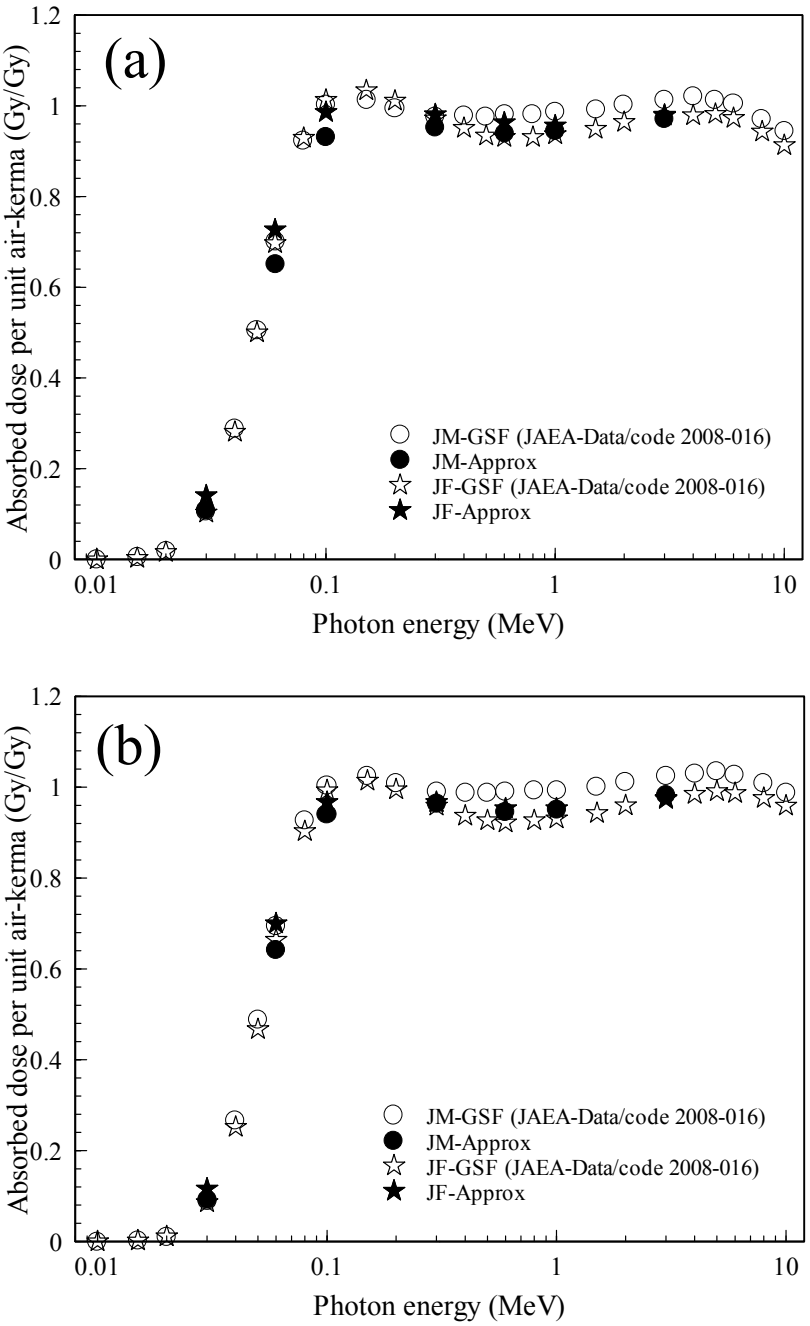

Figure 4-7 Absorbed doses in total marrow of JM-Approx, JF-Approx, JM-GSF and JF-GSF. (a) AP and (b) PA geometries.

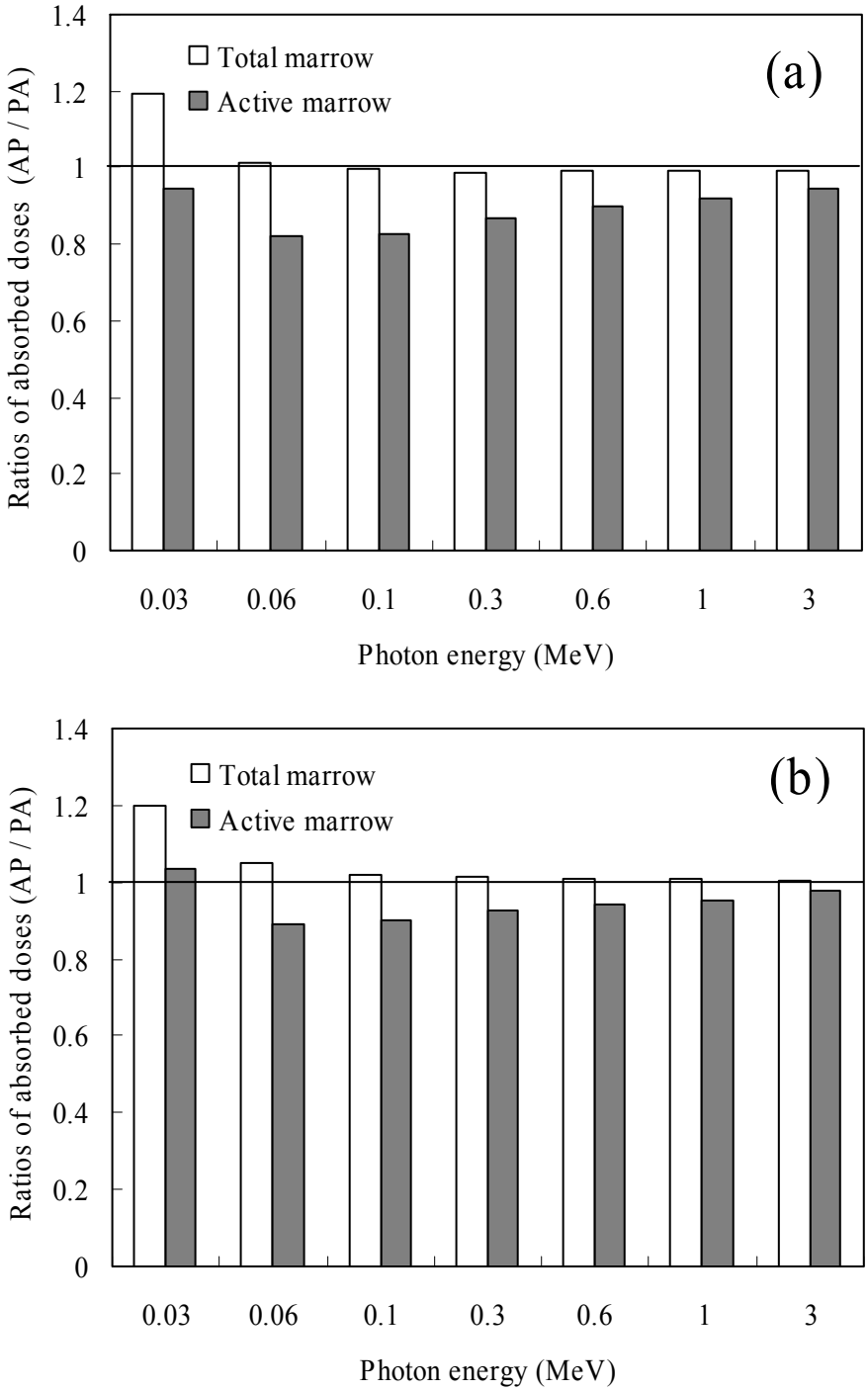

Figure 4-8 Ratios of absorbed doses of total marrow and active marrow in AP geometry to those in PA geometry. (a) JM-Approx and (b) JF-Approx.

5. Conclusions

To clarify the effects of postures and body sizes on the dose assessment, the high-resolution JAEA voxel phantoms were developed by using the CT images of healthy Japanese adult male and female volunteers. The voxel size of the high-resolution JAEA voxel phantoms is $0.98\times0.98\times1mm^3$. This voxel size is advantageous to (1) the representation of shapes and masses of organs and tissues, (2) the evaluations of movement and shape change of organ by the changes in posture and body size, and (3) the accurate calculation of organ doses based on the relationship between mean free path and voxel sizes. The photon SAFs, the dose coefficients for the intake of selected internal photon emitters and the dose conversion coefficients for external photon irradiation were calculated by using the high-resolution JAEA voxel phantoms. The results obtained from this study are as follows.

Significant differences in photon SAFs between upright and supine phantoms were found in the low energy (< 0.05 MeV). The organ doses (Gy Bq^{-1}) due to the intake of internal photon emitters were less dependent on the postures. The posture effects to SAFs were strongly dependent on the photon energy and the locations and shapes of organs. These results indicate that the effects of posture on the organ doses, which are based on the SAFs, are influenced by the energy spectra of emitted photons and the biokinetic behaviors of the radionuclides. In external photon exposures, the variations of absorbed doses in selected organs of the Japanese voxel phantoms are similar to those of the Caucasian voxel phantoms in most cases. Comparison of the organ doses of the Japanese voxel phantoms with those of the Caucasian voxel phantoms revealed that the organ geometry has an influence to the organ doses, and is more important than the body sizes. Now, ICRP is calculating new data set of dose conversion coefficients and dose coefficients, which are calculated by using reference voxel phantoms. The information obtained from this study will be useful to understand the effects of the body sizes and postures on dose assessment in adapting dose conversion coefficients calculated using the reference voxel phantoms by ICRP.

In this study, there are some cases that the postures and the individual differences in the locations and shapes of organ influence the organ doses. These results suggest that the dose assessment considering individual characteristics of body is of great importance to radiation accident and medical treatment. To apply the high-resolution JAEA voxel phantoms to general-purpose radiation transport codes, new model of marrow distribution in bone tissues (Approx-distribution model) were developed. The high-resolution JAEA voxel phantoms with the Approx-distribution model are available for various general-purpose radiation transport codes. The studies on dose assessments for external neutron exposure,[60] heavy ion beam therapy[61] and CT examination[62] were performed by using a combination of the high-resolution JAEA voxel phantoms with the Approx-distribution model and PHITS code. In future, the effects of individual differences on the exposure assessment for radiation accident and medical treatment will be analyzed by using combinations of the high-resolution JAEA voxel phantoms with the Approx-distribution model and PHITS code.

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Appendix A Coordinate system of the high-resolution JAEA voxel phantoms

The organ segmented data are recorded as ASCII text files. The capacity per an ASCII text file is about 1 MB. The formats of organ segmented data are common to the JM, JM2 and JF phantoms. As an example, Figure A-1 depicts three dimensional coordinate system of the JM phantom. The ASCII text files are named in order of CT slice number from top of head to the bottom of feet.

Figure A-2 shows the array of ASCII text file. The numbers of pixels per column and pixels per row are 512 and 512, respectively. Each numeral in ASCII text file corresponds to organ ID (see, Appendix C) assigned to each pixel.

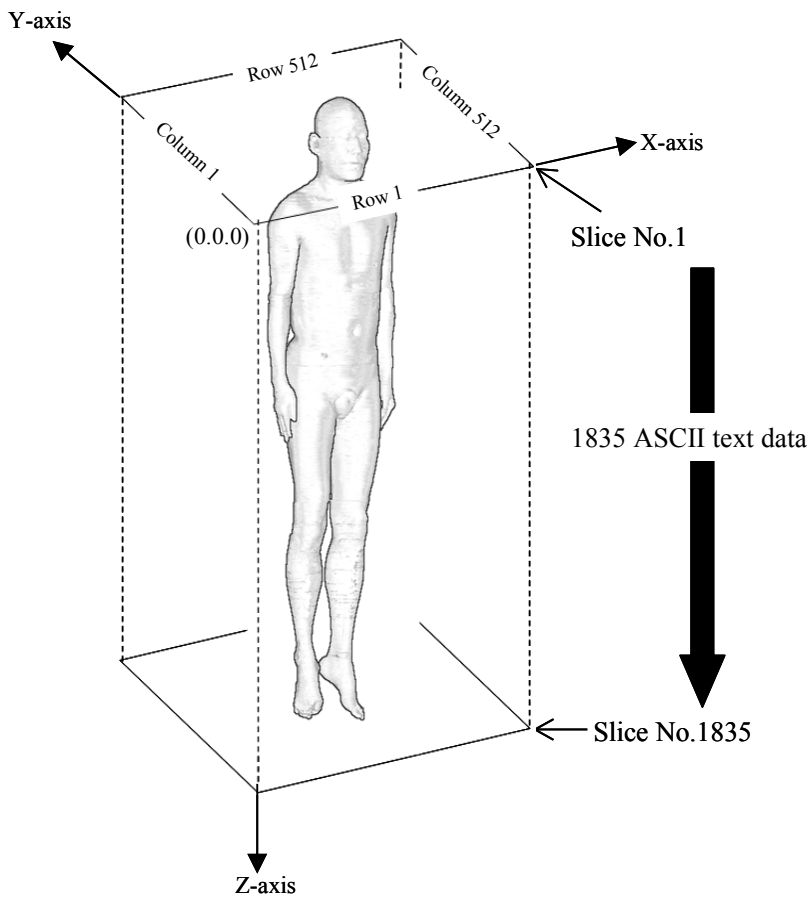

Figure A-1 Three dimensional coordinate system of the JM phantom.

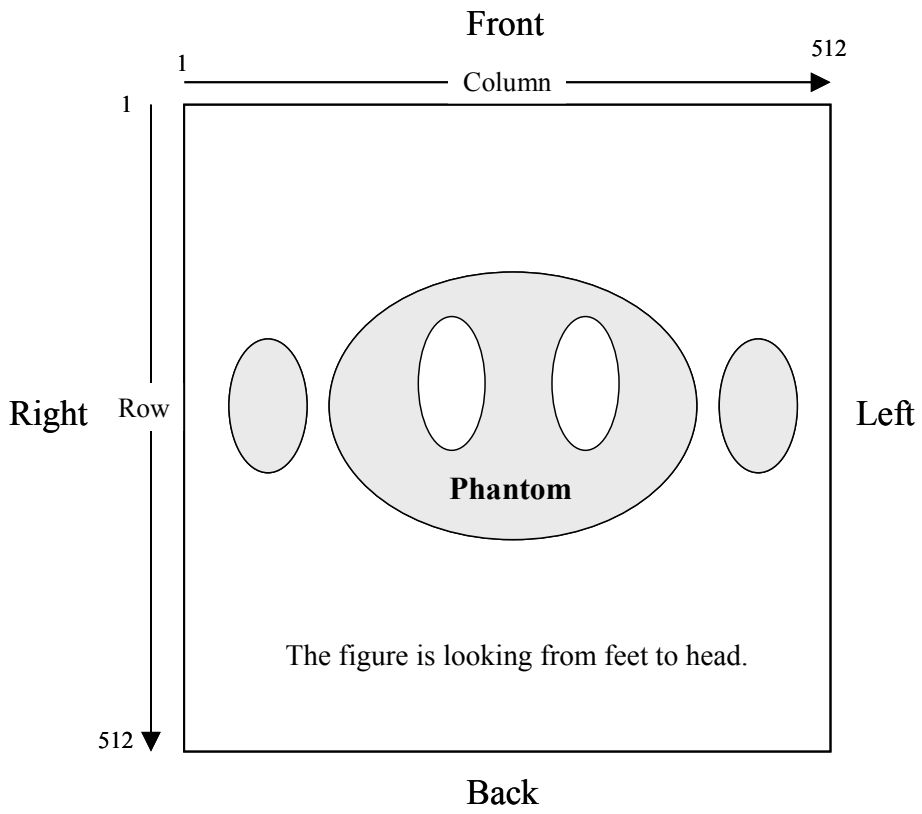

Figure A-2 Example of the phantom geometry in ASCII text file.

Appendix B Cross sectional images of the high-resolution JAEA voxel phantoms

This appendix presents selected transversal cross sectional images of the JM, JM2 and JF phantoms. For example, 'slices No.1' is the cross sectional image at the top of head and 'slice No.1835' is the cross sectional image at the bottom of feet.

B.1 Transversal cross sectional images of the JM phantom

Slice No.110

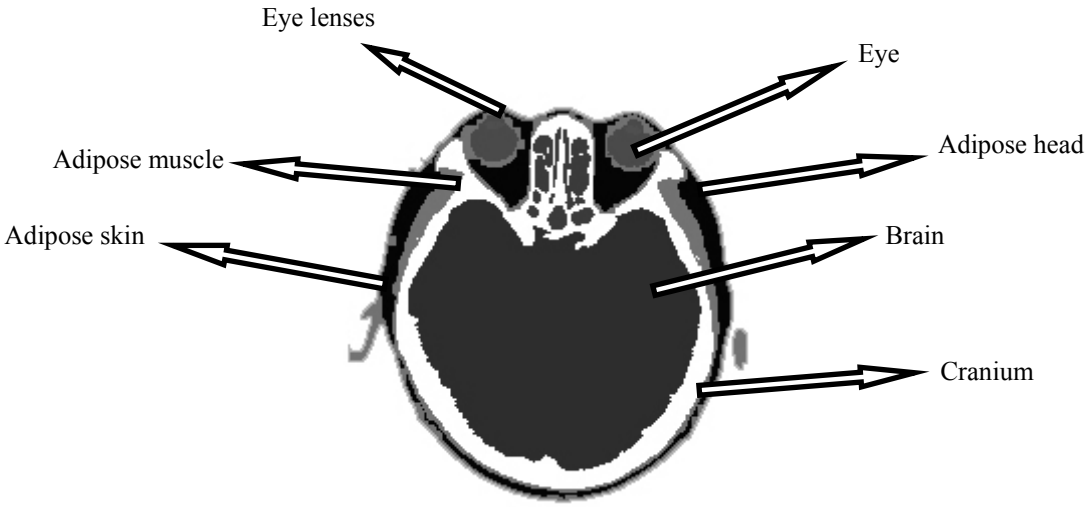

Figure B-1 Cross sectional image at 110 mm from top the head in the JM phantom.

Slice No.275

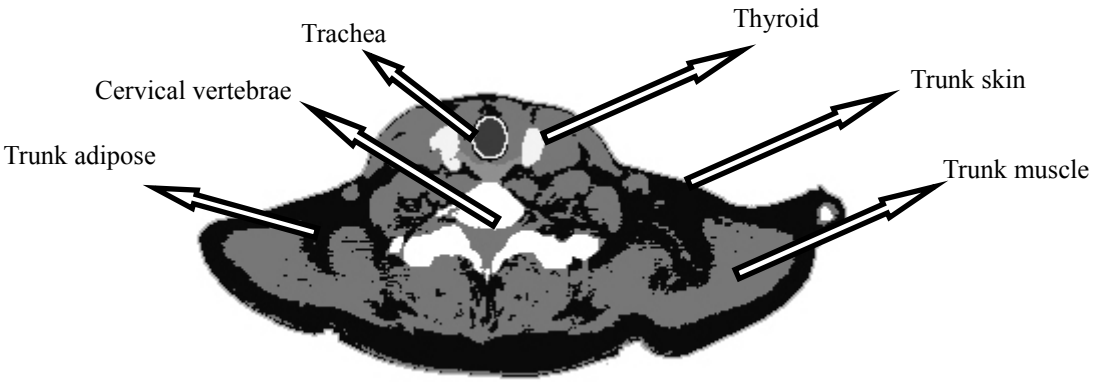

Figure B-2 Cross sectional image at 275 mm from top the head in the JM phantom.

Slice No.440

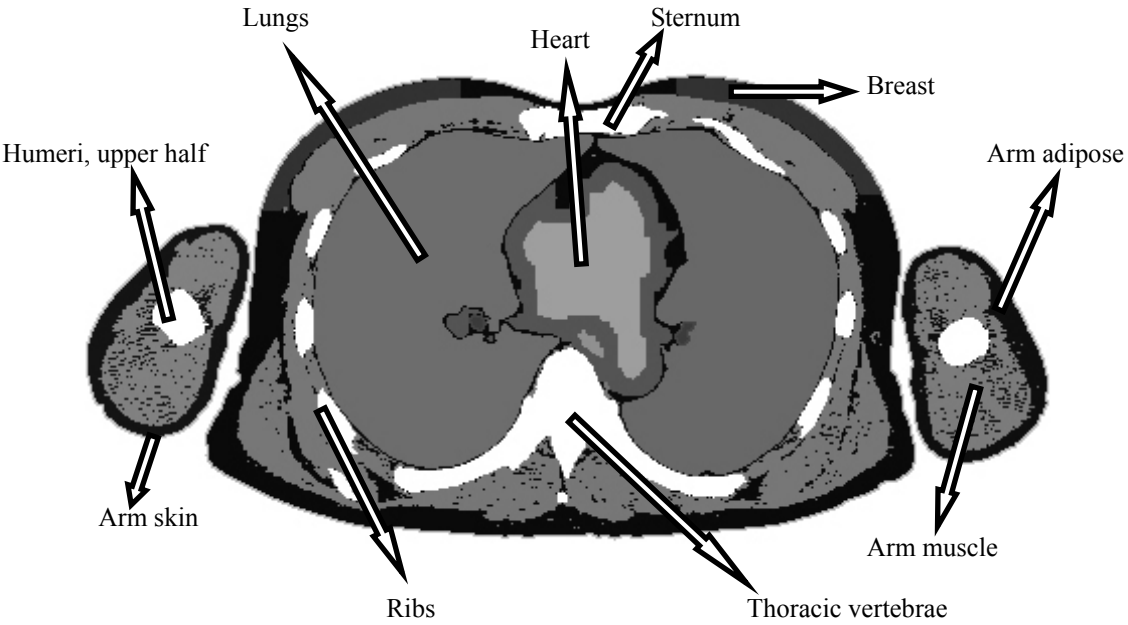

Figure B-3 Cross sectional image at 440 mm from top the head in the JM phantom.

Slice No.590

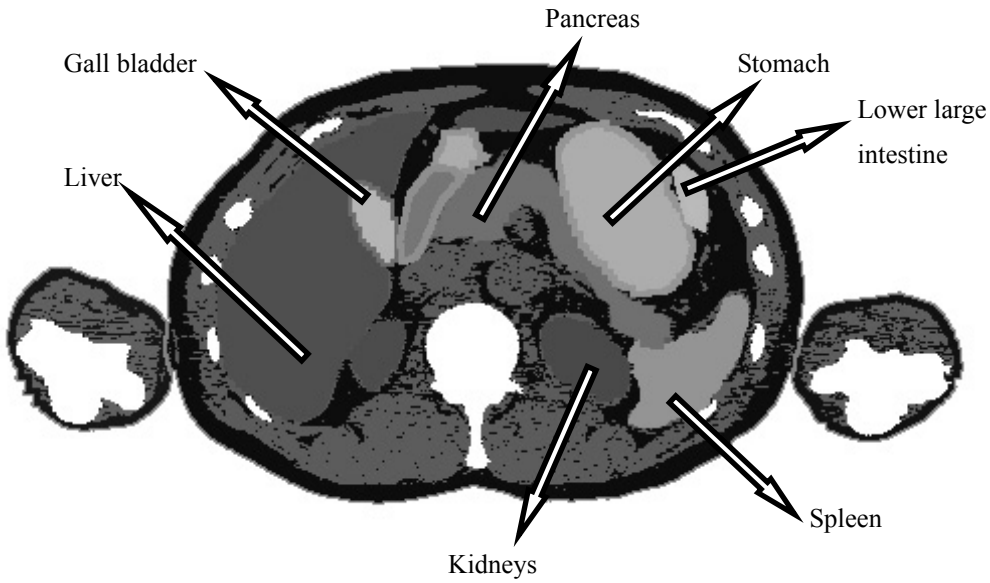

Figure B-4 Cross sectional image at 590 mm from top the head in the JM phantom.

B.2 Transversal cross sectional images of the JM2 phantom

Slice No.730

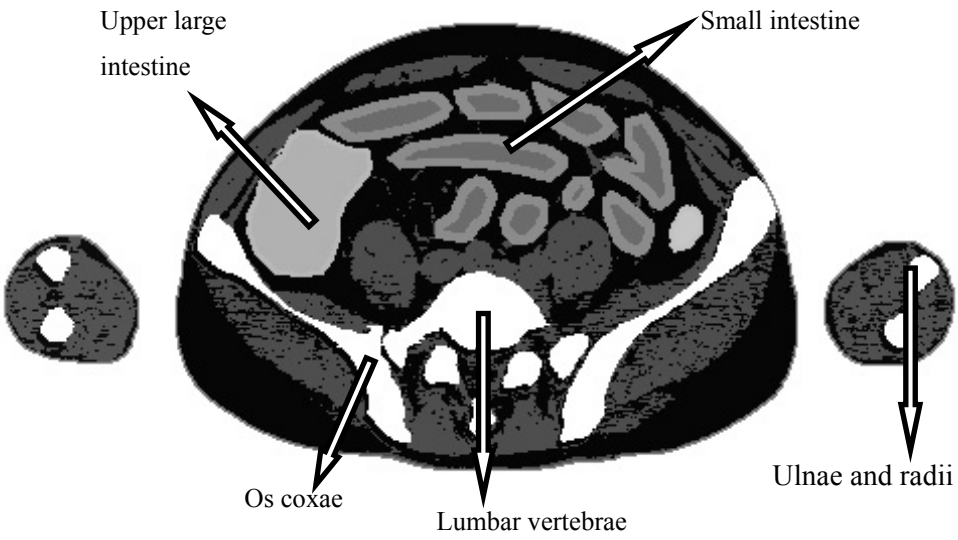

Figure B-5 Cross sectional image at 730 mm from top the head in the JM2 phantom.

Slice No.830

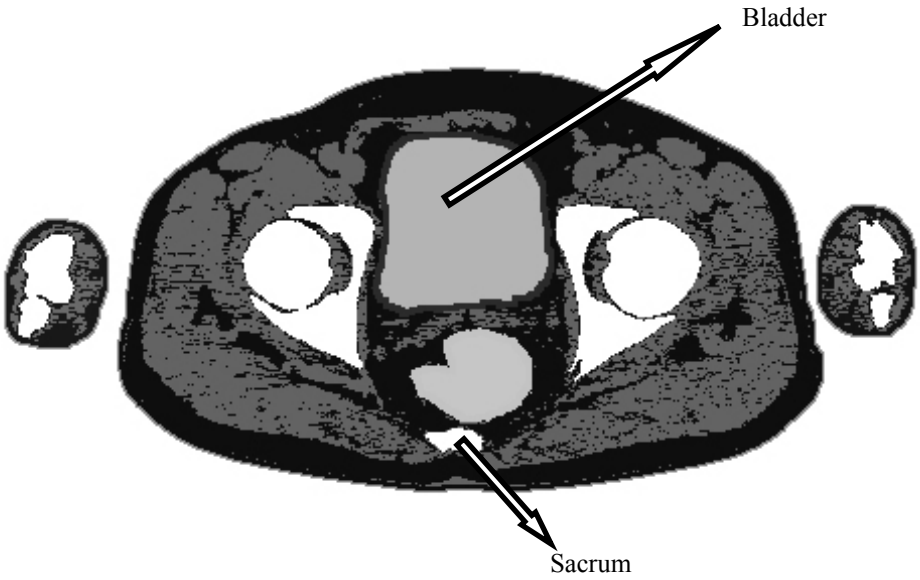

Figure B-6 Cross sectional image at 830 mm from top the head in the JM2 phantom.

Slice No.920

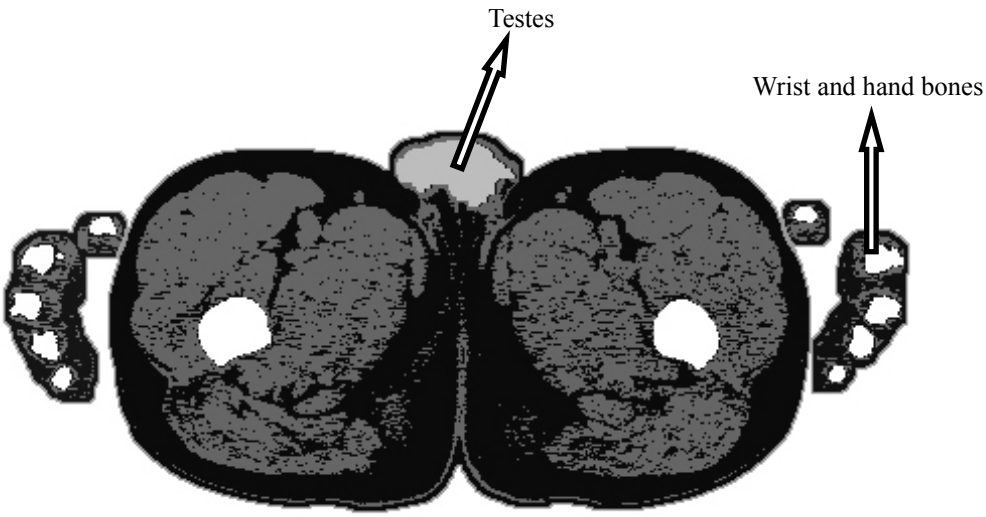

Figure B-7 Cross sectional image at 920 mm from top the head in the JM2 phantom.

Slice No.1100

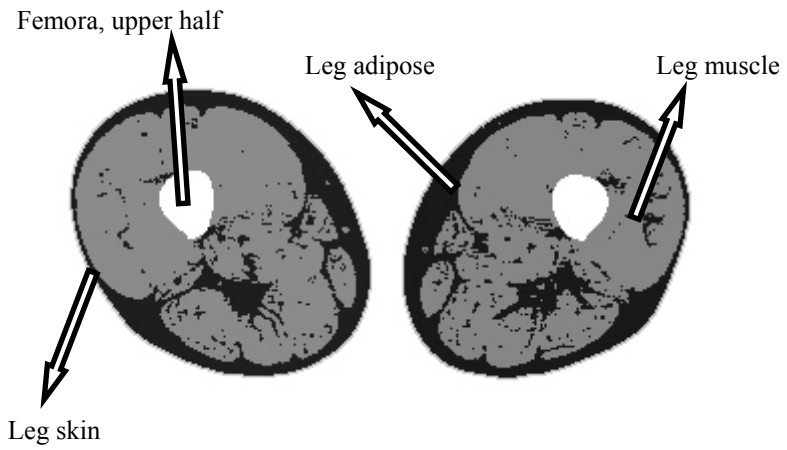

Figure B-8 Cross sectional image at 1100 mm from top the head in the JM2 phantom.

B.3 Transversal cross sectional images of the JF phantom

Slice No.155

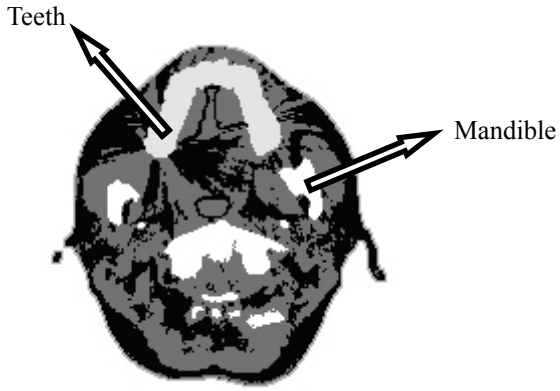

Figure B-9 Cross sectional image at 155 mm from top the head in the JF phantom.

Slice No.440

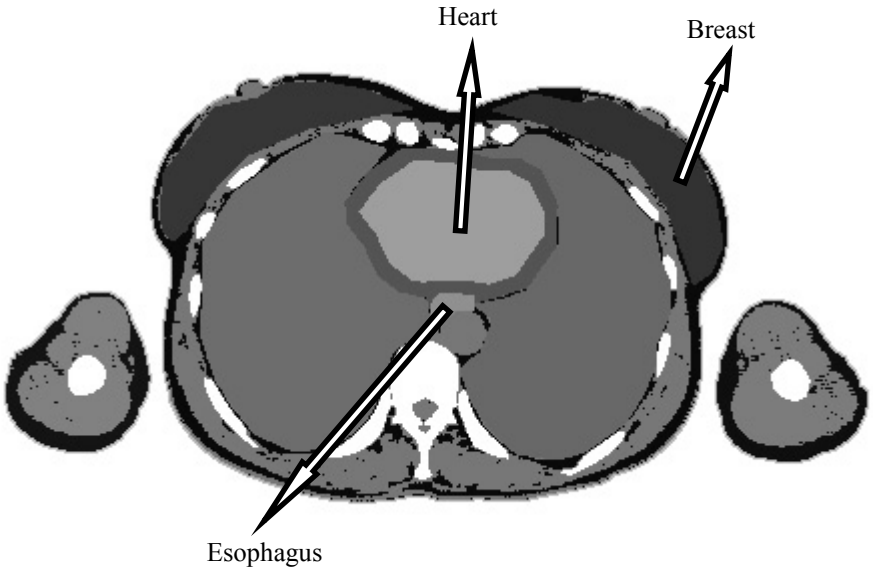

Figure B-10 Cross sectional image at 440 mm from top the head in the JF phantom.

Slice No.785

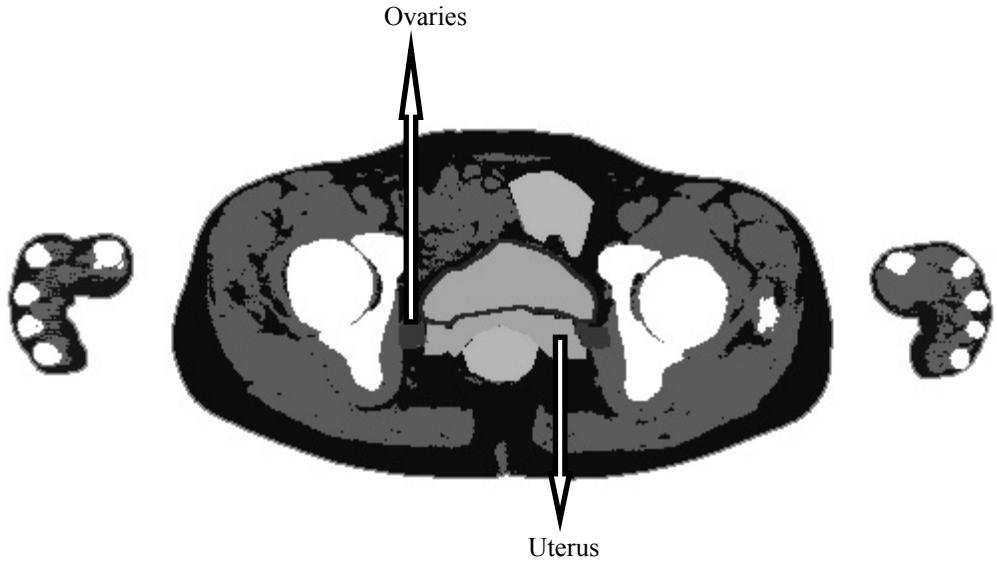

Figure B-11 Cross sectional image at 785 mm from top the head in the JF phantom.

Appendix C Organ ID, material ID, density, volume and mass of each organ, tissue and content in the high-resolution JAEA voxel phantoms

In this appendix, the organ ID, material ID, density, volume and mass of each organ, tissue and content in the JM, JM2 and JF phantoms are presented. The organ ID numbers are assigned to voxels belonging to each organ, tissue and content in order to identify the segmented regions in the phantoms. The elemental compositions corresponding to each material ID of JM, JM2 and JF are given in Tables 2-4 and 2-5. “NONE” means that there is no the organ segmented regions, which the organ ID is assigned.

Table C-1 Organ ID, material ID, density, volume and mass of each organ, tissue and content in the JM phantom.

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
1	None				
2	Adipose_head	m34	9.500E-1	7.6110E+2	7.2304E+2
3	None				
4	Adipose_trunk	m34	9.500E-1	1.2261E+4	1.1648E+4
5	None				
6	Adipose_left_arm	m34	9.500E-1	7.2285E+2	6.8671E+2
7	None				
8	Adipose_right_arm	m34	9.500E-1	7.2021E+2	6.8420E+2
9	None				
10	Adipose_left_leg	m34	9.500E-1	2.6699E+3	2.5364E+3
11	None				
12	Adipose_right_leg	m34	9.500E-1	2.5845E+3	2.4552E+3
13	None				
14	Adrenal	m31	1.030E+0	1.1363E+1	1.1704E+1
15	None				
16	Bladder_wall	m41	1.040E+0	3.5906E+1	3.7342E+1
17	None				
18	Brain	m42	1.040E+0	1.6231E+3	1.6880E+3
19	None				
20	Breast (left+right)	m34	9.500E-1	9.4618E+1	8.9887E+1
21	None				
22	None				
23	None				
24	Air in nose or air duct	m99	1.204E-3	1.9492E+2	2.3468E-1
25	None				
26	None				
27	None				
28	Bronchi	m31	1.030E+0	8.7675E+0	9.0306E+0
29	None				
30	Eye	m43	1.070E+0	1.2890E+1	1.3792E+1
31	None				
32	Eye_lens	m43	1.070E+0	3.5439E-1	3.7920E-1
33	None				
34	Heart_wall	m44	1.050E+0	5.0337E+2	5.2854E+2
35	None				
36	Left_kidney	m45	1.050E+0	1.2136E+2	1.2743E+2
37	None				
38	Right_kidney	m45	1.050E+0	1.3108E+2	1.3764E+2
39	None				
40	Liver	m46	1.050E+0	1.2424E+3	1.3045E+3
41	None				
42	Left_lung	m36	2.600E-1	2.5290E+3	6.5753E+2
43	None				
44	Right_lung	m36	2.600E-1	2.7052E+3	7.0334E+2
45	None				

Table C-1 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
46	Muscle_head	m32	1.050E+0	1.6378E+3	1.7196E+3
47	None				
48	Muscle_trunk	m32	1.050E+0	1.1796E+4	1.2385E+4
49	None				
50	Muscle_left_arm	m32	1.050E+0	1.0070E+3	1.0573E+3
51	None				
52	Muscle_right_arm	m32	1.050E+0	1.0691E+3	1.1226E+3
53	None				
54	Muscle_Left_leg	m32	1.050E+0	4.6393E+3	4.8712E+3
55	None				
56	Muscle_right_leg	m32	1.050E+0	4.7829E+3	5.0220E+3
57	None				
58	Esophagus	m31	1.030E+0	3.5336E+1	3.6396E+1
59	None				
60	Gall_bladder_wall	m31	1.030E+0	6.3809E+0	6.5723E+0
61	None				
62	Pancreas	m47	1.040E+0	1.1314E+2	1.1766E+2
63	None				
64	Heart_content	m51	1.060E+0	3.9307E+2	4.1665E+2
65	None				
66	Small_int_content	m31	1.030E+0	3.1999E+2	3.2959E+2
67	None				
68	None				
69	None				
70	None				
71	None				
72	Skin_head	m33	1.090E+0	1.7754E+2	1.9352E+2
73	None				
74	Skin_trunk	m33	1.090E+0	7.5302E+2	8.2079E+2
75	None				
76	Skin_left_arm	m33	1.090E+0	1.6667E+2	1.8167E+2
77	None				
78	Skin_right_arm	m33	1.090E+0	1.6792E+2	1.8303E+2
79	None				
80	Skin_left_leg	m33	1.090E+0	3.9077E+2	4.2594E+2
81	None				
82	Skin_right_leg	m33	1.090E+0	3.8571E+2	4.2043E+2
83	None				
84	Small_int_wall	m49	1.030E+0	4.1080E+2	4.2312E+2
85	None				
86	None				
87	None				
88	Spleen	m48	1.060E+0	1.3153E+2	1.3943E+2
89	None				
90	Stomach_wall	m49	1.030E+0	1.1846E+2	1.2202E+2
91	None				

Table C-1 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
92	Teeth	m37	2.750E+0	2.2039E+1	6.0607E+1
93	None				
94	Testis	m52	1.040E+0	3.5049E+1	3.6451E+1
95	None				
96	Thymus	m31	1.030E+0	3.0140E+1	3.1044E+1
97	None				
98	Thyroid	m50	1.050E+0	2.0772E+1	2.1810E+1
99	None				
100	Trachea	m31	1.030E+0	9.7211E+0	1.0013E+1
101	None				
102	None				
103	None				
104	Bladder_content	m31	1.030E+0	1.1377E+2	1.1718E+2
105	None				
106	Upper_large_int_cont	m31	1.030E+0	3.3736E+2	3.4748E+2
107	None				
108	Stomach_content	m31	1.030E+0	3.7165E+2	3.8280E+2
109	None				
110	Upper_large_int_wall	m49	1.030E+0	1.2834E+2	1.3219E+2
111	None				
112	None				
113	None				
114	Gall_bladder_content	m31	1.030E+0	9.4609E+0	9.7447E+0
115	None				
116	Lower_large_int_wall	m49	1.030E+0	1.1245E+2	1.1582E+2
117	None				
118	Lower_large_int_cont	m31	1.030E+0	2.3703E+2	2.4414E+2
119	None				
120	Cranium01	m11	1.155E+0	3.9094E+1	4.5153E+1
121	Cranium02	m12	1.254E+0	3.8880E+1	4.8756E+1
122	Cranium03	m13	1.318E+0	9.9525E+1	1.3117E+2
123	Cranium04	m14	1.388E+0	1.4170E+2	1.9667E+2
124	Cranium05	m15	1.494E+0	1.2485E+2	1.8652E+2
125	Cranium06	m16	1.641E+0	1.9359E+2	3.1768E+2
126	Cranium07	m17	1.765E+0	2.3820E+2	4.2042E+2
127	None				
128	None				
129	None				
130	Mandible01	m11	1.155E+0	2.9887E+0	3.4520E+0
131	Mandible02	m12	1.254E+0	8.1261E+0	1.0190E+1
132	Mandible03	m13	1.318E+0	1.5688E+1	2.0677E+1
133	Mandible04	m14	1.388E+0	1.5893E+1	2.2059E+1
134	Mandible05	m15	1.494E+0	1.3097E+1	1.9567E+1
135	Mandible06	m16	1.641E+0	1.7290E+1	2.8372E+1
136	Mandible07	m17	1.765E+0	3.4364E+1	6.0652E+1

Table C-1 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
137	None				
138	None				
139	None				
140	Cer.-vertebra01	m11	1.155E+0	6.9245E-1	7.9978E-1
141	Cer.-vertebra02	m12	1.254E+0	5.6943E+0	7.1406E+0
142	Cer.-vertebra03	m13	1.318E+0	3.0843E+1	4.0651E+1
143	Cer.-vertebra04	m14	1.388E+0	4.5060E+1	6.2544E+1
144	Cer.-vertebra05	m15	1.494E+0	3.1801E+1	4.7511E+1
145	Cer.-vertebra06	m16	1.641E+0	2.4091E+1	3.9534E+1
146	Cer.-vertebra07	m17	1.765E+0	4.8798E+0	8.6128E+0
147	None				
148	None				
149	None				
150	Thor.-vertebra01	m11	1.155E+0	1.9467E+1	2.2485E+1
151	Thor.-vertebra02	m12	1.254E+0	1.1080E+2	1.3894E+2
152	Thor.-vertebra03	m13	1.318E+0	1.5345E+2	2.0225E+2
153	Thor.-vertebra04	m14	1.388E+0	1.1518E+2	1.5987E+2
154	Thor.-vertebra05	m15	1.494E+0	4.8840E+1	7.2966E+1
155	Thor.-vertebra06	m16	1.641E+0	3.0157E+1	4.9488E+1
156	Thor.-vertebra07	m17	1.765E+0	4.3747E+0	7.7214E+0
157	None				
158	None				
159	None				
160	Lumb.-vertebra01	m11	1.155E+0	3.1529E+1	3.6416E+1
161	Lumb.-vertebra02	m12	1.254E+0	1.6897E+2	2.1189E+2
162	Lumb.-vertebra03	m13	1.318E+0	9.2790E+1	1.2230E+2
163	Lumb.-vertebra04	m14	1.388E+0	6.9462E+1	9.6414E+1
164	Lumb.-vertebra05	m15	1.494E+0	3.6167E+1	5.4033E+1
165	Lumb.-vertebra06	m16	1.641E+0	2.9618E+1	4.8603E+1
166	Lumb.-vertebra07	m17	1.765E+0	8.9394E+0	1.5778E+1
167	None				
168	None				
169	None				
170	Sacrum01	m11	1.155E+0	4.7796E+1	5.5204E+1
171	Sacrum02	m12	1.254E+0	5.3940E+1	6.7641E+1
172	Sacrum03	m13	1.318E+0	4.0881E+1	5.3881E+1
173	Sacrum04	m14	1.388E+0	3.0621E+1	4.2501E+1
174	Sacrum05	m15	1.494E+0	1.5508E+1	2.3169E+1
175	Sacrum06	m16	1.641E+0	1.0849E+1	1.7803E+1
176	Sacrum07	m17	1.765E+0	2.5844E+0	4.5615E+0
177	None				
178	None				
179	None				
180	Clavicles01	m11	1.155E+0	4.0538E+0	4.6822E+0
181	Clavicles02	m12	1.254E+0	9.6847E+0	1.2145E+1
182	Clavicles03	m13	1.318E+0	1.4411E+1	1.8993E+1

Table C-1 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
183	Clavicles04	m14	1.388E+0	1.4007E+1	1.9441E+1
184	Clavicles05	m15	1.494E+0	1.0874E+1	1.6245E+1
185	Clavicles06	m16	1.641E+0	1.4573E+1	2.3914E+1
186	Clavicles07	m17	1.765E+0	9.1373E+0	1.6127E+1
187	None				
188	None				
189	None				
190	Scapulae01	m11	1.155E+0	1.8027E+0	2.0821E+0
191	Scapulae02	m12	1.254E+0	2.0493E+1	2.5698E+1
192	Scapulae03	m13	1.318E+0	5.5541E+1	7.3203E+1
193	Scapulae04	m14	1.388E+0	5.8764E+1	8.1565E+1
194	Scapulae05	m15	1.494E+0	3.9926E+1	5.9649E+1
195	Scapulae06	m16	1.641E+0	3.1351E+1	5.1446E+1
196	Scapulae07	m17	1.765E+0	9.3976E+0	1.6587E+1
197	None				
198	None				
199	None				
200	Sternum01	m11	1.155E+0	1.1312E+1	1.3065E+1
201	Sternum02	m12	1.254E+0	2.4162E+1	3.0299E+1
202	Sternum03	m13	1.318E+0	1.7193E+1	2.2660E+1
203	Sternum04	m14	1.388E+0	1.5134E+1	2.1006E+1
204	Sternum05	m15	1.494E+0	9.1890E+0	1.3728E+1
205	Sternum06	m16	1.641E+0	3.8646E+0	6.3418E+0
206	Sternum07	m17	1.765E+0	8.8357E-2	1.5595E-1
207	None				
208	None				
209	None				
210	Ribs01	m11	1.155E+0	4.1094E+1	4.7463E+1
211	Ribs02	m12	1.254E+0	2.3855E+2	2.9914E+2
212	Ribs03	m13	1.318E+0	1.6571E+2	2.1840E+2
213	Ribs04	m14	1.388E+0	1.3386E+2	1.8580E+2
214	Ribs05	m15	1.494E+0	7.4520E+1	1.1133E+2
215	Ribs06	m16	1.641E+0	4.7138E+1	7.7354E+1
216	Ribs07	m17	1.765E+0	3.1655E+0	5.5870E+0
217	None				
218	None				
219	None				
220	Os-coxae01	m11	1.155E+0	9.9662E+1	1.1511E+2
221	Os-coxae02	m12	1.254E+0	1.9826E+2	2.4862E+2
222	Os-coxae03	m13	1.318E+0	1.4570E+2	1.9204E+2
223	Os-coxae04	m14	1.388E+0	1.2673E+2	1.7590E+2
224	Os-coxae05	m15	1.494E+0	8.8653E+1	1.3245E+2
225	Os-coxae06	m16	1.641E+0	9.1130E+1	1.4955E+2
226	Os-coxae07	m17	1.765E+0	2.4644E+1	4.3497E+1
227	None				
228	None				
229	None				

Table C-1 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
230	Hum.-upper01	m11	1.155E+0	5.6717E+1	6.5508E+1
231	Hum.-upper02	m12	1.254E+0	3.7116E+1	4.6543E+1
232	Hum.-upper03	m13	1.318E+0	3.8647E+1	5.0937E+1
233	Hum.-upper04	m14	1.388E+0	2.5780E+1	3.5783E+1
234	Hum.-upper05	m15	1.494E+0	1.3565E+1	2.0266E+1
235	Hum.-upper06	m16	1.641E+0	1.5786E+1	2.5905E+1
236	Hum.-upper07	m17	1.765E+0	3.5320E+1	6.2340E+1
237	None				
238	None				
239	None				
240	Hum.-lower01	m11	1.155E+0	1.7082E+1	1.9729E+1
241	Hum.-lower02	m12	1.254E+0	2.6614E+1	3.3373E+1
242	Hum.-lower03	m13	1.318E+0	3.2214E+1	4.2458E+1
243	Hum.-lower04	m14	1.388E+0	3.2196E+1	4.4687E+1
244	Hum.-lower05	m15	1.494E+0	2.0648E+1	3.0847E+1
245	Hum.-lower06	m16	1.641E+0	2.3173E+1	3.8027E+1
246	Hum.-lower07	m17	1.765E+0	4.5458E+1	8.0233E+1
247	None				
248	None				
249	None				
250	Forearm01	m11	1.155E+0	2.6331E+1	3.0413E+1
251	Forearm02	m12	1.254E+0	3.2766E+1	4.1088E+1
252	Forearm03	m13	1.318E+0	3.5412E+1	4.6673E+1
253	Forearm04	m14	1.388E+0	3.9484E+1	5.4804E+1
254	Forearm05	m15	1.494E+0	2.7504E+1	4.1091E+1
255	Forearm06	m16	1.641E+0	3.7536E+1	6.1596E+1
256	Forearm07	m17	1.765E+0	4.8191E+1	8.5057E+1
257	None				
258	None				
259	None				
260	Wrist-hand01	m11	1.155E+0	7.2202E+0	8.3393E+0
261	Wrist-hand02	m12	1.254E+0	8.7406E+0	1.0961E+1
262	Wrist-hand03	m13	1.318E+0	3.0292E+1	3.9925E+1
263	Wrist-hand04	m14	1.388E+0	5.1908E+1	7.2048E+1
264	Wrist-hand05	m15	1.494E+0	3.1316E+1	4.6786E+1
265	Wrist-hand06	m16	1.641E+0	2.0783E+1	3.4105E+1
266	Wrist-hand07	m17	1.765E+0	6.8765E+0	1.2137E+1
267	None				
268	None				
269	None				
270	Fem.-upper01	m11	1.155E+0	9.1918E+1	1.0616E+2
271	Fem.-upper02	m12	1.254E+0	7.9155E+1	9.9261E+1
272	Fem.-upper03	m13	1.318E+0	7.4121E+1	9.7692E+1
273	Fem.-upper04	m14	1.388E+0	6.6810E+1	9.2732E+1
274	Fem.-upper05	m15	1.494E+0	3.2460E+1	4.8495E+1
275	Fem.-upper06	m16	1.641E+0	3.5866E+1	5.8856E+1

Table C-1 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
276	Fem.-upper07	m17	1.765E+0	1.2610E+2	2.2256E+2
277	None				
278	None				
279	None				
280	Fem.-lower01	m11	1.155E+0	1.1606E+2	1.3405E+2
281	Fem.-lower02	m12	1.254E+0	1.3408E+2	1.6813E+2
282	Fem.-lower03	m13	1.318E+0	1.2373E+2	1.6308E+2
283	Fem.-lower04	m14	1.388E+0	9.1685E+1	1.2726E+2
284	Fem.-lower05	m15	1.494E+0	4.1684E+1	6.2276E+1
285	Fem.-lower06	m16	1.641E+0	3.3990E+1	5.5778E+1
286	Fem.-lower07	m17	1.765E+0	1.2252E+2	2.1625E+2
287	None				
288	None				
289	None				
290	Tib.-fib.-pate01	m11	1.155E+0	1.9045E+2	2.1997E+2
291	Tib.-fib.-pate02	m12	1.254E+0	2.6661E+2	3.3433E+2
292	Tib.-fib.-pate03	m13	1.318E+0	1.7230E+2	2.2709E+2
293	Tib.-fib.-pate04	m14	1.388E+0	1.1901E+2	1.6518E+2
294	Tib.-fib.-pate05	m15	1.494E+0	7.2418E+1	1.0819E+2
295	Tib.-fib.-pate06	m16	1.641E+0	8.3046E+1	1.3628E+2
296	Tib.-fib.-pate07	m17	1.765E+0	2.2091E+2	3.8991E+2
297	None				
298	None				
299	None				
300	Ankle-foot01	m11	1.155E+0	4.5858E+1	5.2966E+1
301	Ankle-foot02	m12	1.254E+0	1.2961E+2	1.6253E+2
302	Ankle-foot03	m13	1.318E+0	1.1751E+2	1.5488E+2
303	Ankle-foot04	m14	1.388E+0	1.3887E+2	1.9275E+2
304	Ankle-foot05	m15	1.494E+0	1.0887E+2	1.6265E+2
305	Ankle-foot06	m16	1.641E+0	7.2294E+1	1.1863E+2
306	Ankle-foot07	m17	1.765E+0	2.0253E+1	3.5747E+1
307	None				
308	None				
309	None				
310	Os-hyoideum01	m11	1.155E+0	9.6040E-4	1.1093E-3
311	Os-hyoideum02	m12	1.254E+0	1.7288E-2	2.1679E-2
312	Os-hyoideum03	m13	1.318E+0	6.7324E-1	8.8733E-1
313	Os-hyoideum04	m14	1.388E+0	7.4143E-1	1.0291E+0
314	Os-hyoideum05	m15	1.494E+0	7.1262E-1	1.0647E+0
315	Os-hyoideum06	m16	1.641E+0	4.6195E-1	7.5806E-1
316	Os-hyoideum07	m17	1.765E+0	3.6495E-2	6.4414E-2
317	None				
318	None				
319	None				

Table C-2 Organ ID, material ID, density, volume and mass of each organ, tissue and content in the JM2 phantom.

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
1	None				
2	Adipose_head	m34	9.500E-1	8.6111E+2	8.1806E+2
3	None				
4	Adipose_trunk	m34	9.500E-1	1.2416E+4	1.1796E+4
5	None				
6	Adipose_left_arm	m34	9.500E-1	6.8795E+2	6.5355E+2
7	None				
8	Adipose_right_arm	m34	9.500E-1	6.8486E+2	6.5062E+2
9	None				
10	Adipose_left_leg	m34	9.500E-1	2.6573E+3	2.5244E+3
11	None				
12	Adipose_right_leg	m34	9.500E-1	2.5711E+3	2.4426E+3
13	None				
14	Adrenal	m31	1.030E+0	1.0476E+1	1.0790E+1
15	None				
16	Bladder_wall	m41	1.040E+0	3.5054E+1	3.6456E+1
17	None				
18	Brain	m42	1.040E+0	1.6211E+3	1.6859E+3
19	None				
20	Breast (left+right)	m34	9.500E-1	1.0437E+2	9.9152E+1
21	None				
22	None				
23	None				
24	Air in nose or air duct	m99	1.204E-3	1.8326E+2	2.2064E-1
25	None				
26	None				
27	None				
28	Bronchi	m31	1.030E+0	1.0669E+1	1.0989E+1
29	None				
30	Eye	m43	1.070E+0	1.2749E+1	1.3641E+1
31	None				
32	Eye_lens	m43	1.070E+0	3.5439E-1	3.7920E-1
33	None				
34	Heart_wall	m44	1.050E+0	4.7671E+2	5.0055E+2
35	None				
36	Left_kidney	m45	1.050E+0	1.1934E+2	1.2531E+2
37	None				
38	Right_kidney	m45	1.050E+0	1.3087E+2	1.3741E+2
39	None				
40	Liver	m46	1.050E+0	1.3335E+3	1.4002E+3
41	None				
42	Left_lung	m36	2.600E-1	2.5950E+3	6.7470E+2
43	None				
44	Right_lung	m36	2.600E-1	2.8206E+3	7.3335E+2
45	None				

Table C-2 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
46	Muscle_head	m32	1.050E+0	1.5981E+3	1.6780E+3
47	None				
48	Muscle_trunk	m32	1.050E+0	1.1910E+4	1.2506E+4
49	None				
50	Muscle_left_arm	m32	1.050E+0	1.1419E+3	1.1990E+3
51	None				
52	Muscle_right_arm	m32	1.050E+0	1.2068E+3	1.2672E+3
53	None				
54	Muscle_Left_leg	m32	1.050E+0	4.6160E+3	4.8468E+3
55	None				
56	Muscle_right_leg	m32	1.050E+0	4.7586E+3	4.9965E+3
57	None				
58	Esophagus	m31	1.030E+0	3.3608E+1	3.4616E+1
59	None				
60	Gall_bladder_wall	m31	1.030E+0	6.7026E+0	6.9037E+0
61	None				
62	Pancreas	m47	1.040E+0	1.1281E+2	1.1732E+2
63	None				
64	Heart_content	m51	1.060E+0	3.2448E+2	3.4395E+2
65	None				
66	Small_int_content	m31	1.030E+0	1.9571E+2	2.0158E+2
67	None				
68	None				
69	None				
70	None				
71	None				
72	Skin_head	m33	1.090E+0	1.7769E+2	1.9369E+2
73	None				
74	Skin_trunk	m33	1.090E+0	7.4499E+2	8.1204E+2
75	None				
76	Skin_left_arm	m33	1.090E+0	1.6711E+2	1.8214E+2
77	None				
78	Skin_right_arm	m33	1.090E+0	1.6963E+2	1.8490E+2
79	None				
80	Skin_left_leg	m33	1.090E+0	3.9040E+2	4.2553E+2
81	None				
82	Skin_right_leg	m33	1.090E+0	3.8553E+2	4.2022E+2
83	None				
84	Small_int_wall	m49	1.030E+0	4.0522E+2	4.1738E+2
85	None				
86	None				
87	None				
88	Spleen	m48	1.060E+0	1.3255E+2	1.4050E+2
89	None				
90	Stomach_wall	m49	1.030E+0	1.1657E+2	1.2006E+2
91	None				

Table C-2 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
92	Teeth	m37	2.750E+0	2.2039E+1	6.0607E+1
93	None				
94	Testis	m52	1.040E+0	3.5255E+1	3.6665E+1
95	None				
96	Thymus	m31	1.030E+0	3.0195E+1	3.1101E+1
97	None				
98	Thyroid	m50	1.050E+0	2.0712E+1	2.1747E+1
99	None				
100	Trachea	m31	1.030E+0	9.4772E+0	9.7615E+0
101	None				
102	None				
103	None				
104	Bladder_content	m31	1.030E+0	1.0714E+2	1.1035E+2
105	None				
106	Upper_large_int_cont	m31	1.030E+0	2.5999E+2	2.6779E+2
107	None				
108	Stomach_content	m31	1.030E+0	3.2644E+2	3.3623E+2
109	None				
110	Upper_large_int_wall	m49	1.030E+0	1.3090E+2	1.3483E+2
111	None				
112	None				
113	None				
114	Gall_bladder_content	m31	1.030E+0	1.0590E+1	1.0908E+1
115	None				
116	Lower_large_int_wall	m49	1.030E+0	1.1353E+2	1.1694E+2
117	None				
118	Lower_large_int_cont	m31	1.030E+0	2.1460E+2	2.2104E+2
119	None				
120	Cranium01	m11	1.155E+0	3.9093E+1	4.5152E+1
121	Cranium02	m12	1.254E+0	3.8877E+1	4.8752E+1
122	Cranium03	m13	1.318E+0	9.9512E+1	1.3116E+2
123	Cranium04	m14	1.388E+0	1.4169E+2	1.9666E+2
124	Cranium05	m15	1.494E+0	1.2485E+2	1.8652E+2
125	Cranium06	m16	1.641E+0	1.9359E+2	3.1768E+2
126	Cranium07	m17	1.765E+0	2.3820E+2	4.2042E+2
127	None				
128	None				
129	None				
130	Mandible01	m11	1.155E+0	2.9888E+0	3.4521E+0
131	Mandible02	m12	1.254E+0	8.1260E+0	1.0190E+1
132	Mandible03	m13	1.318E+0	1.5688E+1	2.0677E+1
133	Mandible04	m14	1.388E+0	1.5893E+1	2.2059E+1
134	Mandible05	m15	1.494E+0	1.3097E+1	1.9567E+1
135	Mandible06	m16	1.641E+0	1.7290E+1	2.8372E+1
136	Mandible07	m17	1.765E+0	3.4364E+1	6.0652E+1
137	None				

Table C-2 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
138	None				
139	None				
140	Cer.-vertebra01	m11	1.155E+0	6.9245E-1	7.9978E-1
141	Cer.-vertebra02	m12	1.254E+0	5.6943E+0	7.1406E+0
142	Cer.-vertebra03	m13	1.318E+0	3.0843E+1	4.0651E+1
143	Cer.-vertebra04	m14	1.388E+0	4.5060E+1	6.2544E+1
144	Cer.-vertebra05	m15	1.494E+0	3.1801E+1	4.7511E+1
145	Cer.-vertebra06	m16	1.641E+0	2.4091E+1	3.9534E+1
146	Cer.-vertebra07	m17	1.765E+0	4.8798E+0	8.6128E+0
147	None				
148	None				
149	None				
150	Thor.-vertebra01	m11	1.155E+0	1.9467E+1	2.2485E+1
151	Thor.-vertebra02	m12	1.254E+0	1.1080E+2	1.3894E+2
152	Thor.-vertebra03	m13	1.318E+0	1.5345E+2	2.0225E+2
153	Thor.-vertebra04	m14	1.388E+0	1.1518E+2	1.5987E+2
154	Thor.-vertebra05	m15	1.494E+0	4.8840E+1	7.2966E+1
155	Thor.-vertebra06	m16	1.641E+0	3.0157E+1	4.9488E+1
156	Thor.-vertebra07	m17	1.765E+0	4.3747E+0	7.7214E+0
157	None				
158	None				
159	None				
160	Lumb.-vertebra01	m11	1.155E+0	3.1529E+1	3.6416E+1
161	Lumb.-vertebra02	m12	1.254E+0	1.6897E+2	2.1189E+2
162	Lumb.-vertebra03	m13	1.318E+0	9.2790E+1	1.2230E+2
163	Lumb.-vertebra04	m14	1.388E+0	6.9462E+1	9.6414E+1
164	Lumb.-vertebra05	m15	1.494E+0	3.6167E+1	5.4033E+1
165	Lumb.-vertebra06	m16	1.641E+0	2.9618E+1	4.8603E+1
166	Lumb.-vertebra07	m17	1.765E+0	8.9394E+0	1.5778E+1
167	None				
168	None				
169	None				
170	Sacrum01	m11	1.155E+0	4.7796E+1	5.5204E+1
171	Sacrum02	m12	1.254E+0	5.3940E+1	6.7641E+1
172	Sacrum03	m13	1.318E+0	4.0881E+1	5.3881E+1
173	Sacrum04	m14	1.388E+0	3.0621E+1	4.2501E+1
174	Sacrum05	m15	1.494E+0	1.5508E+1	2.3169E+1
175	Sacrum06	m16	1.641E+0	1.0849E+1	1.7803E+1
176	Sacrum07	m17	1.765E+0	2.5844E+0	4.5615E+0
177	None				
178	None				
179	None				
180	Clavicles01	m11	1.155E+0	4.0538E+0	4.6822E+0
181	Clavicles02	m12	1.254E+0	9.6847E+0	1.2145E+1
182	Clavicles03	m13	1.318E+0	1.4411E+1	1.8993E+1
183	Clavicles04	m14	1.388E+0	1.4007E+1	1.9441E+1

Table C-2 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
184	Clavicles05	m15	1.494E+0	1.0874E+1	1.6245E+1
185	Clavicles06	m16	1.641E+0	1.4573E+1	2.3914E+1
186	Clavicles07	m17	1.765E+0	9.1373E+0	1.6127E+1
187	None				
188	None				
189	None				
190	Scapulae01	m11	1.155E+0	1.8027E+0	2.0821E+0
191	Scapulae02	m12	1.254E+0	2.0493E+1	2.5698E+1
192	Scapulae03	m13	1.318E+0	5.5541E+1	7.3203E+1
193	Scapulae04	m14	1.388E+0	5.8764E+1	8.1565E+1
194	Scapulae05	m15	1.494E+0	3.9926E+1	5.9649E+1
195	Scapulae06	m16	1.641E+0	3.1351E+1	5.1446E+1
196	Scapulae07	m17	1.765E+0	9.3976E+0	1.6587E+1
197	None				
198	None				
199	None				
200	Sternum01	m11	1.155E+0	1.1312E+1	1.3065E+1
201	Sternum02	m12	1.254E+0	2.4162E+1	3.0299E+1
202	Sternum03	m13	1.318E+0	1.7193E+1	2.2660E+1
203	Sternum04	m14	1.388E+0	1.5134E+1	2.1006E+1
204	Sternum05	m15	1.494E+0	9.1890E+0	1.3728E+1
205	Sternum06	m16	1.641E+0	3.8646E+0	6.3418E+0
206	Sternum07	m17	1.765E+0	8.8357E-2	1.5595E-1
207	None				
208	None				
209	None				
210	Ribs01	m11	1.155E+0	4.1094E+1	4.7463E+1
211	Ribs02	m12	1.254E+0	2.3855E+2	2.9914E+2
212	Ribs03	m13	1.318E+0	1.6571E+2	2.1840E+2
213	Ribs04	m14	1.388E+0	1.3386E+2	1.8580E+2
214	Ribs05	m15	1.494E+0	7.4520E+1	1.1133E+2
215	Ribs06	m16	1.641E+0	4.7138E+1	7.7354E+1
216	Ribs07	m17	1.765E+0	3.1655E+0	5.5870E+0
217	None				
218	None				
219	None				
220	Os-coxae01	m11	1.155E+0	9.9662E+1	1.1511E+2
221	Os-coxae02	m12	1.254E+0	1.9826E+2	2.4861E+2
222	Os-coxae03	m13	1.318E+0	1.4570E+2	1.9203E+2
223	Os-coxae04	m14	1.388E+0	1.2672E+2	1.7589E+2
224	Os-coxae05	m15	1.494E+0	8.8652E+1	1.3245E+2
225	Os-coxae06	m16	1.641E+0	9.1128E+1	1.4954E+2
226	Os-coxae07	m17	1.765E+0	2.4644E+1	4.3497E+1
227	None				
228	None				
229	None				

Table C-2 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
230	Hum.-upper01	m11	1.155E+0	5.6717E+1	6.5508E+1
231	Hum.-upper02	m12	1.254E+0	3.7116E+1	4.6543E+1
232	Hum.-upper03	m13	1.318E+0	3.8647E+1	5.0937E+1
233	Hum.-upper04	m14	1.388E+0	2.5780E+1	3.5783E+1
234	Hum.-upper05	m15	1.494E+0	1.3565E+1	2.0266E+1
235	Hum.-upper06	m16	1.641E+0	1.5786E+1	2.5905E+1
236	Hum.-upper07	m17	1.765E+0	3.5320E+1	6.2340E+1
237	None				
238	None				
239	None				
240	Hum.-lower01	m11	1.155E+0	1.7082E+1	1.9729E+1
241	Hum.-lower02	m12	1.254E+0	2.6614E+1	3.3373E+1
242	Hum.-lower03	m13	1.318E+0	3.2214E+1	4.2458E+1
243	Hum.-lower04	m14	1.388E+0	3.2196E+1	4.4687E+1
244	Hum.-lower05	m15	1.494E+0	2.0648E+1	3.0847E+1
245	Hum.-lower06	m16	1.641E+0	2.3173E+1	3.8027E+1
246	Hum.-lower07	m17	1.765E+0	4.5458E+1	8.0233E+1
247	None				
248	None				
249	None				
250	Forearm01	m11	1.155E+0	2.6331E+1	3.0413E+1
251	Forearm02	m12	1.254E+0	3.2751E+1	4.1069E+1
252	Forearm03	m13	1.318E+0	3.5394E+1	4.6649E+1
253	Forearm04	m14	1.388E+0	3.9462E+1	5.4773E+1
254	Forearm05	m15	1.494E+0	2.7494E+1	4.1076E+1
255	Forearm06	m16	1.641E+0	3.7527E+1	6.1582E+1
256	Forearm07	m17	1.765E+0	4.8189E+1	8.5054E+1
257	None				
258	None				
259	None				
260	Wrist-hand01	m11	1.155E+0	7.2202E+0	8.3393E+0
261	Wrist-hand02	m12	1.254E+0	8.7406E+0	1.0961E+1
262	Wrist-hand03	m13	1.318E+0	3.0292E+1	3.9925E+1
263	Wrist-hand04	m14	1.388E+0	5.1908E+1	7.2048E+1
264	Wrist-hand05	m15	1.494E+0	3.1316E+1	4.6786E+1
265	Wrist-hand06	m16	1.641E+0	2.0783E+1	3.4105E+1
266	Wrist-hand07	m17	1.765E+0	6.8630E+0	1.2113E+1
267	None				
268	None				
269	None				
270	Fem.-upper01	m11	1.155E+0	9.1918E+1	1.0616E+2
271	Fem.-upper02	m12	1.254E+0	7.9155E+1	9.9261E+1
272	Fem.-upper03	m13	1.318E+0	7.4121E+1	9.7692E+1
273	Fem.-upper04	m14	1.388E+0	6.6810E+1	9.2732E+1
274	Fem.-upper05	m15	1.494E+0	3.2460E+1	4.8495E+1
275	Fem.-upper06	m16	1.641E+0	3.5866E+1	5.8856E+1

Table C-2 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
276	Fem.-upper07	m17	1.765E+0	1.2610E+2	2.2256E+2
277	None				
278	None				
279	None				
280	Fem.-lower01	m11	1.155E+0	1.1606E+2	1.3405E+2
281	Fem.-lower02	m12	1.254E+0	1.3408E+2	1.6813E+2
282	Fem.-lower03	m13	1.318E+0	1.2373E+2	1.6308E+2
283	Fem.-lower04	m14	1.388E+0	9.1685E+1	1.2726E+2
284	Fem.-lower05	m15	1.494E+0	4.1684E+1	6.2276E+1
285	Fem.-lower06	m16	1.641E+0	3.3990E+1	5.5778E+1
286	Fem.-lower07	m17	1.765E+0	1.2252E+2	2.1625E+2
287	None				
288	None				
289	None				
290	Tib.-fib.-pate01	m11	1.155E+0	1.8959E+2	2.1897E+2
291	Tib.-fib.-pate02	m12	1.254E+0	2.6504E+2	3.3236E+2
292	Tib.-fib.-pate03	m13	1.318E+0	1.7220E+2	2.2697E+2
293	Tib.-fib.-pate04	m14	1.388E+0	1.1900E+2	1.6517E+2
294	Tib.-fib.-pate05	m15	1.494E+0	7.2418E+1	1.0819E+2
295	Tib.-fib.-pate06	m16	1.641E+0	8.3046E+1	1.3628E+2
296	Tib.-fib.-pate07	m17	1.765E+0	2.2091E+2	3.8991E+2
297	None				
298	None				
299	None				
300	Ankle-foot01	m11	1.155E+0	4.5106E+1	5.2098E+1
301	Ankle-foot02	m12	1.254E+0	1.2906E+2	1.6184E+2
302	Ankle-foot03	m13	1.318E+0	1.1745E+2	1.5480E+2
303	Ankle-foot04	m14	1.388E+0	1.3885E+2	1.9272E+2
304	Ankle-foot05	m15	1.494E+0	1.0885E+2	1.6263E+2
305	Ankle-foot06	m16	1.641E+0	7.2288E+1	1.1862E+2
306	Ankle-foot07	m17	1.765E+0	2.0253E+1	3.5747E+1
307	None				
308	None				
309	None				
310	Os-hyoideum01	m11	1.155E+0	9.6040E-4	1.1093E-3
311	Os-hyoideum02	m12	1.254E+0	1.7288E-2	2.1679E-2
312	Os-hyoideum03	m13	1.318E+0	6.7324E-1	8.8733E-1
313	Os-hyoideum04	m14	1.388E+0	7.4143E-1	1.0291E+0
314	Os-hyoideum05	m15	1.494E+0	7.1262E-1	1.0647E+0
315	Os-hyoideum06	m16	1.641E+0	4.6195E-1	7.5806E-1
316	Os-hyoideum07	m17	1.765E+0	3.6495E-2	6.4414E-2
317	None				
318	None				
319	None				

Table C-3 Organ ID, material ID, density, volume and mass of each organ, tissue and content in the JF phantom.

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
1	None				
2	Adipose_head	m34	9.500E-1	5.9558E+2	5.6580E+2
3	None				
4	Adipose_trunk	m34	9.500E-1	6.2568E+3	5.9440E+3
5	None				
6	Adipose_left_arm	m34	9.500E-1	4.1538E+2	3.9461E+2
7	None				
8	Adipose_right_arm	m34	9.500E-1	4.1138E+2	3.9081E+2
9	None				
10	Adipose_left_leg	m34	9.500E-1	2.0493E+3	1.9468E+3
11	None				
12	Adipose_right_leg	m34	9.500E-1	1.9284E+3	1.8320E+3
13	None				
14	Adrenal	m31	1.030E+0	5.9430E+0	6.1213E+0
15	None				
16	Bladder_wall	m41	1.040E+0	1.9252E+1	2.0022E+1
17	None				
18	Brain	m42	1.040E+0	1.2907E+3	1.3423E+3
19	None				
20	Breast_left	m35	9.400E-1	2.9452E+2	2.7685E+2
21	None				
22	Breast_right	m35	9.400E-1	3.2389E+2	3.0446E+2
23	None				
24	Air in nose or air duct	m99	1.204E-3	1.1529E+2	1.3881E-1
25	None				
26	Ovary	m52	1.050E+0	6.4289E+0	6.7503E+0
27	None				
28	Bronchi	m31	1.030E+0	1.3534E+1	1.3940E+1
29	None				
30	Eye	m43	1.070E+0	1.4029E+1	1.5011E+1
31	None				
32	Eye_lens	m43	1.070E+0	7.8177E-1	8.3649E-1
33	None				
34	Heart_wall	m44	1.050E+0	2.6698E+2	2.8033E+2
35	None				
36	Left_kidney	m45	1.050E+0	1.0385E+2	1.0904E+2
37	None				
38	Right_kidney	m45	1.050E+0	9.8874E+1	1.0382E+2
39	None				
40	Liver	m46	1.050E+0	1.1229E+3	1.1790E+3
41	None				
42	Left_lung	m36	2.600E-1	2.1416E+3	5.5682E+2
43	None				
44	Right_lung	m36	2.600E-1	2.0633E+3	5.3646E+2
45	None				

Table C-3 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
46	Muscle_head	m32	1.050E+0	7.1366E+2	7.4934E+2
47	None				
48	Muscle_trunk	m32	1.050E+0	8.3710E+3	8.7896E+3
49	None				
50	Muscle_left_arm	m32	1.050E+0	7.5555E+2	7.9333E+2
51	None				
52	Muscle_right_arm	m32	1.050E+0	6.9800E+2	7.3290E+2
53	None				
54	Muscle_Left_leg	m32	1.050E+0	3.1818E+3	3.3409E+3
55	None				
56	Muscle_right_leg	m32	1.050E+0	3.2606E+3	3.4236E+3
57	None				
58	Esophagus	m31	1.030E+0	4.7188E+1	4.8604E+1
59	None				
60	Gall_bladder_wall	m31	1.030E+0	3.6178E+0	3.7263E+0
61	None				
62	Pancreas	m47	1.040E+0	9.1343E+1	9.4997E+1
63	None				
64	Heart_content	m51	1.060E+0	3.4828E+2	3.6918E+2
65	None				
66	Small_int_content	m31	1.030E+0	1.6362E+2	1.6853E+2
67	None				
68	None				
69	None				
70	None				
71	None				
72	Skin_head	m33	1.090E+0	1.2803E+2	1.3955E+2
73	None				
74	Skin_trunk	m33	1.090E+0	6.0760E+2	6.6228E+2
75	None				
76	Skin_left_arm	m33	1.090E+0	1.2753E+2	1.3901E+2
77	None				
78	Skin_right_arm	m33	1.090E+0	1.2417E+2	1.3535E+2
79	None				
80	Skin_left_leg	m33	1.090E+0	2.9872E+2	3.2560E+2
81	None				
82	Skin_right_leg	m33	1.090E+0	3.0149E+2	3.2862E+2
83	None				
84	Small_int_wall	m49	1.030E+0	3.6246E+2	3.7333E+2
85	None				
86	None				
87	None				
88	Spleen	m48	1.060E+0	5.2893E+1	5.6067E+1
89	None				
90	Stomach_wall	m49	1.030E+0	1.0128E+2	1.0432E+2
91	None				

Table C-3 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
92	Teeth	m37	2.750E+0	2.0231E+1	5.5635E+1
93	None				
94	None				
95	None				
96	Thymus	m31	1.030E+0	1.8456E+1	1.9010E+1
97	None				
98	Thyroid	m50	1.050E+0	6.9811E+0	7.3302E+0
99	None				
100	Trachea	m31	1.030E+0	1.6633E+1	1.7132E+1
101	None				
102	Uterus	m53	1.020E+0	4.5259E+1	4.6164E+1
103	None				
104	Bladder_content	m31	1.030E+0	5.9308E+1	6.1087E+1
105	None				
106	Upper_large_int_cont	m31	1.030E+0	2.5713E+2	2.6484E+2
107	None				
108	Stomach_content	m31	1.030E+0	3.9859E+2	4.1055E+2
109	None				
110	Upper_large_int_wall	m49	1.030E+0	1.1538E+2	1.1884E+2
111	None				
112	None				
113	None				
114	Gall_bladder_content	m31	1.030E+0	2.3232E+0	2.3929E+0
115	None				
116	Lower_large_int_wall	m49	1.030E+0	1.1015E+2	1.1345E+2
117	None				
118	Lower_large_int_cont	m31	1.030E+0	2.3022E+2	2.3713E+2
119	None				
120	Cranium01	m11	1.155E+0	6.5687E+1	7.5868E+1
121	Cranium02	m12	1.261E+0	7.0799E+1	8.9278E+1
122	Cranium03	m13	1.318E+0	6.6323E+1	8.7414E+1
123	Cranium04	m14	1.388E+0	7.5397E+1	1.0465E+2
124	Cranium05	m15	1.485E+0	7.8789E+1	1.1700E+2
125	Cranium06	m16	1.641E+0	1.5009E+2	2.4630E+2
126	Cranium07	m17	1.765E+0	1.8857E+2	3.3283E+2
127	None				
128	None				
129	None				
130	Mandible01	m11	1.155E+0	7.8945E-1	9.1181E-1
131	Mandible02	m12	1.261E+0	5.9248E+0	7.4712E+0
132	Mandible03	m13	1.318E+0	6.8524E+0	9.0315E+0
133	Mandible04	m14	1.388E+0	7.8128E+0	1.0844E+1
134	Mandible05	m15	1.485E+0	7.9338E+0	1.1782E+1
135	Mandible06	m16	1.641E+0	1.3371E+1	2.1942E+1
136	Mandible07	m17	1.765E+0	2.7143E+1	4.7907E+1
137	None				

Table C-3 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
138	None				
139	None				
140	Cer.-vertebra01	m11	1.155E+0	4.9940E-1	5.7681E-1
141	Cer.-vertebra02	m12	1.261E+0	1.2019E+1	1.5156E+1
142	Cer.-vertebra03	m13	1.318E+0	2.2941E+1	3.0236E+1
143	Cer.-vertebra04	m14	1.388E+0	2.7670E+1	3.8406E+1
144	Cer.-vertebra05	m15	1.485E+0	1.6098E+1	2.3906E+1
145	Cer.-vertebra06	m16	1.641E+0	1.0979E+1	1.8017E+1
146	Cer.-vertebra07	m17	1.765E+0	2.2599E+0	3.9887E+0
147	None				
148	None				
149	None				
150	Thor.-vertebra01	m11	1.155E+0	1.1850E+1	1.3687E+1
151	Thor.-vertebra02	m12	1.261E+0	1.2714E+2	1.6032E+2
152	Thor.-vertebra03	m13	1.318E+0	1.1375E+2	1.4992E+2
153	Thor.-vertebra04	m14	1.388E+0	5.5455E+1	7.6972E+1
154	Thor.-vertebra05	m15	1.485E+0	2.3896E+1	3.5486E+1
155	Thor.-vertebra06	m16	1.641E+0	1.4875E+1	2.4410E+1
156	Thor.-vertebra07	m17	1.765E+0	1.5078E+0	2.6613E+0
157	None				
158	None				
159	None				
160	Lumb.-vertebra01	m11	1.155E+0	3.0609E+1	3.5353E+1
161	Lumb.-vertebra02	m12	1.261E+0	1.5594E+2	1.9664E+2
162	Lumb.-vertebra03	m13	1.318E+0	7.5605E+1	9.9647E+1
163	Lumb.-vertebra04	m14	1.388E+0	4.2296E+1	5.8707E+1
164	Lumb.-vertebra05	m15	1.485E+0	1.9254E+1	2.8592E+1
165	Lumb.-vertebra06	m16	1.641E+0	1.8376E+1	3.0155E+1
166	Lumb.-vertebra07	m17	1.765E+0	4.5638E+0	8.0551E+0
167	None				
168	None				
169	None				
170	Sacrum01	m11	1.155E+0	6.4486E+1	7.4481E+1
171	Sacrum02	m12	1.261E+0	6.1532E+1	7.7592E+1
172	Sacrum03	m13	1.318E+0	3.9039E+1	5.1453E+1
173	Sacrum04	m14	1.388E+0	1.5959E+1	2.2151E+1
174	Sacrum05	m15	1.485E+0	6.1273E+0	9.0990E+0
175	Sacrum06	m16	1.641E+0	3.1894E+0	5.2338E+0
176	Sacrum07	m17	1.765E+0	3.1789E-1	5.6108E-1
177	None				
178	None				
179	None				
180	Clavicles01	m11	1.155E+0	4.4381E+0	5.1260E+0
181	Clavicles02	m12	1.261E+0	9.6597E+0	1.2181E+1
182	Clavicles03	m13	1.318E+0	9.0931E+0	1.1985E+1
183	Clavicles04	m14	1.388E+0	6.8794E+0	9.5486E+0

Table C-3 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
184	Clavicles05	m15	1.485E+0	5.0326E+0	7.4734E+0
185	Clavicles06	m16	1.641E+0	7.6697E+0	1.2586E+1
186	Clavicles07	m17	1.765E+0	5.9017E+0	1.0417E+1
187	None				
188	None				
189	None				
190	Scapulae01	m11	1.155E+0	8.2114E-1	9.4842E-1
191	Scapulae02	m12	1.261E+0	2.5360E+1	3.1979E+1
192	Scapulae03	m13	1.318E+0	3.7209E+1	4.9041E+1
193	Scapulae04	m14	1.388E+0	3.2526E+1	4.5146E+1
194	Scapulae05	m15	1.485E+0	2.1738E+1	3.2281E+1
195	Scapulae06	m16	1.641E+0	1.6037E+1	2.6317E+1
196	Scapulae07	m17	1.765E+0	4.5974E+0	8.1144E+0
197	None				
198	None				
199	None				
200	Sternum01	m11	1.155E+0	1.6175E+1	1.8682E+1
201	Sternum02	m12	1.261E+0	1.5613E+1	1.9688E+1
202	Sternum03	m13	1.318E+0	1.1351E+1	1.4961E+1
203	Sternum04	m14	1.388E+0	5.6481E+0	7.8396E+0
204	Sternum05	m15	1.485E+0	6.2714E-1	9.3130E-1
205	Sternum06	m16	1.641E+0	8.6436E-2	1.4184E-1
206	Sternum07	m17	1.765E+0	0.0000E+0	0.0000E+0
207	None				
208	None				
209	None				
210	Ribs01	m11	1.155E+0	3.3686E+1	3.8907E+1
211	Ribs02	m12	1.261E+0	1.6211E+2	2.0442E+2
212	Ribs03	m13	1.318E+0	8.8497E+1	1.1664E+2
213	Ribs04	m14	1.388E+0	7.2847E+1	1.0111E+2
214	Ribs05	m15	1.485E+0	3.9189E+1	5.8196E+1
215	Ribs06	m16	1.641E+0	1.7919E+1	2.9405E+1
216	Ribs07	m17	1.765E+0	5.5223E-1	9.7469E-1
217	None				
218	None				
219	None				
220	Os-coxae01	m11	1.155E+0	6.2488E+1	7.2174E+1
221	Os-coxae02	m12	1.261E+0	1.5207E+2	1.9176E+2
222	Os-coxae03	m13	1.318E+0	1.1478E+2	1.5128E+2
223	Os-coxae04	m14	1.388E+0	9.3774E+1	1.3016E+2
224	Os-coxae05	m15	1.485E+0	6.4312E+1	9.5503E+1
225	Os-coxae06	m16	1.641E+0	5.2197E+1	8.5655E+1
226	Os-coxae07	m17	1.765E+0	1.1935E+1	2.1065E+1
227	None				
228	None				
229	None				

Table C-3 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
230	Hum.-upper01	m11	1.155E+0	3.8378E+1	4.4327E+1
231	Hum.-upper02	m12	1.261E+0	3.3788E+1	4.2607E+1
232	Hum.-upper03	m13	1.318E+0	2.1161E+1	2.7890E+1
233	Hum.-upper04	m14	1.388E+0	1.2767E+1	1.7721E+1
234	Hum.-upper05	m15	1.485E+0	7.6554E+0	1.1368E+1
235	Hum.-upper06	m16	1.641E+0	1.0998E+1	1.8048E+1
236	Hum.-upper07	m17	1.765E+0	1.6803E+1	2.9657E+1
237	None				
238	None				
239	None				
240	Hum.-lower01	m11	1.155E+0	9.0585E+0	1.0463E+1
241	Hum.-lower02	m12	1.261E+0	1.7111E+1	2.1577E+1
242	Hum.-lower03	m13	1.318E+0	1.3005E+1	1.7141E+1
243	Hum.-lower04	m14	1.388E+0	1.2456E+1	1.7289E+1
244	Hum.-lower05	m15	1.485E+0	8.5081E+0	1.2635E+1
245	Hum.-lower06	m16	1.641E+0	1.1684E+1	1.9173E+1
246	Hum.-lower07	m17	1.765E+0	2.0926E+1	3.6934E+1
247	None				
248	None				
249	None				
250	Forearm01	m11	1.155E+0	1.7597E+1	2.0325E+1
251	Forearm02	m12	1.261E+0	3.6230E+1	4.5686E+1
252	Forearm03	m13	1.318E+0	3.1438E+1	4.1435E+1
253	Forearm04	m14	1.388E+0	2.7764E+1	3.8536E+1
254	Forearm05	m15	1.485E+0	1.7772E+1	2.6391E+1
255	Forearm06	m16	1.641E+0	2.4291E+1	3.9862E+1
256	Forearm07	m17	1.765E+0	1.7475E+1	3.0843E+1
257	None				
258	None				
259	None				
260	Wrist-hand01	m11	1.155E+0	6.7170E+0	7.7581E+0
261	Wrist-hand02	m12	1.261E+0	3.7382E+1	4.7139E+1
262	Wrist-hand03	m13	1.318E+0	4.3585E+1	5.7445E+1
263	Wrist-hand04	m14	1.388E+0	2.5535E+1	3.5443E+1
264	Wrist-hand05	m15	1.485E+0	9.5934E+0	1.4246E+1
265	Wrist-hand06	m16	1.641E+0	6.4932E+0	1.0655E+1
266	Wrist-hand07	m17	1.765E+0	6.2426E-2	1.1018E-1
267	None				
268	None				
269	None				
270	Fem.-upper01	m11	1.155E+0	4.5276E+1	5.2294E+1
271	Fem.-upper02	m12	1.261E+0	7.6497E+1	9.6463E+1
272	Fem.-upper03	m13	1.318E+0	5.4739E+1	7.2146E+1
273	Fem.-upper04	m14	1.388E+0	4.4012E+1	6.1089E+1
274	Fem.-upper05	m15	1.485E+0	2.2101E+1	3.2820E+1
275	Fem.-upper06	m16	1.641E+0	2.4093E+1	3.9537E+1

Table C-3 (Continued).

Organ ID	Organ/tissue/content	Material ID	Density (g/cm^3)	Volume (cc)	Mass (g)
276	Fem.-upper07	m17	1.765E+0	6.5856E+1	1.1624E+2
277	None				
278	None				
279	None				
280	Fem.-lower01	m11	1.155E+0	1.0283E+2	1.1877E+2
281	Fem.-lower02	m12	1.261E+0	1.0521E+2	1.3267E+2
282	Fem.-lower03	m13	1.318E+0	6.9675E+1	9.1832E+1
283	Fem.-lower04	m14	1.388E+0	3.9470E+1	5.4784E+1
284	Fem.-lower05	m15	1.485E+0	2.0192E+1	2.9985E+1
285	Fem.-lower06	m16	1.641E+0	2.0578E+1	3.3768E+1
286	Fem.-lower07	m17	1.765E+0	6.4854E+1	1.1447E+2
287	None				
288	None				
289	None				
290	Tib.-fib.-pate01	m11	1.155E+0	1.6866E+2	1.9480E+2
291	Tib.-fib.-pate02	m12	1.261E+0	1.9092E+2	2.4075E+2
292	Tib.-fib.-pate03	m13	1.318E+0	1.1538E+2	1.5207E+2
293	Tib.-fib.-pate04	m14	1.388E+0	6.5239E+1	9.0552E+1
294	Tib.-fib.-pate05	m15	1.485E+0	4.1447E+1	6.1549E+1
295	Tib.-fib.-pate06	m16	1.641E+0	4.7454E+1	7.7872E+1
296	Tib.-fib.-pate07	m17	1.765E+0	1.0352E+2	1.8271E+2
297	None				
298	None				
299	None				
300	Ankle-foot01	m11	1.155E+0	3.4129E+1	3.9419E+1
301	Ankle-foot02	m12	1.261E+0	8.4562E+1	1.0663E+2
302	Ankle-foot03	m13	1.318E+0	1.0653E+2	1.4041E+2
303	Ankle-foot04	m14	1.388E+0	9.4455E+1	1.3110E+2
304	Ankle-foot05	m15	1.485E+0	3.7666E+1	5.5934E+1
305	Ankle-foot06	m16	1.641E+0	1.5307E+1	2.5119E+1
306	Ankle-foot07	m17	1.765E+0	5.0440E+0	8.9027E+0
307	None				
308	None				
309	None				
310	Os-hyoideum01	m11	1.155E+0	3.8416E-3	4.4370E-3
311	Os-hyoideum02	m12	1.261E+0	7.3471E-1	9.2647E-1
312	Os-hyoideum03	m13	1.318E+0	8.2498E-1	1.0873E+0
313	Os-hyoideum04	m14	1.388E+0	7.2126E-1	1.0011E+0
314	Os-hyoideum05	m15	1.485E+0	2.8909E-1	4.2930E-1
315	Os-hyoideum06	m16	1.641E+0	1.6135E-1	2.6478E-1
316	Os-hyoideum07	m17	1.765E+0	7.6832E-3	1.3561E-2
317	None				
318	None				
319	None				

Appendix D Organ ID, mass of all bone materials, and mass fraction of active and inactive marrows and hard bone in each anatomical bone tissue of the high-resolution JAEA voxel phantoms

In this appendix, organ ID, mass fractions of active marrow, inactive marrow and hard bone to all bone materials in each anatomical bone tissue of the JM, JM2 and JF phantoms are presented. As described in Section 2.4, the masses of active and inactive marrows were evaluated by using the data in ICRP Publication 89.

Table D-1 Organ ID, mass of all bone materials, and mass fraction of active and inactive marrows and hard bone in the JM phantom.

Organ ID	Bone tissue region	Mass of All materials (g)	Mass fraction		
			Active marrow	Inactive marrow	Hard bone
120	Cranium01	4.5153E+1	0.243	0.457	0.300
121	Cranium02	4.8756E+1	0.187	0.353	0.460
122	Cranium03	1.3117E+2	0.156	0.294	0.550
123	Cranium04	1.9667E+2	0.125	0.235	0.640
124	Cranium05	1.8652E+2	0.083	0.157	0.760
125	Cranium06	3.1768E+2	0.035	0.065	0.900
126	Cranium07	4.2042E+2	0.000	0.000	1.000
130	Mandible01	3.4520E+0	0.197	0.503	0.300
131	Mandible02	1.0190E+1	0.152	0.388	0.460
132	Mandible03	2.0677E+1	0.127	0.323	0.550
133	Mandible04	2.2059E+1	0.101	0.259	0.640
134	Mandible05	1.9567E+1	0.068	0.172	0.760
135	Mandible06	2.8372E+1	0.028	0.072	0.900
136	Mandible07	6.0652E+1	0.000	0.000	1.000
140	Cer.-vertebra01	7.9978E-1	0.525	0.175	0.300
141	Cer.-vertebra02	7.1406E+0	0.405	0.135	0.460
142	Cer.-vertebra03	4.0651E+1	0.338	0.112	0.550
143	Cer.-vertebra04	6.2544E+1	0.270	0.090	0.640
144	Cer.-vertebra05	4.7511E+1	0.180	0.060	0.760
145	Cer.-vertebra06	3.9534E+1	0.075	0.025	0.900
146	Cer.-vertebra07	8.6128E+0	0.000	0.000	1.000
150	Thor.-vertebra01	2.2485E+1	0.503	0.197	0.300
151	Thor.-vertebra02	1.3894E+2	0.388	0.152	0.460
152	Thor.-vertebra03	2.0225E+2	0.323	0.127	0.550
153	Thor.-vertebra04	1.5987E+2	0.259	0.101	0.640
154	Thor.-vertebra05	7.2966E+1	0.172	0.068	0.760
155	Thor.-vertebra06	4.9488E+1	0.072	0.028	0.900
156	Thor.-vertebra07	7.7214E+0	0.000	0.000	1.000
160	Lumb.-vertebra01	3.6416E+1	0.407	0.293	0.300
161	Lumb.-vertebra02	2.1189E+2	0.314	0.226	0.460
162	Lumb.-vertebra03	1.2230E+2	0.261	0.189	0.550
163	Lumb.-vertebra04	9.6414E+1	0.209	0.151	0.640
164	Lumb.-vertebra05	5.4033E+1	0.139	0.101	0.760
165	Lumb.-vertebra06	4.8603E+1	0.058	0.042	0.900
166	Lumb.-vertebra07	1.5778E+1	0.000	0.000	1.000
170	Sacrum01	5.5204E+1	0.663	0.037	0.300
171	Sacrum02	6.7641E+1	0.511	0.029	0.460
172	Sacrum03	5.3881E+1	0.426	0.024	0.550
173	Sacrum04	4.2501E+1	0.341	0.019	0.640
174	Sacrum05	2.3169E+1	0.227	0.013	0.760
175	Sacrum06	1.7803E+1	0.095	0.005	0.900
176	Sacrum07	4.5615E+0	0.000	0.000	1.000
180	Clavicles01	4.6822E+0	0.212	0.488	0.300
181	Clavicles02	1.2145E+1	0.163	0.377	0.460
182	Clavicles03	1.8993E+1	0.136	0.314	0.550
183	Clavicles04	1.9441E+1	0.109	0.251	0.640

Table D-1 (Continued).

Organ ID	Bone tissue region	Mass of All materials (g)	Mass fraction		
			Active marrow	Inactive marrow	Hard bone
184	Clavicles05	1.6245E+1	0.073	0.167	0.760
185	Clavicles06	2.3914E+1	0.030	0.070	0.900
186	Clavicles07	1.6127E+1	0.000	0.000	1.000
190	Scapulae01	2.0821E+0	0.246	0.454	0.300
191	Scapulae02	2.5698E+1	0.190	0.350	0.460
192	Scapulae03	7.3203E+1	0.158	0.292	0.550
193	Scapulae04	8.1565E+1	0.126	0.234	0.640
194	Scapulae05	5.9649E+1	0.084	0.156	0.760
195	Scapulae06	5.1446E+1	0.035	0.065	0.900
196	Scapulae07	1.6587E+1	0.000	0.000	1.000
200	Sternum01	1.3065E+1	0.541	0.159	0.300
201	Sternum02	3.0299E+1	0.418	0.122	0.460
202	Sternum03	2.2660E+1	0.348	0.102	0.550
203	Sternum04	2.1006E+1	0.278	0.082	0.640
204	Sternum05	1.3728E+1	0.186	0.054	0.760
205	Sternum06	6.3418E+0	0.077	0.023	0.900
206	Sternum07	1.5595E-1	0.000	0.000	1.000
210	Ribs01	4.7463E+1	0.333	0.367	0.300
211	Ribs02	2.9914E+2	0.257	0.283	0.460
212	Ribs03	2.1840E+2	0.214	0.236	0.550
213	Ribs04	1.8580E+2	0.171	0.189	0.640
214	Ribs05	1.1133E+2	0.114	0.126	0.760
215	Ribs06	7.7354E+1	0.048	0.052	0.900
216	Ribs07	5.5870E+0	0.000	0.000	1.000
220	Os-coxae01	1.1511E+2	0.377	0.323	0.300
221	Os-coxae02	2.4862E+2	0.291	0.249	0.460
222	Os-coxae03	1.9204E+2	0.242	0.208	0.550
223	Os-coxae04	1.7590E+2	0.194	0.166	0.640
224	Os-coxae05	1.3245E+2	0.129	0.111	0.760
225	Os-coxae06	1.4955E+2	0.054	0.046	0.900
226	Os-coxae07	4.3497E+1	0.000	0.000	1.000
230	Hum.-upper01	6.5508E+1	0.176	0.524	0.300
231	Hum.-upper02	4.6543E+1	0.136	0.404	0.460
232	Hum.-upper03	5.0937E+1	0.113	0.337	0.550
233	Hum.-upper04	3.5783E+1	0.090	0.270	0.640
234	Hum.-upper05	2.0266E+1	0.060	0.180	0.760
235	Hum.-upper06	2.5905E+1	0.025	0.075	0.900
236	Hum.-upper07	6.2340E+1	0.000	0.000	1.000
240	Hum.-lower01	1.9729E+1	0.000	0.700	0.300
241	Hum.-lower02	3.3373E+1	0.000	0.540	0.460
242	Hum.-lower03	4.2458E+1	0.000	0.450	0.550
243	Hum.-lower04	4.4687E+1	0.000	0.360	0.640
244	Hum.-lower05	3.0847E+1	0.000	0.240	0.760
245	Hum.-lower06	3.8027E+1	0.000	0.100	0.900
246	Hum.-lower07	8.0233E+1	0.000	0.000	1.000
250	Forearm01	3.0413E+1	0.000	0.700	0.300
251	Forearm02	4.1088E+1	0.000	0.540	0.460

Table D-1 (Continued).

Organ ID	Bone tissue region	Mass of All materials (g)	Mass fraction		
			Active marrow	Inactive marrow	Hard bone
252	Forearm03	4.6673E+1	0.000	0.450	0.550
253	Forearm04	5.4804E+1	0.000	0.360	0.640
254	Forearm05	4.1091E+1	0.000	0.240	0.760
255	Forearm06	6.1596E+1	0.000	0.100	0.900
256	Forearm07	8.5057E+1	0.000	0.000	1.000
260	Wrist-hand01	8.3393E+0	0.000	0.700	0.300
261	Wrist-hand02	1.0961E+1	0.000	0.540	0.460
262	Wrist-hand03	3.9925E+1	0.000	0.450	0.550
263	Wrist-hand04	7.2048E+1	0.000	0.360	0.640
264	Wrist-hand05	4.6786E+1	0.000	0.240	0.760
265	Wrist-hand06	3.4105E+1	0.000	0.100	0.900
266	Wrist-hand07	1.2137E+1	0.000	0.000	1.000
270	Fem.-upper01	1.0616E+2	0.265	0.435	0.300
271	Fem.-upper02	9.9261E+1	0.205	0.335	0.460
272	Fem.-upper03	9.7692E+1	0.171	0.279	0.550
273	Fem.-upper04	9.2732E+1	0.136	0.224	0.640
274	Fem.-upper05	4.8495E+1	0.091	0.149	0.760
275	Fem.-upper06	5.8856E+1	0.038	0.062	0.900
276	Fem.-upper07	2.2256E+2	0.000	0.000	1.000
280	Fem.-lower01	1.3405E+2	0.000	0.700	0.300
281	Fem.-lower02	1.6813E+2	0.000	0.540	0.460
282	Fem.-lower03	1.6308E+2	0.000	0.450	0.550
283	Fem.-lower04	1.2726E+2	0.000	0.360	0.640
284	Fem.-lower05	6.2276E+1	0.000	0.240	0.760
285	Fem.-lower06	5.5778E+1	0.000	0.100	0.900
286	Fem.-lower07	2.1625E+2	0.000	0.000	1.000
290	Tib.-fib.-pate01	2.1997E+2	0.000	0.700	0.300
291	Tib.-fib.-pate02	3.3433E+2	0.000	0.540	0.460
292	Tib.-fib.-pate03	2.2709E+2	0.000	0.450	0.550
293	Tib.-fib.-pate04	1.6518E+2	0.000	0.360	0.640
294	Tib.-fib.-pate05	1.0819E+2	0.000	0.240	0.760
295	Tib.-fib.-pate06	1.3628E+2	0.000	0.100	0.900
296	Tib.-fib.-pate07	3.8991E+2	0.000	0.000	1.000
300	Ankle-foot01	5.2966E+1	0.000	0.700	0.300
301	Ankle-foot02	1.6253E+2	0.000	0.540	0.460
302	Ankle-foot03	1.5488E+2	0.000	0.450	0.550
303	Ankle-foot04	1.9275E+2	0.000	0.360	0.640
304	Ankle-foot05	1.6265E+2	0.000	0.240	0.760
305	Ankle-foot06	1.1863E+2	0.000	0.100	0.900
306	Ankle-foot07	3.5747E+1	0.000	0.000	1.000
310	Os-hyoideum01	1.1093E-3	0.226	0.474	0.300
311	Os-hyoideum02	2.1679E-2	0.174	0.366	0.460
312	Os-hyoideum03	8.8733E-1	0.145	0.305	0.550
313	Os-hyoideum04	1.0291E+0	0.116	0.244	0.640
314	Os-hyoideum05	1.0647E+0	0.077	0.163	0.760
315	Os-hyoideum06	7.5806E-1	0.032	0.068	0.900
316	Os-hyoideum07	6.4414E-2	0.000	0.000	1.000

Table D-2 Organ ID, mass of all bone materials, and mass fraction of active and inactive marrows and hard bone in the JM2 phantom.

Organ ID	Bone tissue region	Mass of All materials (g)	Mass fraction		
			Active marrow	Inactive marrow	Hard bone
120	Cranium01	4.5152E+1	0.242	0.458	0.300
121	Cranium02	4.8752E+1	0.187	0.353	0.460
122	Cranium03	1.3116E+2	0.156	0.294	0.550
123	Cranium04	1.9666E+2	0.125	0.235	0.640
124	Cranium05	1.8652E+2	0.083	0.157	0.760
125	Cranium06	3.1768E+2	0.035	0.065	0.900
126	Cranium07	4.2042E+2	0.000	0.000	1.000
130	Mandible01	3.4521E+0	0.197	0.503	0.300
131	Mandible02	1.0190E+1	0.152	0.388	0.460
132	Mandible03	2.0677E+1	0.127	0.323	0.550
133	Mandible04	2.2059E+1	0.101	0.259	0.640
134	Mandible05	1.9567E+1	0.068	0.172	0.760
135	Mandible06	2.8372E+1	0.028	0.072	0.900
136	Mandible07	6.0652E+1	0.000	0.000	1.000
140	Cer.-vertebra01	7.9978E-1	0.525	0.175	0.300
141	Cer.-vertebra02	7.1406E+0	0.405	0.135	0.460
142	Cer.-vertebra03	4.0651E+1	0.337	0.113	0.550
143	Cer.-vertebra04	6.2544E+1	0.270	0.090	0.640
144	Cer.-vertebra05	4.7511E+1	0.180	0.060	0.760
145	Cer.-vertebra06	3.9534E+1	0.075	0.025	0.900
146	Cer.-vertebra07	8.6128E+0	0.000	0.000	1.000
150	Thor.-vertebra01	2.2485E+1	0.503	0.197	0.300
151	Thor.-vertebra02	1.3894E+2	0.388	0.152	0.460
152	Thor.-vertebra03	2.0225E+2	0.323	0.127	0.550
153	Thor.-vertebra04	1.5987E+2	0.259	0.101	0.640
154	Thor.-vertebra05	7.2966E+1	0.172	0.068	0.760
155	Thor.-vertebra06	4.9488E+1	0.072	0.028	0.900
156	Thor.-vertebra07	7.7214E+0	0.000	0.000	1.000
160	Lumb.-vertebra01	3.6416E+1	0.406	0.294	0.300
161	Lumb.-vertebra02	2.1189E+2	0.313	0.227	0.460
162	Lumb.-vertebra03	1.2230E+2	0.261	0.189	0.550
163	Lumb.-vertebra04	9.6414E+1	0.209	0.151	0.640
164	Lumb.-vertebra05	5.4033E+1	0.139	0.101	0.760
165	Lumb.-vertebra06	4.8603E+1	0.058	0.042	0.900
166	Lumb.-vertebra07	1.5778E+1	0.000	0.000	1.000
170	Sacrum01	5.5204E+1	0.662	0.038	0.300
171	Sacrum02	6.7641E+1	0.511	0.029	0.460
172	Sacrum03	5.3881E+1	0.426	0.024	0.550
173	Sacrum04	4.2501E+1	0.341	0.019	0.640
174	Sacrum05	2.3169E+1	0.227	0.013	0.760
175	Sacrum06	1.7803E+1	0.095	0.005	0.900
176	Sacrum07	4.5615E+0	0.000	0.000	1.000
180	Clavicles01	4.6822E+0	0.211	0.489	0.300
181	Clavicles02	1.2145E+1	0.163	0.377	0.460
182	Clavicles03	1.8993E+1	0.136	0.314	0.550
183	Clavicles04	1.9441E+1	0.109	0.251	0.640

Table D-2 (Continued).

Organ ID	Bone tissue region	Mass of All materials (g)	Mass fraction		
			Active marrow	Inactive marrow	Hard bone
184	Clavicles05	1.6245E+1	0.072	0.168	0.760
185	Clavicles06	2.3914E+1	0.030	0.070	0.900
186	Clavicles07	1.6127E+1	0.000	0.000	1.000
190	Scapulae01	2.0821E+0	0.246	0.454	0.300
191	Scapulae02	2.5698E+1	0.190	0.350	0.460
192	Scapulae03	7.3203E+1	0.158	0.292	0.550
193	Scapulae04	8.1565E+1	0.126	0.234	0.640
194	Scapulae05	5.9649E+1	0.084	0.156	0.760
195	Scapulae06	5.1446E+1	0.035	0.065	0.900
196	Scapulae07	1.6587E+1	0.000	0.000	1.000
200	Sternum01	1.3065E+1	0.541	0.159	0.300
201	Sternum02	3.0299E+1	0.417	0.123	0.460
202	Sternum03	2.2660E+1	0.348	0.102	0.550
203	Sternum04	2.1006E+1	0.278	0.082	0.640
204	Sternum05	1.3728E+1	0.185	0.055	0.760
205	Sternum06	6.3418E+0	0.077	0.023	0.900
206	Sternum07	1.5595E-1	0.000	0.000	1.000
210	Ribs01	4.7463E+1	0.333	0.367	0.300
211	Ribs02	2.9914E+2	0.257	0.283	0.460
212	Ribs03	2.1840E+2	0.214	0.236	0.550
213	Ribs04	1.8580E+2	0.171	0.189	0.640
214	Ribs05	1.1133E+2	0.114	0.126	0.760
215	Ribs06	7.7354E+1	0.048	0.052	0.900
216	Ribs07	5.5870E+0	0.000	0.000	1.000
220	Os-coxae01	1.1511E+2	0.377	0.323	0.300
221	Os-coxae02	2.4861E+2	0.291	0.249	0.460
222	Os-coxae03	1.9203E+2	0.242	0.208	0.550
223	Os-coxae04	1.7589E+2	0.194	0.166	0.640
224	Os-coxae05	1.3245E+2	0.129	0.111	0.760
225	Os-coxae06	1.4954E+2	0.054	0.046	0.900
226	Os-coxae07	4.3497E+1	0.000	0.000	1.000
230	Hum.-upper01	6.5508E+1	0.176	0.524	0.300
231	Hum.-upper02	4.6543E+1	0.136	0.404	0.460
232	Hum.-upper03	5.0937E+1	0.113	0.337	0.550
233	Hum.-upper04	3.5783E+1	0.090	0.270	0.640
234	Hum.-upper05	2.0266E+1	0.060	0.180	0.760
235	Hum.-upper06	2.5905E+1	0.025	0.075	0.900
236	Hum.-upper07	6.2340E+1	0.000	0.000	1.000
240	Hum.-lower01	1.9729E+1	0.000	0.700	0.300
241	Hum.-lower02	3.3373E+1	0.000	0.540	0.460
242	Hum.-lower03	4.2458E+1	0.000	0.450	0.550
243	Hum.-lower04	4.4687E+1	0.000	0.360	0.640
244	Hum.-lower05	3.0847E+1	0.000	0.240	0.760
245	Hum.-lower06	3.8027E+1	0.000	0.100	0.900
246	Hum.-lower07	8.0233E+1	0.000	0.000	1.000
250	Forearm01	3.0413E+1	0.000	0.700	0.300
251	Forearm02	4.1069E+1	0.000	0.540	0.460

Table D-2 (Continued).

Organ ID	Bone tissue region	Mass of All materials (g)	Mass fraction		
			Active marrow	Inactive marrow	Hard bone
252	Forearm03	4.6649E+1	0.000	0.450	0.550
253	Forearm04	5.4773E+1	0.000	0.360	0.640
254	Forearm05	4.1076E+1	0.000	0.240	0.760
255	Forearm06	6.1582E+1	0.000	0.100	0.900
256	Forearm07	8.5054E+1	0.000	0.000	1.000
260	Wrist-hand01	8.3393E+0	0.000	0.700	0.300
261	Wrist-hand02	1.0961E+1	0.000	0.540	0.460
262	Wrist-hand03	3.9925E+1	0.000	0.450	0.550
263	Wrist-hand04	7.2048E+1	0.000	0.360	0.640
264	Wrist-hand05	4.6786E+1	0.000	0.240	0.760
265	Wrist-hand06	3.4105E+1	0.000	0.100	0.900
266	Wrist-hand07	1.2113E+1	0.000	0.000	1.000
270	Fem.-upper01	1.0616E+2	0.265	0.435	0.300
271	Fem.-upper02	9.9261E+1	0.204	0.336	0.460
272	Fem.-upper03	9.7692E+1	0.170	0.280	0.550
273	Fem.-upper04	9.2732E+1	0.136	0.224	0.640
274	Fem.-upper05	4.8495E+1	0.091	0.149	0.760
275	Fem.-upper06	5.8856E+1	0.038	0.062	0.900
276	Fem.-upper07	2.2256E+2	0.000	0.000	1.000
280	Fem.-lower01	1.3405E+2	0.000	0.700	0.300
281	Fem.-lower02	1.6813E+2	0.000	0.540	0.460
282	Fem.-lower03	1.6308E+2	0.000	0.450	0.550
283	Fem.-lower04	1.2726E+2	0.000	0.360	0.640
284	Fem.-lower05	6.2276E+1	0.000	0.240	0.760
285	Fem.-lower06	5.5778E+1	0.000	0.100	0.900
286	Fem.-lower07	2.1625E+2	0.000	0.000	1.000
290	Tib.-fib.-pate01	2.1897E+2	0.000	0.700	0.300
291	Tib.-fib.-pate02	3.3236E+2	0.000	0.540	0.460
292	Tib.-fib.-pate03	2.2697E+2	0.000	0.450	0.550
293	Tib.-fib.-pate04	1.6517E+2	0.000	0.360	0.640
294	Tib.-fib.-pate05	1.0819E+2	0.000	0.240	0.760
295	Tib.-fib.-pate06	1.3628E+2	0.000	0.100	0.900
296	Tib.-fib.-pate07	3.8991E+2	0.000	0.000	1.000
300	Ankle-foot01	5.2098E+1	0.000	0.700	0.300
301	Ankle-foot02	1.6184E+2	0.000	0.540	0.460
302	Ankle-foot03	1.5480E+2	0.000	0.450	0.550
303	Ankle-foot04	1.9272E+2	0.000	0.360	0.640
304	Ankle-foot05	1.6263E+2	0.000	0.240	0.760
305	Ankle-foot06	1.1862E+2	0.000	0.100	0.900
306	Ankle-foot07	3.5747E+1	0.000	0.000	1.000
310	Os-hyoideum01	1.1093E-3	0.225	0.475	0.300
311	Os-hyoideum02	2.1679E-2	0.174	0.366	0.460
312	Os-hyoideum03	8.8733E-1	0.145	0.305	0.550
313	Os-hyoideum04	1.0291E+0	0.116	0.244	0.640
314	Os-hyoideum05	1.0647E+0	0.077	0.163	0.760
315	Os-hyoideum06	7.5806E-1	0.032	0.068	0.900
316	Os-hyoideum07	6.4414E-2	0.000	0.000	1.000

Table D-3 Organ ID, Mass of all bone materials, and mass fraction of active and inactive marrows and hard bone in the JF phantom.

Organ ID	Bone tissue region	Mass of All materials (g)	Mass fraction		
			Active marrow	Inactive marrow	Hard bone
120	Cranium01	7.5868E+1	0.212	0.488	0.300
121	Cranium02	8.9278E+1	0.160	0.370	0.470
122	Cranium03	8.7414E+1	0.136	0.314	0.550
123	Cranium04	1.0465E+2	0.109	0.251	0.640
124	Cranium05	1.1700E+2	0.076	0.174	0.750
125	Cranium06	2.4630E+2	0.030	0.070	0.900
126	Cranium07	3.3283E+2	0.000	0.000	1.000
130	Mandible01	9.1181E-1	0.267	0.433	0.300
131	Mandible02	7.4712E+0	0.202	0.328	0.470
132	Mandible03	9.0315E+0	0.172	0.278	0.550
133	Mandible04	1.0844E+1	0.137	0.223	0.640
134	Mandible05	1.1782E+1	0.095	0.155	0.750
135	Mandible06	2.1942E+1	0.038	0.062	0.900
136	Mandible07	4.7907E+1	0.000	0.000	1.000
140	Cer.-vertebra01	5.7681E-1	0.557	0.143	0.300
141	Cer.-vertebra02	1.5156E+1	0.421	0.109	0.470
142	Cer.-vertebra03	3.0236E+1	0.358	0.092	0.550
143	Cer.-vertebra04	3.8406E+1	0.286	0.074	0.640
144	Cer.-vertebra05	2.3906E+1	0.199	0.051	0.750
145	Cer.-vertebra06	1.8017E+1	0.080	0.020	0.900
146	Cer.-vertebra07	3.9887E+0	0.000	0.000	1.000
150	Thor.-vertebra01	1.3687E+1	0.500	0.200	0.300
151	Thor.-vertebra02	1.6032E+2	0.379	0.151	0.470
152	Thor.-vertebra03	1.4992E+2	0.321	0.129	0.550
153	Thor.-vertebra04	7.6972E+1	0.257	0.103	0.640
154	Thor.-vertebra05	3.5486E+1	0.179	0.071	0.750
155	Thor.-vertebra06	2.4410E+1	0.071	0.029	0.900
156	Thor.-vertebra07	2.6613E+0	0.000	0.000	1.000
160	Lumb.-vertebra01	3.5353E+1	0.374	0.326	0.300
161	Lumb.-vertebra02	1.9664E+2	0.283	0.247	0.470
162	Lumb.-vertebra03	9.9647E+1	0.241	0.209	0.550
163	Lumb.-vertebra04	5.8707E+1	0.193	0.167	0.640
164	Lumb.-vertebra05	2.8592E+1	0.134	0.116	0.750
165	Lumb.-vertebra06	3.0155E+1	0.053	0.047	0.900
166	Lumb.-vertebra07	8.0551E+0	0.000	0.000	1.000
170	Sacrum01	7.4481E+1	0.486	0.214	0.300
171	Sacrum02	7.7592E+1	0.368	0.162	0.470
172	Sacrum03	5.1453E+1	0.312	0.138	0.550
173	Sacrum04	2.2151E+1	0.250	0.110	0.640
174	Sacrum05	9.0990E+0	0.173	0.077	0.750
175	Sacrum06	5.2338E+0	0.069	0.031	0.900
176	Sacrum07	5.6108E-1	0.000	0.000	1.000
180	Clavicles01	5.1260E+0	0.232	0.468	0.300
181	Clavicles02	1.2181E+1	0.176	0.354	0.470
182	Clavicles03	1.1985E+1	0.149	0.301	0.550
183	Clavicles04	9.5486E+0	0.120	0.240	0.640

Table D-3 (Continued).

Organ ID	Bone tissue region	Mass of All materials (g)	Mass fraction		
			Active marrow	Inactive marrow	Hard bone
184	Clavicles05	7.4734E+0	0.083	0.167	0.750
185	Clavicles06	1.2586E+1	0.033	0.067	0.900
186	Clavicles07	1.0417E+1	0.000	0.000	1.000
190	Scapulae01	9.4842E-1	0.273	0.427	0.300
191	Scapulae02	3.1979E+1	0.207	0.323	0.470
192	Scapulae03	4.9041E+1	0.176	0.274	0.550
193	Scapulae04	4.5146E+1	0.141	0.219	0.640
194	Scapulae05	3.2281E+1	0.098	0.152	0.750
195	Scapulae06	2.6317E+1	0.039	0.061	0.900
196	Scapulae07	8.1144E+0	0.000	0.000	1.000
200	Sternum01	1.8682E+1	0.585	0.115	0.300
201	Sternum02	1.9688E+1	0.443	0.087	0.470
202	Sternum03	1.4961E+1	0.376	0.074	0.550
203	Sternum04	7.8396E+0	0.301	0.059	0.640
204	Sternum05	9.3130E-1	0.209	0.041	0.750
205	Sternum06	1.4184E-1	0.084	0.016	0.900
206	Sternum07	0.0000E+0	-	-	-
210	Ribs01	3.8907E+1	0.414	0.286	0.300
211	Ribs02	2.0442E+2	0.313	0.217	0.470
212	Ribs03	1.1664E+2	0.266	0.184	0.550
213	Ribs04	1.0111E+2	0.213	0.147	0.640
214	Ribs05	5.8196E+1	0.148	0.102	0.750
215	Ribs06	2.9405E+1	0.059	0.041	0.900
216	Ribs07	9.7469E-1	0.000	0.000	1.000
220	Os-coxae01	7.2174E+1	0.395	0.305	0.300
221	Os-coxae02	1.9176E+2	0.299	0.231	0.470
222	Os-coxae03	1.5128E+2	0.254	0.196	0.550
223	Os-coxae04	1.3016E+2	0.203	0.157	0.640
224	Os-coxae05	9.5503E+1	0.141	0.109	0.750
225	Os-coxae06	8.5655E+1	0.056	0.044	0.900
226	Os-coxae07	2.1065E+1	0.000	0.000	1.000
230	Hum.-upper01	4.4327E+1	0.199	0.501	0.300
231	Hum.-upper02	4.2607E+1	0.151	0.379	0.470
232	Hum.-upper03	2.7890E+1	0.128	0.322	0.550
233	Hum.-upper04	1.7721E+1	0.102	0.258	0.640
234	Hum.-upper05	1.1368E+1	0.071	0.179	0.750
235	Hum.-upper06	1.8048E+1	0.028	0.072	0.900
236	Hum.-upper07	2.9657E+1	0.000	0.000	1.000
240	Hum.-lower01	1.0463E+1	0.000	0.700	0.300
241	Hum.-lower02	2.1577E+1	0.000	0.530	0.470
242	Hum.-lower03	1.7141E+1	0.000	0.450	0.550
243	Hum.-lower04	1.7289E+1	0.000	0.360	0.640
244	Hum.-lower05	1.2635E+1	0.000	0.250	0.750
245	Hum.-lower06	1.9173E+1	0.000	0.100	0.900
246	Hum.-lower07	3.6934E+1	0.000	0.000	1.000
250	Forearm01	2.0325E+1	0.000	0.700	0.300
251	Forearm02	4.5686E+1	0.000	0.530	0.470

Table D-3 (Continued).

Organ ID	Bone tissue region	Mass of All materials (g)	Mass fraction		
			Active marrow	Inactive marrow	Hard bone
252	Forearm03	4.1435E+1	0.000	0.450	0.550
253	Forearm04	3.8536E+1	0.000	0.360	0.640
254	Forearm05	2.6391E+1	0.000	0.250	0.750
255	Forearm06	3.9862E+1	0.000	0.100	0.900
256	Forearm07	3.0843E+1	0.000	0.000	1.000
260	Wrist-hand01	7.7581E+0	0.000	0.700	0.300
261	Wrist-hand02	4.7139E+1	0.000	0.530	0.470
262	Wrist-hand03	5.7445E+1	0.000	0.450	0.550
263	Wrist-hand04	3.5443E+1	0.000	0.360	0.640
264	Wrist-hand05	1.4246E+1	0.000	0.250	0.750
265	Wrist-hand06	1.0655E+1	0.000	0.100	0.900
266	Wrist-hand07	1.1018E-1	0.000	0.000	1.000
270	Fem.-upper01	5.2294E+1	0.292	0.408	0.300
271	Fem.-upper02	9.6463E+1	0.221	0.309	0.470
272	Fem.-upper03	7.2146E+1	0.188	0.262	0.550
273	Fem.-upper04	6.1089E+1	0.150	0.210	0.640
274	Fem.-upper05	3.2820E+1	0.104	0.146	0.750
275	Fem.-upper06	3.9537E+1	0.042	0.058	0.900
276	Fem.-upper07	1.1624E+2	0.000	0.000	1.000
280	Fem.-lower01	1.1877E+2	0.000	0.700	0.300
281	Fem.-lower02	1.3267E+2	0.000	0.530	0.470
282	Fem.-lower03	9.1832E+1	0.000	0.450	0.550
283	Fem.-lower04	5.4784E+1	0.000	0.360	0.640
284	Fem.-lower05	2.9985E+1	0.000	0.250	0.750
285	Fem.-lower06	3.3768E+1	0.000	0.100	0.900
286	Fem.-lower07	1.1447E+2	0.000	0.000	1.000
290	Tib.-fib.-pate01	1.9480E+2	0.000	0.700	0.300
291	Tib.-fib.-pate02	2.4075E+2	0.000	0.530	0.470
292	Tib.-fib.-pate03	1.5207E+2	0.000	0.450	0.550
293	Tib.-fib.-pate04	9.0552E+1	0.000	0.360	0.640
294	Tib.-fib.-pate05	6.1549E+1	0.000	0.250	0.750
295	Tib.-fib.-pate06	7.7872E+1	0.000	0.100	0.900
296	Tib.-fib.-pate07	1.8271E+2	0.000	0.000	1.000
300	Ankle-foot01	3.9419E+1	0.000	0.700	0.300
301	Ankle-foot02	1.0663E+2	0.000	0.530	0.470
302	Ankle-foot03	1.4041E+2	0.000	0.450	0.550
303	Ankle-foot04	1.3110E+2	0.000	0.360	0.640
304	Ankle-foot05	5.5934E+1	0.000	0.250	0.750
305	Ankle-foot06	2.5119E+1	0.000	0.100	0.900
306	Ankle-foot07	8.9027E+0	0.000	0.000	1.000
310	Os-hyoideum01	4.4370E-3	0.260	0.440	0.300
311	Os-hyoideum02	9.2647E-1	0.197	0.333	0.470
312	Os-hyoideum03	1.0873E+0	0.167	0.283	0.550
313	Os-hyoideum04	1.0011E+0	0.134	0.226	0.640
314	Os-hyoideum05	4.2930E-1	0.093	0.157	0.750
315	Os-hyoideum06	2.6478E-1	0.037	0.063	0.900
316	Os-hyoideum07	1.3561E-2	0.000	0.000	1.000

Appendix E Tabulated data of SAFs of the high-resolution JAEA voxel phantoms

This appendix presents a data set of SAFs for selected combinations of source and target in the JM, JM2 and JF phantoms. The SAFs are given as absorbed fractions per unit mass (kg) of target organs, and are tabulated for 12 photon energies ranging from 0.01 MeV to 4 MeV. The radiation transport in the bone tissues was carried out according to the methods described in Section 3.1.

Table E-1 - Table E-33:

SAFs (kg^{-1}) for 25 target organs and for 33 source region in the JM phantom.

Table E-34 - Table E-66:

SAFs (kg^{-1}) for 25 target organs and for 33 source region in the JM2 phantom.

Table E-67 - Table E-100:

SAFs (kg^{-1}) for 26 target organs and for 34 source region in the JF phantom.

Table E-1 SAFs (kg^{-1}) for 25 target organs and for adipose as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.84E-2	2.99E-2	2.28E-2	1.41E-2	7.62E-3	5.26E-3	5.41E-3	5.67E-3	5.35E-3	4.93E-3	4.55E-3	3.58E-3
Adrenal	7.05E-3	1.11E-2	1.10E-2	8.95E-3	6.64E-3	5.46E-3	5.39E-3	5.46E-3	5.06E-3	4.80E-3	4.35E-3	3.64E-3
Bladder	7.77E-3	1.21E-2	1.38E-2	1.37E-2	1.05E-2	7.88E-3	7.79E-3	7.74E-3	7.34E-3	6.63E-3	6.35E-3	5.18E-3
Bone (hard bone)	1.62E-3	4.83E-3	9.31E-3	1.70E-2	1.83E-2	9.39E-3	5.26E-3	4.04E-3	3.65E-3	3.38E-3	3.18E-3	2.71E-3
Bone (marrow)	4.73E-4	6.87E-4	9.77E-4	1.58E-3	2.09E-3	2.44E-3	2.74E-3	2.89E-3	2.85E-3	2.72E-3	2.58E-3	2.15E-3
Brain	4.64E-6	1.37E-5	4.18E-5	2.72E-4	6.73E-4	7.98E-4	8.79E-4	9.82E-4	1.00E-3	9.75E-4	9.40E-4	8.35E-4
Breast	2.13E-3	3.90E-3	4.63E-3	4.27E-3	2.93E-3	2.28E-3	2.44E-3	2.70E-3	2.75E-3	2.60E-3	2.50E-3	2.09E-3
Esophagus	3.78E-3	6.66E-3	7.25E-3	6.54E-3	5.43E-3	4.36E-3	4.43E-3	4.43E-3	4.21E-3	3.95E-3	3.71E-3	3.07E-3
Gall bladder	2.13E-3	3.22E-3	4.13E-3	5.77E-3	6.25E-3	5.17E-3	4.63E-3	4.74E-3	4.60E-3	4.17E-3	3.99E-3	3.34E-3
Heart	3.48E-3	5.65E-3	6.36E-3	6.26E-3	5.22E-3	4.12E-3	4.03E-3	4.10E-3	3.90E-3	3.64E-3	3.41E-3	2.81E-3
Kidney	1.57E-3	4.58E-3	7.43E-3	9.83E-3	8.46E-3	6.42E-3	6.09E-3	6.02E-3	5.69E-3	5.31E-3	5.04E-3	4.16E-3
Liver	7.70E-4	1.81E-3	3.02E-3	4.92E-3	5.23E-3	4.25E-3	4.10E-3	4.15E-3	3.97E-3	3.75E-3	3.54E-3	3.02E-3
Lower large intestine	9.50E-3	1.50E-2	1.74E-2	1.65E-2	1.16E-2	8.26E-3	7.96E-3	7.97E-3	7.50E-3	6.90E-3	6.44E-3	5.25E-3
Lung	2.88E-3	4.79E-3	5.96E-3	6.61E-3	5.41E-3	4.04E-3	3.94E-3	4.00E-3	3.80E-3	3.55E-3	3.33E-3	2.78E-3
Muscle	5.50E-3	8.42E-3	9.51E-3	8.39E-3	5.50E-3	3.61E-3	3.67E-3	3.84E-3	3.68E-3	3.46E-3	3.25E-3	2.68E-3
Pancreas	1.88E-3	5.27E-3	8.09E-3	1.01E-2	8.78E-3	6.55E-3	6.09E-3	5.96E-3	5.67E-3	5.28E-3	4.99E-3	4.17E-3
Skin	1.31E-2	1.42E-2	1.19E-2	7.43E-3	3.87E-3	2.83E-3	3.14E-3	3.45E-3	3.25E-3	2.93E-3	2.68E-3	2.08E-3
Small Intestine	6.61E-3	1.24E-2	1.59E-2	1.67E-2	1.22E-2	8.52E-3	8.05E-3	7.97E-3	7.45E-3	6.97E-3	6.51E-3	5.32E-3
Spleen	1.38E-3	3.82E-3	6.28E-3	8.53E-3	7.30E-3	5.39E-3	5.21E-3	5.22E-3	4.98E-3	4.70E-3	4.46E-3	3.72E-3
Stomach	5.76E-3	9.52E-3	1.11E-2	1.12E-2	8.53E-3	6.16E-3	5.88E-3	5.85E-3	5.58E-3	5.21E-3	4.91E-3	4.01E-3
Testis	4.59E-4	2.92E-3	6.31E-3	8.49E-3	6.51E-3	4.76E-3	4.67E-3	4.88E-3	4.79E-3	4.51E-3	4.27E-3	3.55E-3
Thymus	3.36E-3	4.63E-3	5.34E-3	5.71E-3	4.83E-3	3.72E-3	3.77E-3	3.85E-3	3.63E-3	3.39E-3	3.25E-3	2.65E-3
Thyroid	2.22E-3	6.35E-3	9.37E-3	8.95E-3	5.81E-3	4.30E-3	4.40E-3	4.50E-3	4.19E-3	4.04E-3	3.78E-3	3.15E-3
Upper large intestine	8.77E-3	1.35E-2	1.56E-2	1.52E-2	1.07E-2	7.41E-3	7.10E-3	7.11E-3	6.67E-3	6.30E-3	5.88E-3	4.74E-3
Whole body	1.47E-2	1.38E-2	1.27E-2	1.04E-2	7.32E-3	4.71E-3	4.32E-3	4.35E-3	4.12E-3	3.83E-3	3.58E-3	2.91E-3

Table E-2 SAFs (kg^{-1}) for 25 target organs and for adrenal as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	7.42E-3	1.17E-2	1.17E-2	9.35E-3	7.19E-3	5.78E-3	5.63E-3	5.65E-3	5.34E-3	4.99E-3	4.69E-3	3.84E-3
Adrenal	6.06E+1	3.73E+1	2.14E+1	8.01E+0	2.50E+0	1.44E+0	1.58E+0	1.65E+0	1.40E+0	1.14E+0	9.32E-1	4.85E-1
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.17E-4	9.03E-4	1.15E-3	1.44E-3	1.54E-3	1.54E-3	1.50E-3	1.39E-3
Bone (hard bone)	4.92E-5	1.89E-3	7.33E-3	2.06E-2	2.80E-2	1.63E-2	8.84E-3	6.08E-3	5.21E-3	4.74E-3	4.43E-3	3.76E-3
Bone (marrow)	1.29E-5	4.30E-4	1.40E-3	3.10E-3	4.32E-3	4.99E-3	5.35E-3	5.35E-3	5.12E-3	4.83E-3	4.56E-3	3.76E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.29E-6	3.97E-5	7.30E-5	1.31E-4	1.88E-4	2.23E-4	2.42E-4	2.75E-4
Breast	0.00E+0	0.00E+0	5.28E-6	6.01E-4	2.64E-3	3.25E-3	3.37E-3	3.62E-3	3.61E-3	3.50E-3	3.32E-3	2.87E-3
Esophagus	0.00E+0	5.11E-4	1.08E-2	3.99E-2	3.86E-2	2.72E-2	2.46E-2	2.30E-2	2.09E-2	1.93E-2	1.78E-2	1.48E-2
Gall bladder	0.00E+0	9.72E-3	6.35E-2	1.34E-1	1.05E-1	6.75E-2	5.97E-2	5.67E-2	5.09E-2	4.64E-2	4.30E-2	3.51E-2
Heart	0.00E+0	1.43E-5	7.46E-4	7.61E-3	1.38E-2	1.24E-2	1.12E-2	1.05E-2	9.70E-3	9.01E-3	8.49E-3	7.12E-3
Kidney	6.66E-3	6.61E-2	1.39E-1	1.64E-1	1.05E-1	6.71E-2	6.24E-2	5.99E-2	5.46E-2	5.00E-2	4.65E-2	3.74E-2
Liver	3.50E-2	7.56E-2	1.04E-1	1.14E-1	8.01E-2	5.25E-2	4.83E-2	4.63E-2	4.23E-2	3.87E-2	3.59E-2	2.86E-2
Lower large intestine	0.00E+0	0.00E+0	3.71E-4	4.55E-3	7.85E-3	7.00E-3	6.44E-3	6.17E-3	5.86E-3	5.54E-3	5.26E-3	4.48E-3
Lung	6.74E-5	1.35E-3	6.24E-3	1.66E-2	1.75E-2	1.34E-2	1.22E-2	1.14E-2	1.04E-2	9.64E-3	9.00E-3	7.46E-3
Muscle	3.15E-3	6.34E-3	7.80E-3	7.61E-3	6.00E-3	4.83E-3	4.74E-3	4.72E-3	4.45E-3	4.17E-3	3.92E-3	3.24E-3
Pancreas	6.15E-3	6.36E-2	1.45E-1	2.00E-1	1.38E-1	8.53E-2	7.71E-2	7.29E-2	6.60E-2	6.02E-2	5.58E-2	4.49E-2
Skin	0.00E+0	0.00E+0	9.90E-6	3.87E-4	1.22E-3	1.47E-3	1.62E-3	1.79E-3	1.78E-3	1.70E-3	1.62E-3	1.40E-3
Small Intestine	0.00E+0	1.78E-4	2.63E-3	1.17E-2	1.63E-2	1.39E-2	1.26E-2	1.17E-2	1.08E-2	9.99E-3	9.39E-3	7.80E-3
Spleen	2.84E-3	2.40E-2	6.15E-2	1.03E-1	7.89E-2	5.10E-2	4.62E-2	4.42E-2	4.04E-2	3.71E-2	3.46E-2	2.80E-2
Stomach	4.48E-2	1.23E-1	1.72E-1	1.59E-1	9.72E-2	6.10E-2	5.66E-2	5.49E-2	5.00E-2	4.59E-2	4.22E-2	3.35E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.24E-4	2.20E-4	3.85E-4	5.01E-4	5.64E-4	6.21E-4	6.13E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	4.32E-4	2.75E-3	3.63E-3	3.43E-3	3.42E-3	3.38E-3	3.26E-3	3.11E-3	2.79E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.78E-4	1.11E-3	1.18E-3	1.26E-3	1.26E-3	1.30E-3	1.27E-3	1.16E-3
Upper large intestine	0.00E+0	1.13E-5	7.94E-4	8.85E-3	1.64E-2	1.44E-2	1.29E-2	1.20E-2	1.11E-2	1.03E-2	9.66E-3	8.08E-3
Whole body	1.47E-2	1.49E-2	1.48E-2	1.42E-2	1.18E-2	8.40E-3	7.32E-3	6.92E-3	6.40E-3	5.91E-3	5.51E-3	4.48E-3

Table E-3 SAFs (kg^{-1}) for 25 target organs and for bladder as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	8.26E-3	1.28E-2	1.46E-2	1.45E-2	1.11E-2	8.42E-3	8.17E-3	8.08E-3	7.59E-3	7.05E-3	6.60E-3	5.40E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.05E-4	1.17E-3	1.40E-3	1.50E-3	1.56E-3	1.53E-3	1.44E-3
Bladder	1.63E+1	9.16E+0	5.34E+0	2.22E+0	7.83E-1	4.54E-1	4.81E-1	4.89E-1	4.13E-1	3.41E-1	2.87E-1	1.75E-1
Bone (hard bone)	1.02E-3	5.37E-3	1.21E-2	2.52E-2	3.06E-2	1.74E-2	7.88E-3	6.67E-3	5.71E-3	4.23E-3	3.93E-3	4.07E-3
Bone (marrow)	3.93E-4	8.15E-4	1.35E-3	2.75E-3	3.99E-3	4.66E-3	6.34E-3	4.93E-3	4.81E-3	5.62E-3	5.32E-3	3.58E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.30E-7	1.93E-6	7.31E-6	1.76E-5	2.77E-5	3.58E-5	5.59E-5
Breast	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.09E-6	4.28E-5	7.90E-5	1.54E-4	2.35E-4	2.90E-4	3.19E-4	3.56E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.71E-4	2.53E-4	3.60E-4	4.48E-4	4.85E-4	5.05E-4	5.15E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.34E-3	1.55E-3	1.78E-3	1.83E-3	1.89E-3	1.83E-3	1.71E-3
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.56E-5	1.11E-4	1.79E-4	2.76E-4	3.70E-4	4.21E-4	4.48E-4	4.73E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	1.33E-4	1.33E-3	2.43E-3	2.70E-3	2.84E-3	2.85E-3	2.80E-3	2.71E-3	2.41E-3
Liver	0.00E+0	0.00E+0	0.00E+0	1.26E-5	3.02E-4	7.52E-4	9.37E-4	1.16E-3	1.30E-3	1.34E-3	1.34E-3	1.27E-3
Lower large intestine	3.78E-2	9.97E-2	1.66E-1	1.81E-1	1.10E-1	6.65E-2	6.18E-2	5.96E-2	5.42E-2	4.96E-2	4.59E-2	3.64E-2
Lung	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.63E-5	1.38E-4	2.14E-4	3.28E-4	4.32E-4	4.84E-4	5.09E-4	5.26E-4
Muscle	1.67E-3	3.40E-3	4.72E-3	6.07E-3	6.11E-3	5.30E-3	5.25E-3	5.15E-3	4.86E-3	4.57E-3	4.31E-3	3.60E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	5.47E-5	8.83E-4	1.75E-3	1.96E-3	2.12E-3	2.19E-3	2.15E-3	2.11E-3	1.92E-3
Skin	0.00E+0	1.78E-5	2.29E-4	9.21E-4	1.48E-3	1.64E-3	1.85E-3	2.04E-3	2.03E-3	1.94E-3	1.84E-3	1.58E-3
Small Intestine	1.83E-5	1.55E-3	8.21E-3	2.39E-2	2.69E-2	2.03E-2	1.83E-2	1.72E-2	1.58E-2	1.46E-2	1.36E-2	1.13E-2
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.88E-4	7.66E-4	9.89E-4	1.19E-3	1.34E-3	1.38E-3	1.37E-3	1.29E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	6.51E-5	8.28E-4	1.49E-3	1.66E-3	1.84E-3	1.95E-3	1.96E-3	1.93E-3	1.76E-3
Testis	0.00E+0	0.00E+0	5.29E-4	9.54E-3	2.21E-2	2.02E-2	1.95E-2	1.95E-2	1.84E-2	1.71E-2	1.61E-2	1.34E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.82E-5	7.23E-5	1.30E-4	1.96E-4	2.40E-4	2.65E-4	3.11E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.13E-5	2.75E-5	5.67E-5	9.29E-5	1.19E-4	1.36E-4	1.66E-4
Upper large intestine	0.00E+0	0.00E+0	1.04E-4	2.22E-3	5.96E-3	6.52E-3	6.33E-3	6.26E-3	5.99E-3	5.66E-3	5.38E-3	4.59E-3
Whole body	1.30E-2	1.15E-2	1.13E-2	1.16E-2	1.04E-2	7.50E-3	6.43E-3	6.16E-3	5.72E-3	5.26E-3	4.92E-3	4.09E-3

Table E-4 SAFs (kg^{-1}) for 25 target organs and for bladder content as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	8.74E-4	4.25E-3	8.22E-3	1.18E-2	1.05E-2	8.24E-3	7.78E-3	7.62E-3	7.15E-3	6.68E-3	6.27E-3	5.21E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.61E-4	1.19E-3	1.42E-3	1.53E-3	1.55E-3	1.54E-3	1.44E-3
Bladder	1.50E+0	2.22E+0	2.09E+0	1.27E+0	5.34E-1	3.04E-1	3.03E-1	3.07E-1	2.82E-1	2.54E-1	2.30E-1	1.63E-1
Bone (hard bone)	1.55E-4	2.61E-3	8.90E-3	2.33E-2	2.99E-2	1.46E-2	7.78E-3	5.28E-3	4.51E-3	4.09E-3	3.81E-3	3.20E-3
Bone (marrow)	7.27E-5	5.14E-4	1.25E-3	2.71E-3	3.93E-3	5.93E-3	6.21E-3	6.09E-3	5.77E-3	5.46E-3	5.18E-3	4.37E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.41E-7	1.93E-6	7.14E-6	1.77E-5	2.74E-5	3.54E-5	5.48E-5
Breast	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.45E-6	4.43E-5	7.93E-5	1.53E-4	2.41E-4	2.92E-4	3.23E-4	3.64E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.79E-4	2.58E-4	3.59E-4	4.42E-4	4.84E-4	5.02E-4	5.19E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.37E-3	1.58E-3	1.80E-3	1.89E-3	1.90E-3	1.85E-3	1.69E-3
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.58E-5	1.16E-4	1.80E-4	2.81E-4	3.73E-4	4.21E-4	4.49E-4	4.74E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	1.36E-4	1.37E-3	2.54E-3	2.74E-3	2.89E-3	2.90E-3	2.83E-3	2.73E-3	2.42E-3
Liver	0.00E+0	0.00E+0	0.00E+0	1.29E-5	3.11E-4	7.71E-4	9.50E-4	1.17E-3	1.30E-3	1.34E-3	1.35E-3	1.27E-3
Lower large intestine	1.97E-2	8.12E-2	1.57E-1	1.86E-1	1.15E-1	6.97E-2	6.40E-2	6.14E-2	5.60E-2	5.12E-2	4.73E-2	3.78E-2
Lung	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.58E-5	1.44E-4	2.16E-4	3.34E-4	4.36E-4	4.87E-4	5.11E-4	5.23E-4
Muscle	2.78E-4	1.33E-3	2.93E-3	5.23E-3	5.94E-3	5.38E-3	5.15E-3	5.05E-3	4.75E-3	4.46E-3	4.21E-3	3.54E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	6.43E-5	8.90E-4	1.81E-3	1.98E-3	2.14E-3	2.19E-3	2.17E-3	2.12E-3	1.91E-3
Skin	0.00E+0	4.76E-6	1.16E-4	7.28E-4	1.39E-3	1.66E-3	1.81E-3	2.01E-3	2.00E-3	1.91E-3	1.81E-3	1.56E-3
Small Intestine	4.91E-6	9.62E-4	7.08E-3	2.41E-2	2.79E-2	2.11E-2	1.88E-2	1.76E-2	1.61E-2	1.49E-2	1.39E-2	1.15E-2
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.91E-4	8.18E-4	9.96E-4	1.21E-3	1.34E-3	1.38E-3	1.38E-3	1.29E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	6.30E-5	8.39E-4	1.54E-3	1.67E-3	1.86E-3	1.96E-3	1.96E-3	1.93E-3	1.75E-3
Testis	0.00E+0	0.00E+0	3.38E-4	8.37E-3	2.26E-2	2.17E-2	2.07E-2	2.05E-2	1.93E-2	1.80E-2	1.69E-2	1.40E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.14E-5	7.25E-5	1.33E-4	1.96E-4	2.37E-4	2.61E-4	3.02E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.35E-5	2.71E-5	5.63E-5	9.30E-5	1.18E-4	1.37E-4	1.68E-4
Upper large intestine	0.00E+0	0.00E+0	8.22E-5	2.15E-3	6.09E-3	6.67E-3	6.39E-3	6.26E-3	5.97E-3	5.66E-3	5.38E-3	4.60E-3
Whole body	1.32E-3	3.61E-3	6.30E-3	9.73E-3	9.93E-3	7.16E-3	6.16E-3	5.78E-3	5.39E-3	5.03E-3	4.73E-3	3.95E-3

Table E-5 SAFs (kg^{-1}) for 25 target organs and for brain as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	4.95E-6	1.51E-5	4.38E-5	2.42E-4	5.60E-4	7.10E-4	7.91E-4	8.50E-4	8.70E-4	8.84E-4	8.54E-4	7.29E-4
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.05E-5	8.54E-5	1.41E-4	2.03E-4	2.34E-4	2.54E-4	2.65E-4
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.36E-7	2.33E-6	7.85E-6	1.98E-5	2.89E-5	3.70E-5	5.87E-5
Bone (hard bone)	3.24E-3	1.08E-2	2.34E-2	4.91E-2	4.80E-2	1.84E-2	9.48E-3	8.07E-3	7.26E-3	6.05E-3	5.64E-3	5.18E-3
Bone (marrow)	1.06E-3	1.39E-3	1.85E-3	2.62E-3	2.83E-3	3.62E-3	3.85E-3	3.13E-3	2.99E-3	3.54E-3	3.35E-3	2.13E-3
Brain	5.70E-1	5.37E-1	4.80E-1	3.38E-1	1.72E-1	1.04E-1	1.01E-1	1.02E-1	9.26E-2	8.36E-2	7.62E-2	5.76E-2
Breast	0.00E+0	0.00E+0	0.00E+0	7.61E-6	1.10E-4	2.66E-4	3.89E-4	5.88E-4	7.17E-4	7.60E-4	7.68E-4	7.15E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.47E-4	7.21E-4	9.20E-4	1.05E-3	1.10E-3	1.11E-3	1.06E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.01E-5	7.05E-5	1.27E-4	1.87E-4	2.17E-4	2.38E-4	2.61E-4
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.28E-5	2.92E-4	4.01E-4	5.58E-4	6.81E-4	7.37E-4	7.61E-4	7.61E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.51E-5	4.70E-5	9.01E-5	1.39E-4	1.67E-4	1.86E-4	2.14E-4
Liver	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.21E-5	6.38E-5	1.07E-4	1.82E-4	2.52E-4	2.88E-4	3.07E-4	3.27E-4
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.41E-6	1.48E-5	3.28E-5	5.72E-5	7.26E-5	8.50E-5	1.07E-4
Lung	0.00E+0	0.00E+0	0.00E+0	4.00E-6	1.18E-4	3.50E-4	4.74E-4	6.59E-4	7.87E-4	8.32E-4	8.45E-4	8.19E-4
Muscle	1.69E-5	2.84E-5	7.53E-5	4.60E-4	1.07E-3	1.23E-3	1.32E-3	1.42E-3	1.40E-3	1.33E-3	1.27E-3	1.10E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.32E-5	5.76E-5	1.00E-4	1.47E-4	1.76E-4	1.93E-4	2.21E-4
Skin	0.00E+0	4.59E-7	2.08E-5	4.69E-4	1.27E-3	1.53E-3	1.77E-3	1.97E-3	1.89E-3	1.75E-3	1.63E-3	1.36E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.77E-6	1.63E-5	3.59E-5	6.29E-5	8.18E-5	9.57E-5	1.22E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.71E-5	9.65E-5	1.71E-4	2.41E-4	2.75E-4	2.93E-4	3.10E-4
Stomach	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.28E-5	7.19E-5	1.25E-4	1.80E-4	2.11E-4	2.31E-4	2.55E-4
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.68E-7	5.47E-7	2.55E-6	7.86E-6	1.39E-5	1.97E-5	3.38E-5
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.48E-4	6.14E-4	8.51E-4	1.02E-3	1.08E-3	1.10E-3	1.07E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.75E-4	1.90E-3	2.34E-3	2.85E-3	3.07E-3	3.07E-3	3.01E-3	2.71E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.18E-5	2.43E-5	5.34E-5	9.06E-5	1.16E-4	1.32E-4	1.60E-4
Whole body	1.56E-2	1.56E-2	1.56E-2	1.50E-2	1.09E-2	5.84E-3	4.84E-3	4.71E-3	4.37E-3	4.00E-3	3.71E-3	2.98E-3

Table E-6 SAFs (kg^{-1}) for 25 target organs and for breast as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.95E-3	3.54E-3	4.35E-3	4.24E-3	3.02E-3	2.33E-3	2.51E-3	2.78E-3	2.78E-3	2.66E-3	2.53E-3	2.13E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	6.37E-4	2.93E-3	3.54E-3	3.59E-3	3.78E-3	3.64E-3	3.53E-3	3.42E-3	2.96E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.03E-5	9.03E-5	1.65E-4	2.54E-4	3.07E-4	3.40E-4	3.77E-4
Bone (hard bone)	7.59E-7	3.31E-4	2.50E-3	8.28E-3	1.05E-2	5.58E-3	3.12E-3	2.47E-3	2.31E-3	2.17E-3	2.07E-3	1.81E-3
Bone (marrow)	2.10E-7	4.28E-5	2.83E-4	8.97E-4	1.32E-3	1.51E-3	1.74E-3	1.92E-3	1.93E-3	1.88E-3	1.79E-3	1.52E-3
Brain	0.00E+0	0.00E+0	0.00E+0	7.29E-6	1.14E-4	2.78E-4	4.09E-4	6.03E-4	7.38E-4	7.76E-4	7.81E-4	7.56E-4
Breast	9.06E+0	6.41E+0	4.07E+0	1.69E+0	5.67E-1	3.26E-1	3.62E-1	3.85E-1	3.42E-1	2.93E-1	2.51E-1	1.50E-1
Esophagus	0.00E+0	0.00E+0	6.69E-5	3.02E-3	7.69E-3	7.30E-3	7.09E-3	7.14E-3	6.75E-3	6.30E-3	5.99E-3	5.01E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.43E-3	3.02E-3	3.14E-3	3.42E-3	3.53E-3	3.39E-3	3.28E-3	2.89E-3
Heart	0.00E+0	4.81E-5	1.77E-3	1.25E-2	1.71E-2	1.31E-2	1.25E-2	1.25E-2	1.17E-2	1.08E-2	1.01E-2	8.30E-3
Kidney	0.00E+0	0.00E+0	0.00E+0	1.14E-4	9.82E-4	1.53E-3	1.68E-3	1.92E-3	2.02E-3	2.01E-3	1.96E-3	1.74E-3
Liver	0.00E+0	0.00E+0	1.06E-4	2.12E-3	5.14E-3	4.97E-3	4.94E-3	5.20E-3	5.10E-3	4.87E-3	4.64E-3	3.97E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	5.16E-5	3.01E-4	4.60E-4	5.38E-4	6.99E-4	8.00E-4	8.41E-4	8.53E-4	8.23E-4
Lung	0.00E+0	6.97E-4	6.95E-3	2.13E-2	1.94E-2	1.32E-2	1.29E-2	1.32E-2	1.24E-2	1.14E-2	1.07E-2	8.85E-3
Muscle	2.09E-3	5.78E-3	7.79E-3	6.50E-3	3.74E-3	2.67E-3	2.84E-3	3.10E-3	3.04E-3	2.89E-3	2.73E-3	2.27E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	3.54E-4	2.24E-3	2.87E-3	2.98E-3	3.27E-3	3.34E-3	3.25E-3	3.15E-3	2.76E-3
Skin	1.66E-2	2.13E-2	1.80E-2	1.02E-2	4.51E-3	3.13E-3	3.55E-3	3.94E-3	3.66E-3	3.26E-3	2.95E-3	2.19E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	2.33E-5	3.02E-4	5.85E-4	7.00E-4	8.98E-4	1.04E-3	1.09E-3	1.11E-3	1.06E-3
Spleen	0.00E+0	0.00E+0	0.00E+0	7.33E-4	2.54E-3	2.83E-3	2.88E-3	3.07E-3	3.03E-3	2.89E-3	2.77E-3	2.35E-3
Stomach	0.00E+0	0.00E+0	4.73E-5	1.02E-3	3.05E-3	3.28E-3	3.36E-3	3.63E-3	3.68E-3	3.57E-3	3.44E-3	3.02E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.95E-6	1.94E-5	5.16E-5	9.38E-5	1.30E-4	1.55E-4	1.97E-4
Thymus	0.00E+0	0.00E+0	1.76E-3	1.47E-2	2.02E-2	1.53E-2	1.51E-2	1.52E-2	1.44E-2	1.32E-2	1.23E-2	1.03E-2
Thyroid	0.00E+0	0.00E+0	0.00E+0	5.06E-4	2.41E-3	3.11E-3	3.33E-3	3.78E-3	3.99E-3	3.92E-3	3.82E-3	3.48E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	4.69E-5	4.86E-4	8.24E-4	9.50E-4	1.20E-3	1.35E-3	1.43E-3	1.42E-3	1.35E-3
Whole body	1.52E-2	1.34E-2	1.14E-2	8.28E-3	5.37E-3	3.63E-3	3.54E-3	3.73E-3	3.59E-3	3.36E-3	3.14E-3	2.54E-3

Table E-7 SAFs (kg^{-1}) for 25 target organs and for bronchi as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.25E-2	1.29E-2	1.06E-2	7.75E-3	5.54E-3	4.28E-3	4.29E-3	4.33E-3	4.08E-3	3.78E-3	3.51E-3	2.82E-3
Adrenal	0.00E+0	0.00E+0	3.59E-4	4.26E-3	8.57E-3	8.41E-3	7.97E-3	7.48E-3	6.83E-3	6.35E-3	5.99E-3	4.97E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.67E-5	1.38E-4	2.36E-4	3.18E-4	3.70E-4	3.94E-4	4.20E-4
Bone (hard bone)	1.26E-5	1.24E-3	7.51E-3	2.57E-2	3.09E-2	1.54E-2	6.67E-3	5.47E-3	4.76E-3	3.65E-3	3.40E-3	3.43E-3
Bone (marrow)	5.68E-6	2.78E-4	1.18E-3	3.12E-3	4.08E-3	4.27E-3	5.44E-3	4.44E-3	4.18E-3	4.73E-3	4.47E-3	3.01E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.26E-5	2.94E-4	4.32E-4	6.21E-4	7.61E-4	8.21E-4	8.44E-4	8.36E-4
Breast	0.00E+0	2.15E-5	1.44E-3	1.08E-2	1.39E-2	1.08E-2	1.05E-2	1.05E-2	9.76E-3	9.03E-3	8.41E-3	6.87E-3
Esophagus	5.06E-2	1.77E-1	2.42E-1	2.06E-1	1.09E-1	6.69E-2	6.46E-2	6.36E-2	5.84E-2	5.34E-2	4.93E-2	3.84E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	1.29E-3	4.64E-3	5.16E-3	4.82E-3	4.68E-3	4.42E-3	4.19E-3	3.99E-3	3.38E-3
Heart	1.94E-1	4.69E-1	5.23E-1	3.73E-1	1.76E-1	1.02E-1	1.02E-1	1.03E-1	9.55E-2	8.72E-2	7.99E-2	5.97E-2
Kidney	0.00E+0	0.00E+0	1.67E-5	6.91E-4	2.59E-3	3.33E-3	3.37E-3	3.34E-3	3.22E-3	3.09E-3	2.95E-3	2.54E-3
Liver	0.00E+0	6.09E-5	1.11E-3	6.24E-3	9.89E-3	8.64E-3	7.88E-3	7.41E-3	6.87E-3	6.41E-3	6.03E-3	5.04E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	1.14E-4	5.18E-4	7.36E-4	7.98E-4	8.91E-4	9.66E-4	9.84E-4	9.82E-4	9.13E-4
Lung	5.86E-2	1.25E-1	1.60E-1	1.32E-1	6.82E-2	3.99E-2	3.76E-2	3.66E-2	3.34E-2	3.05E-2	2.81E-2	2.20E-2
Muscle	2.47E-4	6.10E-4	1.27E-3	3.03E-3	3.76E-3	3.28E-3	3.24E-3	3.18E-3	2.99E-3	2.80E-3	2.64E-3	2.21E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	9.01E-4	3.96E-3	4.76E-3	4.50E-3	4.33E-3	4.10E-3	3.94E-3	3.76E-3	3.22E-3
Skin	3.39E-5	4.13E-5	1.07E-4	8.14E-4	1.54E-3	1.59E-3	1.74E-3	1.87E-3	1.80E-3	1.69E-3	1.59E-3	1.34E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	6.69E-5	5.50E-4	9.78E-4	1.08E-3	1.21E-3	1.29E-3	1.30E-3	1.29E-3	1.19E-3
Spleen	0.00E+0	1.04E-5	4.60E-4	3.89E-3	7.01E-3	6.54E-3	6.14E-3	5.71E-3	5.28E-3	4.90E-3	4.60E-3	3.86E-3
Stomach	0.00E+0	1.93E-5	4.74E-4	2.95E-3	5.58E-3	5.41E-3	5.03E-3	4.80E-3	4.54E-3	4.30E-3	4.08E-3	3.46E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.13E-5	2.80E-5	6.55E-5	1.22E-4	1.57E-4	1.84E-4	2.24E-4
Thymus	0.00E+0	1.11E-3	1.76E-2	7.12E-2	6.47E-2	4.16E-2	3.86E-2	3.80E-2	3.54E-2	3.28E-2	3.06E-2	2.50E-2
Thyroid	0.00E+0	2.12E-4	1.95E-3	1.14E-2	1.59E-2	1.29E-2	1.21E-2	1.17E-2	1.08E-2	1.01E-2	9.51E-3	7.89E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	1.03E-4	8.20E-4	1.32E-3	1.41E-3	1.54E-3	1.61E-3	1.62E-3	1.59E-3	1.44E-3
Whole body	6.96E-3	1.13E-2	1.30E-2	1.33E-2	1.04E-2	6.76E-3	5.74E-3	5.52E-3	5.12E-3	4.71E-3	4.38E-3	3.57E-3

Table E-8 SAFs (kg^{-1}) for 25 target organs and for esophagus as a source region in the JM phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	4.09E-3	7.06E-3	7.65E-3	6.76E-3	5.38E-3	4.46E-3	4.44E-3	4.49E-3	4.26E-3	3.99E-3	3.74E-3	3.08E-3
Adrenal	0.00E+0	6.10E-4	1.14E-2	3.95E-2	3.72E-2	2.68E-2	2.45E-2	2.28E-2	2.08E-2	1.91E-2	1.79E-2	1.48E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.48E-5	1.65E-4	2.46E-4	3.53E-4	4.33E-4	4.88E-4	5.03E-4	5.27E-4
Bone (hard bone)	2.30E-3	9.76E-3	1.91E-2	3.51E-2	3.83E-2	1.90E-2	1.01E-2	7.41E-3	6.51E-3	5.95E-3	5.54E-3	4.62E-3
Bone (marrow)	7.00E-4	1.42E-3	2.07E-3	3.54E-3	4.72E-3	5.34E-3	5.76E-3	5.82E-3	5.56E-3	5.22E-3	4.90E-3	4.00E-3
Brain	0.00E+0	0.00E+0	0.00E+0	7.55E-6	1.60E-4	5.11E-4	6.96E-4	9.01E-4	1.03E-3	1.08E-3	1.10E-3	1.06E-3
Breast	0.00E+0	0.00E+0	7.96E-5	3.01E-3	7.23E-3	6.90E-3	6.83E-3	6.98E-3	6.61E-3	6.29E-3	5.87E-3	4.92E-3
Esophagus	2.05E+1	1.31E+1	7.70E+0	2.96E+0	9.57E-1	5.63E-1	6.15E-1	6.44E-1	5.55E-1	4.61E-1	3.82E-1	2.07E-1
Gall bladder	0.00E+0	0.00E+0	2.89E-4	5.79E-3	1.21E-2	1.09E-2	9.82E-3	9.06E-3	8.35E-3	7.71E-3	7.32E-3	5.99E-3
Heart	1.34E-1	2.31E-1	2.65E-1	2.14E-1	1.15E-1	7.06E-2	6.81E-2	6.78E-2	6.24E-2	5.70E-2	5.24E-2	4.04E-2
Kidney	0.00E+0	2.93E-6	2.99E-4	3.71E-3	7.45E-3	7.36E-3	6.90E-3	6.56E-3	6.11E-3	5.80E-3	5.42E-3	4.62E-3
Liver	1.38E-2	2.82E-2	3.95E-2	4.28E-2	3.09E-2	2.15E-2	2.00E-2	1.92E-2	1.77E-2	1.63E-2	1.51E-2	1.22E-2
Lower large intestine	0.00E+0	0.00E+0	1.37E-5	4.86E-4	1.45E-3	1.61E-3	1.57E-3	1.59E-3	1.61E-3	1.58E-3	1.54E-3	1.37E-3
Lung	2.77E-3	1.51E-2	3.29E-2	4.94E-2	3.80E-2	2.60E-2	2.37E-2	2.24E-2	2.03E-2	1.86E-2	1.73E-2	1.41E-2
Muscle	3.22E-2	2.25E-2	1.52E-2	8.50E-3	5.43E-3	4.48E-3	4.55E-3	4.60E-3	4.27E-3	3.92E-3	3.61E-3	2.85E-3
Pancreas	2.71E-4	3.96E-4	3.43E-3	1.74E-2	2.17E-2	1.64E-2	1.44E-2	1.33E-2	1.21E-2	1.12E-2	1.05E-2	8.74E-3
Skin	6.56E-6	1.81E-5	1.20E-4	6.33E-4	1.31E-3	1.51E-3	1.66E-3	1.82E-3	1.77E-3	1.67E-3	1.58E-3	1.34E-3
Small Intestine	0.00E+0	0.00E+0	2.24E-5	6.66E-4	2.09E-3	2.46E-3	2.37E-3	2.37E-3	2.33E-3	2.27E-3	2.18E-3	1.93E-3
Spleen	0.00E+0	2.21E-5	9.92E-4	9.16E-3	1.45E-2	1.19E-2	1.06E-2	9.86E-3	9.07E-3	8.39E-3	7.93E-3	6.49E-3
Stomach	3.36E-2	4.86E-2	5.18E-2	4.48E-2	2.98E-2	2.01E-2	1.87E-2	1.81E-2	1.67E-2	1.53E-2	1.42E-2	1.12E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.71E-5	1.02E-4	1.66E-4	2.03E-4	2.11E-4	2.60E-4
Thymus	0.00E+0	3.86E-4	8.41E-3	3.69E-2	3.85E-2	2.76E-2	2.54E-2	2.44E-2	2.28E-2	2.11E-2	1.98E-2	1.64E-2
Thyroid	2.86E-2	1.66E-1	2.88E-1	2.42E-1	1.14E-1	6.71E-2	6.56E-2	6.57E-2	6.03E-2	5.47E-2	5.09E-2	4.05E-2
Upper large intestine	0.00E+0	0.00E+0	8.85E-6	6.03E-4	2.35E-3	2.85E-3	2.75E-3	2.79E-3	2.76E-3	2.64E-3	2.57E-3	2.22E-3
Whole body	2.73E-2	2.26E-2	1.89E-2	1.54E-2	1.17E-2	7.80E-3	6.76E-3	6.46E-3	5.95E-3	5.47E-3	5.06E-3	4.03E-3

Table E-9 SAFs (kg^{-1}) for 25 target organs and for gall bladder as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	2.26E-3	3.40E-3	4.34E-3	6.15E-3	6.46E-3	5.20E-3	4.94E-3	4.91E-3	4.68E-3	4.41E-3	4.17E-3	3.50E-3
Adrenal	0.00E+0	9.78E-3	6.37E-2	1.33E-1	1.04E-1	6.65E-2	5.98E-2	5.61E-2	5.10E-2	4.66E-2	4.32E-2	3.51E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.70E-4	1.31E-3	1.52E-3	1.76E-3	1.86E-3	1.88E-3	1.85E-3	1.69E-3
Bone (hard bone)	0.00E+0	2.95E-5	7.47E-4	6.60E-3	1.39E-2	9.76E-3	5.28E-3	3.34E-3	2.87E-3	2.64E-3	2.49E-3	2.17E-3
Bone (marrow)	0.00E+0	4.72E-6	1.22E-4	1.06E-3	2.39E-3	3.04E-3	3.37E-3	3.42E-3	3.21E-3	3.00E-3	2.83E-3	2.38E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.95E-6	3.27E-5	6.29E-5	1.19E-4	1.77E-4	2.12E-4	2.32E-4	2.60E-4
Breast	0.00E+0	0.00E+0	0.00E+0	3.72E-4	2.11E-3	2.73E-3	2.91E-3	3.27E-3	3.41E-3	3.35E-3	3.23E-3	2.85E-3
Esophagus	0.00E+0	0.00E+0	2.40E-4	5.66E-3	1.21E-2	1.08E-2	9.70E-3	9.08E-3	8.36E-3	7.77E-3	7.33E-3	6.14E-3
Gall bladder	8.18E+1	4.50E+1	2.57E+1	9.95E+0	3.19E+0	1.81E+0	1.97E+0	2.02E+0	1.67E+0	1.35E+0	1.12E+0	6.33E-1
Heart	0.00E+0	0.00E+0	5.09E-5	2.28E-3	7.13E-3	7.31E-3	6.71E-3	6.41E-3	6.09E-3	5.76E-3	5.48E-3	4.70E-3
Kidney	0.00E+0	8.31E-4	1.35E-2	5.49E-2	5.89E-2	4.08E-2	3.58E-2	3.30E-2	2.98E-2	2.74E-2	2.54E-2	2.07E-2
Liver	1.34E-1	2.32E-1	2.99E-1	2.97E-1	1.79E-1	1.05E-1	9.74E-2	9.46E-2	8.63E-2	7.87E-2	7.25E-2	5.68E-2
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	3.38E-4	2.26E-3	3.27E-3	3.31E-3	3.38E-3	3.33E-3	3.22E-3	3.11E-3	2.74E-3
Lung	0.00E+0	7.66E-7	2.32E-4	4.70E-3	9.50E-3	8.24E-3	7.44E-3	7.07E-3	6.61E-3	6.19E-3	5.83E-3	4.93E-3
Muscle	2.36E-2	1.44E-2	1.01E-2	7.03E-3	5.23E-3	4.11E-3	4.02E-3	4.04E-3	3.79E-3	3.53E-3	3.30E-3	2.71E-3
Pancreas	2.41E-3	1.63E-2	8.06E-2	1.68E-1	1.28E-1	7.79E-2	6.90E-2	6.45E-2	5.85E-2	5.33E-2	4.94E-2	4.01E-2
Skin	0.00E+0	1.04E-6	6.34E-5	7.24E-4	1.54E-3	1.63E-3	1.75E-3	1.93E-3	1.92E-3	1.82E-3	1.73E-3	1.48E-3
Small Intestine	2.58E-2	5.72E-2	6.94E-2	5.68E-2	3.60E-2	2.45E-2	2.28E-2	2.21E-2	2.04E-2	1.87E-2	1.74E-2	1.37E-2
Spleen	0.00E+0	0.00E+0	0.00E+0	9.89E-4	5.47E-3	7.05E-3	6.73E-3	6.47E-3	6.15E-3	5.85E-3	5.54E-3	4.72E-3
Stomach	0.00E+0	3.91E-4	7.10E-3	3.32E-2	4.06E-2	2.92E-2	2.55E-2	2.36E-2	2.15E-2	1.98E-2	1.84E-2	1.52E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.85E-4	2.90E-4	4.77E-4	6.19E-4	6.85E-4	7.32E-4	7.34E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	3.23E-4	2.17E-3	2.88E-3	2.79E-3	2.77E-3	2.75E-3	2.73E-3	2.63E-3	2.40E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.50E-4	8.75E-4	9.54E-4	1.07E-3	1.15E-3	1.17E-3	1.16E-3	1.08E-3
Upper large intestine	6.22E-2	1.07E-1	1.39E-1	1.34E-1	8.28E-2	5.10E-2	4.71E-2	4.56E-2	4.18E-2	3.82E-2	3.53E-2	2.78E-2
Whole body	2.13E-2	1.66E-2	1.51E-2	1.39E-2	1.11E-2	7.79E-3	6.96E-3	6.65E-3	6.15E-3	5.68E-3	5.29E-3	4.30E-3

Table E-10 SAFs (kg^{-1}) for 25 target organs and for gall bladder content as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.58E-4	1.71E-3	3.31E-3	5.81E-3	6.38E-3	5.15E-3	4.87E-3	4.84E-3	4.62E-3	4.36E-3	4.13E-3	3.48E-3
Adrenal	0.00E+0	3.73E-3	3.85E-2	1.06E-1	9.29E-2	6.01E-2	5.35E-2	5.00E-2	4.51E-2	4.13E-2	3.82E-2	3.11E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.10E-4	1.32E-3	1.52E-3	1.74E-3	1.88E-3	1.90E-3	1.86E-3	1.71E-3
Bone (hard bone)	0.00E+0	1.63E-5	5.99E-4	6.16E-3	1.35E-2	9.55E-3	5.18E-3	3.27E-3	2.81E-3	2.58E-3	2.44E-3	2.13E-3
Bone (marrow)	0.00E+0	2.36E-6	9.18E-5	9.55E-4	2.28E-3	2.93E-3	3.25E-3	3.32E-3	3.12E-3	2.92E-3	2.75E-3	2.32E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.70E-6	3.25E-5	6.23E-5	1.19E-4	1.78E-4	2.13E-4	2.33E-4	2.60E-4
Breast	0.00E+0	0.00E+0	0.00E+0	3.65E-4	2.11E-3	2.70E-3	2.89E-3	3.27E-3	3.37E-3	3.34E-3	3.22E-3	2.84E-3
Esophagus	0.00E+0	0.00E+0	1.76E-4	5.02E-3	1.14E-2	1.04E-2	9.32E-3	8.66E-3	8.00E-3	7.45E-3	7.02E-3	5.85E-3
Gall bladder	1.79E+1	2.12E+1	1.61E+1	7.39E+0	2.51E+0	1.39E+0	1.47E+0	1.55E+0	1.43E+0	1.26E+0	1.11E+0	6.77E-1
Heart	0.00E+0	0.00E+0	4.15E-5	2.12E-3	6.87E-3	7.12E-3	6.54E-3	6.26E-3	5.95E-3	5.64E-3	5.36E-3	4.60E-3
Kidney	0.00E+0	4.45E-4	1.07E-2	5.12E-2	5.71E-2	3.98E-2	3.49E-2	3.20E-2	2.89E-2	2.65E-2	2.47E-2	2.02E-2
Liver	2.71E-2	1.32E-1	2.39E-1	2.78E-1	1.74E-1	1.02E-1	9.40E-2	9.08E-2	8.29E-2	7.59E-2	7.02E-2	5.60E-2
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	3.13E-4	2.24E-3	3.26E-3	3.26E-3	3.34E-3	3.33E-3	3.21E-3	3.09E-3	2.71E-3
Lung	0.00E+0	0.00E+0	1.99E-4	4.49E-3	9.27E-3	8.09E-3	7.30E-3	6.95E-3	6.50E-3	6.08E-3	5.74E-3	4.87E-3
Muscle	5.12E-3	6.74E-3	6.49E-3	5.86E-3	4.87E-3	3.89E-3	3.78E-3	3.80E-3	3.62E-3	3.41E-3	3.21E-3	2.67E-3
Pancreas	8.06E-4	1.14E-2	7.26E-2	1.63E-1	1.26E-1	7.68E-2	6.79E-2	6.35E-2	5.75E-2	5.25E-2	4.86E-2	3.93E-2
Skin	0.00E+0	5.60E-7	5.65E-5	7.23E-4	1.55E-3	1.63E-3	1.75E-3	1.94E-3	1.92E-3	1.83E-3	1.73E-3	1.49E-3
Small Intestine	6.98E-3	3.74E-2	5.81E-2	5.36E-2	3.55E-2	2.41E-2	2.23E-2	2.15E-2	1.98E-2	1.83E-2	1.70E-2	1.37E-2
Spleen	0.00E+0	0.00E+0	0.00E+0	9.04E-4	5.21E-3	6.79E-3	6.50E-3	6.26E-3	5.95E-3	5.65E-3	5.37E-3	4.60E-3
Stomach	0.00E+0	2.71E-4	6.56E-3	3.28E-2	4.05E-2	2.90E-2	2.54E-2	2.34E-2	2.14E-2	1.97E-2	1.84E-2	1.51E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.92E-4	2.91E-4	4.79E-4	6.40E-4	7.03E-4	7.42E-4	7.41E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	3.20E-4	2.15E-3	2.85E-3	2.73E-3	2.74E-3	2.74E-3	2.67E-3	2.61E-3	2.33E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.48E-4	8.53E-4	9.64E-4	1.09E-3	1.17E-3	1.19E-3	1.15E-3	1.08E-3
Upper large intestine	1.98E-2	8.53E-2	1.38E-1	1.40E-1	8.64E-2	5.28E-2	4.88E-2	4.73E-2	4.33E-2	3.97E-2	3.69E-2	2.93E-2
Whole body	4.59E-3	8.47E-3	1.10E-2	1.26E-2	1.06E-2	7.55E-3	6.69E-3	6.38E-3	5.95E-3	5.53E-3	5.18E-3	4.26E-3

Table E-11 SAFs (kg^{-1}) for 25 target organs and for heart as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.69E-3	5.98E-3	6.71E-3	6.54E-3	5.26E-3	4.14E-3	4.10E-3	4.17E-3	3.96E-3	3.71E-3	3.49E-3	2.88E-3
Adrenal	0.00E+0	0.00E+0	7.51E-4	7.52E-3	1.35E-2	1.22E-2	1.12E-2	1.05E-2	9.69E-3	8.91E-3	8.42E-3	7.13E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.03E-4	1.76E-4	2.75E-4	3.67E-4	4.28E-4	4.46E-4	4.57E-4
Bone (hard bone)	3.01E-4	1.89E-3	7.32E-3	2.29E-2	2.85E-2	1.46E-2	7.58E-3	5.33E-3	4.63E-3	4.24E-3	3.96E-3	3.35E-3
Bone (marrow)	6.30E-5	2.54E-4	9.10E-4	2.54E-3	3.57E-3	3.86E-3	4.07E-3	4.08E-3	3.92E-3	3.71E-3	3.49E-3	2.89E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.55E-5	2.53E-4	3.73E-4	5.39E-4	6.70E-4	7.25E-4	7.52E-4	7.55E-4
Breast	0.00E+0	6.14E-5	2.00E-3	1.27E-2	1.62E-2	1.26E-2	1.22E-2	1.23E-2	1.16E-2	1.07E-2	9.98E-3	8.20E-3
Esophagus	1.32E-1	2.29E-1	2.65E-1	2.16E-1	1.15E-1	7.04E-2	6.83E-2	6.78E-2	6.23E-2	5.71E-2	5.25E-2	4.08E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	2.29E-3	7.14E-3	7.33E-3	6.74E-3	6.43E-3	6.14E-3	5.77E-3	5.45E-3	4.76E-3
Heart	1.58E+0	1.21E+0	8.93E-1	4.95E-1	2.14E-1	1.25E-1	1.27E-1	1.29E-1	1.17E-1	1.04E-1	9.25E-2	6.54E-2
Kidney	0.00E+0	0.00E+0	3.31E-5	1.04E-3	3.60E-3	4.34E-3	4.20E-3	4.13E-3	3.98E-3	3.82E-3	3.63E-3	3.17E-3
Liver	2.87E-3	6.51E-3	1.13E-2	1.93E-2	1.94E-2	1.46E-2	1.34E-2	1.29E-2	1.19E-2	1.11E-2	1.04E-2	8.60E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	2.44E-4	8.80E-4	1.12E-3	1.14E-3	1.22E-3	1.29E-3	1.29E-3	1.27E-3	1.17E-3
Lung	9.21E-3	4.38E-2	7.77E-2	8.55E-2	5.32E-2	3.24E-2	2.98E-2	2.87E-2	2.62E-2	2.40E-2	2.23E-2	1.80E-2
Muscle	3.82E-4	7.81E-4	1.39E-3	2.80E-3	3.46E-3	3.07E-3	3.02E-3	3.01E-3	2.85E-3	2.69E-3	2.54E-3	2.15E-3
Pancreas	0.00E+0	0.00E+0	1.61E-4	3.70E-3	9.14E-3	8.68E-3	7.83E-3	7.38E-3	6.95E-3	6.57E-3	6.19E-3	5.28E-3
Skin	0.00E+0	3.31E-6	9.80E-5	8.26E-4	1.55E-3	1.60E-3	1.74E-3	1.89E-3	1.83E-3	1.72E-3	1.62E-3	1.36E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	1.70E-4	1.01E-3	1.50E-3	1.55E-3	1.66E-3	1.72E-3	1.72E-3	1.69E-3	1.54E-3
Spleen	0.00E+0	3.25E-5	7.41E-4	5.47E-3	9.65E-3	8.48E-3	7.65E-3	7.18E-3	6.62E-3	6.18E-3	5.78E-3	4.82E-3
Stomach	0.00E+0	3.72E-4	2.44E-3	8.74E-3	1.21E-2	9.83E-3	8.88E-3	8.46E-3	7.93E-3	7.43E-3	7.00E-3	5.88E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.60E-5	3.42E-5	7.42E-5	1.46E-4	1.79E-4	2.12E-4	2.37E-4
Thymus	7.45E-2	2.05E-1	2.79E-1	2.46E-1	1.30E-1	7.70E-2	7.54E-2	7.67E-2	7.11E-2	6.56E-2	6.07E-2	4.74E-2
Thyroid	0.00E+0	2.17E-4	3.44E-3	1.53E-2	1.78E-2	1.38E-2	1.31E-2	1.29E-2	1.21E-2	1.14E-2	1.08E-2	9.01E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	2.22E-4	1.37E-3	1.94E-3	1.96E-3	2.08E-3	2.16E-3	2.13E-3	2.10E-3	1.88E-3
Whole body	1.48E-2	1.38E-2	1.33E-2	1.27E-2	1.02E-2	6.70E-3	5.80E-3	5.56E-3	5.16E-3	4.77E-3	4.44E-3	3.60E-3

Table E-12 SAFs (kg^{-1}) for 25 target organs and for heart content as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	7.06E-5	8.99E-4	2.59E-3	4.77E-3	4.84E-3	3.92E-3	3.81E-3	3.84E-3	3.67E-3	3.46E-3	3.27E-3	2.77E-3
Adrenal	0.00E+0	0.00E+0	5.67E-4	9.86E-3	1.89E-2	1.64E-2	1.48E-2	1.37E-2	1.25E-2	1.16E-2	1.09E-2	9.11E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.44E-4	2.22E-4	3.43E-4	4.52E-4	5.19E-4	5.31E-4	5.48E-4
Bone (hard bone)	8.29E-7	2.18E-4	2.54E-3	1.49E-2	2.33E-2	1.30E-2	6.71E-3	4.54E-3	3.93E-3	3.60E-3	3.38E-3	2.88E-3
Bone (marrow)	2.61E-7	3.35E-5	3.61E-4	1.77E-3	3.02E-3	3.40E-3	3.58E-3	3.59E-3	3.43E-3	3.25E-3	3.07E-3	2.56E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.16E-5	1.73E-4	2.62E-4	3.94E-4	5.05E-4	5.58E-4	5.87E-4	6.07E-4
Breast	0.00E+0	1.26E-5	1.11E-3	1.19E-2	1.74E-2	1.35E-2	1.30E-2	1.31E-2	1.23E-2	1.14E-2	1.06E-2	8.72E-3
Esophagus	7.92E-4	3.13E-2	1.02E-1	1.52E-1	1.01E-1	6.19E-2	5.74E-2	5.54E-2	5.10E-2	4.69E-2	4.34E-2	3.53E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	3.15E-3	1.03E-2	9.86E-3	8.90E-3	8.38E-3	7.70E-3	7.40E-3	7.05E-3	6.00E-3
Heart	1.45E-1	3.07E-1	3.89E-1	3.36E-1	1.77E-1	1.02E-1	9.86E-2	9.86E-2	9.09E-2	8.32E-2	7.66E-2	5.94E-2
Kidney	0.00E+0	0.00E+0	2.23E-5	1.20E-3	4.71E-3	5.54E-3	5.27E-3	5.11E-3	4.88E-3	4.68E-3	4.44E-3	3.82E-3
Liver	1.13E-3	6.65E-3	1.63E-2	3.11E-2	2.99E-2	2.11E-2	1.90E-2	1.82E-2	1.68E-2	1.55E-2	1.45E-2	1.20E-2
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	3.09E-4	1.26E-3	1.49E-3	1.49E-3	1.57E-3	1.63E-3	1.61E-3	1.58E-3	1.42E-3
Lung	3.91E-5	5.26E-3	2.69E-2	5.76E-2	4.59E-2	2.88E-2	2.58E-2	2.45E-2	2.23E-2	2.04E-2	1.90E-2	1.56E-2
Muscle	1.28E-5	1.21E-4	5.64E-4	2.10E-3	3.14E-3	2.87E-3	2.79E-3	2.78E-3	2.65E-3	2.50E-3	2.38E-3	2.03E-3
Pancreas	0.00E+0	0.00E+0	2.87E-4	6.33E-3	1.45E-2	1.29E-2	1.14E-2	1.05E-2	9.79E-3	9.16E-3	8.63E-3	7.24E-3
Skin	0.00E+0	7.10E-7	5.07E-5	6.98E-4	1.50E-3	1.58E-3	1.70E-3	1.85E-3	1.80E-3	1.69E-3	1.60E-3	1.36E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	2.58E-4	1.50E-3	2.08E-3	2.09E-3	2.18E-3	2.23E-3	2.19E-3	2.14E-3	1.93E-3
Spleen	0.00E+0	0.00E+0	3.66E-4	5.34E-3	1.14E-2	1.01E-2	9.02E-3	8.39E-3	7.78E-3	7.19E-3	6.76E-3	5.68E-3
Stomach	0.00E+0	1.64E-4	2.34E-3	1.24E-2	1.80E-2	1.41E-2	1.26E-2	1.19E-2	1.10E-2	1.02E-2	9.59E-3	8.03E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.10E-5	4.39E-5	9.44E-5	1.68E-4	2.12E-4	2.37E-4	2.77E-4
Thymus	2.98E-4	2.30E-2	7.94E-2	1.23E-1	8.44E-2	5.20E-2	4.89E-2	4.87E-2	4.51E-2	4.19E-2	3.87E-2	3.17E-2
Thyroid	0.00E+0	0.00E+0	8.44E-4	5.59E-3	8.83E-3	8.03E-3	7.63E-3	7.61E-3	7.34E-3	6.89E-3	6.70E-3	5.64E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	3.32E-4	1.95E-3	2.63E-3	2.61E-3	2.73E-3	2.75E-3	2.69E-3	2.62E-3	2.33E-3
Whole body	1.25E-3	3.18E-3	5.62E-3	9.11E-3	9.00E-3	6.21E-3	5.29E-3	5.00E-3	4.67E-3	4.35E-3	4.09E-3	3.41E-3

Table E-13 SAFs (kg^{-1}) for 25 target organs and for kidney as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.65E-3	4.84E-3	7.87E-3	1.04E-2	8.84E-3	6.68E-3	6.37E-3	6.32E-3	5.97E-3	5.60E-3	5.28E-3	4.40E-3
Adrenal	6.64E-3	6.62E-2	1.39E-1	1.63E-1	1.03E-1	6.68E-2	6.22E-2	5.99E-2	5.48E-2	5.01E-2	4.64E-2	3.72E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	1.30E-4	1.28E-3	2.36E-3	2.65E-3	2.85E-3	2.87E-3	2.79E-3	2.71E-3	2.41E-3
Bone (hard bone)	3.20E-6	2.73E-4	2.26E-3	1.15E-2	2.07E-2	1.36E-2	7.53E-3	5.13E-3	4.36E-3	3.98E-3	3.72E-3	3.20E-3
Bone (marrow)	1.53E-6	5.11E-5	3.34E-4	1.43E-3	2.81E-3	3.63E-3	3.91E-3	3.93E-3	3.89E-3	3.73E-3	3.55E-3	2.97E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.93E-5	4.05E-5	8.40E-5	1.32E-4	1.61E-4	1.79E-4	2.06E-4
Breast	0.00E+0	0.00E+0	0.00E+0	1.17E-4	8.57E-4	1.36E-3	1.55E-3	1.81E-3	1.95E-3	1.94E-3	1.91E-3	1.75E-3
Esophagus	0.00E+0	0.00E+0	2.76E-4	3.63E-3	7.56E-3	7.43E-3	6.97E-3	6.59E-3	6.16E-3	5.78E-3	5.50E-3	4.62E-3
Gall bladder	0.00E+0	7.92E-4	1.36E-2	5.53E-2	5.83E-2	4.08E-2	3.58E-2	3.28E-2	3.03E-2	2.74E-2	2.54E-2	2.05E-2
Heart	0.00E+0	0.00E+0	3.54E-5	1.04E-3	3.62E-3	4.36E-3	4.22E-3	4.15E-3	4.00E-3	3.82E-3	3.66E-3	3.16E-3
Kidney	3.52E+0	3.04E+0	2.34E+0	1.22E+0	4.71E-1	2.66E-1	2.72E-1	2.79E-1	2.52E-1	2.22E-1	1.97E-1	1.34E-1
Liver	2.12E-3	1.02E-2	2.59E-2	4.65E-2	4.14E-2	2.91E-2	2.64E-2	2.50E-2	2.29E-2	2.11E-2	1.96E-2	1.61E-2
Lower large intestine	1.14E-4	2.57E-3	9.73E-3	2.00E-2	1.80E-2	1.33E-2	1.23E-2	1.18E-2	1.10E-2	1.02E-2	9.57E-3	7.94E-3
Lung	0.00E+0	3.47E-5	4.43E-4	3.20E-3	5.82E-3	5.54E-3	5.22E-3	5.11E-3	4.82E-3	4.55E-3	4.31E-3	3.70E-3
Muscle	1.19E-3	2.71E-3	4.72E-3	6.81E-3	5.99E-3	4.70E-3	4.56E-3	4.54E-3	4.31E-3	4.05E-3	3.82E-3	3.22E-3
Pancreas	2.97E-3	2.13E-2	5.58E-2	9.35E-2	7.64E-2	5.06E-2	4.52E-2	4.22E-2	3.82E-2	3.49E-2	3.24E-2	2.63E-2
Skin	0.00E+0	5.69E-7	6.23E-5	8.25E-4	1.63E-3	1.68E-3	1.80E-3	1.99E-3	1.97E-3	1.87E-3	1.78E-3	1.53E-3
Small Intestine	4.46E-4	6.58E-3	1.97E-2	3.71E-2	3.46E-2	2.51E-2	2.26E-2	2.11E-2	1.93E-2	1.78E-2	1.66E-2	1.36E-2
Spleen	6.16E-3	3.67E-2	8.88E-2	1.27E-1	8.56E-2	5.22E-2	4.79E-2	4.61E-2	4.25E-2	3.89E-2	3.61E-2	2.93E-2
Stomach	0.00E+0	9.44E-4	7.92E-3	2.80E-2	3.37E-2	2.54E-2	2.24E-2	2.07E-2	1.90E-2	1.74E-2	1.63E-2	1.34E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.41E-4	4.74E-4	6.85E-4	8.88E-4	9.35E-4	9.51E-4	9.55E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.17E-4	1.43E-3	1.50E-3	1.61E-3	1.64E-3	1.68E-3	1.65E-3	1.54E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.78E-4	5.93E-4	6.99E-4	7.70E-4	7.96E-4	8.15E-4	7.38E-4
Upper large intestine	2.28E-3	1.83E-2	4.18E-2	6.30E-2	5.00E-2	3.32E-2	3.01E-2	2.84E-2	2.61E-2	2.39E-2	2.23E-2	1.81E-2
Whole body	1.56E-2	1.56E-2	1.53E-2	1.43E-2	1.13E-2	8.07E-3	7.16E-3	6.84E-3	6.35E-3	5.89E-3	5.49E-3	4.47E-3

Table E-14 SAFs (kg^{-1}) for 25 target organs and for liver as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	8.14E-4	1.91E-3	3.16E-3	5.08E-3	5.37E-3	4.38E-3	4.23E-3	4.30E-3	4.13E-3	3.90E-3	3.70E-3	3.13E-3
Adrenal	3.50E-2	7.57E-2	1.04E-1	1.14E-1	8.05E-2	5.23E-2	4.86E-2	4.67E-2	4.22E-2	3.87E-2	3.56E-2	2.85E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.32E-4	7.47E-4	9.37E-4	1.15E-3	1.28E-3	1.36E-3	1.36E-3	1.27E-3
Bone (hard bone)	1.01E-4	9.69E-4	3.73E-3	1.21E-2	1.71E-2	1.02E-2	5.44E-3	3.62E-3	3.13E-3	2.88E-3	2.71E-3	2.33E-3
Bone (marrow)	3.08E-5	1.46E-4	4.79E-4	1.51E-3	2.53E-3	2.97E-3	3.22E-3	3.32E-3	3.17E-3	2.99E-3	2.83E-3	2.37E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.06E-5	5.59E-5	9.83E-5	1.75E-4	2.47E-4	2.80E-4	3.03E-4	3.22E-4
Breast	0.00E+0	0.00E+0	9.63E-5	1.89E-3	4.66E-3	4.63E-3	4.73E-3	5.03E-3	5.02E-3	4.76E-3	4.57E-3	3.83E-3
Esophagus	1.36E-2	2.77E-2	3.92E-2	4.31E-2	3.13E-2	2.16E-2	2.01E-2	1.92E-2	1.78E-2	1.63E-2	1.52E-2	1.20E-2
Gall bladder	1.34E-1	2.32E-1	2.98E-1	2.96E-1	1.80E-1	1.06E-1	9.76E-2	9.46E-2	8.60E-2	7.87E-2	7.26E-2	5.70E-2
Heart	2.87E-3	6.51E-3	1.13E-2	1.94E-2	1.96E-2	1.47E-2	1.34E-2	1.29E-2	1.19E-2	1.11E-2	1.04E-2	8.62E-3
Kidney	2.12E-3	1.02E-2	2.59E-2	4.66E-2	4.20E-2	2.94E-2	2.65E-2	2.50E-2	2.29E-2	2.11E-2	1.97E-2	1.62E-2
Liver	7.35E-1	6.80E-1	5.94E-1	4.01E-1	1.97E-1	1.15E-1	1.11E-1	1.11E-1	1.01E-1	9.10E-2	8.25E-2	6.13E-2
Lower large intestine	0.00E+0	0.00E+0	2.77E-5	5.04E-4	1.79E-3	2.39E-3	2.45E-3	2.59E-3	2.61E-3	2.56E-3	2.50E-3	2.23E-3
Lung	1.89E-3	9.18E-3	1.79E-2	2.59E-2	2.12E-2	1.44E-2	1.30E-2	1.24E-2	1.14E-2	1.05E-2	9.85E-3	8.11E-3
Muscle	6.27E-4	1.39E-3	2.38E-3	3.85E-3	4.08E-3	3.38E-3	3.30E-3	3.33E-3	3.19E-3	3.02E-3	2.86E-3	2.43E-3
Pancreas	1.26E-3	7.69E-3	2.50E-2	5.79E-2	5.61E-2	3.79E-2	3.35E-2	3.12E-2	2.84E-2	2.61E-2	2.43E-2	1.98E-2
Skin	0.00E+0	2.96E-5	3.12E-4	1.33E-3	1.96E-3	1.86E-3	1.99E-3	2.18E-3	2.13E-3	2.00E-3	1.89E-3	1.60E-3
Small Intestine	3.53E-5	4.18E-4	1.75E-3	5.88E-3	9.34E-3	8.43E-3	7.74E-3	7.45E-3	7.05E-3	6.61E-3	6.27E-3	5.32E-3
Spleen	0.00E+0	0.00E+0	7.91E-5	1.93E-3	6.28E-3	7.04E-3	6.62E-3	6.44E-3	6.14E-3	5.80E-3	5.53E-3	4.75E-3
Stomach	6.84E-3	1.37E-2	2.21E-2	3.45E-2	3.27E-2	2.33E-2	2.11E-2	2.01E-2	1.85E-2	1.72E-2	1.60E-2	1.31E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.14E-4	1.80E-4	3.18E-4	4.52E-4	5.23E-4	5.56E-4	5.82E-4
Thymus	0.00E+0	0.00E+0	9.22E-5	1.84E-3	5.25E-3	5.17E-3	4.83E-3	4.79E-3	4.51E-3	4.33E-3	4.13E-3	3.52E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	1.74E-4	9.97E-4	1.50E-3	1.57E-3	1.72E-3	1.69E-3	1.74E-3	1.63E-3	1.44E-3
Upper large intestine	5.98E-3	1.33E-2	2.07E-2	2.95E-2	2.72E-2	1.95E-2	1.77E-2	1.70E-2	1.57E-2	1.46E-2	1.37E-2	1.12E-2
Whole body	1.56E-2	1.55E-2	1.53E-2	1.40E-2	1.06E-2	7.24E-3	6.49E-3	6.29E-3	5.86E-3	5.42E-3	5.06E-3	4.10E-3

Table E-15 SAFs (kg^{-1}) for 25 target organs and for lower large intestine as a source region in the JM phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.00E-2	1.59E-2	1.84E-2	1.75E-2	1.21E-2	8.63E-3	8.33E-3	8.34E-3	7.83E-3	7.27E-3	6.80E-3	5.54E-3
Adrenal	0.00E+0	0.00E+0	3.56E-4	4.41E-3	7.94E-3	6.91E-3	6.36E-3	6.16E-3	5.88E-3	5.50E-3	5.25E-3	4.52E-3
Bladder	3.79E-2	9.98E-2	1.66E-1	1.81E-1	1.09E-1	6.61E-2	6.16E-2	5.94E-2	5.42E-2	4.95E-2	4.60E-2	3.66E-2
Bone (hard bone)	1.14E-5	6.04E-4	3.52E-3	1.41E-2	2.22E-2	1.38E-2	7.59E-3	5.18E-3	4.45E-3	4.06E-3	3.81E-3	3.26E-3
Bone (marrow)	4.06E-6	1.42E-4	6.16E-4	1.92E-3	3.14E-3	3.78E-3	4.06E-3	4.03E-3	3.87E-3	3.70E-3	3.51E-3	2.94E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.67E-6	1.31E-5	3.09E-5	5.24E-5	6.96E-5	8.01E-5	1.04E-4
Breast	0.00E+0	0.00E+0	0.00E+0	5.15E-5	2.77E-4	4.13E-4	4.91E-4	6.52E-4	7.53E-4	8.07E-4	8.18E-4	7.78E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	4.89E-4	1.45E-3	1.62E-3	1.57E-3	1.62E-3	1.60E-3	1.58E-3	1.53E-3	1.39E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.24E-3	3.19E-3	3.33E-3	3.37E-3	3.41E-3	3.16E-3	3.13E-3	2.71E-3
Heart	0.00E+0	0.00E+0	6.42E-6	2.43E-4	8.93E-4	1.10E-3	1.13E-3	1.24E-3	1.28E-3	1.29E-3	1.28E-3	1.18E-3
Kidney	1.13E-4	2.58E-3	9.73E-3	2.00E-2	1.79E-2	1.31E-2	1.22E-2	1.18E-2	1.09E-2	1.02E-2	9.51E-3	7.95E-3
Liver	0.00E+0	0.00E+0	2.69E-5	5.05E-4	1.73E-3	2.31E-3	2.41E-3	2.56E-3	2.59E-3	2.55E-3	2.48E-3	2.21E-3
Lower large intestine	4.81E+0	2.77E+0	1.69E+0	7.55E-1	2.83E-1	1.63E-1	1.70E-1	1.72E-1	1.47E-1	1.24E-1	1.07E-1	6.92E-2
Lung	0.00E+0	1.29E-5	1.40E-4	8.06E-4	1.36E-3	1.33E-3	1.35E-3	1.46E-3	1.49E-3	1.47E-3	1.44E-3	1.31E-3
Muscle	1.19E-3	2.30E-3	3.86E-3	5.77E-3	5.58E-3	4.60E-3	4.49E-3	4.49E-3	4.27E-3	4.01E-3	3.79E-3	3.20E-3
Pancreas	3.10E-4	4.58E-3	1.25E-2	2.16E-2	1.92E-2	1.39E-2	1.26E-2	1.21E-2	1.12E-2	1.04E-2	9.70E-3	8.02E-3
Skin	0.00E+0	4.42E-5	3.72E-4	1.37E-3	1.84E-3	1.79E-3	1.95E-3	2.17E-3	2.14E-3	2.02E-3	1.92E-3	1.64E-3
Small Intestine	9.67E-3	3.06E-2	5.05E-2	6.33E-2	4.76E-2	3.17E-2	2.90E-2	2.78E-2	2.54E-2	2.34E-2	2.17E-2	1.75E-2
Spleen	1.33E-3	9.29E-3	2.14E-2	3.34E-2	2.63E-2	1.72E-2	1.58E-2	1.54E-2	1.43E-2	1.32E-2	1.24E-2	1.01E-2
Stomach	1.33E-2	2.36E-2	2.80E-2	2.81E-2	2.07E-2	1.43E-2	1.33E-2	1.31E-2	1.22E-2	1.13E-2	1.06E-2	8.53E-3
Testis	0.00E+0	0.00E+0	0.00E+0	1.42E-3	5.44E-3	6.24E-3	6.23E-3	6.47E-3	6.26E-3	5.94E-3	5.77E-3	4.96E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.34E-4	4.08E-4	4.77E-4	5.81E-4	6.11E-4	6.23E-4	6.17E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.64E-4	2.16E-4	2.83E-4	3.27E-4	3.32E-4	3.31E-4
Upper large intestine	2.49E-3	6.19E-3	1.07E-2	1.60E-2	1.55E-2	1.21E-2	1.14E-2	1.10E-2	1.03E-2	9.60E-3	9.04E-3	7.51E-3
Whole body	1.25E-2	1.13E-2	1.13E-2	1.15E-2	9.85E-3	7.08E-3	6.23E-3	5.96E-3	5.56E-3	5.16E-3	4.83E-3	3.98E-3

Table E-16 SAFs (kg^{-1}) for 25 target organs and for lower large intestine content as a source region in the JM phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.49E-3	7.46E-3	1.32E-2	1.57E-2	1.17E-2	8.42E-3	8.06E-3	8.02E-3	7.54E-3	7.02E-3	6.59E-3	5.46E-3
Adrenal	0.00E+0	0.00E+0	3.09E-4	4.29E-3	7.23E-3	6.39E-3	6.00E-3	5.89E-3	5.64E-3	5.29E-3	4.94E-3	4.18E-3
Bladder	1.38E-2	7.12E-2	1.61E-1	2.01E-1	1.24E-1	7.44E-2	6.88E-2	6.65E-2	6.06E-2	5.52E-2	5.09E-2	4.10E-2
Bone (hard bone)	1.46E-6	3.24E-4	2.89E-3	1.41E-2	2.32E-2	1.45E-2	7.90E-3	5.35E-3	4.58E-3	4.18E-3	3.91E-3	3.35E-3
Bone (marrow)	5.23E-7	7.31E-5	4.82E-4	1.87E-3	3.24E-3	3.97E-3	4.24E-3	4.18E-3	4.03E-3	3.83E-3	3.63E-3	3.04E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.53E-6	1.21E-5	2.93E-5	4.96E-5	6.62E-5	7.66E-5	9.88E-5
Breast	0.00E+0	0.00E+0	0.00E+0	4.86E-5	2.58E-4	3.81E-4	4.66E-4	6.36E-4	7.38E-4	7.75E-4	7.93E-4	7.51E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	4.50E-4	1.38E-3	1.50E-3	1.48E-3	1.54E-3	1.51E-3	1.50E-3	1.48E-3	1.30E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.06E-3	3.09E-3	3.18E-3	3.34E-3	3.26E-3	3.17E-3	2.99E-3	2.68E-3
Heart	0.00E+0	0.00E+0	4.78E-6	2.28E-4	8.30E-4	1.04E-3	1.06E-3	1.16E-3	1.22E-3	1.22E-3	1.21E-3	1.11E-3
Kidney	1.39E-5	1.32E-3	7.34E-3	1.74E-2	1.61E-2	1.20E-2	1.13E-2	1.09E-2	1.01E-2	9.43E-3	8.84E-3	7.38E-3
Liver	0.00E+0	0.00E+0	2.22E-5	4.60E-4	1.63E-3	2.22E-3	2.32E-3	2.48E-3	2.53E-3	2.48E-3	2.41E-3	2.16E-3
Lower large intestine	8.35E-1	1.10E+0	9.71E-1	5.60E-1	2.34E-1	1.33E-1	1.33E-1	1.36E-1	1.25E-1	1.12E-1	1.01E-1	7.08E-2
Lung	0.00E+0	6.23E-6	1.08E-4	7.36E-4	1.28E-3	1.26E-3	1.27E-3	1.38E-3	1.42E-3	1.40E-3	1.38E-3	1.25E-3
Muscle	1.95E-4	1.06E-3	2.77E-3	5.23E-3	5.44E-3	4.58E-3	4.46E-3	4.44E-3	4.22E-3	3.97E-3	3.76E-3	3.18E-3
Pancreas	4.54E-5	2.53E-3	1.01E-2	1.99E-2	1.80E-2	1.30E-2	1.18E-2	1.13E-2	1.05E-2	9.75E-3	9.13E-3	7.57E-3
Skin	0.00E+0	2.26E-5	2.67E-4	1.18E-3	1.71E-3	1.72E-3	1.88E-3	2.10E-3	2.08E-3	1.97E-3	1.87E-3	1.60E-3
Small Intestine	0.00E+0	1.46E-2	3.44E-2	5.26E-2	4.31E-2	2.92E-2	2.66E-2	2.52E-2	2.31E-2	2.13E-2	1.98E-2	1.61E-2
Spleen	2.59E-4	5.29E-3	1.69E-2	3.04E-2	2.43E-2	1.58E-2	1.46E-2	1.42E-2	1.32E-2	1.22E-2	1.14E-2	9.40E-3
Stomach	2.02E-3	1.21E-2	2.05E-2	2.48E-2	1.91E-2	1.32E-2	1.22E-2	1.19E-2	1.12E-2	1.04E-2	9.72E-3	8.04E-3
Testis	0.00E+0	0.00E+0	0.00E+0	1.48E-3	5.96E-3	6.70E-3	6.74E-3	6.93E-3	6.73E-3	6.41E-3	6.09E-3	5.15E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.21E-4	3.82E-4	4.60E-4	5.39E-4	5.91E-4	6.02E-4	5.90E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.10E-4	1.50E-4	2.08E-4	2.57E-4	2.92E-4	2.96E-4	3.16E-4
Upper large intestine	1.29E-3	5.13E-3	1.01E-2	1.54E-2	1.49E-2	1.19E-2	1.11E-2	1.09E-2	1.01E-2	9.50E-3	8.87E-3	7.40E-3
Whole body	2.08E-3	4.95E-3	7.71E-3	1.03E-2	9.65E-3	7.01E-3	6.09E-3	5.78E-3	5.40E-3	5.04E-3	4.74E-3	3.95E-3

Table E-17 SAFs (kg^{-1}) for 25 target organs and for lung as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	2.73E-3	4.54E-3	5.63E-3	6.20E-3	5.10E-3	3.98E-3	3.98E-3	4.07E-3	3.86E-3	3.61E-3	3.39E-3	2.79E-3
Adrenal	6.04E-5	1.24E-3	5.57E-3	1.49E-2	1.66E-2	1.31E-2	1.21E-2	1.14E-2	1.04E-2	9.72E-3	9.09E-3	7.59E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.40E-4	2.20E-4	3.48E-4	4.57E-4	4.90E-4	5.11E-4	5.28E-4
Bone (hard bone)	1.63E-3	9.04E-3	2.07E-2	3.48E-2	3.02E-2	1.36E-2	7.17E-3	5.26E-3	4.60E-3	4.19E-3	3.90E-3	3.24E-3
Bone (marrow)	5.93E-4	1.69E-3	2.86E-3	3.90E-3	3.83E-3	3.78E-3	3.99E-3	4.02E-3	3.85E-3	3.62E-3	3.38E-3	2.72E-3
Brain	0.00E+0	0.00E+0	0.00E+0	3.19E-6	1.02E-4	3.23E-4	4.59E-4	6.57E-4	7.87E-4	8.29E-4	8.47E-4	8.16E-4
Breast	0.00E+0	7.15E-4	6.54E-3	1.90E-2	1.73E-2	1.25E-2	1.26E-2	1.30E-2	1.22E-2	1.14E-2	1.05E-2	8.67E-3
Esophagus	2.35E-3	1.31E-2	2.94E-2	4.57E-2	3.63E-2	2.54E-2	2.37E-2	2.25E-2	2.03E-2	1.86E-2	1.72E-2	1.40E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	4.30E-3	9.04E-3	8.07E-3	7.41E-3	7.07E-3	6.64E-3	6.36E-3	5.81E-3	4.95E-3
Heart	8.25E-3	3.93E-2	6.97E-2	7.75E-2	4.97E-2	3.18E-2	2.97E-2	2.87E-2	2.62E-2	2.40E-2	2.22E-2	1.77E-2
Kidney	0.00E+0	3.07E-5	4.08E-4	2.96E-3	5.62E-3	5.48E-3	5.24E-3	5.14E-3	4.83E-3	4.56E-3	4.33E-3	3.64E-3
Liver	1.69E-3	8.22E-3	1.61E-2	2.34E-2	1.96E-2	1.40E-2	1.29E-2	1.24E-2	1.14E-2	1.05E-2	9.81E-3	7.99E-3
Lower large intestine	0.00E+0	1.16E-5	1.26E-4	7.37E-4	1.31E-3	1.34E-3	1.36E-3	1.47E-3	1.50E-3	1.49E-3	1.45E-3	1.31E-3
Lung	5.88E-1	4.82E-1	3.53E-1	1.77E-1	7.09E-2	4.06E-2	3.99E-2	3.96E-2	3.51E-2	3.07E-2	2.72E-2	1.84E-2
Muscle	5.30E-4	2.02E-3	3.60E-3	5.08E-3	4.60E-3	3.67E-3	3.66E-3	3.70E-3	3.49E-3	3.26E-3	3.06E-3	2.54E-3
Pancreas	0.00E+0	0.00E+0	2.76E-4	3.93E-3	8.23E-3	7.62E-3	6.98E-3	6.68E-3	6.18E-3	5.79E-3	5.48E-3	4.58E-3
Skin	0.00E+0	5.21E-5	4.63E-4	1.67E-3	2.09E-3	1.92E-3	2.09E-3	2.28E-3	2.18E-3	2.02E-3	1.89E-3	1.58E-3
Small Intestine	0.00E+0	0.00E+0	4.63E-6	2.77E-4	1.22E-3	1.63E-3	1.68E-3	1.81E-3	1.86E-3	1.83E-3	1.77E-3	1.59E-3
Spleen	1.82E-3	9.78E-3	1.82E-2	2.36E-2	1.79E-2	1.25E-2	1.17E-2	1.13E-2	1.04E-2	9.58E-3	8.96E-3	7.20E-3
Stomach	2.51E-3	1.03E-2	1.61E-2	1.76E-2	1.37E-2	1.01E-2	9.41E-3	9.14E-3	8.50E-3	7.90E-3	7.33E-3	5.99E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.23E-5	4.42E-5	9.33E-5	1.53E-4	2.02E-4	2.39E-4	2.79E-4
Thymus	3.23E-2	7.74E-2	9.62E-2	8.39E-2	4.86E-2	3.05E-2	2.91E-2	2.83E-2	2.61E-2	2.37E-2	2.18E-2	1.68E-2
Thyroid	0.00E+0	7.14E-4	6.32E-3	1.72E-2	1.62E-2	1.24E-2	1.20E-2	1.19E-2	1.09E-2	1.01E-2	9.28E-3	7.59E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	4.99E-4	1.85E-3	2.23E-3	2.25E-3	2.40E-3	2.39E-3	2.38E-3	2.28E-3	2.02E-3
Whole body	1.56E-2	1.55E-2	1.53E-2	1.37E-2	9.80E-3	6.16E-3	5.38E-3	5.19E-3	4.80E-3	4.42E-3	4.10E-3	3.28E-3

Table E-18 SAFs (kg^{-1}) for 25 target organs and for muscle as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	5.76E-3	8.80E-3	9.91E-3	8.73E-3	5.74E-3	4.18E-3	4.24E-3	4.44E-3	4.26E-3	4.00E-3	3.77E-3	3.09E-3
Adrenal	3.11E-3	6.32E-3	7.71E-3	7.40E-3	6.12E-3	4.82E-3	4.68E-3	4.79E-3	4.26E-3	4.15E-3	3.93E-3	3.24E-3
Bladder	1.67E-3	3.40E-3	4.72E-3	6.12E-3	6.16E-3	5.45E-3	5.32E-3	5.28E-3	4.98E-3	4.65E-3	4.47E-3	3.75E-3
Bone (hard bone)	2.64E-3	7.55E-3	1.38E-2	2.34E-2	2.32E-2	1.11E-2	6.13E-3	4.77E-3	4.31E-3	3.98E-3	3.73E-3	3.14E-3
Bone (marrow)	7.18E-4	9.82E-4	1.29E-3	1.90E-3	2.39E-3	2.72E-3	3.04E-3	3.20E-3	3.12E-3	2.97E-3	2.82E-3	2.32E-3
Brain	1.69E-5	2.83E-5	7.48E-5	4.86E-4	1.15E-3	1.26E-3	1.34E-3	1.42E-3	1.40E-3	1.35E-3	1.28E-3	1.12E-3
Breast	2.09E-3	5.78E-3	7.77E-3	6.45E-3	3.71E-3	2.64E-3	2.82E-3	3.07E-3	2.99E-3	2.91E-3	2.73E-3	2.24E-3
Esophagus	1.23E-3	2.62E-3	3.57E-3	4.09E-3	4.22E-3	3.72E-3	3.70E-3	3.75E-3	3.49E-3	3.25E-3	3.05E-3	2.54E-3
Gall bladder	1.26E-3	2.15E-3	3.07E-3	4.34E-3	4.39E-3	3.74E-3	3.56E-3	3.47E-3	3.44E-3	3.21E-3	3.05E-3	2.53E-3
Heart	1.83E-4	4.34E-4	9.89E-4	2.52E-3	3.46E-3	3.10E-3	2.99E-3	2.92E-3	2.80E-3	2.62E-3	2.47E-3	2.09E-3
Kidney	1.19E-3	2.71E-3	4.71E-3	6.84E-3	6.08E-3	4.81E-3	4.61E-3	4.59E-3	4.30E-3	4.07E-3	3.83E-3	3.25E-3
Liver	5.70E-4	1.29E-3	2.27E-3	3.78E-3	4.10E-3	3.41E-3	3.29E-3	3.31E-3	3.14E-3	3.00E-3	2.83E-3	2.41E-3
Lower large intestine	1.20E-3	2.30E-3	3.87E-3	5.80E-3	5.71E-3	4.74E-3	4.60E-3	4.59E-3	4.33E-3	4.10E-3	3.88E-3	3.29E-3
Lung	5.89E-4	2.23E-3	3.97E-3	5.59E-3	4.97E-3	3.80E-3	3.69E-3	3.69E-3	3.46E-3	3.25E-3	3.04E-3	2.57E-3
Muscle	3.48E-2	2.97E-2	2.43E-2	1.57E-2	8.36E-3	4.79E-3	4.90E-3	5.08E-3	4.78E-3	4.40E-3	4.07E-3	3.21E-3
Pancreas	2.15E-3	3.99E-3	5.40E-3	6.25E-3	5.38E-3	4.28E-3	4.10E-3	4.03E-3	3.80E-3	3.59E-3	3.38E-3	2.84E-3
Skin	1.71E-3	3.61E-3	5.05E-3	5.01E-3	3.31E-3	2.55E-3	2.78E-3	3.06E-3	2.91E-3	2.68E-3	2.49E-3	2.04E-3
Small Intestine	2.17E-3	3.26E-3	4.40E-3	5.57E-3	5.16E-3	4.26E-3	4.10E-3	4.11E-3	3.89E-3	3.67E-3	3.47E-3	2.94E-3
Spleen	1.25E-3	2.48E-3	3.87E-3	5.65E-3	5.28E-3	4.05E-3	3.91E-3	3.95E-3	3.81E-3	3.53E-3	3.35E-3	2.80E-3
Stomach	1.12E-3	2.29E-3	3.28E-3	4.36E-3	4.19E-3	3.39E-3	3.25E-3	3.32E-3	3.14E-3	3.00E-3	2.83E-3	2.39E-3
Testis	3.64E-3	6.27E-3	7.94E-3	8.95E-3	6.91E-3	5.00E-3	4.92E-3	5.17E-3	5.02E-3	4.74E-3	4.49E-3	3.59E-3
Thymus	2.45E-4	5.08E-4	1.17E-3	2.60E-3	3.15E-3	2.85E-3	2.76E-3	2.74E-3	2.58E-3	2.53E-3	2.35E-3	2.00E-3
Thyroid	4.40E-3	9.08E-3	1.14E-2	9.67E-3	6.13E-3	4.57E-3	4.51E-3	4.64E-3	4.37E-3	4.10E-3	3.73E-3	3.18E-3
Upper large intestine	1.64E-3	2.73E-3	3.84E-3	5.02E-3	4.58E-3	3.67E-3	3.55E-3	3.64E-3	3.47E-3	3.26E-3	3.13E-3	2.68E-3
Whole body	1.56E-2	1.53E-2	1.44E-2	1.20E-2	8.26E-3	4.96E-3	4.46E-3	4.46E-3	4.21E-3	3.92E-3	3.66E-3	2.97E-3

Table E-19 SAFs (kg^{-1}) for 25 target organs and for pancreas as a source region in the JM phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	2.00E-3	5.59E-3	8.57E-3	1.07E-2	9.06E-3	6.70E-3	6.30E-3	6.24E-3	5.89E-3	5.50E-3	5.17E-3	4.31E-3
Adrenal	6.18E-3	6.36E-2	1.45E-1	2.00E-1	1.36E-1	8.38E-2	7.63E-2	7.26E-2	6.57E-2	6.03E-2	5.58E-2	4.51E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.29E-4	1.64E-3	1.87E-3	2.06E-3	2.13E-3	2.15E-3	2.11E-3	1.88E-3
Bone (hard bone)	0.00E+0	2.08E-5	5.81E-4	5.93E-3	1.43E-2	1.05E-2	5.84E-3	3.79E-3	3.24E-3	2.99E-3	2.81E-3	2.42E-3
Bone (marrow)	0.00E+0	6.34E-6	1.13E-4	8.53E-4	2.10E-3	2.87E-3	3.16E-3	3.19E-3	3.04E-3	2.89E-3	2.74E-3	2.32E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.38E-5	4.64E-5	8.85E-5	1.35E-4	1.65E-4	1.84E-4	2.19E-4
Breast	0.00E+0	0.00E+0	0.00E+0	3.51E-4	1.94E-3	2.54E-3	2.74E-3	3.09E-3	3.21E-3	3.16E-3	3.06E-3	2.65E-3
Esophagus	0.00E+0	1.16E-4	3.04E-3	1.71E-2	2.17E-2	1.61E-2	1.43E-2	1.32E-2	1.22E-2	1.12E-2	1.05E-2	8.64E-3
Gall bladder	2.41E-3	1.63E-2	8.09E-2	1.67E-1	1.27E-1	7.72E-2	6.88E-2	6.45E-2	5.79E-2	5.33E-2	4.95E-2	4.02E-2
Heart	0.00E+0	0.00E+0	1.65E-4	3.68E-3	8.95E-3	8.51E-3	7.71E-3	7.33E-3	6.90E-3	6.52E-3	6.17E-3	5.25E-3
Kidney	2.96E-3	2.14E-2	5.58E-2	9.32E-2	7.56E-2	5.00E-2	4.48E-2	4.20E-2	3.80E-2	3.49E-2	3.23E-2	2.62E-2
Liver	1.27E-3	7.69E-3	2.51E-2	5.77E-2	5.53E-2	3.74E-2	3.32E-2	3.11E-2	2.83E-2	2.60E-2	2.42E-2	1.98E-2
Lower large intestine	3.14E-4	4.58E-3	1.25E-2	2.15E-2	1.91E-2	1.38E-2	1.26E-2	1.21E-2	1.12E-2	1.04E-2	9.72E-3	8.09E-3
Lung	0.00E+0	2.47E-6	3.00E-4	4.26E-3	8.47E-3	7.58E-3	6.89E-3	6.58E-3	6.15E-3	5.76E-3	5.44E-3	4.63E-3
Muscle	2.15E-3	4.00E-3	5.44E-3	6.26E-3	5.30E-3	4.16E-3	4.02E-3	4.01E-3	3.81E-3	3.59E-3	3.39E-3	2.84E-3
Pancreas	7.44E+0	5.93E+0	4.23E+0	2.04E+0	7.62E-1	4.28E-1	4.41E-1	4.54E-1	4.05E-1	3.54E-1	3.10E-1	2.01E-1
Skin	6.62E-7	7.70E-7	3.94E-5	6.16E-4	1.42E-3	1.54E-3	1.66E-3	1.84E-3	1.83E-3	1.75E-3	1.66E-3	1.43E-3
Small Intestine	1.90E-2	4.09E-2	5.90E-2	6.63E-2	4.91E-2	3.28E-2	2.96E-2	2.82E-2	2.57E-2	2.36E-2	2.19E-2	1.76E-2
Spleen	9.15E-3	3.57E-2	7.38E-2	9.95E-2	7.21E-2	4.60E-2	4.18E-2	4.00E-2	3.66E-2	3.35E-2	3.10E-2	2.51E-2
Stomach	8.15E-2	1.83E-1	2.57E-1	2.65E-1	1.61E-1	9.51E-2	8.75E-2	8.46E-2	7.71E-2	7.06E-2	6.51E-2	5.11E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.21E-4	3.55E-4	5.71E-4	7.23E-4	7.74E-4	8.10E-4	8.29E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	2.04E-4	1.67E-3	2.50E-3	2.48E-3	2.53E-3	2.58E-3	2.56E-3	2.49E-3	2.22E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.47E-4	7.42E-4	8.13E-4	9.39E-4	9.51E-4	9.52E-4	9.09E-4
Upper large intestine	7.59E-4	6.11E-3	2.08E-2	4.74E-2	4.57E-2	3.10E-2	2.75E-2	2.57E-2	2.34E-2	2.16E-2	2.01E-2	1.64E-2
Whole body	1.56E-2	1.52E-2	1.45E-2	1.33E-2	1.07E-2	7.71E-3	6.86E-3	6.54E-3	6.07E-3	5.61E-3	5.24E-3	4.26E-3

Table E-20 SAFs (kg^{-1}) for 25 target organs and for skeleton（hard bone + bone marrow）as a source region in the JM phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	5.54E-4	9.68E-4	1.51E-3	2.55E-3	3.23E-3	3.20E-3	3.39E-3	3.51E-3	3.38E-3	3.22E-3	3.05E-3	2.53E-3
Adrenal	0.00E+0	3.06E-4	1.15E-3	3.29E-3	5.38E-3	5.67E-3	5.54E-3	5.46E-3	5.07E-3	4.87E-3	4.45E-3	3.74E-3
Bladder	3.86E-4	1.07E-3	2.03E-3	4.05E-3	5.77E-3	5.78E-3	5.81E-3	5.60E-3	5.24E-3	4.89E-3	4.61E-3	3.81E-3
Bone (hard bone)	1.09E-1	1.15E-1	1.12E-1	9.62E-2	6.02E-2	2.31E-2	1.33E-2	1.13E-2	1.01E-2	9.10E-3	8.27E-3	6.28E-3
Bone (marrow)	4.25E-2	2.21E-2	1.52E-2	1.02E-2	7.54E-3	7.42E-3	8.57E-3	8.66E-3	8.12E-3	7.51E-3	6.85E-3	5.05E-3
Brain	1.09E-3	1.88E-3	3.13E-3	5.75E-3	6.42E-3	5.47E-3	5.63E-3	5.66E-3	5.33E-3	5.01E-3	4.70E-3	3.81E-3
Breast	0.00E+0	6.61E-5	4.17E-4	1.27E-3	1.81E-3	1.77E-3	1.93E-3	2.10E-3	2.10E-3	2.08E-3	1.95E-3	1.66E-3
Esophagus	8.63E-4	2.31E-3	3.77E-3	6.15E-3	7.13E-3	6.59E-3	6.66E-3	6.51E-3	6.09E-3	5.72E-3	5.39E-3	4.38E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	1.17E-3	2.82E-3	3.40E-3	3.33E-3	3.09E-3	2.95E-3	2.94E-3	2.77E-3	2.23E-3
Heart	9.89E-5	4.30E-4	1.42E-3	3.99E-3	5.37E-3	4.84E-3	4.76E-3	4.60E-3	4.29E-3	4.05E-3	3.82E-3	3.13E-3
Kidney	0.00E+0	5.64E-5	3.89E-4	1.90E-3	3.98E-3	4.46E-3	4.48E-3	4.30E-3	4.07E-3	3.86E-3	3.64E-3	3.05E-3
Liver	4.54E-5	2.48E-4	7.19E-4	1.95E-3	3.19E-3	3.35E-3	3.35E-3	3.28E-3	3.10E-3	2.96E-3	2.81E-3	2.36E-3
Lower large intestine	0.00E+0	1.22E-4	6.10E-4	2.39E-3	4.38E-3	4.67E-3	4.61E-3	4.41E-3	4.15E-3	3.93E-3	3.66E-3	3.09E-3
Lung	6.59E-4	2.14E-3	3.96E-3	5.88E-3	5.66E-3	4.69E-3	4.65E-3	4.54E-3	4.23E-3	3.97E-3	3.74E-3	3.05E-3
Muscle	7.99E-4	1.36E-3	2.02E-3	3.19E-3	3.76E-3	3.18E-3	3.36E-3	3.44E-3	3.29E-3	3.12E-3	2.94E-3	2.43E-3
Pancreas	0.00E+0	0.00E+0	1.31E-4	1.20E-3	3.12E-3	3.61E-3	3.53E-3	3.34E-3	3.17E-3	2.98E-3	2.85E-3	2.39E-3
Skin	7.62E-4	7.50E-4	1.01E-3	1.62E-3	1.96E-3	2.06E-3	2.39E-3	2.65E-3	2.53E-3	2.35E-3	2.20E-3	1.81E-3
Small Intestine	0.00E+0	1.44E-5	1.71E-4	1.27E-3	3.20E-3	3.75E-3	3.69E-3	3.54E-3	3.32E-3	3.18E-3	3.00E-3	2.53E-3
Spleen	6.38E-5	3.24E-4	8.54E-4	2.09E-3	3.24E-3	3.29E-3	3.30E-3	3.24E-3	3.07E-3	2.95E-3	2.82E-3	2.38E-3
Stomach	7.44E-6	6.32E-5	2.91E-4	1.19E-3	2.51E-3	2.79E-3	2.74E-3	2.64E-3	2.58E-3	2.47E-3	2.34E-3	1.99E-3
Testis	0.00E+0	0.00E+0	0.00E+0	4.55E-4	1.35E-3	1.65E-3	1.71E-3	1.85E-3	1.88E-3	1.81E-3	1.74E-3	1.55E-3
Thymus	3.79E-4	1.43E-3	3.09E-3	5.43E-3	5.59E-3	4.66E-3	4.78E-3	4.77E-3	4.42E-3	4.23E-3	3.93E-3	3.25E-3
Thyroid	0.00E+0	2.00E-4	1.09E-3	3.52E-3	5.02E-3	4.64E-3	4.77E-3	4.88E-3	4.53E-3	4.36E-3	4.02E-3	3.44E-3
Upper large intestine	0.00E+0	7.97E-5	3.21E-4	1.14E-3	2.40E-3	2.89E-3	2.93E-3	2.87E-3	2.77E-3	2.68E-3	2.53E-3	2.17E-3
Whole body	1.54E-2	1.54E-2	1.52E-2	1.41E-2	1.03E-2	5.80E-3	4.89E-3	4.73E-3	4.44E-3	4.14E-3	3.86E-3	3.09E-3

Table E-21 SAFs (kg^{-1}) for 25 target organs and for skin as a source region in the JM phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.21E-2	1.50E-2	1.31E-2	8.36E-3	4.35E-3	3.05E-3	3.31E-3	3.67E-3	3.59E-3	3.37E-3	3.14E-3	2.50E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	4.24E-4	1.49E-3	1.63E-3	1.73E-3	1.95E-3	1.90E-3	1.92E-3	1.81E-3	1.57E-3
Bladder	0.00E+0	0.00E+0	2.53E-4	1.05E-3	1.70E-3	1.81E-3	1.96E-3	2.08E-3	2.16E-3	2.15E-3	2.05E-3	1.82E-3
Bone (hard bone)	7.83E-4	3.39E-3	7.25E-3	1.35E-2	1.38E-2	6.58E-3	3.86E-3	3.30E-3	3.10E-3	2.92E-3	2.77E-3	2.38E-3
Bone (marrow)	1.36E-4	2.93E-4	5.21E-4	9.61E-4	1.32E-3	1.61E-3	1.90E-3	2.14E-3	2.15E-3	2.08E-3	1.98E-3	1.68E-3
Brain	0.00E+0	0.00E+0	2.36E-5	5.71E-4	1.57E-3	1.68E-3	1.87E-3	2.06E-3	2.02E-3	1.94E-3	1.84E-3	1.57E-3
Breast	1.81E-2	2.30E-2	1.94E-2	1.09E-2	4.76E-3	3.18E-3	3.57E-3	4.05E-3	3.93E-3	3.71E-3	3.41E-3	2.57E-3
Esophagus	0.00E+0	0.00E+0	1.26E-4	6.94E-4	1.51E-3	1.69E-3	1.80E-3	1.98E-3	1.87E-3	1.85E-3	1.74E-3	1.52E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.88E-3	1.98E-3	2.03E-3	1.98E-3	1.97E-3	1.75E-3
Heart	0.00E+0	3.45E-6	1.09E-4	9.43E-4	1.83E-3	1.81E-3	1.86E-3	1.98E-3	1.97E-3	1.89E-3	1.80E-3	1.54E-3
Kidney	0.00E+0	0.00E+0	6.71E-5	9.55E-4	1.92E-3	1.88E-3	1.92E-3	2.10E-3	2.07E-3	2.07E-3	1.97E-3	1.74E-3
Liver	0.00E+0	3.32E-5	3.69E-4	1.61E-3	2.33E-3	2.06E-3	2.11E-3	2.28E-3	2.27E-3	2.18E-3	2.10E-3	1.81E-3
Lower large intestine	0.00E+0	4.66E-5	4.03E-4	1.51E-3	2.06E-3	1.98E-3	2.07E-3	2.29E-3	2.29E-3	2.23E-3	2.15E-3	1.87E-3
Lung	0.00E+0	6.37E-5	5.65E-4	2.07E-3	2.54E-3	2.11E-3	2.19E-3	2.38E-3	2.32E-3	2.22E-3	2.11E-3	1.82E-3
Muscle	1.83E-3	3.91E-3	5.52E-3	5.53E-3	3.63E-3	2.22E-3	2.38E-3	2.62E-3	2.58E-3	2.46E-3	2.34E-3	1.97E-3
Pancreas	0.00E+0	0.00E+0	4.26E-5	6.98E-4	1.72E-3	1.79E-3	1.83E-3	1.93E-3	1.94E-3	1.91E-3	1.85E-3	1.67E-3
Skin	2.21E-1	1.08E-1	5.80E-2	2.24E-2	8.05E-3	5.37E-3	6.15E-3	6.47E-3	5.32E-3	4.34E-3	3.67E-3	2.45E-3
Small Intestine	0.00E+0	5.97E-5	4.20E-4	1.45E-3	2.01E-3	1.88E-3	1.95E-3	2.17E-3	2.19E-3	2.11E-3	2.05E-3	1.77E-3
Spleen	0.00E+0	4.30E-5	5.72E-4	2.38E-3	2.96E-3	2.49E-3	2.52E-3	2.67E-3	2.63E-3	2.54E-3	2.44E-3	2.07E-3
Stomach	0.00E+0	7.00E-5	5.46E-4	1.75E-3	2.26E-3	2.03E-3	2.06E-3	2.25E-3	2.22E-3	2.18E-3	2.08E-3	1.82E-3
Testis	4.22E-3	1.55E-2	1.96E-2	1.43E-2	6.80E-3	4.37E-3	4.51E-3	4.95E-3	4.84E-3	4.41E-3	4.09E-3	3.24E-3
Thymus	0.00E+0	0.00E+0	2.24E-4	1.27E-3	2.04E-3	1.90E-3	1.98E-3	2.22E-3	2.14E-3	2.08E-3	1.98E-3	1.64E-3
Thyroid	0.00E+0	7.34E-4	2.62E-3	3.64E-3	2.71E-3	1.96E-3	2.28E-3	2.61E-3	2.59E-3	2.41E-3	2.32E-3	1.97E-3
Upper large intestine	1.01E-5	1.45E-4	8.45E-4	2.35E-3	2.57E-3	2.12E-3	2.20E-3	2.37E-3	2.42E-3	2.34E-3	2.25E-3	1.95E-3
Whole body	1.22E-2	1.03E-2	9.04E-3	7.21E-3	4.87E-3	3.02E-3	2.90E-3	3.08E-3	2.98E-3	2.80E-3	2.63E-3	2.15E-3

Table E-22 SAFs (kg^{-1}) for 25 target organs and for small intestine as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	7.01E-3	1.32E-2	1.69E-2	1.76E-2	1.27E-2	8.80E-3	8.36E-3	8.33E-3	7.83E-3	7.27E-3	6.80E-3	5.57E-3
Adrenal	0.00E+0	1.73E-4	2.59E-3	1.16E-2	1.60E-2	1.35E-2	1.24E-2	1.17E-2	1.06E-2	1.00E-2	9.37E-3	7.59E-3
Bladder	0.00E+0	1.54E-3	8.18E-3	2.38E-2	2.64E-2	2.00E-2	1.82E-2	1.71E-2	1.58E-2	1.46E-2	1.36E-2	1.13E-2
Bone (hard bone)	1.69E-7	6.59E-5	8.98E-4	6.76E-3	1.50E-2	1.09E-2	6.11E-3	4.03E-3	3.46E-3	3.18E-3	2.99E-3	2.57E-3
Bone (marrow)	0.00E+0	1.15E-5	1.35E-4	8.97E-4	2.19E-3	3.02E-3	3.33E-3	3.36E-3	3.21E-3	3.05E-3	2.90E-3	2.45E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.41E-6	1.31E-5	3.19E-5	5.80E-5	7.77E-5	9.16E-5	1.18E-4
Breast	0.00E+0	0.00E+0	0.00E+0	2.35E-5	2.62E-4	5.05E-4	6.30E-4	8.31E-4	9.91E-4	1.04E-3	1.06E-3	1.05E-3
Esophagus	0.00E+0	0.00E+0	0.00E+0	6.12E-4	2.10E-3	2.42E-3	2.37E-3	2.37E-3	2.34E-3	2.23E-3	2.21E-3	1.94E-3
Gall bladder	2.58E-2	5.72E-2	6.92E-2	5.70E-2	3.61E-2	2.45E-2	2.29E-2	2.19E-2	2.03E-2	1.84E-2	1.75E-2	1.37E-2
Heart	0.00E+0	0.00E+0	0.00E+0	1.67E-4	9.88E-4	1.47E-3	1.53E-3	1.66E-3	1.72E-3	1.70E-3	1.68E-3	1.55E-3
Kidney	4.44E-4	6.59E-3	1.97E-2	3.70E-2	3.43E-2	2.48E-2	2.24E-2	2.10E-2	1.92E-2	1.77E-2	1.65E-2	1.36E-2
Liver	3.55E-5	4.14E-4	1.76E-3	5.87E-3	9.14E-3	8.26E-3	7.65E-3	7.39E-3	7.00E-3	6.58E-3	6.23E-3	5.28E-3
Lower large intestine	9.68E-3	3.06E-2	5.04E-2	6.33E-2	4.76E-2	3.15E-2	2.89E-2	2.78E-2	2.54E-2	2.33E-2	2.17E-2	1.76E-2
Lung	0.00E+0	0.00E+0	5.18E-6	2.89E-4	1.21E-3	1.59E-3	1.64E-3	1.78E-3	1.83E-3	1.81E-3	1.76E-3	1.60E-3
Muscle	2.18E-3	3.28E-3	4.42E-3	5.57E-3	5.04E-3	4.09E-3	3.99E-3	4.01E-3	3.84E-3	3.62E-3	3.42E-3	2.89E-3
Pancreas	1.90E-2	4.09E-2	5.89E-2	6.63E-2	4.93E-2	3.29E-2	2.97E-2	2.82E-2	2.58E-2	2.36E-2	2.19E-2	1.75E-2
Skin	0.00E+0	5.45E-5	3.81E-4	1.28E-3	1.72E-3	1.67E-3	1.82E-3	2.03E-3	2.02E-3	1.92E-3	1.81E-3	1.56E-3
Small Intestine	1.54E+0	1.03E+0	7.29E-1	4.07E-1	1.86E-1	1.09E-1	1.07E-1	1.07E-1	9.48E-2	8.34E-2	7.42E-2	5.29E-2
Spleen	0.00E+0	2.39E-5	6.21E-4	5.49E-3	1.05E-2	9.41E-3	8.54E-3	8.15E-3	7.61E-3	7.20E-3	6.80E-3	5.76E-3
Stomach	1.90E-3	8.20E-3	1.67E-2	3.08E-2	3.07E-2	2.18E-2	1.94E-2	1.84E-2	1.70E-2	1.56E-2	1.46E-2	1.20E-2
Testis	0.00E+0	0.00E+0	0.00E+0	3.83E-4	1.90E-3	2.54E-3	2.75E-3	3.20E-3	3.29E-3	3.27E-3	3.23E-3	2.85E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.43E-4	4.68E-4	5.55E-4	6.82E-4	8.22E-4	8.46E-4	8.19E-4	8.47E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.37E-4	1.90E-4	2.60E-4	3.55E-4	3.63E-4	3.93E-4	4.05E-4
Upper large intestine	1.58E-2	4.09E-2	6.51E-2	8.23E-2	6.10E-2	3.91E-2	3.55E-2	3.41E-2	3.13E-2	2.87E-2	2.67E-2	2.14E-2
Whole body	1.35E-2	1.25E-2	1.24E-2	1.19E-2	9.74E-3	7.08E-3	6.32E-3	6.07E-3	5.66E-3	5.25E-3	4.91E-3	4.03E-3

Table E-23 SAFs (kg^{-1}) for 25 target organs and for small intestine content as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.11E-3	6.90E-3	1.28E-2	1.60E-2	1.21E-2	8.46E-3	8.01E-3	7.97E-3	7.47E-3	6.97E-3	6.55E-3	5.43E-3
Adrenal	0.00E+0	1.41E-4	2.34E-3	1.07E-2	1.52E-2	1.30E-2	1.20E-2	1.13E-2	1.03E-2	9.72E-3	9.00E-3	7.57E-3
Bladder	0.00E+0	1.23E-3	8.52E-3	2.60E-2	2.80E-2	2.06E-2	1.87E-2	1.77E-2	1.64E-2	1.51E-2	1.41E-2	1.17E-2
Bone (hard bone)	0.00E+0	4.09E-5	7.61E-4	6.44E-3	1.47E-2	1.07E-2	6.02E-3	3.98E-3	3.40E-3	3.14E-3	2.95E-3	2.55E-3
Bone (marrow)	0.00E+0	6.84E-6	1.11E-4	8.29E-4	2.09E-3	2.92E-3	3.20E-3	3.23E-3	3.11E-3	2.96E-3	2.81E-3	2.39E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.15E-6	1.32E-5	3.29E-5	5.84E-5	7.94E-5	9.37E-5	1.19E-4
Breast	0.00E+0	0.00E+0	0.00E+0	2.27E-5	2.57E-4	4.93E-4	6.06E-4	8.41E-4	9.95E-4	1.04E-3	1.06E-3	1.02E-3
Esophagus	0.00E+0	0.00E+0	0.00E+0	5.92E-4	2.00E-3	2.33E-3	2.30E-3	2.39E-3	2.34E-3	2.26E-3	2.17E-3	1.88E-3
Gall bladder	4.11E-3	3.20E-2	4.99E-2	4.57E-2	3.05E-2	2.12E-2	1.98E-2	1.93E-2	1.78E-2	1.63E-2	1.52E-2	1.23E-2
Heart	0.00E+0	0.00E+0	0.00E+0	1.61E-4	9.73E-4	1.44E-3	1.50E-3	1.62E-3	1.69E-3	1.69E-3	1.66E-3	1.53E-3
Kidney	7.30E-5	4.04E-3	1.68E-2	3.57E-2	3.38E-2	2.44E-2	2.20E-2	2.06E-2	1.89E-2	1.74E-2	1.62E-2	1.33E-2
Liver	8.76E-6	2.81E-4	1.40E-3	5.02E-3	8.26E-3	7.63E-3	7.10E-3	6.91E-3	6.55E-3	6.19E-3	5.87E-3	5.00E-3
Lower large intestine	2.14E-3	2.29E-2	5.13E-2	6.89E-2	5.07E-2	3.31E-2	3.03E-2	2.91E-2	2.67E-2	2.46E-2	2.28E-2	1.86E-2
Lung	0.00E+0	0.00E+0	4.48E-6	2.77E-4	1.18E-3	1.57E-3	1.61E-3	1.76E-3	1.81E-3	1.79E-3	1.75E-3	1.57E-3
Muscle	4.52E-4	1.77E-3	3.37E-3	5.13E-3	4.89E-3	4.00E-3	3.89E-3	3.91E-3	3.74E-3	3.54E-3	3.36E-3	2.85E-3
Pancreas	2.96E-3	1.97E-2	4.02E-2	5.51E-2	4.46E-2	3.03E-2	2.71E-2	2.56E-2	2.33E-2	2.13E-2	1.99E-2	1.62E-2
Skin	0.00E+0	3.76E-5	3.58E-4	1.32E-3	1.77E-3	1.70E-3	1.84E-3	2.06E-3	2.04E-3	1.94E-3	1.84E-3	1.58E-3
Small Intestine	4.34E-1	5.94E-1	5.47E-1	3.57E-1	1.73E-1	1.01E-1	9.74E-2	9.73E-2	8.91E-2	8.05E-2	7.31E-2	5.33E-2
Spleen	0.00E+0	1.71E-5	6.25E-4	6.16E-3	1.15E-2	1.01E-2	9.08E-3	8.66E-3	8.15E-3	7.62E-3	7.19E-3	6.02E-3
Stomach	2.25E-4	3.70E-3	1.17E-2	2.72E-2	2.92E-2	2.10E-2	1.86E-2	1.75E-2	1.61E-2	1.50E-2	1.40E-2	1.15E-2
Testis	0.00E+0	0.00E+0	0.00E+0	4.21E-4	1.94E-3	2.63E-3	2.84E-3	3.22E-3	3.39E-3	3.36E-3	3.24E-3	2.86E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.10E-4	4.65E-4	5.50E-4	6.81E-4	7.79E-4	8.14E-4	8.52E-4	8.41E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.28E-4	1.88E-4	2.50E-4	3.50E-4	4.04E-4	3.78E-4	3.98E-4
Upper large intestine	4.56E-3	2.65E-2	5.64E-2	7.97E-2	5.98E-2	3.82E-2	3.48E-2	3.33E-2	3.06E-2	2.81E-2	2.61E-2	2.12E-2
Whole body	3.46E-3	6.95E-3	9.39E-3	1.08E-2	9.35E-3	6.83E-3	6.07E-3	5.82E-3	5.45E-3	5.09E-3	4.78E-3	3.96E-3

Table E-24 SAFs (kg^{-1}) for 25 target organs and for spleen as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.45E-3	4.05E-3	6.70E-3	9.14E-3	7.60E-3	5.57E-3	5.40E-3	5.50E-3	5.24E-3	4.92E-3	4.64E-3	3.88E-3
Adrenal	2.85E-3	2.40E-2	6.11E-2	1.03E-1	7.74E-2	5.00E-2	4.58E-2	4.40E-2	4.08E-2	3.68E-2	3.46E-2	2.77E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.44E-4	7.09E-4	9.35E-4	1.17E-3	1.30E-3	1.41E-3	1.40E-3	1.30E-3
Bone (hard bone)	1.44E-4	1.57E-3	5.12E-3	1.30E-2	1.74E-2	1.05E-2	5.86E-3	4.19E-3	3.66E-3	3.37E-3	3.17E-3	2.73E-3
Bone (marrow)	8.85E-5	4.16E-4	8.73E-4	1.45E-3	1.90E-3	2.29E-3	2.47E-3	2.49E-3	2.54E-3	2.49E-3	2.39E-3	2.01E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.35E-6	4.80E-5	8.65E-5	1.62E-4	2.33E-4	2.65E-4	2.83E-4	3.06E-4
Breast	0.00E+0	0.00E+0	1.50E-5	7.30E-4	2.31E-3	2.57E-3	2.73E-3	3.00E-3	2.96E-3	2.86E-3	2.73E-3	2.27E-3
Esophagus	0.00E+0	0.00E+0	9.04E-4	8.86E-3	1.42E-2	1.18E-2	1.06E-2	9.95E-3	9.06E-3	8.50E-3	7.90E-3	6.57E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	9.18E-4	4.86E-3	6.70E-3	6.54E-3	6.34E-3	6.35E-3	5.85E-3	5.59E-3	4.59E-3
Heart	0.00E+0	3.38E-5	7.37E-4	5.44E-3	9.43E-3	8.35E-3	7.61E-3	7.19E-3	6.64E-3	6.17E-3	5.80E-3	4.84E-3
Kidney	6.17E-3	3.67E-2	8.88E-2	1.27E-1	8.51E-2	5.17E-2	4.77E-2	4.61E-2	4.22E-2	3.89E-2	3.60E-2	2.92E-2
Liver	1.40E-6	6.45E-6	7.57E-5	1.84E-3	5.70E-3	6.70E-3	6.47E-3	6.32E-3	6.07E-3	5.75E-3	5.50E-3	4.71E-3
Lower large intestine	1.33E-3	9.27E-3	2.14E-2	3.36E-2	2.63E-2	1.71E-2	1.58E-2	1.53E-2	1.42E-2	1.33E-2	1.24E-2	1.02E-2
Lung	2.03E-3	1.09E-2	2.03E-2	2.61E-2	1.89E-2	1.26E-2	1.17E-2	1.13E-2	1.04E-2	9.56E-3	8.91E-3	7.32E-3
Muscle	1.25E-3	2.49E-3	3.94E-3	5.70E-3	5.13E-3	3.94E-3	3.86E-3	3.92E-3	3.75E-3	3.54E-3	3.35E-3	2.82E-3
Pancreas	9.14E-3	3.57E-2	7.37E-2	9.99E-2	7.23E-2	4.61E-2	4.20E-2	3.99E-2	3.64E-2	3.36E-2	3.11E-2	2.51E-2
Skin	0.00E+0	4.21E-5	5.79E-4	2.29E-3	2.71E-3	2.27E-3	2.39E-3	2.59E-3	2.50E-3	2.33E-3	2.19E-3	1.85E-3
Small Intestine	0.00E+0	2.35E-5	6.14E-4	5.53E-3	1.05E-2	9.43E-3	8.59E-3	8.23E-3	7.70E-3	7.23E-3	6.82E-3	5.79E-3
Spleen	6.71E+0	5.74E+0	4.41E+0	2.30E+0	8.75E-1	4.87E-1	5.02E-1	5.19E-1	4.68E-1	4.13E-1	3.67E-1	2.49E-1
Stomach	4.67E-2	1.03E-1	1.40E-1	1.37E-1	8.45E-2	5.20E-2	4.87E-2	4.78E-2	4.39E-2	4.02E-2	3.74E-2	2.95E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.05E-4	1.82E-4	3.10E-4	4.67E-4	5.31E-4	5.72E-4	6.00E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	4.54E-4	2.09E-3	2.63E-3	2.56E-3	2.65E-3	2.52E-3	2.51E-3	2.43E-3	2.09E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.32E-4	9.95E-4	1.14E-3	1.26E-3	1.32E-3	1.28E-3	1.26E-3	1.14E-3
Upper large intestine	0.00E+0	0.00E+0	3.35E-4	3.97E-3	7.66E-3	7.15E-3	6.66E-3	6.47E-3	6.20E-3	5.83E-3	5.57E-3	4.71E-3
Whole body	1.56E-2	1.55E-2	1.51E-2	1.34E-2	9.83E-3	6.72E-3	6.08E-3	5.95E-3	5.57E-3	5.17E-3	4.83E-3	3.92E-3

Table E-25 SAFs (kg^{-1}) for 25 target organs and for stomach as a source region in the JM phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	6.12E-3	1.01E-2	1.17E-2	1.19E-2	8.85E-3	6.32E-3	6.07E-3	6.14E-3	5.83E-3	5.44E-3	5.11E-3	4.20E-3
Adrenal	4.48E-2	1.23E-1	1.72E-1	1.59E-1	9.62E-2	6.01E-2	5.61E-2	5.47E-2	4.98E-2	4.61E-2	4.26E-2	3.37E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.75E-4	1.42E-3	1.61E-3	1.83E-3	1.92E-3	1.98E-3	1.94E-3	1.76E-3
Bone (hard bone)	1.23E-5	2.60E-4	1.59E-3	6.65E-3	1.20E-2	8.41E-3	4.72E-3	3.20E-3	2.79E-3	2.58E-3	2.43E-3	2.12E-3
Bone (marrow)	9.33E-6	8.09E-5	3.00E-4	8.39E-4	1.56E-3	2.08E-3	2.29E-3	2.36E-3	2.33E-3	2.26E-3	2.16E-3	1.85E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.82E-6	3.34E-5	6.20E-5	1.17E-4	1.70E-4	2.03E-4	2.24E-4	2.54E-4
Breast	0.00E+0	0.00E+0	1.07E-3	1.07E-3	2.80E-3	3.00E-3	3.15E-3	3.48E-3	3.57E-3	3.49E-3	3.40E-3	2.95E-3
Esophagus	3.31E-2	4.84E-2	5.17E-2	4.51E-2	3.00E-2	2.00E-2	1.87E-2	1.81E-2	1.68E-2	1.54E-2	1.41E-2	1.12E-2
Gall bladder	0.00E+0	3.73E-4	7.03E-3	3.33E-2	4.05E-2	2.90E-2	2.55E-2	2.39E-2	2.16E-2	2.00E-2	1.87E-2	1.53E-2
Heart	1.29E-6	3.68E-4	2.44E-3	8.68E-3	1.19E-2	9.70E-3	8.82E-3	8.45E-3	7.91E-3	7.38E-3	6.98E-3	5.85E-3
Kidney	0.00E+0	9.38E-4	7.89E-3	2.80E-2	3.34E-2	2.50E-2	2.22E-2	2.07E-2	1.89E-2	1.74E-2	1.63E-2	1.34E-2
Liver	6.85E-3	1.37E-2	2.21E-2	3.44E-2	3.23E-2	2.31E-2	2.10E-2	2.01E-2	1.86E-2	1.71E-2	1.60E-2	1.31E-2
Lower large intestine	1.32E-2	2.36E-2	2.79E-2	2.80E-2	2.07E-2	1.42E-2	1.33E-2	1.31E-2	1.22E-2	1.13E-2	1.06E-2	8.57E-3
Lung	2.80E-3	1.15E-2	1.79E-2	1.94E-2	1.45E-2	1.01E-2	9.38E-3	9.11E-3	8.48E-3	7.85E-3	7.36E-3	6.07E-3
Muscle	1.18E-3	2.38E-3	3.38E-3	4.42E-3	4.11E-3	3.29E-3	3.22E-3	3.27E-3	3.15E-3	2.99E-3	2.83E-3	2.40E-3
Pancreas	8.16E-2	1.83E-1	2.57E-1	2.65E-1	1.62E-1	9.53E-2	8.76E-2	8.47E-2	7.73E-2	7.05E-2	6.51E-2	5.12E-2
Skin	0.00E+0	6.42E-5	5.06E-4	1.61E-3	1.98E-3	1.80E-3	1.93E-3	2.13E-3	2.09E-3	1.97E-3	1.86E-3	1.58E-3
Small Intestine	1.90E-3	8.17E-3	1.67E-2	3.08E-2	3.08E-2	2.18E-2	1.95E-2	1.85E-2	1.70E-2	1.57E-2	1.46E-2	1.20E-2
Spleen	4.67E-2	1.03E-1	1.40E-1	1.37E-1	8.45E-2	5.20E-2	4.86E-2	4.77E-2	4.40E-2	4.04E-2	3.73E-2	2.96E-2
Stomach	5.40E+0	3.24E+0	1.99E+0	9.08E-1	3.53E-1	2.03E-1	2.09E-1	2.13E-1	1.84E-1	1.56E-1	1.34E-1	8.72E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.13E-4	3.18E-4	5.18E-4	6.68E-4	7.73E-4	8.03E-4	8.10E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	4.86E-4	2.26E-3	2.76E-3	2.71E-3	2.74E-3	2.80E-3	2.71E-3	2.66E-3	2.46E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.86E-4	8.06E-4	8.93E-4	1.03E-3	1.07E-3	1.11E-3	1.15E-3	1.02E-3
Upper large intestine	5.55E-3	2.29E-2	4.33E-2	5.97E-2	4.52E-2	2.91E-2	2.66E-2	2.57E-2	2.38E-2	2.18E-2	2.03E-2	1.65E-2
Whole body	1.33E-2	1.16E-2	1.10E-2	1.05E-2	8.61E-3	6.18E-3	5.56E-3	5.40E-3	5.05E-3	4.70E-3	4.39E-3	3.61E-3

Table E-26 SAFs (kg^{-1}) for 25 target organs and for stomach content as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.24E-4	2.44E-3	5.66E-3	9.07E-3	8.01E-3	5.87E-3	5.56E-3	5.58E-3	5.30E-3	4.97E-3	4.69E-3	3.94E-3
Adrenal	1.59E-3	3.05E-2	9.22E-2	1.39E-1	9.71E-2	6.06E-2	5.53E-2	5.30E-2	4.81E-2	4.38E-2	4.10E-2	3.34E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.59E-4	1.26E-3	1.46E-3	1.69E-3	1.82E-3	1.83E-3	1.78E-3	1.67E-3
Bone (hard bone)	8.31E-7	8.03E-5	1.02E-3	6.42E-3	1.26E-2	8.79E-3	4.91E-3	3.32E-3	2.87E-3	2.65E-3	2.50E-3	2.18E-3
Bone (marrow)	6.89E-7	2.50E-5	1.94E-4	8.02E-4	1.58E-3	2.10E-3	2.29E-3	2.34E-3	2.32E-3	2.25E-3	2.15E-3	1.84E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.34E-6	3.74E-5	6.95E-5	1.26E-4	1.85E-4	2.17E-4	2.39E-4	2.65E-4
Breast	0.00E+0	0.00E+0	5.14E-5	1.31E-3	3.38E-3	3.45E-3	3.60E-3	3.97E-3	3.99E-3	3.84E-3	3.70E-3	3.10E-3
Esophagus	8.55E-3	2.18E-2	3.22E-2	4.07E-2	3.16E-2	2.11E-2	1.92E-2	1.85E-2	1.69E-2	1.56E-2	1.45E-2	1.16E-2
Gall bladder	0.00E+0	0.00E+0	2.57E-3	1.93E-2	3.02E-2	2.32E-2	2.03E-2	1.87E-2	1.69E-2	1.56E-2	1.46E-2	1.22E-2
Heart	0.00E+0	2.68E-4	2.59E-3	1.05E-2	1.40E-2	1.11E-2	1.00E-2	9.51E-3	8.86E-3	8.27E-3	7.77E-3	6.50E-3
Kidney	0.00E+0	3.60E-4	5.85E-3	2.81E-2	3.48E-2	2.57E-2	2.28E-2	2.12E-2	1.93E-2	1.78E-2	1.66E-2	1.37E-2
Liver	7.67E-4	4.43E-3	1.21E-2	2.67E-2	2.84E-2	2.09E-2	1.88E-2	1.79E-2	1.65E-2	1.53E-2	1.44E-2	1.18E-2
Lower large intestine	8.50E-4	7.62E-3	1.79E-2	2.73E-2	2.21E-2	1.49E-2	1.37E-2	1.33E-2	1.24E-2	1.15E-2	1.08E-2	8.88E-3
Lung	4.49E-4	5.73E-3	1.48E-2	2.18E-2	1.69E-2	1.16E-2	1.06E-2	1.02E-2	9.42E-3	8.72E-3	8.16E-3	6.76E-3
Muscle	6.71E-5	5.60E-4	1.64E-3	3.56E-3	3.92E-3	3.22E-3	3.12E-3	3.15E-3	3.03E-3	2.87E-3	2.73E-3	2.33E-3
Pancreas	4.54E-3	4.72E-2	1.34E-1	2.08E-1	1.45E-1	8.62E-2	7.76E-2	7.39E-2	6.71E-2	6.13E-2	5.68E-2	4.58E-2
Skin	0.00E+0	1.82E-5	2.76E-4	1.33E-3	1.92E-3	1.78E-3	1.90E-3	2.09E-3	2.04E-3	1.93E-3	1.83E-3	1.55E-3
Small Intestine	1.63E-4	2.01E-3	8.48E-3	2.38E-2	2.68E-2	1.95E-2	1.73E-2	1.63E-2	1.50E-2	1.39E-2	1.30E-2	1.08E-2
Spleen	1.50E-3	2.19E-2	6.67E-2	1.14E-1	8.53E-2	5.30E-2	4.82E-2	4.63E-2	4.24E-2	3.91E-2	3.62E-2	2.94E-2
Stomach	3.99E-1	6.78E-1	7.30E-1	5.28E-1	2.52E-1	1.42E-1	1.38E-1	1.39E-1	1.28E-1	1.16E-1	1.06E-1	7.91E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.90E-4	2.91E-4	4.60E-4	6.16E-4	6.65E-4	7.15E-4	7.38E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	5.23E-4	2.56E-3	3.08E-3	2.96E-3	3.01E-3	2.96E-3	2.92E-3	2.82E-3	2.56E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.09E-4	9.06E-4	9.98E-4	1.11E-3	1.18E-3	1.23E-3	1.16E-3	1.06E-3
Upper large intestine	2.31E-4	6.09E-3	2.19E-2	4.33E-2	3.71E-2	2.46E-2	2.22E-2	2.13E-2	1.96E-2	1.81E-2	1.69E-2	1.39E-2
Whole body	9.47E-4	2.71E-3	5.12E-3	8.24E-3	8.07E-3	5.91E-3	5.21E-3	5.00E-3	4.69E-3	4.39E-3	4.14E-3	3.47E-3

Table E-27 SAFs (kg^{-1}) for 25 target organs and for testis as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	4.87E-4	3.10E-3	6.66E-3	9.03E-3	6.92E-3	4.99E-3	5.00E-3	5.24E-3	5.07E-3	4.78E-3	4.51E-3	3.78E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.43E-4	2.44E-4	3.98E-4	5.28E-4	5.94E-4	6.26E-4	6.39E-4
Bladder	0.00E+0	0.00E+0	5.40E-4	9.63E-3	2.17E-2	2.02E-2	1.98E-2	1.97E-2	1.85E-2	1.73E-2	1.62E-2	1.34E-2
Bone (hard bone)	1.68E-6	2.47E-5	2.61E-4	2.93E-3	7.36E-3	5.48E-3	2.78E-3	2.31E-3	2.10E-3	1.71E-3	1.63E-3	1.68E-3
Bone (marrow)	0.00E+0	3.06E-6	2.84E-5	2.84E-4	8.15E-4	1.23E-3	1.77E-3	1.63E-3	1.65E-3	1.95E-3	1.89E-3	1.36E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.48E-7	5.17E-7	2.59E-6	8.15E-6	1.39E-5	1.95E-5	3.44E-5
Breast	0.00E+0	0.00E+0	0.00E+0	2.34E-6	3.38E-6	9.22E-6	1.93E-5	4.84E-5	9.14E-5	1.23E-4	1.46E-4	1.84E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.82E-5	5.54E-5	1.09E-4	1.69E-4	2.03E-4	2.29E-4	2.72E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.15E-4	3.22E-4	5.05E-4	6.29E-4	7.06E-4	7.47E-4	7.69E-4
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.91E-5	3.99E-5	8.66E-5	1.45E-4	1.83E-4	2.09E-4	2.48E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.05E-4	3.63E-4	5.30E-4	7.43E-4	9.05E-4	9.66E-4	9.85E-4	9.59E-4
Liver	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.97E-5	1.22E-4	1.99E-4	3.35E-4	4.62E-4	5.27E-4	5.60E-4	5.87E-4
Lower large intestine	0.00E+0	0.00E+0	2.21E-5	1.51E-3	5.85E-3	6.50E-3	6.48E-3	6.60E-3	6.40E-3	6.09E-3	5.79E-3	4.94E-3
Lung	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.34E-5	4.77E-5	1.03E-4	1.69E-4	2.11E-4	2.36E-4	2.75E-4
Muscle	3.64E-3	6.26E-3	7.94E-3	8.94E-3	6.89E-3	4.69E-3	4.69E-3	4.87E-3	4.68E-3	4.40E-3	4.15E-3	3.44E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.86E-5	2.79E-4	4.07E-4	5.97E-4	7.50E-4	8.11E-4	8.37E-4	8.34E-4
Skin	3.91E-3	1.43E-2	1.80E-2	1.30E-2	6.32E-3	4.18E-3	4.50E-3	4.82E-3	4.48E-3	4.08E-3	3.77E-3	2.97E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	3.96E-4	2.03E-3	2.71E-3	2.94E-3	3.28E-3	3.40E-3	3.34E-3	3.25E-3	2.87E-3
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.23E-4	2.11E-4	3.45E-4	4.71E-4	5.38E-4	5.69E-4	5.89E-4
Stomach	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.81E-5	2.49E-4	3.59E-4	5.40E-4	6.88E-4	7.64E-4	7.89E-4	7.93E-4
Testis	2.41E+1	1.88E+1	1.27E+1	5.52E+0	1.81E+0	1.03E+0	1.12E+0	1.19E+0	1.07E+0	9.21E-1	7.97E-1	4.88E-1
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.12E-6	1.67E-5	4.05E-5	8.02E-5	1.09E-4	1.27E-4	1.70E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.18E-6	6.35E-6	1.79E-5	3.85E-5	5.63E-5	6.99E-5	9.59E-5
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	5.54E-5	5.49E-4	1.02E-3	1.25E-3	1.58E-3	1.76E-3	1.81E-3	1.80E-3	1.67E-3
Whole body	1.55E-2	1.46E-2	1.31E-2	1.02E-2	6.94E-3	4.81E-3	4.60E-3	4.74E-3	4.52E-3	4.20E-3	3.92E-3	3.20E-3

Table E-28 SAFs (kg^{-1}) for 25 target organs and for thymus as a source region in the JM phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.54E-3	4.89E-3	5.57E-3	5.87E-3	4.83E-3	3.76E-3	3.79E-3	3.87E-3	3.69E-3	3.46E-3	3.25E-3	2.68E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	4.21E-4	2.68E-3	3.62E-3	3.50E-3	3.45E-3	3.45E-3	3.26E-3	3.18E-3	2.83E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.77E-5	7.14E-5	1.32E-4	1.93E-4	2.39E-4	2.69E-4	2.94E-4
Bone (hard bone)	8.89E-4	6.03E-3	1.62E-2	3.23E-2	3.05E-2	1.37E-2	6.12E-3	5.24E-3	4.65E-3	3.62E-3	3.98E-3	3.34E-3
Bone (marrow)	3.91E-4	1.28E-3	2.58E-3	4.09E-3	4.18E-3	4.05E-3	5.14E-3	4.41E-3	4.17E-3	4.69E-3	3.66E-3	2.99E-3
Brain	0.00E+0	0.00E+0	0.00E+0	2.30E-6	1.13E-4	4.20E-4	6.01E-4	8.42E-4	1.01E-3	1.08E-3	1.11E-3	1.08E-3
Breast	0.00E+0	2.84E-5	1.86E-3	1.51E-2	2.05E-2	1.49E-2	1.49E-2	1.51E-2	1.42E-2	1.32E-2	1.24E-2	1.01E-2
Esophagus	0.00E+0	3.22E-4	7.81E-3	3.64E-2	3.92E-2	2.76E-2	2.55E-2	2.45E-2	2.28E-2	2.11E-2	1.98E-2	1.64E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.19E-3	2.95E-3	2.84E-3	2.78E-3	2.77E-3	2.71E-3	2.63E-3	2.41E-3
Heart	7.45E-2	2.05E-1	2.79E-1	2.46E-1	1.31E-1	7.73E-2	7.57E-2	7.66E-2	7.13E-2	6.57E-2	6.07E-2	4.76E-2
Kidney	0.00E+0	0.00E+0	0.00E+0	7.13E-5	8.45E-4	1.47E-3	1.55E-3	1.62E-3	1.69E-3	1.69E-3	1.66E-3	1.53E-3
Liver	0.00E+0	9.84E-7	9.03E-5	1.86E-3	5.21E-3	5.25E-3	4.87E-3	4.74E-3	4.54E-3	4.32E-3	4.11E-3	3.54E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.05E-4	3.65E-4	4.11E-4	4.90E-4	5.72E-4	6.10E-4	6.32E-4	6.41E-4
Lung	3.60E-2	8.61E-2	1.07E-1	9.33E-2	5.29E-2	3.14E-2	2.93E-2	2.85E-2	2.60E-2	2.38E-2	2.20E-2	1.73E-2
Muscle	2.46E-4	5.08E-4	1.17E-3	2.60E-3	3.17E-3	2.78E-3	2.79E-3	2.81E-3	2.67E-3	2.52E-3	2.38E-3	2.01E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	2.06E-4	1.80E-3	2.64E-3	2.58E-3	2.59E-3	2.63E-3	2.60E-3	2.52E-3	2.29E-3
Skin	0.00E+0	1.28E-5	2.06E-4	1.13E-3	1.77E-3	1.73E-3	1.92E-3	2.09E-3	2.00E-3	1.86E-3	1.73E-3	1.45E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	1.32E-5	2.30E-4	5.06E-4	5.83E-4	6.93E-4	7.96E-4	8.41E-4	8.61E-4	8.52E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	4.36E-4	2.13E-3	2.71E-3	2.64E-3	2.62E-3	2.57E-3	2.50E-3	2.41E-3	2.13E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	4.89E-4	2.32E-3	2.88E-3	2.76E-3	2.78E-3	2.80E-3	2.76E-3	2.69E-3	2.40E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.39E-5	3.73E-5	7.39E-5	1.04E-4	1.26E-4	1.58E-4
Thymus	2.60E+1	1.87E+1	1.21E+1	5.07E+0	1.67E+0	9.54E-1	1.04E+0	1.10E+0	9.70E-1	8.26E-1	7.07E-1	4.19E-1
Thyroid	0.00E+0	1.01E-4	4.29E-3	2.82E-2	3.68E-2	2.84E-2	2.76E-2	2.80E-2	2.65E-2	2.47E-2	2.31E-2	1.92E-2
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.84E-4	7.49E-4	8.31E-4	9.68E-4	1.08E-3	1.12E-3	1.13E-3	1.07E-3
Whole body	1.56E-2	1.55E-2	1.51E-2	1.36E-2	9.86E-3	6.14E-3	5.33E-3	5.24E-3	4.89E-3	4.49E-3	4.19E-3	3.37E-3

Table E-29 SAFs (kg^{-1}) for 25 target organs and for thyroid as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	2.38E-3	6.56E-3	9.50E-3	8.97E-3	5.70E-3	4.15E-3	4.30E-3	4.43E-3	4.23E-3	3.99E-3	3.75E-3	3.05E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.46E-4	1.17E-3	1.25E-3	1.29E-3	1.32E-3	1.31E-3	1.30E-3	1.21E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.35E-5	2.80E-5	5.71E-5	9.01E-5	1.19E-4	1.38E-4	1.70E-4
Bone (hard bone)	2.43E-5	9.63E-4	6.17E-3	2.29E-2	2.94E-2	1.47E-2	6.71E-3	5.73E-3	5.15E-3	4.10E-3	3.84E-3	3.80E-3
Bone (marrow)	5.36E-6	1.77E-4	8.32E-4	2.44E-3	3.37E-3	3.66E-3	4.85E-3	4.12E-3	3.90E-3	4.49E-3	4.26E-3	2.85E-3
Brain	0.00E+0	0.00E+0	0.00E+0	5.91E-5	8.15E-4	1.88E-3	2.37E-3	2.88E-3	3.09E-3	3.09E-3	3.02E-3	2.73E-3
Breast	0.00E+0	0.00E+0	1.86E-5	5.04E-4	2.36E-3	3.03E-3	3.31E-3	3.69E-3	3.92E-3	3.94E-3	3.86E-3	3.43E-3
Esophagus	2.72E-2	1.60E-1	2.86E-1	2.45E-1	1.15E-1	6.72E-2	6.59E-2	6.56E-2	6.03E-2	5.51E-2	5.10E-2	4.06E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.30E-4	1.03E-3	1.13E-3	1.17E-3	1.19E-3	1.17E-3	1.06E-3
Heart	0.00E+0	2.13E-4	3.46E-3	1.54E-2	1.82E-2	1.41E-2	1.33E-2	1.30E-2	1.22E-2	1.15E-2	1.08E-2	8.99E-3
Kidney	0.00E+0	0.00E+0	0.00E+0	1.47E-5	2.32E-4	5.34E-4	6.36E-4	7.24E-4	7.91E-4	8.17E-4	8.21E-4	7.83E-4
Liver	0.00E+0	0.00E+0	0.00E+0	1.70E-4	1.03E-3	1.56E-3	1.63E-3	1.71E-3	1.73E-3	1.69E-3	1.64E-3	1.46E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.62E-5	1.35E-4	1.74E-4	2.27E-4	2.75E-4	3.07E-4	3.20E-4	3.37E-4
Lung	1.60E-6	8.04E-4	6.99E-3	1.88E-2	1.76E-2	1.29E-2	1.23E-2	1.19E-2	1.09E-2	1.00E-2	9.33E-3	7.70E-3
Muscle	4.46E-3	9.31E-3	1.18E-2	9.99E-3	6.13E-3	4.49E-3	4.62E-3	4.76E-3	4.52E-3	4.22E-3	3.95E-3	3.22E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.30E-4	7.36E-4	8.13E-4	8.75E-4	9.51E-4	9.69E-4	9.76E-4	9.51E-4
Skin	4.91E-6	6.62E-4	2.35E-3	3.31E-3	2.41E-3	2.01E-3	2.23E-3	2.45E-3	2.34E-3	2.16E-3	2.02E-3	1.68E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.01E-5	1.60E-4	2.11E-4	2.75E-4	3.39E-4	3.77E-4	3.97E-4	4.24E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	1.00E-4	6.91E-4	1.09E-3	1.20E-3	1.29E-3	1.33E-3	1.30E-3	1.27E-3	1.13E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	7.06E-5	5.30E-4	8.93E-4	9.67E-4	1.04E-3	1.10E-3	1.12E-3	1.11E-3	1.03E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.73E-6	1.64E-5	3.90E-5	5.24E-5	6.40E-5	9.65E-5
Thymus	0.00E+0	1.07E-4	4.31E-3	2.83E-2	3.68E-2	2.84E-2	2.77E-2	2.80E-2	2.65E-2	2.47E-2	2.31E-2	1.91E-2
Thyroid	3.82E+1	2.73E+1	1.72E+1	7.02E+0	2.26E+0	1.28E+0	1.39E+0	1.46E+0	1.29E+0	1.09E+0	9.20E-1	5.24E-1
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.18E-5	2.49E-4	3.18E-4	4.12E-4	4.96E-4	5.37E-4	5.53E-4	5.57E-4
Whole body	1.55E-2	1.51E-2	1.45E-2	1.26E-2	9.22E-3	5.96E-3	5.25E-3	5.23E-3	4.91E-3	4.53E-3	4.22E-3	3.41E-3

Table E-30 SAFs (kg^{-1}) for 25 target organs and for trachea as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.37E-2	1.64E-2	1.46E-2	1.03E-2	6.37E-3	4.69E-3	4.79E-3	4.87E-3	4.58E-3	4.25E-3	3.94E-3	3.10E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	4.30E-4	1.78E-3	2.49E-3	2.51E-3	2.50E-3	2.39E-3	2.36E-3	2.26E-3	2.00E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.45E-5	4.83E-5	8.62E-5	1.39E-4	1.73E-4	1.91E-4	2.25E-4
Bone (hard bone)	6.73E-5	2.43E-3	1.07E-2	3.10E-2	3.55E-2	1.69E-2	7.60E-3	6.36E-3	5.64E-3	5.18E-3	4.84E-3	4.07E-3
Bone (marrow)	2.81E-5	6.35E-4	1.76E-3	3.73E-3	4.55E-3	4.71E-3	5.99E-3	5.12E-3	4.77E-3	4.43E-3	4.14E-3	3.40E-3
Brain	0.00E+0	0.00E+0	0.00E+0	3.91E-5	4.96E-4	1.25E-3	1.61E-3	2.00E-3	2.19E-3	2.21E-3	2.19E-3	2.01E-3
Breast	0.00E+0	0.00E+0	1.38E-4	3.26E-3	6.63E-3	6.16E-3	6.25E-3	6.50E-3	6.31E-3	5.98E-3	5.63E-3	4.72E-3
Esophagus	5.29E-1	1.31E+0	1.23E+0	6.56E-1	2.50E-1	1.43E-1	1.46E-1	1.50E-1	1.39E-1	1.26E-1	1.14E-1	7.71E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.14E-3	1.74E-3	1.74E-3	1.76E-3	1.74E-3	1.71E-3	1.65E-3	1.49E-3
Heart	4.50E-2	1.43E-1	1.92E-1	1.62E-1	8.45E-2	5.09E-2	4.95E-2	4.94E-2	4.57E-2	4.19E-2	3.87E-2	3.01E-2
Kidney	0.00E+0	0.00E+0	0.00E+0	7.13E-5	6.01E-4	1.06E-3	1.18E-3	1.27E-3	1.31E-3	1.31E-3	1.29E-3	1.17E-3
Liver	0.00E+0	0.00E+0	2.94E-5	7.96E-4	2.61E-3	3.03E-3	2.90E-3	2.84E-3	2.73E-3	2.61E-3	2.49E-3	2.16E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.08E-4	2.22E-4	2.69E-4	3.31E-4	3.90E-4	4.21E-4	4.43E-4	4.50E-4
Lung	7.50E-3	3.40E-2	5.65E-2	6.14E-2	3.83E-2	2.40E-2	2.24E-2	2.14E-2	1.94E-2	1.78E-2	1.64E-2	1.32E-2
Muscle	3.25E-3	6.91E-3	7.84E-3	6.86E-3	5.11E-3	4.06E-3	4.11E-3	4.14E-3	3.90E-3	3.63E-3	3.40E-3	2.76E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	6.23E-5	7.77E-4	1.42E-3	1.46E-3	1.48E-3	1.53E-3	1.53E-3	1.51E-3	1.39E-3
Skin	2.69E-6	2.29E-4	7.97E-4	1.52E-3	1.75E-3	1.69E-3	1.88E-3	2.05E-3	1.98E-3	1.84E-3	1.72E-3	1.44E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.13E-4	2.97E-4	3.63E-4	4.38E-4	5.12E-4	5.50E-4	5.70E-4	5.70E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	2.51E-4	1.37E-3	1.91E-3	1.97E-3	2.00E-3	1.98E-3	1.92E-3	1.85E-3	1.61E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	1.93E-4	1.11E-3	1.59E-3	1.60E-3	1.64E-3	1.66E-3	1.65E-3	1.62E-3	1.48E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.59E-6	9.67E-6	2.57E-5	5.12E-5	7.40E-5	9.28E-5	1.29E-4
Thymus	0.00E+0	3.90E-3	4.61E-2	1.18E-1	8.81E-2	5.56E-2	5.30E-2	5.28E-2	4.90E-2	4.52E-2	4.20E-2	3.42E-2
Thyroid	3.93E-1	1.53E+0	1.80E+0	1.12E+0	4.42E-1	2.45E-1	2.48E-1	2.55E-1	2.35E-1	2.15E-1	1.97E-1	1.43E-1
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.96E-4	4.51E-4	5.26E-4	6.23E-4	7.09E-4	7.45E-4	7.56E-4	7.32E-4
Whole body	6.42E-3	1.13E-2	1.31E-2	1.32E-2	1.03E-2	6.57E-3	5.60E-3	5.44E-3	5.06E-3	4.69E-3	4.37E-3	3.52E-3

Table E-31 SAFs (kg^{-1}) for 25 target organs and for upper large intestine as a source region in the JM phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	9.29E-3	1.43E-2	1.65E-2	1.60E-2	1.12E-2	7.73E-3	7.42E-3	7.49E-3	7.07E-3	6.58E-3	6.16E-3	5.03E-3
Adrenal	0.00E+0	0.00E+0	8.17E-4	8.76E-3	1.63E-2	1.43E-2	1.29E-2	1.20E-2	1.12E-2	1.02E-2	9.66E-3	8.12E-3
Bladder	0.00E+0	0.00E+0	1.07E-4	2.25E-3	6.08E-3	6.51E-3	6.29E-3	6.20E-3	5.95E-3	5.64E-3	5.39E-3	4.58E-3
Bone (hard bone)	4.18E-6	3.16E-4	1.65E-3	6.81E-3	1.24E-2	8.69E-3	4.88E-3	3.26E-3	2.83E-3	2.63E-3	2.48E-3	2.16E-3
Bone (marrow)	6.63E-7	2.94E-5	1.48E-4	7.60E-4	1.80E-3	2.46E-3	2.75E-3	2.87E-3	2.78E-3	2.64E-3	2.52E-3	2.14E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.49E-6	2.08E-5	5.16E-5	8.77E-5	1.13E-4	1.31E-4	1.58E-4
Breast	0.00E+0	0.00E+0	0.00E+0	4.49E-5	4.14E-4	7.26E-4	8.72E-4	1.14E-3	1.31E-3	1.38E-3	1.38E-3	1.29E-3
Esophagus	0.00E+0	0.00E+0	0.00E+0	5.68E-4	2.39E-3	2.83E-3	2.75E-3	2.82E-3	2.74E-3	2.66E-3	2.55E-3	2.23E-3
Gall bladder	6.21E-2	1.07E-1	1.39E-1	1.35E-1	8.20E-2	5.13E-2	4.69E-2	4.61E-2	4.22E-2	3.83E-2	3.52E-2	2.78E-2
Heart	0.00E+0	0.00E+0	0.00E+0	2.27E-4	1.36E-3	1.92E-3	1.96E-3	2.10E-3	2.16E-3	2.13E-3	2.08E-3	1.88E-3
Kidney	2.27E-3	1.83E-2	4.17E-2	6.29E-2	5.01E-2	3.33E-2	3.01E-2	2.86E-2	2.60E-2	2.39E-2	2.23E-2	1.82E-2
Liver	5.99E-3	1.33E-2	2.07E-2	2.95E-2	2.71E-2	1.94E-2	1.77E-2	1.70E-2	1.58E-2	1.46E-2	1.37E-2	1.12E-2
Lower large intestine	2.50E-3	6.19E-3	1.06E-2	1.60E-2	1.56E-2	1.22E-2	1.14E-2	1.11E-2	1.03E-2	9.64E-3	9.02E-3	7.51E-3
Lung	0.00E+0	0.00E+0	1.32E-5	5.25E-4	1.92E-3	2.25E-3	2.25E-3	2.38E-3	2.41E-3	2.35E-3	2.27E-3	2.02E-3
Muscle	1.65E-3	2.76E-3	3.88E-3	4.98E-3	4.51E-3	3.60E-3	3.53E-3	3.60E-3	3.47E-3	3.29E-3	3.12E-3	2.64E-3
Pancreas	7.51E-4	6.13E-3	2.07E-2	4.76E-2	4.60E-2	3.13E-2	2.77E-2	2.57E-2	2.35E-2	2.16E-2	2.01E-2	1.64E-2
Skin	8.69E-6	1.34E-4	7.56E-4	2.03E-3	2.23E-3	1.95E-3	2.09E-3	2.31E-3	2.26E-3	2.13E-3	2.01E-3	1.71E-3
Small Intestine	1.58E-2	4.09E-2	6.51E-2	8.23E-2	6.10E-2	3.92E-2	3.57E-2	3.41E-2	3.13E-2	2.87E-2	2.66E-2	2.14E-2
Spleen	0.00E+0	0.00E+0	3.29E-4	3.94E-3	7.78E-3	7.26E-3	6.69E-3	6.51E-3	6.19E-3	5.85E-3	5.57E-3	4.73E-3
Stomach	5.56E-3	2.29E-2	4.34E-2	5.98E-2	4.52E-2	2.92E-2	2.66E-2	2.58E-2	2.37E-2	2.18E-2	2.03E-2	1.65E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.27E-4	9.66E-4	1.19E-3	1.54E-3	1.72E-3	1.80E-3	1.79E-3	1.66E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.67E-4	7.30E-4	8.13E-4	9.79E-4	1.07E-3	1.11E-3	1.12E-3	1.06E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.22E-4	2.93E-4	4.06E-4	4.97E-4	5.34E-4	5.53E-4	5.61E-4
Upper large intestine	4.10E+0	2.34E+0	1.43E+0	6.55E-1	2.54E-1	1.47E-1	1.51E-1	1.53E-1	1.31E-1	1.11E-1	9.64E-2	6.37E-2
Whole body	1.24E-2	1.11E-2	1.09E-2	1.08E-2	8.75E-3	6.29E-3	5.67E-3	5.52E-3	5.18E-3	4.82E-3	4.52E-3	3.72E-3

Table E-32 SAFs (kg^{-1}) for 25 target organs and for upper large intestine content as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.13E-3	5.70E-3	1.08E-2	1.39E-2	1.06E-2	7.46E-3	7.13E-3	7.13E-3	6.74E-3	6.31E-3	5.93E-3	4.92E-3
Adrenal	0.00E+0	0.00E+0	5.28E-4	7.18E-3	1.43E-2	1.29E-2	1.16E-2	1.09E-2	1.01E-2	9.43E-3	8.97E-3	7.47E-3
Bladder	0.00E+0	1.10E-4	4.45E-4	2.79E-3	6.66E-3	7.12E-3	6.82E-3	6.72E-3	6.45E-3	6.07E-3	5.73E-3	4.87E-3
Bone (hard bone)	5.50E-7	1.77E-4	1.50E-3	7.31E-3	1.32E-2	9.05E-3	5.05E-3	3.37E-3	2.92E-3	2.69E-3	2.54E-3	2.22E-3
Bone (marrow)	0.00E+0	1.51E-5	1.26E-4	7.89E-4	1.88E-3	2.55E-3	2.88E-3	2.96E-3	2.86E-3	2.73E-3	2.59E-3	2.20E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.66E-6	2.01E-5	4.80E-5	8.49E-5	1.10E-4	1.26E-4	1.54E-4
Breast	0.00E+0	0.00E+0	0.00E+0	3.83E-5	3.70E-4	6.57E-4	7.98E-4	1.05E-3	1.23E-3	1.28E-3	1.30E-3	1.21E-3
Esophagus	0.00E+0	0.00E+0	0.00E+0	4.62E-4	2.01E-3	2.54E-3	2.50E-3	2.60E-3	2.54E-3	2.48E-3	2.37E-3	2.11E-3
Gall bladder	1.08E-2	4.99E-2	9.13E-2	1.06E-1	7.08E-2	4.46E-2	4.04E-2	3.87E-2	3.56E-2	3.26E-2	3.03E-2	2.42E-2
Heart	0.00E+0	0.00E+0	0.00E+0	1.83E-4	1.19E-3	1.73E-3	1.79E-3	1.92E-3	1.99E-3	1.98E-3	1.94E-3	1.75E-3
Kidney	2.06E-4	8.00E-3	3.00E-2	5.69E-2	4.81E-2	3.22E-2	2.89E-2	2.72E-2	2.48E-2	2.29E-2	2.13E-2	1.74E-2
Liver	9.94E-4	7.11E-3	1.59E-2	2.64E-2	2.53E-2	1.83E-2	1.66E-2	1.60E-2	1.48E-2	1.38E-2	1.29E-2	1.06E-2
Lower large intestine	3.51E-3	7.71E-3	1.14E-2	1.50E-2	1.47E-2	1.18E-2	1.11E-2	1.07E-2	1.00E-2	9.35E-3	8.78E-3	7.27E-3
Lung	0.00E+0	0.00E+0	1.08E-5	4.48E-4	1.71E-3	2.06E-3	2.08E-3	2.21E-3	2.25E-3	2.20E-3	2.14E-3	1.90E-3
Muscle	2.37E-4	1.11E-3	2.61E-3	4.51E-3	4.44E-3	3.59E-3	3.51E-3	3.56E-3	3.43E-3	3.26E-3	3.09E-3	2.63E-3
Pancreas	5.73E-5	2.41E-3	1.30E-2	3.71E-2	3.90E-2	2.73E-2	2.40E-2	2.22E-2	2.04E-2	1.87E-2	1.74E-2	1.44E-2
Skin	8.19E-7	5.81E-5	5.52E-4	1.88E-3	2.20E-3	1.94E-3	2.08E-3	2.30E-3	2.25E-3	2.12E-3	2.01E-3	1.71E-3
Small Intestine	3.70E-3	1.96E-2	4.49E-2	7.10E-2	5.69E-2	3.70E-2	3.34E-2	3.18E-2	2.91E-2	2.67E-2	2.48E-2	2.02E-2
Spleen	0.00E+0	5.11E-5	3.99E-4	3.29E-3	6.58E-3	6.32E-3	5.91E-3	5.75E-3	5.54E-3	5.23E-3	4.97E-3	4.27E-3
Stomach	5.86E-4	9.76E-3	2.83E-2	4.74E-2	3.83E-2	2.52E-2	2.29E-2	2.20E-2	2.02E-2	1.87E-2	1.74E-2	1.43E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.11E-4	1.04E-3	1.28E-3	1.63E-3	1.80E-3	1.90E-3	1.85E-3	1.76E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.29E-4	6.77E-4	7.51E-4	8.69E-4	9.92E-4	1.04E-3	1.04E-3	1.03E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.00E-4	2.84E-4	3.92E-4	4.48E-4	5.11E-4	5.25E-4	5.29E-4
Upper large intestine	6.24E-1	8.38E-1	7.73E-1	4.74E-1	2.08E-1	1.19E-1	1.17E-1	1.19E-1	1.09E-1	9.86E-2	8.93E-2	6.43E-2
Whole body	1.80E-3	4.30E-3	6.97E-3	9.38E-3	8.43E-3	6.12E-3	5.47E-3	5.28E-3	4.97E-3	4.66E-3	4.39E-3	3.66E-3

Table E-33 SAFs (kg^{-1}) for 25 target organs and for whole body as a source region in the JM phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.54E-2	1.42E-2	1.26E-2	9.40E-3	5.98E-3	4.40E-3	4.49E-3	4.69E-3	4.47E-3	4.17E-3	3.89E-3	3.15E-3
Adrenal	1.49E-2	1.48E-2	1.41E-2	1.26E-2	9.79E-3	7.67E-3	7.33E-3	7.19E-3	6.55E-3	6.26E-3	5.81E-3	4.62E-3
Bladder	1.23E-2	1.06E-2	9.88E-3	8.90E-3	7.27E-3	5.99E-3	5.84E-3	5.89E-3	5.51E-3	5.16E-3	4.79E-3	3.99E-3
Bone (hard bone)	1.51E-2	1.98E-2	2.48E-2	3.14E-2	2.72E-2	1.24E-2	6.89E-3	5.40E-3	4.86E-3	4.45E-3	4.15E-3	3.42E-3
Bone (marrow)	5.74E-3	3.50E-3	3.00E-3	2.98E-3	3.07E-3	3.37E-3	3.75E-3	3.91E-3	3.75E-3	3.51E-3	3.29E-3	2.64E-3
Brain	1.44E-2	1.37E-2	1.25E-2	9.46E-3	5.80E-3	4.07E-3	4.09E-3	4.19E-3	3.95E-3	3.65E-3	3.40E-3	2.72E-3
Breast	1.52E-2	1.35E-2	1.15E-2	8.41E-3	5.16E-3	3.76E-3	3.96E-3	4.30E-3	4.08E-3	3.83E-3	3.62E-3	2.93E-3
Esophagus	1.47E-2	1.46E-2	1.41E-2	1.28E-2	9.52E-3	7.29E-3	7.14E-3	7.01E-3	6.48E-3	6.01E-3	5.57E-3	4.47E-3
Gall bladder	1.21E-2	1.13E-2	1.17E-2	1.20E-2	9.66E-3	7.14E-3	6.72E-3	6.58E-3	6.08E-3	5.55E-3	5.26E-3	4.37E-3
Heart	1.44E-2	1.51E-2	1.58E-2	1.44E-2	1.01E-2	7.18E-3	6.91E-3	6.82E-3	6.34E-3	5.85E-3	5.44E-3	4.38E-3
Kidney	1.48E-2	1.47E-2	1.45E-2	1.29E-2	9.50E-3	7.09E-3	6.84E-3	6.72E-3	6.31E-3	5.84E-3	5.45E-3	4.41E-3
Liver	1.48E-2	1.50E-2	1.50E-2	1.36E-2	9.73E-3	6.97E-3	6.67E-3	6.63E-3	6.19E-3	5.75E-3	5.35E-3	4.35E-3
Lower large intestine	1.20E-2	1.09E-2	1.07E-2	1.01E-2	7.69E-3	5.99E-3	5.77E-3	5.76E-3	5.39E-3	5.06E-3	4.73E-3	3.87E-3
Lung	4.89E-2	4.23E-2	3.36E-2	2.07E-2	1.12E-2	7.35E-3	7.17E-3	7.14E-3	6.53E-3	5.93E-3	5.46E-3	4.19E-3
Muscle	1.54E-2	1.47E-2	1.33E-2	9.93E-3	6.17E-3	3.97E-3	4.05E-3	4.20E-3	3.99E-3	3.71E-3	3.47E-3	2.81E-3
Pancreas	1.47E-2	1.45E-2	1.39E-2	1.24E-2	9.67E-3	7.24E-3	6.78E-3	6.64E-3	6.16E-3	5.70E-3	5.29E-3	4.35E-3
Skin	1.10E-2	9.07E-3	7.61E-3	5.37E-3	3.29E-3	2.58E-3	2.86E-3	3.13E-3	2.95E-3	2.70E-3	2.49E-3	1.99E-3
Small Intestine	1.28E-2	1.21E-2	1.19E-2	1.11E-2	8.37E-3	6.26E-3	5.98E-3	5.94E-3	5.55E-3	5.17E-3	4.85E-3	3.97E-3
Spleen	1.48E-2	1.51E-2	1.49E-2	1.29E-2	8.99E-3	6.53E-3	6.29E-3	6.27E-3	5.86E-3	5.43E-3	5.11E-3	4.13E-3
Stomach	1.28E-2	1.17E-2	1.13E-2	1.05E-2	8.15E-3	6.02E-3	5.71E-3	5.64E-3	5.35E-3	4.97E-3	4.63E-3	3.85E-3
Testis	1.47E-2	1.40E-2	1.25E-2	9.66E-3	6.11E-3	4.39E-3	4.42E-3	4.62E-3	4.50E-3	4.25E-3	3.90E-3	3.14E-3
Thymus	1.65E-2	1.84E-2	1.81E-2	1.46E-2	9.49E-3	6.51E-3	6.42E-3	6.49E-3	6.05E-3	5.63E-3	5.21E-3	4.04E-3
Thyroid	1.49E-2	1.49E-2	1.43E-2	1.13E-2	7.33E-3	5.43E-3	5.46E-3	5.62E-3	5.33E-3	4.94E-3	4.60E-3	3.75E-3
Upper large intestine	1.18E-2	1.07E-2	1.06E-2	1.00E-2	7.61E-3	5.61E-3	5.40E-3	5.40E-3	5.15E-3	4.81E-3	4.48E-3	3.71E-3
Whole body	1.54E-2	1.49E-2	1.41E-2	1.21E-2	8.51E-3	5.21E-3	4.65E-3	4.62E-3	4.35E-3	4.04E-3	3.77E-3	3.05E-3

Table E-34 SAFs (kg^{-1}) for 25 target organs and for adipose as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.82E-2	2.97E-2	2.28E-2	1.41E-2	7.61E-3	5.25E-3	5.40E-3	5.66E-3	5.34E-3	4.92E-3	4.55E-3	3.57E-3
Adrenal	5.24E-3	9.88E-3	1.09E-2	9.19E-3	6.88E-3	5.75E-3	5.63E-3	5.68E-3	5.23E-3	4.97E-3	4.64E-3	3.87E-3
Bladder	7.88E-3	1.23E-2	1.40E-2	1.39E-2	1.09E-2	8.26E-3	7.98E-3	7.87E-3	7.39E-3	6.83E-3	6.44E-3	5.27E-3
Bone (hard bone)	2.28E-3	5.95E-3	1.06E-2	1.82E-2	1.91E-2	9.68E-3	5.40E-3	4.16E-3	3.76E-3	3.48E-3	3.28E-3	2.78E-3
Bone (marrow)	6.76E-4	8.40E-4	1.10E-3	1.66E-3	2.16E-3	2.54E-3	2.85E-3	3.01E-3	2.93E-3	2.79E-3	2.64E-3	2.20E-3
Brain	4.67E-6	1.43E-5	4.33E-5	2.97E-4	7.37E-4	8.52E-4	9.33E-4	1.03E-3	1.04E-3	1.01E-3	9.79E-4	8.65E-4
Breast	2.44E-3	3.70E-3	4.27E-3	3.93E-3	2.76E-3	2.19E-3	2.35E-3	2.61E-3	2.62E-3	2.51E-3	2.40E-3	2.01E-3
Esophagus	8.03E-3	1.18E-2	1.18E-2	8.91E-3	6.20E-3	4.93E-3	4.95E-3	5.02E-3	4.76E-3	4.38E-3	4.07E-3	3.31E-3
Gall bladder	2.20E-3	3.68E-3	4.94E-3	6.82E-3	6.73E-3	5.20E-3	4.97E-3	4.90E-3	4.72E-3	4.37E-3	4.16E-3	3.58E-3
Heart	1.36E-3	2.60E-3	3.68E-3	4.85E-3	4.68E-3	3.77E-3	3.65E-3	3.67E-3	3.48E-3	3.26E-3	3.09E-3	2.57E-3
Kidney	3.23E-3	6.64E-3	9.75E-3	1.20E-2	9.73E-3	7.19E-3	6.79E-3	6.67E-3	6.27E-3	5.85E-3	5.46E-3	4.56E-3
Liver	1.20E-3	2.56E-3	3.99E-3	5.79E-3	5.64E-3	4.47E-3	4.29E-3	4.31E-3	4.12E-3	3.89E-3	3.68E-3	3.11E-3
Lower large intestine	9.95E-3	1.54E-2	1.79E-2	1.70E-2	1.20E-2	8.53E-3	8.19E-3	8.14E-3	7.64E-3	7.05E-3	6.56E-3	5.33E-3
Lung	2.21E-3	3.93E-3	5.29E-3	6.31E-3	5.30E-3	3.98E-3	3.88E-3	3.92E-3	3.69E-3	3.45E-3	3.25E-3	2.72E-3
Muscle	5.28E-3	8.03E-3	9.16E-3	8.28E-3	5.55E-3	4.06E-3	4.12E-3	4.30E-3	4.13E-3	3.88E-3	3.65E-3	3.02E-3
Pancreas	4.03E-3	7.74E-3	1.01E-2	1.10E-2	9.09E-3	6.73E-3	6.30E-3	6.17E-3	5.76E-3	5.35E-3	5.07E-3	4.13E-3
Skin	1.18E-2	1.40E-2	1.20E-2	7.49E-3	3.92E-3	2.88E-3	3.17E-3	3.49E-3	3.29E-3	3.00E-3	2.75E-3	2.14E-3
Small Intestine	9.15E-3	1.53E-2	1.82E-2	1.77E-2	1.25E-2	8.72E-3	8.27E-3	8.16E-3	7.64E-3	7.11E-3	6.61E-3	5.40E-3
Spleen	3.04E-3	6.84E-3	9.93E-3	1.15E-2	8.74E-3	6.23E-3	5.96E-3	5.99E-3	5.64E-3	5.29E-3	5.00E-3	4.12E-3
Stomach	7.17E-3	1.08E-2	1.21E-2	1.21E-2	9.05E-3	6.41E-3	6.09E-3	6.10E-3	5.81E-3	5.38E-3	5.04E-3	4.12E-3
Testis	1.52E-3	5.18E-3	8.94E-3	1.06E-2	7.73E-3	5.50E-3	5.46E-3	5.74E-3	5.54E-3	5.24E-3	4.88E-3	4.12E-3
Thymus	1.16E-3	2.28E-3	3.28E-3	4.47E-3	4.34E-3	3.44E-3	3.44E-3	3.51E-3	3.32E-3	3.15E-3	2.89E-3	2.43E-3
Thyroid	6.33E-3	1.15E-2	1.39E-2	1.16E-2	6.96E-3	4.94E-3	5.03E-3	5.20E-3	4.96E-3	4.54E-3	4.21E-3	3.56E-3
Upper large intestine	8.73E-3	1.26E-2	1.42E-2	1.39E-2	1.01E-2	7.08E-3	6.76E-3	6.77E-3	6.40E-3	5.98E-3	5.57E-3	4.61E-3
Whole body	1.49E-2	1.40E-2	1.28E-2	1.06E-2	7.43E-3	4.93E-3	4.53E-3	4.57E-3	4.33E-3	4.03E-3	3.77E-3	3.06E-3

Table E-35 SAFs (kg^{-1}) for 25 target organs and for adrenal as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	5.17E-3	9.85E-3	1.10E-2	9.22E-3	7.04E-3	5.71E-3	5.58E-3	5.56E-3	5.26E-3	4.92E-3	4.63E-3	3.80E-3
Adrenal	7.28E+1	4.81E+1	2.81E+1	1.05E+1	3.24E+0	1.87E+0	2.06E+0	2.16E+0	1.86E+0	1.53E+0	1.26E+0	6.44E-1
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.04E-4	1.15E-3	1.41E-3	1.66E-3	1.75E-3	1.78E-3	1.73E-3	1.59E-3
Bone (hard bone)	1.22E-3	6.69E-3	1.55E-2	2.91E-2	3.33E-2	1.82E-2	9.88E-3	6.94E-3	6.01E-3	5.49E-3	5.13E-3	4.32E-3
Bone (marrow)	3.19E-4	1.25E-3	2.52E-3	4.33E-3	5.44E-3	6.22E-3	6.76E-3	6.81E-3	6.38E-3	5.96E-3	5.58E-3	4.55E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.98E-6	3.90E-5	7.41E-5	1.31E-4	1.89E-4	2.22E-4	2.43E-4	2.70E-4
Breast	0.00E+0	1.03E-5	6.54E-5	5.12E-4	2.17E-3	2.87E-3	3.06E-3	3.31E-3	3.35E-3	3.25E-3	3.09E-3	2.72E-3
Esophagus	0.00E+0	2.83E-5	1.72E-3	1.23E-2	1.71E-2	1.48E-2	1.37E-2	1.30E-2	1.19E-2	1.10E-2	1.03E-2	8.55E-3
Gall bladder	0.00E+0	1.65E-2	9.41E-2	1.79E-1	1.31E-1	8.18E-2	7.34E-2	6.94E-2	6.30E-2	5.70E-2	5.27E-2	4.30E-2
Heart	0.00E+0	0.00E+0	1.93E-4	4.28E-3	1.02E-2	1.00E-2	9.18E-3	8.66E-3	8.06E-3	7.59E-3	7.15E-3	6.06E-3
Kidney	2.23E-4	1.74E-2	6.12E-2	1.00E-1	7.86E-2	5.49E-2	5.04E-2	4.73E-2	4.29E-2	3.93E-2	3.64E-2	2.98E-2
Liver	1.20E-2	4.96E-2	9.51E-2	1.28E-1	9.38E-2	6.14E-2	5.60E-2	5.32E-2	4.85E-2	4.44E-2	4.12E-2	3.32E-2
Lower large intestine	0.00E+0	0.00E+0	3.18E-4	3.75E-3	7.09E-3	6.88E-3	6.42E-3	6.15E-3	5.78E-3	5.44E-3	5.17E-3	4.39E-3
Lung	4.63E-7	2.50E-4	2.32E-3	9.89E-3	1.32E-2	1.12E-2	1.03E-2	9.70E-3	8.89E-3	8.22E-3	7.66E-3	6.38E-3
Muscle	2.53E-3	5.26E-3	6.27E-3	6.03E-3	5.20E-3	4.52E-3	4.48E-3	4.49E-3	4.25E-3	4.00E-3	3.77E-3	3.14E-3
Pancreas	3.17E-3	4.06E-2	1.25E-1	2.05E-1	1.49E-1	9.36E-2	8.41E-2	7.89E-2	7.11E-2	6.50E-2	6.03E-2	4.85E-2
Skin	0.00E+0	0.00E+0	6.87E-6	3.41E-4	1.19E-3	1.51E-3	1.65E-3	1.83E-3	1.83E-3	1.75E-3	1.67E-3	1.45E-3
Small Intestine	0.00E+0	7.63E-6	4.03E-4	4.91E-3	1.09E-2	1.10E-2	1.00E-2	9.33E-3	8.64E-3	8.02E-3	7.56E-3	6.34E-3
Spleen	2.45E-4	1.26E-2	4.70E-2	8.60E-2	6.84E-2	4.63E-2	4.21E-2	3.98E-2	3.63E-2	3.34E-2	3.10E-2	2.53E-2
Stomach	2.93E-5	5.18E-3	2.45E-2	5.20E-2	5.02E-2	3.61E-2	3.21E-2	2.99E-2	2.72E-2	2.50E-2	2.32E-2	1.90E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.71E-4	2.73E-4	4.39E-4	5.82E-4	6.59E-4	6.77E-4	7.00E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	3.21E-4	2.21E-3	3.20E-3	3.07E-3	2.98E-3	2.96E-3	2.93E-3	2.85E-3	2.51E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.96E-4	1.25E-3	1.37E-3	1.46E-3	1.48E-3	1.44E-3	1.43E-3	1.30E-3
Upper large intestine	0.00E+0	2.97E-5	1.42E-3	1.30E-2	2.19E-2	1.87E-2	1.66E-2	1.53E-2	1.40E-2	1.29E-2	1.21E-2	1.00E-2
Whole body	1.53E-2	1.53E-2	1.52E-2	1.46E-2	1.22E-2	8.62E-3	7.50E-3	7.08E-3	6.54E-3	6.05E-3	5.64E-3	4.59E-3

Table E-36 SAFs (kg^{-1}) for 25 target organs and for bladder as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	7.89E-3	1.22E-2	1.39E-2	1.38E-2	1.07E-2	8.19E-3	7.90E-3	7.81E-3	7.32E-3	6.82E-3	6.38E-3	5.22E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.12E-3	1.42E-3	1.63E-3	1.77E-3	1.74E-3	1.74E-3	1.64E-3
Bladder	1.68E+1	9.38E+0	5.45E+0	2.26E+0	8.00E-1	4.64E-1	4.90E-1	4.99E-1	4.21E-1	3.47E-1	2.92E-1	1.79E-1
Bone (hard bone)	9.89E-4	5.30E-3	1.20E-2	2.50E-2	3.06E-2	1.74E-2	9.55E-3	6.62E-3	5.66E-3	5.14E-3	4.79E-3	4.04E-3
Bone (marrow)	3.87E-4	8.13E-4	1.35E-3	2.74E-3	3.96E-3	4.72E-3	5.05E-3	5.00E-3	4.82E-3	4.58E-3	4.32E-3	3.56E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.75E-6	8.64E-6	1.94E-5	3.01E-5	3.79E-5	5.73E-5
Breast	0.00E+0	3.31E-6	1.62E-5	3.75E-5	4.09E-5	6.34E-5	9.92E-5	1.78E-4	2.69E-4	3.20E-4	3.44E-4	3.77E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.79E-4	2.39E-4	3.37E-4	4.02E-4	4.42E-4	4.77E-4	4.69E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.50E-4	1.77E-3	1.91E-3	2.22E-3	2.29E-3	2.21E-3	2.19E-3	2.05E-3
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.48E-5	1.53E-4	2.15E-4	3.14E-4	4.06E-4	4.51E-4	4.80E-4	5.01E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	3.81E-4	2.59E-3	3.97E-3	4.08E-3	4.09E-3	3.99E-3	3.83E-3	3.68E-3	3.18E-3
Liver	0.00E+0	0.00E+0	0.00E+0	2.24E-5	4.18E-4	9.58E-4	1.15E-3	1.37E-3	1.50E-3	1.52E-3	1.51E-3	1.42E-3
Lower large intestine	4.76E-2	1.10E-1	1.75E-1	1.89E-1	1.15E-1	6.97E-2	6.47E-2	6.23E-2	5.68E-2	5.17E-2	4.79E-2	3.80E-2
Lung	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.46E-5	1.69E-4	2.39E-4	3.58E-4	4.55E-4	5.04E-4	5.31E-4	5.35E-4
Muscle	1.48E-3	3.24E-3	4.66E-3	6.25E-3	6.46E-3	5.70E-3	5.57E-3	5.51E-3	5.20E-3	4.89E-3	4.61E-3	3.87E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	6.05E-5	9.44E-4	1.90E-3	2.10E-3	2.25E-3	2.32E-3	2.28E-3	2.24E-3	2.00E-3
Skin	0.00E+0	1.11E-5	1.69E-4	7.67E-4	1.31E-3	1.51E-3	1.68E-3	1.88E-3	1.89E-3	1.81E-3	1.73E-3	1.49E-3
Small Intestine	1.06E-3	5.13E-3	1.40E-2	3.23E-2	3.44E-2	2.53E-2	2.27E-2	2.12E-2	1.94E-2	1.78E-2	1.66E-2	1.36E-2
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.50E-4	9.18E-4	1.14E-3	1.36E-3	1.49E-3	1.52E-3	1.51E-3	1.41E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	8.79E-5	9.99E-4	1.74E-3	1.86E-3	2.07E-3	2.15E-3	2.13E-3	2.08E-3	1.91E-3
Testis	0.00E+0	0.00E+0	5.38E-4	9.64E-3	2.27E-2	2.11E-2	2.00E-2	1.98E-2	1.84E-2	1.73E-2	1.63E-2	1.34E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.22E-5	1.19E-4	1.82E-4	2.35E-4	2.76E-4	3.12E-4	3.11E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.54E-4	1.70E-4	2.06E-4	2.17E-4	2.45E-4	2.43E-4	2.39E-4
Upper large intestine	0.00E+0	0.00E+0	1.20E-4	2.37E-3	6.36E-3	6.98E-3	6.72E-3	6.56E-3	6.21E-3	5.89E-3	5.57E-3	4.77E-3
Whole body	1.27E-2	1.12E-2	1.10E-2	1.15E-2	1.04E-2	7.63E-3	6.63E-3	6.25E-3	5.81E-3	5.40E-3	5.05E-3	4.16E-3

Table E-37 SAFs (kg^{-1}) for 25 target organs and for bladder content as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	8.55E-4	4.12E-3	7.91E-3	1.14E-2	1.02E-2	7.92E-3	7.54E-3	7.39E-3	6.93E-3	6.48E-3	6.09E-3	5.07E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.12E-3	1.43E-3	1.67E-3	1.77E-3	1.77E-3	1.74E-3	1.57E-3
Bladder	1.49E+0	2.23E+0	2.12E+0	1.30E+0	5.51E-1	3.12E-1	3.12E-1	3.17E-1	2.91E-1	2.63E-1	2.37E-1	1.70E-1
Bone (hard bone)	1.50E-4	2.56E-3	8.77E-3	2.30E-2	2.99E-2	1.73E-2	9.44E-3	6.47E-3	5.50E-3	5.03E-3	4.69E-3	3.96E-3
Bone (marrow)	7.12E-5	5.07E-4	1.24E-3	2.68E-3	3.91E-3	4.63E-3	4.93E-3	4.86E-3	4.68E-3	4.45E-3	4.22E-3	3.48E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.15E-6	7.72E-6	1.85E-5	2.92E-5	3.67E-5	5.59E-5
Breast	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.20E-6	4.14E-5	7.88E-5	1.52E-4	2.36E-4	2.79E-4	3.25E-4	3.53E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.19E-4	1.87E-4	2.71E-4	3.48E-4	3.96E-4	4.02E-4	4.40E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.77E-3	2.00E-3	2.19E-3	2.32E-3	2.25E-3	2.11E-3	1.99E-3
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.62E-5	1.16E-4	1.80E-4	2.82E-4	3.75E-4	4.24E-4	4.53E-4	4.78E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	3.94E-4	2.71E-3	4.04E-3	4.14E-3	4.14E-3	4.02E-3	3.81E-3	3.67E-3	3.21E-3
Liver	0.00E+0	0.00E+0	0.00E+0	2.24E-5	4.27E-4	9.66E-4	1.15E-3	1.37E-3	1.50E-3	1.52E-3	1.52E-3	1.42E-3
Lower large intestine	1.93E-2	8.66E-2	1.66E-1	1.95E-1	1.20E-1	7.28E-2	6.71E-2	6.45E-2	5.87E-2	5.37E-2	4.96E-2	3.97E-2
Lung	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.51E-5	1.38E-4	2.11E-4	3.28E-4	4.33E-4	4.81E-4	5.04E-4	5.22E-4
Muscle	2.52E-4	1.26E-3	2.87E-3	5.37E-3	6.26E-3	5.63E-3	5.46E-3	5.37E-3	5.07E-3	4.76E-3	4.51E-3	3.81E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	6.17E-5	9.49E-4	1.91E-3	2.11E-3	2.25E-3	2.32E-3	2.25E-3	2.23E-3	2.01E-3
Skin	0.00E+0	2.82E-6	8.44E-5	6.01E-4	1.24E-3	1.47E-3	1.64E-3	1.85E-3	1.85E-3	1.77E-3	1.70E-3	1.47E-3
Small Intestine	4.04E-5	1.62E-3	9.58E-3	3.08E-2	3.49E-2	2.59E-2	2.30E-2	2.13E-2	1.94E-2	1.79E-2	1.66E-2	1.37E-2
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.51E-4	9.19E-4	1.14E-3	1.36E-3	1.47E-3	1.50E-3	1.51E-3	1.40E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	8.05E-5	9.96E-4	1.76E-3	1.90E-3	2.07E-3	2.17E-3	2.12E-3	2.09E-3	1.91E-3
Testis	0.00E+0	0.00E+0	3.33E-4	8.51E-3	2.36E-2	2.22E-2	2.12E-2	2.09E-2	1.94E-2	1.82E-2	1.71E-2	1.42E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.00E-5	7.01E-5	1.27E-4	1.98E-4	2.35E-4	2.42E-4	2.96E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.62E-4
Upper large intestine	0.00E+0	0.00E+0	9.17E-5	2.25E-3	6.46E-3	7.05E-3	6.73E-3	6.56E-3	6.24E-3	5.88E-3	5.58E-3	4.76E-3
Whole body	1.26E-3	3.51E-3	6.18E-3	9.65E-3	9.98E-3	7.42E-3	6.36E-3	5.95E-3	5.54E-3	5.18E-3	4.87E-3	4.07E-3

Table E-38 SAFs (kg^{-1}) for 25 target organs and for brain as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	4.70E-6	1.45E-5	4.34E-5	2.83E-4	6.81E-4	8.07E-4	9.11E-4	1.02E-3	1.03E-3	1.00E-3	9.66E-4	8.44E-4
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Bone (hard bone)	3.28E-3	1.08E-2	2.35E-2	4.92E-2	4.82E-2	2.02E-2	1.05E-2	8.06E-3	7.24E-3	6.66E-3	6.21E-3	5.17E-3
Bone (marrow)	1.08E-3	1.41E-3	1.79E-3	2.63E-3	2.84E-3	2.87E-3	3.09E-3	3.18E-3	3.01E-3	2.82E-3	2.63E-3	2.13E-3
Brain	5.70E-1	5.36E-1	4.80E-1	3.37E-1	1.72E-1	1.04E-1	1.02E-1	1.02E-1	9.27E-2	8.37E-2	7.63E-2	5.76E-2
Breast	0.00E+0	0.00E+0	0.00E+0	1.02E-5	1.20E-4	2.94E-4	4.28E-4	6.37E-4	7.52E-4	7.98E-4	8.06E-4	7.35E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.08E-4	7.98E-4	1.02E-3	1.18E-3	1.21E-3	1.26E-3	1.16E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.26E-5	2.95E-4	4.11E-4	5.71E-4	6.96E-4	7.51E-4	7.67E-4	7.57E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.02E-5	3.90E-5	7.96E-5	1.24E-4	1.54E-4	1.72E-4	2.00E-4
Liver	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.01E-5	5.77E-5	9.80E-5	1.68E-4	2.33E-4	2.68E-4	2.86E-4	3.03E-4
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.94E-6	1.65E-5	3.42E-5	5.85E-5	7.31E-5	8.63E-5	1.05E-4
Lung	0.00E+0	0.00E+0	0.00E+0	3.82E-6	1.19E-4	3.59E-4	4.95E-4	6.84E-4	8.15E-4	8.59E-4	8.70E-4	8.40E-4
Muscle	2.10E-5	3.74E-5	8.45E-5	4.67E-4	1.06E-3	1.19E-3	1.30E-3	1.39E-3	1.36E-3	1.30E-3	1.24E-3	1.08E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.31E-5	5.68E-5	9.95E-5	1.46E-4	1.69E-4	1.90E-4	2.16E-4
Skin	0.00E+0	0.00E+0	1.72E-5	4.24E-4	1.16E-3	1.38E-3	1.62E-3	1.82E-3	1.75E-3	1.63E-3	1.53E-3	1.27E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.64E-6	1.32E-5	3.07E-5	5.47E-5	7.24E-5	8.63E-5	1.11E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.08E-5	1.03E-4	1.85E-4	2.54E-4	2.90E-4	3.00E-4	3.23E-4
Stomach	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.30E-5	7.32E-5	1.27E-4	1.82E-4	2.09E-4	2.33E-4	2.49E-4
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.46E-4	6.25E-4	8.66E-4	1.02E-3	1.07E-3	1.11E-3	1.06E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.23E-4	1.92E-3	2.39E-3	2.85E-3	3.05E-3	3.08E-3	2.98E-3	2.69E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.24E-5	2.58E-5	5.38E-5	8.88E-5	1.12E-4	1.30E-4	1.61E-4
Whole body	1.53E-2	1.53E-2	1.52E-2	1.47E-2	1.07E-2	5.88E-3	4.84E-3	4.66E-3	4.33E-3	3.98E-3	3.69E-3	2.95E-3

Table E-39 SAFs (kg^{-1}) for 25 target organs and for breast as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	2.40E-3	3.68E-3	4.26E-3	3.95E-3	2.80E-3	2.21E-3	2.38E-3	2.65E-3	2.64E-3	2.53E-3	2.41E-3	2.02E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	4.06E-4	2.37E-3	3.13E-3	3.22E-3	3.44E-3	3.51E-3	3.22E-3	3.27E-3	2.74E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.17E-5	1.10E-4	1.96E-4	3.00E-4	3.22E-4	3.42E-4	3.81E-4
Bone (hard bone)	2.15E-5	8.78E-4	3.85E-3	9.91E-3	1.14E-2	5.82E-3	3.25E-3	2.57E-3	2.40E-3	2.27E-3	2.15E-3	1.88E-3
Bone (marrow)	8.51E-6	1.63E-4	5.30E-4	1.16E-3	1.49E-3	1.66E-3	1.90E-3	2.09E-3	2.09E-3	2.02E-3	1.92E-3	1.62E-3
Brain	0.00E+0	0.00E+0	0.00E+0	9.10E-6	1.28E-4	3.11E-4	4.48E-4	6.57E-4	7.80E-4	8.23E-4	8.29E-4	7.85E-4
Breast	7.74E+0	5.54E+0	3.58E+0	1.52E+0	5.04E-1	2.96E-1	3.26E-1	3.48E-1	3.10E-1	2.66E-1	2.30E-1	1.40E-1
Esophagus	0.00E+0	0.00E+0	1.19E-4	3.74E-3	8.53E-3	7.82E-3	7.64E-3	7.69E-3	7.20E-3	6.82E-3	6.42E-3	5.44E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.61E-3	2.32E-3	2.44E-3	2.75E-3	2.86E-3	2.87E-3	2.80E-3	2.53E-3
Heart	0.00E+0	1.97E-4	3.94E-3	2.00E-2	2.36E-2	1.72E-2	1.67E-2	1.68E-2	1.57E-2	1.46E-2	1.36E-2	1.12E-2
Kidney	0.00E+0	0.00E+0	0.00E+0	6.64E-5	7.13E-4	1.22E-3	1.37E-3	1.62E-3	1.75E-3	1.76E-3	1.73E-3	1.58E-3
Liver	0.00E+0	0.00E+0	4.74E-5	1.38E-3	4.04E-3	4.17E-3	4.19E-3	4.47E-3	4.45E-3	4.29E-3	4.10E-3	3.55E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	4.80E-5	3.03E-4	4.59E-4	5.22E-4	6.71E-4	7.73E-4	8.25E-4	8.09E-4	8.01E-4
Lung	1.19E-6	8.86E-4	7.94E-3	2.29E-2	2.03E-2	1.38E-2	1.35E-2	1.37E-2	1.28E-2	1.19E-2	1.11E-2	9.18E-3
Muscle	3.54E-2	2.97E-2	2.28E-2	1.24E-2	5.52E-3	2.46E-3	2.63E-3	2.88E-3	2.82E-3	2.68E-3	2.54E-3	2.11E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	3.02E-4	2.06E-3	2.76E-3	2.88E-3	3.18E-3	3.26E-3	3.20E-3	3.09E-3	2.72E-3
Skin	1.80E-2	2.06E-2	1.70E-2	9.48E-3	4.22E-3	2.97E-3	3.37E-3	3.74E-3	3.49E-3	3.14E-3	2.84E-3	2.13E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	1.11E-5	1.86E-4	4.33E-4	5.36E-4	7.20E-4	8.67E-4	9.26E-4	9.51E-4	9.26E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	7.57E-4	2.59E-3	2.86E-3	2.92E-3	3.09E-3	3.04E-3	2.90E-3	2.76E-3	2.38E-3
Stomach	0.00E+0	0.00E+0	4.64E-5	9.95E-4	2.85E-3	3.09E-3	3.17E-3	3.43E-3	3.48E-3	3.39E-3	3.29E-3	2.88E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.28E-4	1.51E-4	1.98E-4
Thymus	0.00E+0	1.76E-4	4.49E-3	2.40E-2	2.75E-2	2.00E-2	1.99E-2	2.03E-2	1.91E-2	1.77E-2	1.64E-2	1.34E-2
Thyroid	0.00E+0	0.00E+0	0.00E+0	6.32E-4	2.78E-3	3.41E-3	3.63E-3	4.05E-3	4.33E-3	4.21E-3	4.22E-3	3.70E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	4.02E-5	4.67E-4	8.14E-4	9.49E-4	1.19E-3	1.35E-3	1.41E-3	1.42E-3	1.36E-3
Whole body	2.70E-2	2.20E-2	1.69E-2	1.06E-2	6.07E-3	3.55E-3	3.44E-3	3.63E-3	3.50E-3	3.27E-3	3.06E-3	2.48E-3

Table E-40 SAFs (kg^{-1}) for 25 target organs and for bronchi as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.10E-3	4.41E-3	5.11E-3	5.60E-3	4.76E-3	3.79E-3	3.75E-3	3.77E-3	3.56E-3	3.32E-3	3.11E-3	2.56E-3
Adrenal	0.00E+0	0.00E+0	3.53E-4	4.32E-3	8.00E-3	8.23E-3	7.98E-3	7.42E-3	6.81E-3	6.48E-3	5.88E-3	4.88E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.46E-4	2.05E-4	3.21E-4	3.93E-4	4.38E-4	4.76E-4	4.77E-4
Bone (hard bone)	6.64E-5	1.66E-3	9.18E-3	2.76E-2	3.06E-2	1.47E-2	7.48E-3	5.24E-3	4.57E-3	4.18E-3	3.90E-3	3.29E-3
Bone (marrow)	2.80E-5	3.88E-4	1.46E-3	3.37E-3	4.08E-3	4.23E-3	4.46E-3	4.44E-3	4.13E-3	3.83E-3	3.58E-3	2.92E-3
Brain	0.00E+0	0.00E+0	0.00E+0	2.56E-6	9.32E-5	3.21E-4	4.68E-4	6.71E-4	8.12E-4	8.65E-4	8.83E-4	8.57E-4
Breast	0.00E+0	9.52E-5	3.18E-3	1.60E-2	1.73E-2	1.27E-2	1.24E-2	1.25E-2	1.16E-2	1.07E-2	1.00E-2	8.16E-3
Esophagus	5.29E-3	6.99E-2	1.58E-1	1.72E-1	9.71E-2	6.00E-2	5.76E-2	5.65E-2	5.13E-2	4.72E-2	4.36E-2	3.49E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	1.14E-3	3.75E-3	4.51E-3	4.24E-3	4.23E-3	3.92E-3	3.80E-3	3.55E-3	3.05E-3
Heart	9.16E-2	2.36E-1	3.05E-1	2.50E-1	1.26E-1	7.39E-2	7.19E-2	7.23E-2	6.69E-2	6.12E-2	5.63E-2	4.33E-2
Kidney	0.00E+0	8.86E-6	2.82E-5	5.22E-4	2.14E-3	2.84E-3	2.90E-3	2.97E-3	2.87E-3	2.74E-3	2.63E-3	2.31E-3
Liver	0.00E+0	1.03E-4	1.52E-3	7.16E-3	1.01E-2	8.53E-3	7.76E-3	7.30E-3	6.74E-3	6.26E-3	5.87E-3	4.86E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	1.62E-4	6.01E-4	8.32E-4	8.77E-4	9.78E-4	1.03E-3	1.06E-3	1.03E-3	9.63E-4
Lung	2.13E-1	3.12E-1	2.97E-1	1.84E-1	8.15E-2	4.66E-2	4.48E-2	4.44E-2	4.04E-2	3.65E-2	3.31E-2	2.40E-2
Muscle	6.68E-5	2.49E-4	1.13E-3	3.13E-3	3.68E-3	3.08E-3	3.02E-3	3.00E-3	2.82E-3	2.64E-3	2.49E-3	2.09E-3
Pancreas	0.00E+0	0.00E+0	2.50E-5	1.37E-3	4.67E-3	5.28E-3	4.91E-3	4.71E-3	4.47E-3	4.22E-3	4.03E-3	3.39E-3
Skin	2.60E-5	3.44E-5	1.61E-4	1.07E-3	1.76E-3	1.74E-3	1.87E-3	2.01E-3	1.94E-3	1.81E-3	1.70E-3	1.42E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	4.06E-5	4.26E-4	8.13E-4	9.27E-4	1.08E-3	1.17E-3	1.19E-3	1.18E-3	1.10E-3
Spleen	0.00E+0	3.15E-5	8.52E-4	5.28E-3	8.16E-3	7.23E-3	6.64E-3	6.24E-3	5.71E-3	5.26E-3	4.97E-3	4.04E-3
Stomach	0.00E+0	1.16E-4	1.32E-3	4.59E-3	6.45E-3	5.75E-3	5.33E-3	5.07E-3	4.79E-3	4.47E-3	4.24E-3	3.57E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.77E-5	8.36E-5	1.46E-4	1.78E-4	1.91E-4	2.38E-4
Thymus	1.74E-4	6.57E-3	3.44E-2	9.07E-2	7.08E-2	4.44E-2	4.15E-2	4.13E-2	3.83E-2	3.53E-2	3.30E-2	2.69E-2
Thyroid	4.52E-3	5.20E-3	6.91E-3	1.67E-2	1.86E-2	1.42E-2	1.34E-2	1.30E-2	1.22E-2	1.11E-2	1.05E-2	8.53E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	1.57E-4	1.02E-3	1.52E-3	1.59E-3	1.73E-3	1.79E-3	1.78E-3	1.72E-3	1.57E-3
Whole body	6.91E-3	1.12E-2	1.29E-2	1.30E-2	9.95E-3	6.33E-3	5.43E-3	5.17E-3	4.79E-3	4.42E-3	4.12E-3	3.32E-3

Table E-41 SAFs (kg^{-1}) for 25 target organs and for esophagus as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	8.01E-3	1.18E-2	1.18E-2	8.85E-3	6.04E-3	4.81E-3	4.86E-3	4.94E-3	4.66E-3	4.34E-3	4.05E-3	3.27E-3
Adrenal	0.00E+0	0.00E+0	1.76E-3	1.19E-2	1.66E-2	1.45E-2	1.35E-2	1.30E-2	1.18E-2	1.11E-2	1.03E-2	8.42E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.69E-4	2.38E-4	3.35E-4	4.09E-4	4.53E-4	4.58E-4	4.89E-4
Bone (hard bone)	4.65E-3	1.48E-2	2.56E-2	4.20E-2	4.24E-2	2.01E-2	1.08E-2	8.07E-3	7.12E-3	6.50E-3	6.04E-3	5.00E-3
Bone (marrow)	1.34E-3	2.08E-3	2.75E-3	4.16E-3	5.20E-3	5.76E-3	6.24E-3	6.34E-3	6.06E-3	5.69E-3	5.33E-3	4.32E-3
Brain	0.00E+0	0.00E+0	0.00E+0	7.75E-6	1.77E-4	5.82E-4	7.88E-4	1.01E-3	1.17E-3	1.20E-3	1.22E-3	1.16E-3
Breast	0.00E+0	0.00E+0	1.40E-4	3.74E-3	8.02E-3	7.48E-3	7.38E-3	7.52E-3	7.17E-3	6.72E-3	6.33E-3	5.26E-3
Esophagus	2.08E+1	1.33E+1	7.82E+0	3.01E+0	9.69E-1	5.65E-1	6.18E-1	6.47E-1	5.60E-1	4.64E-1	3.85E-1	2.10E-1
Gall bladder	0.00E+0	0.00E+0	0.00E+0	1.61E-3	5.24E-3	5.90E-3	5.55E-3	5.26E-3	5.03E-3	4.78E-3	4.44E-3	3.88E-3
Heart	2.55E-2	8.67E-2	1.49E-1	1.55E-1	9.13E-2	5.64E-2	5.39E-2	5.33E-2	4.92E-2	4.52E-2	4.20E-2	3.35E-2
Kidney	1.73E-5	3.53E-5	6.71E-5	1.11E-3	3.40E-3	4.08E-3	3.99E-3	3.89E-3	3.75E-3	3.59E-3	3.41E-3	2.93E-3
Liver	1.11E-3	4.57E-3	9.21E-3	1.56E-2	1.57E-2	1.24E-2	1.15E-2	1.10E-2	1.01E-2	9.40E-3	8.78E-3	7.21E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	2.96E-4	1.03E-3	1.19E-3	1.19E-3	1.23E-3	1.26E-3	1.24E-3	1.21E-3	1.13E-3
Lung	5.57E-3	2.37E-2	4.81E-2	6.34E-2	4.44E-2	2.94E-2	2.73E-2	2.60E-2	2.35E-2	2.15E-2	1.99E-2	1.62E-2
Muscle	3.08E-2	2.13E-2	1.42E-2	7.86E-3	5.06E-3	4.16E-3	4.24E-3	4.30E-3	4.00E-3	3.67E-3	3.38E-3	2.67E-3
Pancreas	0.00E+0	0.00E+0	3.58E-4	5.43E-3	1.04E-2	9.42E-3	8.42E-3	7.82E-3	7.29E-3	6.81E-3	6.41E-3	5.40E-3
Skin	2.22E-5	3.33E-5	1.38E-4	7.11E-4	1.40E-3	1.59E-3	1.75E-3	1.90E-3	1.85E-3	1.74E-3	1.64E-3	1.38E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	1.20E-4	7.39E-4	1.18E-3	1.23E-3	1.32E-3	1.38E-3	1.38E-3	1.35E-3	1.25E-3
Spleen	0.00E+0	1.77E-5	8.95E-4	7.95E-3	1.24E-2	1.04E-2	9.38E-3	8.74E-3	8.08E-3	7.49E-3	6.98E-3	5.80E-3
Stomach	7.50E-3	1.41E-2	1.74E-2	1.96E-2	1.59E-2	1.16E-2	1.07E-2	1.03E-2	9.52E-3	8.88E-3	8.29E-3	6.76E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.54E-5	7.77E-5	1.34E-4	1.81E-4	1.86E-4	2.07E-4
Thymus	0.00E+0	2.69E-4	7.47E-3	3.73E-2	3.98E-2	2.84E-2	2.62E-2	2.55E-2	2.37E-2	2.23E-2	2.07E-2	1.71E-2
Thyroid	2.16E-2	1.46E-1	2.83E-1	2.57E-1	1.25E-1	7.29E-2	7.13E-2	7.08E-2	6.54E-2	5.94E-2	5.53E-2	4.38E-2
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	3.04E-4	1.53E-3	2.07E-3	2.08E-3	2.13E-3	2.17E-3	2.12E-3	2.03E-3	1.83E-3
Whole body	2.64E-2	2.22E-2	1.90E-2	1.56E-2	1.17E-2	7.60E-3	6.57E-3	6.30E-3	5.81E-3	5.33E-3	4.93E-3	3.93E-3

Table E-42 SAFs (kg^{-1}) for 25 target organs and for gall bladder as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	2.22E-3	3.64E-3	4.90E-3	6.84E-3	6.65E-3	5.16E-3	4.87E-3	4.86E-3	4.63E-3	4.36E-3	4.12E-3	3.45E-3
Adrenal	0.00E+0	1.65E-2	9.36E-2	1.79E-1	1.31E-1	8.17E-2	7.34E-2	6.91E-2	6.21E-2	5.69E-2	5.28E-2	4.28E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.96E-4	1.76E-3	1.92E-3	2.16E-3	2.27E-3	2.24E-3	2.18E-3	1.95E-3
Bone (hard bone)	0.00E+0	1.39E-5	4.61E-4	4.79E-3	1.15E-2	8.66E-3	4.78E-3	2.99E-3	2.58E-3	2.41E-3	2.28E-3	1.98E-3
Bone (marrow)	0.00E+0	2.62E-6	8.37E-5	8.11E-4	2.02E-3	2.72E-3	3.03E-3	3.15E-3	2.94E-3	2.75E-3	2.60E-3	2.19E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.60E-5	5.10E-5	1.01E-4	1.55E-4	1.84E-4	2.04E-4	2.30E-4
Breast	0.00E+0	0.00E+0	0.00E+0	1.97E-4	1.44E-3	2.05E-3	2.24E-3	2.63E-3	2.82E-3	2.80E-3	2.73E-3	2.44E-3
Esophagus	0.00E+0	0.00E+0	0.00E+0	1.64E-3	5.36E-3	5.83E-3	5.47E-3	5.29E-3	4.99E-3	4.77E-3	4.52E-3	3.83E-3
Gall bladder	7.45E+1	4.11E+1	2.37E+1	9.30E+0	3.00E+0	1.71E+0	1.84E+0	1.89E+0	1.57E+0	1.28E+0	1.06E+0	6.09E-1
Heart	0.00E+0	0.00E+0	2.01E-5	1.51E-3	5.59E-3	5.98E-3	5.53E-3	5.38E-3	5.19E-3	4.95E-3	4.71E-3	4.08E-3
Kidney	0.00E+0	1.61E-3	1.80E-2	6.29E-2	6.45E-2	4.42E-2	3.86E-2	3.56E-2	3.22E-2	2.94E-2	2.73E-2	2.24E-2
Liver	1.65E-1	2.61E-1	3.13E-1	2.90E-1	1.71E-1	1.01E-1	9.38E-2	9.13E-2	8.33E-2	7.59E-2	6.98E-2	5.43E-2
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	5.66E-4	3.19E-3	4.24E-3	4.13E-3	4.10E-3	4.01E-3	3.81E-3	3.66E-3	3.20E-3
Lung	0.00E+0	0.00E+0	6.44E-5	2.40E-3	6.28E-3	6.03E-3	5.54E-3	5.38E-3	5.09E-3	4.80E-3	4.54E-3	3.87E-3
Muscle	1.07E-4	3.33E-4	1.04E-3	2.79E-3	3.57E-3	3.14E-3	3.04E-3	3.08E-3	2.98E-3	2.84E-3	2.71E-3	2.33E-3
Pancreas	2.08E-2	1.48E-1	3.12E-1	3.65E-1	2.18E-1	1.26E-1	1.15E-1	1.11E-1	1.01E-1	9.21E-2	8.53E-2	6.81E-2
Skin	0.00E+0	4.64E-6	1.41E-4	9.83E-4	1.72E-3	1.72E-3	1.82E-3	2.02E-3	2.01E-3	1.91E-3	1.82E-3	1.55E-3
Small Intestine	0.00E+0	5.41E-5	1.94E-3	1.38E-2	2.16E-2	1.73E-2	1.52E-2	1.41E-2	1.30E-2	1.20E-2	1.13E-2	9.37E-3
Spleen	0.00E+0	0.00E+0	0.00E+0	1.32E-3	6.56E-3	8.10E-3	7.59E-3	7.22E-3	6.80E-3	6.38E-3	6.10E-3	5.19E-3
Stomach	0.00E+0	5.24E-5	2.41E-3	2.00E-2	3.10E-2	2.39E-2	2.07E-2	1.92E-2	1.75E-2	1.63E-2	1.52E-2	1.26E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.74E-4	3.82E-4	5.90E-4	7.36E-4	8.27E-4	8.49E-4	8.58E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	1.67E-4	1.46E-3	2.11E-3	2.09E-3	2.15E-3	2.19E-3	2.19E-3	2.18E-3	1.95E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.13E-4	6.79E-4	7.78E-4	8.75E-4	9.44E-4	9.53E-4	9.78E-4	9.15E-4
Upper large intestine	2.03E-2	9.26E-2	1.66E-1	1.84E-1	1.13E-1	6.74E-2	6.21E-2	6.02E-2	5.51E-2	5.05E-2	4.69E-2	3.73E-2
Whole body	1.23E-2	1.17E-2	1.22E-2	1.25E-2	1.02E-2	7.29E-3	6.51E-3	6.24E-3	5.81E-3	5.39E-3	5.04E-3	4.13E-3

Table E-43 SAFs (kg^{-1}) for 25 target organs and for gall bladder content as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.69E-4	1.73E-3	3.55E-3	6.29E-3	6.49E-3	5.06E-3	4.77E-3	4.74E-3	4.53E-3	4.27E-3	4.04E-3	3.41E-3
Adrenal	0.00E+0	6.37E-3	5.62E-2	1.41E-1	1.13E-1	7.25E-2	6.48E-2	6.05E-2	5.47E-2	4.97E-2	4.65E-2	3.77E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.71E-4	1.75E-3	1.94E-3	2.15E-3	2.26E-3	2.23E-3	2.17E-3	2.00E-3
Bone (hard bone)	0.00E+0	7.54E-6	3.65E-4	4.43E-3	1.11E-2	8.45E-3	4.68E-3	2.93E-3	2.53E-3	2.35E-3	2.23E-3	1.94E-3
Bone (marrow)	0.00E+0	1.21E-6	5.99E-5	7.25E-4	1.93E-3	2.62E-3	2.92E-3	3.05E-3	2.86E-3	2.67E-3	2.53E-3	2.13E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.53E-5	5.10E-5	1.01E-4	1.54E-4	1.85E-4	2.04E-4	2.29E-4
Breast	0.00E+0	0.00E+0	0.00E+0	1.96E-4	1.43E-3	2.04E-3	2.24E-3	2.65E-3	2.80E-3	2.81E-3	2.73E-3	2.42E-3
Esophagus	0.00E+0	0.00E+0	0.00E+0	1.49E-3	5.23E-3	5.61E-3	5.34E-3	5.17E-3	4.95E-3	4.64E-3	4.34E-3	3.73E-3
Gall bladder	1.72E+1	1.99E+1	1.52E+1	7.04E+0	2.41E+0	1.34E+0	1.41E+0	1.48E+0	1.36E+0	1.20E+0	1.06E+0	6.52E-1
Heart	0.00E+0	0.00E+0	1.81E-5	1.45E-3	5.46E-3	5.88E-3	5.46E-3	5.32E-3	5.12E-3	4.89E-3	4.68E-3	4.07E-3
Kidney	0.00E+0	8.31E-4	1.39E-2	5.77E-2	6.20E-2	4.28E-2	3.73E-2	3.43E-2	3.09E-2	2.83E-2	2.64E-2	2.15E-2
Liver	4.00E-2	1.55E-1	2.54E-1	2.72E-1	1.67E-1	9.89E-2	9.07E-2	8.78E-2	8.02E-2	7.34E-2	6.79E-2	5.38E-2
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	5.39E-4	3.12E-3	4.20E-3	4.09E-3	4.04E-3	3.96E-3	3.78E-3	3.64E-3	3.16E-3
Lung	0.00E+0	0.00E+0	5.54E-5	2.29E-3	6.14E-3	5.93E-3	5.45E-3	5.30E-3	5.02E-3	4.74E-3	4.49E-3	3.84E-3
Muscle	1.43E-5	1.54E-4	7.84E-4	2.60E-3	3.48E-3	3.08E-3	2.98E-3	3.02E-3	2.92E-3	2.79E-3	2.66E-3	2.30E-3
Pancreas	2.33E-3	6.71E-2	2.18E-1	3.15E-1	2.01E-1	1.17E-1	1.06E-1	1.01E-1	9.18E-2	8.39E-2	7.76E-2	6.27E-2
Skin	0.00E+0	2.75E-6	1.22E-4	9.76E-4	1.72E-3	1.72E-3	1.82E-3	2.02E-3	2.00E-3	1.91E-3	1.81E-3	1.55E-3
Small Intestine	0.00E+0	4.62E-5	1.89E-3	1.40E-2	2.18E-2	1.74E-2	1.53E-2	1.42E-2	1.30E-2	1.21E-2	1.14E-2	9.43E-3
Spleen	0.00E+0	0.00E+0	0.00E+0	1.21E-3	6.33E-3	7.79E-3	7.35E-3	7.01E-3	6.63E-3	6.20E-3	5.94E-3	5.03E-3
Stomach	0.00E+0	3.88E-5	2.27E-3	1.99E-2	3.11E-2	2.38E-2	2.08E-2	1.91E-2	1.76E-2	1.62E-2	1.51E-2	1.25E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.67E-4	3.89E-4	6.00E-4	7.73E-4	8.37E-4	8.39E-4	8.65E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	1.62E-4	1.44E-3	2.09E-3	2.08E-3	2.19E-3	2.21E-3	2.22E-3	2.13E-3	1.98E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.16E-4	6.56E-4	7.75E-4	8.89E-4	9.15E-4	9.14E-4	9.57E-4	9.09E-4
Upper large intestine	6.77E-3	7.44E-2	1.63E-1	1.91E-1	1.17E-1	6.95E-2	6.39E-2	6.19E-2	5.66E-2	5.20E-2	4.82E-2	3.88E-2
Whole body	2.84E-3	6.33E-3	9.33E-3	1.15E-2	9.88E-3	7.09E-3	6.30E-3	6.03E-3	5.63E-3	5.26E-3	4.93E-3	4.08E-3

Table E-44 SAFs (kg^{-1}) for 25 target organs and for heart as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.36E-3	2.61E-3	3.68E-3	4.81E-3	4.51E-3	3.63E-3	3.58E-3	3.63E-3	3.46E-3	3.25E-3	3.07E-3	2.57E-3
Adrenal	0.00E+0	0.00E+0	2.12E-4	4.27E-3	1.00E-2	9.78E-3	9.14E-3	8.69E-3	8.11E-3	7.67E-3	7.18E-3	6.05E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.52E-4	2.10E-4	3.21E-4	4.23E-4	4.50E-4	4.86E-4	4.97E-4
Bone (hard bone)	7.31E-5	1.31E-3	6.42E-3	2.13E-2	2.62E-2	1.32E-2	6.79E-3	4.75E-3	4.14E-3	3.80E-3	3.55E-3	3.02E-3
Bone (marrow)	1.68E-5	2.79E-4	1.01E-3	2.58E-3	3.43E-3	3.61E-3	3.80E-3	3.83E-3	3.64E-3	3.44E-3	3.23E-3	2.69E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.96E-5	2.64E-4	3.87E-4	5.54E-4	6.85E-4	7.38E-4	7.64E-4	7.62E-4
Breast	0.00E+0	2.48E-4	4.43E-3	2.03E-2	2.26E-2	1.67E-2	1.63E-2	1.66E-2	1.56E-2	1.45E-2	1.36E-2	1.10E-2
Esophagus	2.55E-2	8.65E-2	1.48E-1	1.55E-1	9.07E-2	5.61E-2	5.37E-2	5.33E-2	4.92E-2	4.52E-2	4.21E-2	3.37E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	1.51E-3	5.71E-3	6.02E-3	5.52E-3	5.49E-3	5.19E-3	5.06E-3	4.83E-3	4.17E-3
Heart	1.77E+0	1.42E+0	1.05E+0	5.70E-1	2.38E-1	1.38E-1	1.41E-1	1.45E-1	1.32E-1	1.17E-1	1.05E-1	7.29E-2
Kidney	3.17E-6	5.07E-6	1.19E-5	4.91E-4	2.50E-3	3.32E-3	3.26E-3	3.30E-3	3.24E-3	3.13E-3	3.03E-3	2.65E-3
Liver	6.53E-7	4.00E-4	3.24E-3	1.23E-2	1.58E-2	1.23E-2	1.12E-2	1.07E-2	9.93E-3	9.25E-3	8.69E-3	7.27E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	2.56E-4	9.44E-4	1.13E-3	1.14E-3	1.21E-3	1.28E-3	1.29E-3	1.28E-3	1.18E-3
Lung	2.08E-2	5.88E-2	9.06E-2	9.30E-2	5.55E-2	3.30E-2	3.04E-2	2.93E-2	2.67E-2	2.45E-2	2.27E-2	1.82E-2
Muscle	1.48E-4	6.43E-4	1.47E-3	2.98E-3	3.44E-3	2.86E-3	2.80E-3	2.81E-3	2.68E-3	2.52E-3	2.39E-3	2.03E-3
Pancreas	0.00E+0	0.00E+0	9.97E-5	3.19E-3	8.77E-3	8.49E-3	7.67E-3	7.30E-3	6.85E-3	6.49E-3	6.15E-3	5.24E-3
Skin	6.57E-7	9.36E-6	1.51E-4	1.01E-3	1.74E-3	1.72E-3	1.86E-3	2.01E-3	1.94E-3	1.82E-3	1.71E-3	1.44E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	8.15E-5	6.71E-4	1.12E-3	1.21E-3	1.34E-3	1.42E-3	1.46E-3	1.45E-3	1.34E-3
Spleen	0.00E+0	9.29E-6	3.97E-4	4.31E-3	8.64E-3	7.85E-3	7.10E-3	6.72E-3	6.26E-3	5.87E-3	5.52E-3	4.63E-3
Stomach	0.00E+0	5.24E-4	2.94E-3	9.03E-3	1.18E-2	9.52E-3	8.59E-3	8.30E-3	7.76E-3	7.31E-3	6.89E-3	5.82E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.71E-5	8.03E-5	1.34E-4	1.86E-4	2.07E-4	2.57E-4
Thymus	1.85E-1	3.39E-1	3.98E-1	3.14E-1	1.56E-1	9.10E-2	9.05E-2	9.30E-2	8.59E-2	7.91E-2	7.30E-2	5.59E-2
Thyroid	0.00E+0	1.79E-4	3.40E-3	1.62E-2	1.85E-2	1.40E-2	1.33E-2	1.33E-2	1.26E-2	1.18E-2	1.09E-2	9.20E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	2.89E-4	1.61E-3	2.14E-3	2.14E-3	2.26E-3	2.31E-3	2.30E-3	2.25E-3	2.02E-3
Whole body	1.46E-2	1.37E-2	1.31E-2	1.24E-2	9.65E-3	6.27E-3	5.47E-3	5.27E-3	4.90E-3	4.53E-3	4.22E-3	3.41E-3

Table E-45 SAFs (kg^{-1}) for 25 target organs and for heart content as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.33E-4	4.61E-4	1.35E-3	3.31E-3	3.96E-3	3.33E-3	3.24E-3	3.27E-3	3.14E-3	2.97E-3	2.81E-3	2.40E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	5.36E-3	1.39E-2	1.31E-2	1.19E-2	1.11E-2	1.04E-2	9.90E-3	9.07E-3	7.58E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.66E-4	2.52E-4	3.76E-4	4.80E-4	5.43E-4	5.81E-4	5.84E-4
Bone (hard bone)	3.23E-4	8.95E-4	3.12E-3	1.46E-2	2.19E-2	1.20E-2	6.19E-3	4.21E-3	3.66E-3	3.37E-3	3.16E-3	2.70E-3
Bone (marrow)	1.46E-4	2.01E-4	5.15E-4	1.83E-3	2.92E-3	3.21E-3	3.40E-3	3.43E-3	3.26E-3	3.08E-3	2.91E-3	2.43E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.24E-4	6.07E-4	7.17E-4	8.52E-4	9.31E-4	9.54E-4	9.50E-4	8.98E-4
Breast	0.00E+0	4.21E-5	2.02E-3	1.65E-2	2.19E-2	1.66E-2	1.61E-2	1.63E-2	1.52E-2	1.42E-2	1.33E-2	1.09E-2
Esophagus	2.54E-5	6.34E-3	3.91E-2	8.60E-2	6.77E-2	4.27E-2	3.95E-2	3.81E-2	3.51E-2	3.24E-2	3.02E-2	2.47E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	2.08E-3	8.16E-3	8.13E-3	7.47E-3	7.03E-3	6.72E-3	6.56E-3	5.93E-3	5.14E-3
Heart	1.18E-1	2.76E-1	3.83E-1	3.49E-1	1.84E-1	1.06E-1	1.02E-1	1.03E-1	9.50E-2	8.70E-2	8.02E-2	6.28E-2
Kidney	0.00E+0	0.00E+0	0.00E+0	5.90E-4	3.29E-3	4.28E-3	4.15E-3	4.09E-3	3.96E-3	3.83E-3	3.69E-3	3.20E-3
Liver	0.00E+0	3.36E-4	4.01E-3	1.78E-2	2.27E-2	1.70E-2	1.52E-2	1.44E-2	1.33E-2	1.23E-2	1.16E-2	9.59E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	2.64E-4	1.18E-3	1.44E-3	1.43E-3	1.50E-3	1.54E-3	1.55E-3	1.55E-3	1.39E-3
Lung	4.28E-5	4.54E-3	2.55E-2	5.66E-2	4.50E-2	2.78E-2	2.49E-2	2.37E-2	2.16E-2	1.98E-2	1.84E-2	1.51E-2
Muscle	1.08E-4	4.26E-4	1.14E-3	2.70E-3	3.33E-3	2.79E-3	2.72E-3	2.73E-3	2.61E-3	2.46E-3	2.34E-3	2.00E-3
Pancreas	0.00E+0	0.00E+0	1.32E-4	4.97E-3	1.33E-2	1.21E-2	1.07E-2	1.00E-2	9.26E-3	8.72E-3	8.23E-3	6.90E-3
Skin	2.24E-4	5.37E-4	5.78E-4	1.05E-3	1.71E-3	1.71E-3	1.83E-3	1.99E-3	1.93E-3	1.82E-3	1.71E-3	1.44E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	1.14E-4	9.53E-4	1.51E-3	1.58E-3	1.71E-3	1.79E-3	1.80E-3	1.77E-3	1.62E-3
Spleen	0.00E+0	0.00E+0	1.57E-4	3.89E-3	9.87E-3	9.15E-3	8.17E-3	7.63E-3	7.17E-3	6.66E-3	6.35E-3	5.39E-3
Stomach	0.00E+0	9.00E-5	1.70E-3	1.03E-2	1.58E-2	1.26E-2	1.13E-2	1.07E-2	1.01E-2	9.37E-3	8.76E-3	7.40E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.73E-5	1.04E-4	1.65E-4	2.19E-4	2.36E-4	2.80E-4
Thymus	5.47E-4	2.51E-2	8.60E-2	1.30E-1	8.65E-2	5.25E-2	4.98E-2	4.97E-2	4.63E-2	4.26E-2	3.97E-2	3.26E-2
Thyroid	0.00E+0	0.00E+0	4.70E-4	3.85E-3	7.19E-3	6.74E-3	6.38E-3	6.49E-3	6.35E-3	6.04E-3	5.75E-3	5.05E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	3.97E-4	2.24E-3	2.89E-3	2.82E-3	2.91E-3	2.91E-3	2.86E-3	2.80E-3	2.44E-3
Whole body	1.04E-3	2.68E-3	4.96E-3	8.44E-3	8.40E-3	5.73E-3	4.89E-3	4.65E-3	4.35E-3	4.06E-3	3.82E-3	3.20E-3

Table E-46 SAFs (kg^{-1}) for 25 target organs and for kidney as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.23E-3	6.64E-3	9.74E-3	1.19E-2	9.61E-3	7.07E-3	6.71E-3	6.62E-3	6.23E-3	5.82E-3	5.47E-3	4.53E-3
Adrenal	2.33E-4	1.73E-2	6.13E-2	9.98E-2	7.71E-2	5.37E-2	4.99E-2	4.72E-2	4.31E-2	3.92E-2	3.63E-2	2.96E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	3.79E-4	2.59E-3	3.92E-3	4.02E-3	4.09E-3	3.98E-3	3.84E-3	3.61E-3	3.18E-3
Bone (hard bone)	1.72E-5	4.09E-4	2.67E-3	1.21E-2	2.13E-2	1.40E-2	7.76E-3	5.22E-3	4.45E-3	4.06E-3	3.80E-3	3.25E-3
Bone (marrow)	6.48E-6	7.04E-5	3.79E-4	1.53E-3	3.00E-3	3.94E-3	4.27E-3	4.28E-3	4.14E-3	3.93E-3	3.73E-3	3.11E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.59E-5	3.45E-5	7.35E-5	1.19E-4	1.46E-4	1.63E-4	1.91E-4
Breast	0.00E+0	0.00E+0	2.10E-6	6.74E-5	6.20E-4	1.06E-3	1.25E-3	1.53E-3	1.67E-3	1.67E-3	1.71E-3	1.53E-3
Esophagus	0.00E+0	3.66E-5	7.28E-5	1.08E-3	3.35E-3	4.02E-3	3.98E-3	3.93E-3	3.76E-3	3.60E-3	3.44E-3	2.96E-3
Gall bladder	0.00E+0	1.59E-3	1.80E-2	6.27E-2	6.40E-2	4.39E-2	3.90E-2	3.51E-2	3.24E-2	2.94E-2	2.72E-2	2.25E-2
Heart	3.07E-6	4.98E-6	1.23E-5	4.96E-4	2.48E-3	3.29E-3	3.26E-3	3.28E-3	3.23E-3	3.14E-3	3.02E-3	2.64E-3
Kidney	3.49E+0	3.00E+0	2.31E+0	1.21E+0	4.69E-1	2.66E-1	2.72E-1	2.78E-1	2.50E-1	2.21E-1	1.96E-1	1.34E-1
Liver	1.33E-4	3.23E-3	1.36E-2	3.31E-2	3.46E-2	2.57E-2	2.31E-2	2.16E-2	1.98E-2	1.83E-2	1.70E-2	1.40E-2
Lower large intestine	3.28E-3	1.34E-2	2.71E-2	3.67E-2	2.78E-2	1.95E-2	1.80E-2	1.72E-2	1.59E-2	1.46E-2	1.38E-2	1.12E-2
Lung	2.32E-5	2.95E-5	1.09E-4	1.42E-3	3.65E-3	3.98E-3	3.87E-3	3.86E-3	3.72E-3	3.54E-3	3.37E-3	2.91E-3
Muscle	4.61E-4	1.74E-3	3.62E-3	5.84E-3	5.57E-3	4.58E-3	4.45E-3	4.43E-3	4.22E-3	3.98E-3	3.76E-3	3.19E-3
Pancreas	3.58E-5	4.46E-3	2.72E-2	7.49E-2	7.32E-2	5.02E-2	4.40E-2	4.03E-2	3.64E-2	3.32E-2	3.09E-2	2.51E-2
Skin	0.00E+0	0.00E+0	4.24E-5	7.16E-4	1.55E-3	1.65E-3	1.77E-3	1.95E-3	1.95E-3	1.86E-3	1.78E-3	1.53E-3
Small Intestine	5.39E-3	1.82E-2	3.43E-2	5.21E-2	4.58E-2	3.21E-2	2.88E-2	2.69E-2	2.44E-2	2.24E-2	2.08E-2	1.69E-2
Spleen	6.09E-5	8.71E-3	4.24E-2	8.57E-2	6.67E-2	4.27E-2	3.85E-2	3.65E-2	3.33E-2	3.06E-2	2.86E-2	2.33E-2
Stomach	0.00E+0	1.57E-4	4.01E-3	2.48E-2	3.43E-2	2.60E-2	2.27E-2	2.09E-2	1.90E-2	1.75E-2	1.63E-2	1.35E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.89E-4	5.42E-4	7.47E-4	1.00E-3	1.17E-3	1.22E-3	1.24E-3	1.21E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.86E-4	1.09E-3	1.19E-3	1.30E-3	1.38E-3	1.41E-3	1.35E-3	1.34E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.45E-4	5.39E-4	6.52E-4	7.07E-4	7.19E-4	7.47E-4	6.76E-4
Upper large intestine	1.01E-2	3.56E-2	6.91E-2	9.59E-2	7.13E-2	4.60E-2	4.15E-2	3.92E-2	3.59E-2	3.28E-2	3.05E-2	2.46E-2
Whole body	1.53E-2	1.52E-2	1.49E-2	1.40E-2	1.13E-2	8.13E-3	7.20E-3	6.85E-3	6.35E-3	5.88E-3	5.49E-3	4.47E-3

Table E-47 SAFs (kg^{-1}) for 25 target organs and for liver as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.20E-3	2.56E-3	3.97E-3	5.70E-3	5.53E-3	4.38E-3	4.23E-3	4.28E-3	4.10E-3	3.88E-3	3.67E-3	3.09E-3
Adrenal	1.19E-2	4.96E-2	9.47E-2	1.28E-1	9.37E-2	6.11E-2	5.58E-2	5.33E-2	4.84E-2	4.47E-2	4.10E-2	3.34E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.16E-4	9.42E-4	1.15E-3	1.38E-3	1.54E-3	1.53E-3	1.54E-3	1.43E-3
Bone (hard bone)	1.68E-5	5.61E-4	2.77E-3	1.03E-2	1.59E-2	9.80E-3	5.26E-3	3.48E-3	3.02E-3	2.79E-3	2.63E-3	2.27E-3
Bone (marrow)	6.59E-6	9.86E-5	3.83E-4	1.34E-3	2.39E-3	2.92E-3	3.19E-3	3.29E-3	3.12E-3	2.94E-3	2.78E-3	2.33E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.02E-6	5.10E-5	9.07E-5	1.61E-4	2.27E-4	2.63E-4	2.81E-4	3.01E-4
Breast	0.00E+0	0.00E+0	4.50E-5	1.34E-3	3.67E-3	3.85E-3	3.96E-3	4.32E-3	4.33E-3	4.19E-3	4.00E-3	3.46E-3
Esophagus	1.12E-3	4.54E-3	9.25E-3	1.59E-2	1.58E-2	1.24E-2	1.16E-2	1.10E-2	1.02E-2	9.47E-3	8.81E-3	7.26E-3
Gall bladder	1.65E-1	2.61E-1	3.12E-1	2.90E-1	1.71E-1	1.02E-1	9.38E-2	9.14E-2	8.29E-2	7.58E-2	7.00E-2	5.44E-2
Heart	0.00E+0	4.01E-4	3.24E-3	1.23E-2	1.58E-2	1.23E-2	1.11E-2	1.06E-2	9.92E-3	9.25E-3	8.70E-3	7.23E-3
Kidney	1.33E-4	3.23E-3	1.36E-2	3.33E-2	3.51E-2	2.60E-2	2.32E-2	2.17E-2	1.98E-2	1.83E-2	1.71E-2	1.41E-2
Liver	6.86E-1	6.36E-1	5.58E-1	3.80E-1	1.90E-1	1.11E-1	1.07E-1	1.06E-1	9.68E-2	8.71E-2	7.91E-2	5.89E-2
Lower large intestine	0.00E+0	0.00E+0	4.10E-5	7.84E-4	2.49E-3	3.06E-3	3.03E-3	3.11E-3	3.10E-3	3.00E-3	2.88E-3	2.55E-3
Lung	2.73E-3	7.07E-3	1.28E-2	1.97E-2	1.74E-2	1.22E-2	1.11E-2	1.05E-2	9.70E-3	8.96E-3	8.35E-3	6.90E-3
Muscle	3.00E-4	1.17E-3	2.35E-3	3.94E-3	4.07E-3	3.36E-3	3.28E-3	3.33E-3	3.21E-3	3.04E-3	2.89E-3	2.47E-3
Pancreas	1.07E-3	1.32E-2	4.39E-2	9.06E-2	7.82E-2	5.10E-2	4.50E-2	4.21E-2	3.81E-2	3.50E-2	3.24E-2	2.64E-2
Skin	0.00E+0	3.42E-5	3.62E-4	1.51E-3	2.14E-3	1.99E-3	2.10E-3	2.29E-3	2.24E-3	2.11E-3	2.00E-3	1.69E-3
Small Intestine	0.00E+0	1.24E-5	3.53E-4	3.60E-3	8.09E-3	7.85E-3	7.19E-3	6.95E-3	6.57E-3	6.21E-3	5.89E-3	5.01E-3
Spleen	0.00E+0	0.00E+0	2.25E-4	3.25E-3	8.56E-3	8.96E-3	8.31E-3	7.96E-3	7.49E-3	7.06E-3	6.71E-3	5.66E-3
Stomach	8.31E-4	6.98E-3	1.70E-2	3.07E-2	3.04E-2	2.19E-2	1.98E-2	1.88E-2	1.74E-2	1.60E-2	1.50E-2	1.24E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.44E-4	2.33E-4	3.86E-4	5.16E-4	5.77E-4	6.26E-4	6.29E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	1.22E-3	3.91E-3	4.16E-3	3.95E-3	3.90E-3	3.78E-3	3.67E-3	3.49E-3	3.06E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	1.84E-4	8.93E-4	1.37E-3	1.46E-3	1.51E-3	1.54E-3	1.47E-3	1.42E-3	1.36E-3
Upper large intestine	3.51E-3	1.23E-2	2.23E-2	3.39E-2	3.14E-2	2.21E-2	2.00E-2	1.92E-2	1.77E-2	1.65E-2	1.53E-2	1.26E-2
Whole body	1.52E-2	1.52E-2	1.50E-2	1.38E-2	1.04E-2	7.13E-3	6.41E-3	6.22E-3	5.80E-3	5.37E-3	5.01E-3	4.07E-3

Table E-48 SAFs (kg^{-1}) for 25 target organs and for lower large intestine as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	9.95E-3	1.54E-2	1.78E-2	1.70E-2	1.19E-2	8.41E-3	8.09E-3	8.05E-3	7.55E-3	7.03E-3	6.56E-3	5.34E-3
Adrenal	0.00E+0	0.00E+0	3.01E-4	3.75E-3	6.77E-3	6.50E-3	6.27E-3	6.11E-3	5.84E-3	5.46E-3	5.12E-3	4.34E-3
Bladder	4.75E-2	1.10E-1	1.75E-1	1.89E-1	1.14E-1	6.91E-2	6.44E-2	6.22E-2	5.66E-2	5.17E-2	4.80E-2	3.80E-2
Bone (hard bone)	8.44E-6	4.84E-4	3.10E-3	1.36E-2	2.23E-2	1.41E-2	7.74E-3	5.21E-3	4.46E-3	4.07E-3	3.82E-3	3.27E-3
Bone (marrow)	2.95E-6	1.12E-4	5.36E-4	1.83E-3	3.13E-3	3.87E-3	4.15E-3	4.10E-3	3.92E-3	3.71E-3	3.52E-3	2.94E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.17E-6	1.31E-5	3.15E-5	5.50E-5	7.21E-5	8.29E-5	1.03E-4
Breast	0.00E+0	0.00E+0	0.00E+0	4.70E-5	2.60E-4	4.00E-4	4.81E-4	6.26E-4	7.42E-4	7.94E-4	7.85E-4	7.62E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	2.87E-4	9.76E-4	1.13E-3	1.15E-3	1.22E-3	1.28E-3	1.26E-3	1.24E-3	1.14E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	5.33E-4	3.06E-3	4.23E-3	4.11E-3	4.18E-3	3.93E-3	3.81E-3	3.71E-3	3.18E-3
Heart	0.00E+0	0.00E+0	8.27E-6	2.61E-4	8.99E-4	1.11E-3	1.13E-3	1.22E-3	1.28E-3	1.29E-3	1.26E-3	1.17E-3
Kidney	3.30E-3	1.35E-2	2.71E-2	3.66E-2	2.76E-2	1.93E-2	1.79E-2	1.73E-2	1.59E-2	1.47E-2	1.37E-2	1.12E-2
Liver	0.00E+0	0.00E+0	4.05E-5	7.72E-4	2.40E-3	2.97E-3	2.99E-3	3.08E-3	3.08E-3	2.99E-3	2.87E-3	2.56E-3
Lower large intestine	4.92E+0	2.84E+0	1.74E+0	7.79E-1	2.93E-1	1.70E-1	1.76E-1	1.78E-1	1.53E-1	1.29E-1	1.11E-1	7.20E-2
Lung	0.00E+0	6.93E-7	5.63E-5	6.45E-4	1.25E-3	1.26E-3	1.27E-3	1.37E-3	1.41E-3	1.40E-3	1.37E-3	1.25E-3
Muscle	7.13E-4	1.91E-3	3.62E-3	5.96E-3	5.97E-3	4.99E-3	4.86E-3	4.83E-3	4.59E-3	4.32E-3	4.09E-3	3.45E-3
Pancreas	1.67E-3	7.12E-3	1.44E-2	2.13E-2	1.89E-2	1.39E-2	1.27E-2	1.21E-2	1.12E-2	1.03E-2	9.67E-3	8.01E-3
Skin	0.00E+0	1.63E-5	2.12E-4	1.08E-3	1.67E-3	1.68E-3	1.83E-3	2.03E-3	2.02E-3	1.92E-3	1.83E-3	1.57E-3
Small Intestine	8.76E-3	3.25E-2	5.57E-2	6.96E-2	5.26E-2	3.50E-2	3.19E-2	3.03E-2	2.77E-2	2.54E-2	2.36E-2	1.90E-2
Spleen	1.43E-3	1.24E-2	2.78E-2	4.06E-2	3.02E-2	1.94E-2	1.78E-2	1.72E-2	1.59E-2	1.47E-2	1.37E-2	1.13E-2
Stomach	1.63E-2	2.90E-2	3.39E-2	3.57E-2	2.65E-2	1.77E-2	1.63E-2	1.59E-2	1.48E-2	1.36E-2	1.26E-2	1.02E-2
Testis	0.00E+0	0.00E+0	0.00E+0	1.54E-3	5.96E-3	6.75E-3	6.64E-3	6.78E-3	6.59E-3	6.31E-3	5.94E-3	5.07E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.37E-4	3.87E-4	4.64E-4	5.57E-4	5.58E-4	6.05E-4	5.97E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.38E-4	1.78E-4	2.19E-4	2.73E-4	3.04E-4	3.00E-4	3.44E-4
Upper large intestine	7.80E-3	2.09E-2	3.00E-2	3.06E-2	2.25E-2	1.62E-2	1.52E-2	1.48E-2	1.37E-2	1.27E-2	1.19E-2	9.68E-3
Whole body	1.25E-2	1.13E-2	1.13E-2	1.17E-2	1.01E-2	7.28E-3	6.41E-3	6.10E-3	5.68E-3	5.28E-3	4.94E-3	4.07E-3

Table E-49 SAFs (kg^{-1}) for 25 target organs and for lower large intestine content as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.53E-3	7.23E-3	1.27E-2	1.52E-2	1.14E-2	8.22E-3	7.85E-3	7.76E-3	7.29E-3	6.80E-3	6.39E-3	5.28E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	2.32E-3	4.46E-3	4.94E-3	4.85E-3	4.80E-3	4.60E-3	4.43E-3	4.11E-3	3.66E-3
Bladder	1.07E-2	6.28E-2	1.50E-1	1.96E-1	1.26E-1	7.61E-2	7.00E-2	6.70E-2	6.10E-2	5.58E-2	5.17E-2	4.16E-2
Bone (hard bone)	8.09E-7	2.59E-4	2.59E-3	1.37E-2	2.33E-2	1.49E-2	8.12E-3	5.41E-3	4.62E-3	4.21E-3	3.94E-3	3.37E-3
Bone (marrow)	3.41E-7	6.24E-5	4.55E-4	1.88E-3	3.33E-3	4.12E-3	4.41E-3	4.33E-3	4.12E-3	3.91E-3	3.69E-3	3.08E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.20E-6	9.75E-6	2.47E-5	4.39E-5	5.84E-5	7.00E-5	9.07E-5
Breast	0.00E+0	0.00E+0	0.00E+0	2.42E-5	1.61E-4	2.75E-4	3.50E-4	4.78E-4	5.96E-4	6.56E-4	6.53E-4	6.53E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	1.57E-4	6.23E-4	8.03E-4	8.47E-4	9.36E-4	9.78E-4	9.92E-4	9.92E-4	9.30E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.72E-3	3.73E-3	3.69E-3	3.73E-3	3.59E-3	3.47E-3	3.47E-3	2.94E-3
Heart	0.00E+0	0.00E+0	0.00E+0	1.39E-4	5.60E-4	7.69E-4	8.18E-4	9.24E-4	9.99E-4	1.02E-3	1.02E-3	9.66E-4
Kidney	3.01E-4	5.16E-3	1.55E-2	2.50E-2	2.08E-2	1.55E-2	1.44E-2	1.39E-2	1.28E-2	1.19E-2	1.11E-2	9.21E-3
Liver	0.00E+0	0.00E+0	1.51E-5	4.40E-4	1.73E-3	2.40E-3	2.49E-3	2.64E-3	2.66E-3	2.62E-3	2.54E-3	2.26E-3
Lower large intestine	7.90E-1	1.09E+0	9.81E-1	5.75E-1	2.43E-1	1.39E-1	1.39E-1	1.41E-1	1.30E-1	1.16E-1	1.05E-1	7.43E-2
Lung	0.00E+0	0.00E+0	2.49E-5	3.54E-4	7.83E-4	8.82E-4	9.28E-4	1.05E-3	1.12E-3	1.13E-3	1.11E-3	1.04E-3
Muscle	1.14E-4	9.19E-4	2.73E-3	5.55E-3	5.91E-3	5.04E-3	4.88E-3	4.84E-3	4.59E-3	4.33E-3	4.09E-3	3.47E-3
Pancreas	2.70E-4	2.51E-3	6.98E-3	1.24E-2	1.25E-2	1.00E-2	9.20E-3	8.78E-3	8.21E-3	7.67E-3	7.19E-3	6.02E-3
Skin	0.00E+0	9.64E-6	1.68E-4	9.44E-4	1.54E-3	1.61E-3	1.76E-3	1.96E-3	1.96E-3	1.87E-3	1.78E-3	1.53E-3
Small Intestine	2.38E-3	2.10E-2	4.90E-2	7.01E-2	5.46E-2	3.64E-2	3.29E-2	3.12E-2	2.84E-2	2.60E-2	2.42E-2	1.97E-2
Spleen	1.03E-4	4.10E-3	1.40E-2	2.48E-2	1.99E-2	1.34E-2	1.22E-2	1.19E-2	1.11E-2	1.03E-2	9.65E-3	8.03E-3
Stomach	9.93E-4	5.51E-3	1.09E-2	1.75E-2	1.61E-2	1.17E-2	1.07E-2	1.04E-2	9.71E-3	9.08E-3	8.55E-3	7.08E-3
Testis	0.00E+0	0.00E+0	0.00E+0	1.47E-3	6.16E-3	7.15E-3	7.08E-3	7.18E-3	6.97E-3	6.70E-3	6.31E-3	5.40E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.40E-4	2.87E-4	3.51E-4	4.14E-4	4.83E-4	4.96E-4	5.03E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.06E-5	1.23E-4	1.75E-4	2.20E-4	2.59E-4	2.59E-4	2.89E-4
Upper large intestine	2.62E-3	1.00E-2	1.78E-2	2.14E-2	1.82E-2	1.40E-2	1.31E-2	1.27E-2	1.18E-2	1.09E-2	1.03E-2	8.46E-3
Whole body	1.99E-3	4.87E-3	7.70E-3	1.04E-2	9.82E-3	7.22E-3	6.27E-3	5.93E-3	5.53E-3	5.17E-3	4.86E-3	4.05E-3

Table E-50 SAFs (kg^{-1}) for 25 target organs and for lung as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.99E-3	3.52E-3	4.74E-3	5.68E-3	4.83E-3	3.81E-3	3.81E-3	3.89E-3	3.69E-3	3.23E-3	3.23E-3	2.67E-3
Adrenal	0.00E+0	2.17E-4	2.15E-3	8.90E-3	1.18E-2	1.08E-2	1.03E-2	9.75E-3	8.90E-3	7.59E-3	7.59E-3	6.33E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.70E-4	2.43E-4	3.78E-4	4.73E-4	5.28E-4	5.28E-4	5.51E-4
Bone (hard bone)	2.05E-3	9.26E-3	2.09E-2	3.54E-2	3.09E-2	1.37E-2	7.19E-3	5.28E-3	4.63E-3	3.93E-3	3.93E-3	3.27E-3
Bone (marrow)	7.76E-4	1.74E-3	2.88E-3	3.95E-3	3.91E-3	3.92E-3	4.16E-3	4.18E-3	3.95E-3	3.45E-3	3.45E-3	2.76E-3
Brain	0.00E+0	0.00E+0	0.00E+0	3.34E-6	1.07E-4	3.38E-4	4.84E-4	6.83E-4	8.14E-4	8.70E-4	8.70E-4	8.40E-4
Breast	7.54E-3	9.13E-4	7.54E-3	2.06E-2	1.81E-2	1.31E-2	1.31E-2	1.36E-2	1.28E-2	1.18E-2	1.09E-2	8.99E-3
Esophagus	5.03E-3	2.16E-2	4.41E-2	5.90E-2	4.23E-2	2.88E-2	2.72E-2	2.61E-2	2.36E-2	2.00E-2	2.00E-2	1.60E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	2.18E-3	6.06E-3	5.93E-3	5.61E-3	5.44E-3	5.08E-3	4.55E-3	4.55E-3	3.85E-3
Heart	1.86E-2	5.27E-2	8.14E-2	8.40E-2	5.15E-2	3.22E-2	3.03E-2	2.93E-2	2.67E-2	2.26E-2	2.26E-2	1.78E-2
Kidney	2.12E-5	2.69E-5	9.73E-5	1.33E-3	3.55E-3	3.98E-3	3.91E-3	3.90E-3	3.72E-3	3.43E-3	3.43E-3	2.90E-3
Liver	2.45E-3	6.32E-3	1.15E-2	1.78E-2	1.61E-2	1.19E-2	1.10E-2	1.05E-2	9.68E-3	8.34E-3	8.34E-3	6.81E-3
Lower large intestine	0.00E+0	0.00E+0	5.16E-5	5.94E-4	1.22E-3	1.30E-3	1.31E-3	1.40E-3	1.45E-3	1.39E-3	1.39E-3	1.26E-3
Lung	5.67E-1	4.74E-1	3.52E-1	1.78E-1	7.20E-2	4.12E-2	4.05E-2	4.02E-2	3.57E-2	2.77E-2	2.77E-2	1.89E-2
Muscle	5.67E-4	1.82E-3	3.34E-3	4.86E-3	4.41E-3	3.47E-3	3.46E-3	3.51E-3	3.31E-3	2.91E-3	2.91E-3	2.43E-3
Pancreas	0.00E+0	0.00E+0	1.75E-4	3.25E-3	7.46E-3	7.19E-3	6.61E-3	6.32E-3	5.85E-3	5.17E-3	5.17E-3	4.35E-3
Skin	8.87E-6	6.31E-5	4.96E-4	1.78E-3	2.21E-3	2.01E-3	2.17E-3	2.36E-3	2.27E-3	1.96E-3	1.96E-3	1.64E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	1.09E-4	7.28E-4	1.16E-3	1.26E-3	1.42E-3	1.49E-3	1.46E-3	1.46E-3	1.33E-3
Spleen	1.66E-3	7.81E-3	1.53E-2	2.15E-2	1.69E-2	1.21E-2	1.12E-2	1.08E-2	9.86E-3	8.46E-3	8.46E-3	6.91E-3
Stomach	5.72E-3	1.41E-2	1.81E-2	1.77E-2	1.30E-2	9.51E-3	8.92E-3	8.68E-3	8.00E-3	6.95E-3	6.95E-3	5.60E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.40E-5	9.82E-5	1.63E-4	2.36E-4	2.36E-4	2.62E-4
Thymus	4.38E-2	8.07E-2	9.62E-2	8.46E-2	4.89E-2	3.09E-2	2.94E-2	2.89E-2	2.61E-2	2.19E-2	2.19E-2	1.70E-2
Thyroid	5.60E-5	1.02E-3	7.55E-3	1.93E-2	1.76E-2	1.32E-2	1.29E-2	1.25E-2	1.16E-2	9.91E-3	9.91E-3	8.10E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	3.96E-4	1.69E-3	2.13E-3	2.18E-3	2.29E-3	2.31E-3	2.20E-3	2.20E-3	1.93E-3
Whole body	1.52E-2	1.52E-2	1.49E-2	1.35E-2	9.62E-3	5.99E-3	5.23E-3	5.05E-3	4.67E-3	3.99E-3	3.99E-3	3.20E-3

Table E-51 SAFs (kg^{-1}) for 25 target organs and for muscle as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	5.48E-3	8.34E-3	9.46E-3	8.46E-3	5.64E-3	4.13E-3	4.19E-3	4.38E-3	4.20E-3	3.95E-3	3.71E-3	3.05E-3
Adrenal	2.50E-3	5.26E-3	6.25E-3	6.14E-3	5.15E-3	4.53E-3	4.49E-3	4.48E-3	4.18E-3	4.01E-3	3.71E-3	3.18E-3
Bladder	1.49E-3	3.25E-3	4.68E-3	6.27E-3	6.47E-3	5.79E-3	5.61E-3	5.57E-3	5.29E-3	4.94E-3	4.64E-3	3.91E-3
Bone (hard bone)	2.58E-3	7.45E-3	1.37E-2	2.32E-2	2.32E-2	1.11E-2	6.11E-3	4.71E-3	4.26E-3	3.94E-3	3.70E-3	3.12E-3
Bone (marrow)	6.83E-4	9.52E-4	1.26E-3	1.88E-3	2.39E-3	2.76E-3	3.08E-3	3.24E-3	3.12E-3	2.96E-3	2.80E-3	2.32E-3
Brain	2.07E-5	3.66E-5	8.56E-5	4.93E-4	1.14E-3	1.25E-3	1.32E-3	1.40E-3	1.37E-3	1.31E-3	1.25E-3	1.08E-3
Breast	3.32E-3	6.50E-3	7.65E-3	5.88E-3	3.32E-3	2.43E-3	2.60E-3	2.84E-3	2.81E-3	2.63E-3	2.50E-3	2.05E-3
Esophagus	1.18E-3	2.38E-3	3.01E-3	3.54E-3	3.77E-3	3.44E-3	3.44E-3	3.42E-3	3.24E-3	2.99E-3	2.84E-3	2.38E-3
Gall bladder	1.04E-4	3.29E-4	1.06E-3	2.87E-3	3.45E-3	3.30E-3	3.08E-3	3.08E-3	2.95E-3	2.89E-3	2.69E-3	2.34E-3
Heart	1.11E-4	5.19E-4	1.24E-3	2.71E-3	3.36E-3	2.90E-3	2.79E-3	2.78E-3	2.63E-3	2.47E-3	2.34E-3	1.99E-3
Kidney	4.67E-4	1.75E-3	3.64E-3	5.90E-3	5.74E-3	4.71E-3	4.53E-3	4.48E-3	4.23E-3	3.98E-3	3.78E-3	3.20E-3
Liver	2.98E-4	1.16E-3	2.36E-3	3.96E-3	4.16E-3	3.44E-3	3.32E-3	3.34E-3	3.20E-3	3.03E-3	2.88E-3	2.45E-3
Lower large intestine	7.07E-4	1.91E-3	3.61E-3	5.93E-3	6.12E-3	5.16E-3	4.94E-3	4.88E-3	4.61E-3	4.35E-3	4.10E-3	3.48E-3
Lung	6.24E-4	1.99E-3	3.62E-3	5.24E-3	4.68E-3	3.59E-3	3.48E-3	3.50E-3	3.29E-3	3.08E-3	2.91E-3	2.43E-3
Muscle	3.28E-2	2.82E-2	2.33E-2	1.52E-2	8.18E-3	5.57E-3	5.68E-3	5.89E-3	5.53E-3	5.10E-3	4.71E-3	3.71E-3
Pancreas	1.28E-3	2.49E-3	3.59E-3	4.56E-3	4.55E-3	3.92E-3	3.74E-3	3.68E-3	3.56E-3	3.32E-3	3.16E-3	2.65E-3
Skin	1.54E-3	3.33E-3	4.77E-3	4.82E-3	3.21E-3	2.48E-3	2.71E-3	2.97E-3	2.85E-3	2.63E-3	2.45E-3	2.01E-3
Small Intestine	1.84E-3	2.98E-3	4.32E-3	5.79E-3	5.51E-3	4.58E-3	4.38E-3	4.33E-3	4.14E-3	3.87E-3	3.69E-3	3.10E-3
Spleen	2.00E-4	1.12E-3	2.78E-3	5.21E-3	5.18E-3	4.09E-3	3.95E-3	3.95E-3	3.80E-3	3.54E-3	3.34E-3	2.86E-3
Stomach	9.04E-4	1.92E-3	2.83E-3	3.92E-3	3.95E-3	3.31E-3	3.18E-3	3.21E-3	3.06E-3	2.92E-3	2.76E-3	2.37E-3
Testis	3.09E-3	5.56E-3	7.19E-3	8.43E-3	6.66E-3	5.01E-3	4.91E-3	5.13E-3	4.94E-3	4.63E-3	4.45E-3	3.63E-3
Thymus	1.33E-5	1.56E-4	7.24E-4	2.11E-3	2.75E-3	2.52E-3	2.47E-3	2.52E-3	2.41E-3	2.25E-3	2.11E-3	1.81E-3
Thyroid	2.98E-3	6.72E-3	9.00E-3	8.07E-3	5.21E-3	3.97E-3	4.07E-3	4.18E-3	3.92E-3	3.68E-3	3.47E-3	2.91E-3
Upper large intestine	1.09E-3	2.41E-3	3.60E-3	4.85E-3	4.67E-3	3.82E-3	3.72E-3	3.73E-3	3.58E-3	3.42E-3	3.25E-3	2.75E-3
Whole body	1.46E-2	1.45E-2	1.38E-2	1.17E-2	8.09E-3	5.21E-3	4.73E-3	4.73E-3	4.47E-3	4.15E-3	3.88E-3	3.14E-3

Table E-52 SAFs (kg^{-1}) for 25 target organs and for pancreas as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	4.04E-3	7.72E-3	1.01E-2	1.10E-2	8.89E-3	6.53E-3	6.16E-3	6.09E-3	5.73E-3	5.36E-3	5.03E-3	4.16E-3
Adrenal	3.19E-3	4.05E-2	1.25E-1	2.03E-1	1.45E-1	9.16E-2	8.34E-2	7.86E-2	7.13E-2	6.50E-2	6.04E-2	4.84E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.14E-4	1.80E-3	2.02E-3	2.21E-3	2.29E-3	2.24E-3	2.25E-3	2.01E-3
Bone (hard bone)	4.43E-7	7.92E-5	8.52E-4	6.33E-3	1.45E-2	1.06E-2	5.86E-3	3.77E-3	3.23E-3	2.98E-3	2.80E-3	2.41E-3
Bone (marrow)	2.66E-7	2.71E-5	1.98E-4	1.03E-3	2.31E-3	3.10E-3	3.42E-3	3.46E-3	3.25E-3	3.05E-3	2.89E-3	2.44E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.44E-5	4.72E-5	8.75E-5	1.32E-4	1.64E-4	1.79E-4	2.12E-4
Breast	0.00E+0	0.00E+0	0.00E+0	2.90E-4	1.78E-3	2.44E-3	2.63E-3	3.01E-3	3.19E-3	3.12E-3	3.02E-3	2.68E-3
Esophagus	0.00E+0	0.00E+0	3.64E-4	5.41E-3	1.03E-2	9.17E-3	8.33E-3	7.74E-3	7.25E-3	6.73E-3	6.38E-3	5.34E-3
Gall bladder	2.08E-2	1.48E-1	3.12E-1	3.66E-1	2.17E-1	1.25E-1	1.15E-1	1.11E-1	1.00E-1	9.20E-2	8.51E-2	6.81E-2
Heart	0.00E+0	0.00E+0	1.00E-4	3.20E-3	8.63E-3	8.30E-3	7.52E-3	7.18E-3	6.80E-3	6.45E-3	6.12E-3	5.23E-3
Kidney	3.56E-5	4.46E-3	2.72E-2	7.48E-2	7.27E-2	4.96E-2	4.37E-2	4.02E-2	3.62E-2	3.32E-2	3.08E-2	2.52E-2
Liver	1.07E-3	1.32E-2	4.40E-2	9.03E-2	7.78E-2	5.04E-2	4.47E-2	4.19E-2	3.81E-2	3.49E-2	3.24E-2	2.64E-2
Lower large intestine	1.68E-3	7.15E-3	1.44E-2	2.13E-2	1.88E-2	1.38E-2	1.26E-2	1.20E-2	1.11E-2	1.03E-2	9.61E-3	7.96E-3
Lung	0.00E+0	1.19E-6	1.96E-4	3.51E-3	7.72E-3	7.14E-3	6.52E-3	6.24E-3	5.85E-3	5.48E-3	5.17E-3	4.37E-3
Muscle	1.28E-3	2.51E-3	3.59E-3	4.55E-3	4.45E-3	3.74E-3	3.63E-3	3.64E-3	3.48E-3	3.29E-3	3.12E-3	2.65E-3
Pancreas	7.35E+0	6.02E+0	4.45E+0	2.23E+0	8.46E-1	4.73E-1	4.84E-1	4.97E-1	4.45E-1	3.91E-1	3.44E-1	2.29E-1
Skin	0.00E+0	0.00E+0	2.89E-5	5.50E-4	1.39E-3	1.55E-3	1.66E-3	1.84E-3	1.84E-3	1.76E-3	1.68E-3	1.45E-3
Small Intestine	9.87E-3	2.05E-2	3.25E-2	4.30E-2	3.71E-2	2.61E-2	2.34E-2	2.20E-2	2.02E-2	1.85E-2	1.73E-2	1.40E-2
Spleen	4.69E-4	9.99E-3	3.16E-2	5.87E-2	5.30E-2	3.63E-2	3.23E-2	3.03E-2	2.75E-2	2.54E-2	2.37E-2	1.93E-2
Stomach	3.53E-2	9.27E-2	1.58E-1	1.97E-1	1.34E-1	8.05E-2	7.28E-2	6.96E-2	6.36E-2	5.80E-2	5.37E-2	4.29E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.69E-4	3.97E-4	5.99E-4	7.15E-4	8.06E-4	8.43E-4	8.56E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	1.56E-4	1.56E-3	2.29E-3	2.28E-3	2.37E-3	2.42E-3	2.32E-3	2.42E-3	2.12E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.30E-4	7.10E-4	7.86E-4	8.73E-4	8.70E-4	9.19E-4	8.80E-4
Upper large intestine	7.65E-3	3.22E-2	6.35E-2	9.09E-2	7.04E-2	4.51E-2	4.04E-2	3.82E-2	3.49E-2	3.18E-2	2.97E-2	2.40E-2
Whole body	1.52E-2	1.50E-2	1.45E-2	1.34E-2	1.09E-2	7.81E-3	6.94E-3	6.61E-3	6.12E-3	5.67E-3	5.29E-3	4.30E-3

Table E-53 SAFs (kg^{-1}) for 25 target organs and for skeleton（hard bone + bone marrow）as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	7.23E-4	1.11E-3	1.63E-3	2.63E-3	3.23E-3	3.22E-3	3.38E-3	3.53E-3	3.40E-3	3.21E-3	3.03E-3	2.54E-3
Adrenal	3.12E-4	1.20E-3	2.56E-3	4.92E-3	6.52E-3	6.62E-3	6.80E-3	6.58E-3	6.06E-3	5.75E-3	5.36E-3	4.68E-3
Bladder	4.07E-4	1.10E-3	2.04E-3	4.14E-3	5.75E-3	5.90E-3	5.81E-3	5.71E-3	5.26E-3	4.93E-3	4.56E-3	3.83E-3
Bone (hard bone)	1.10E-1	1.16E-1	1.13E-1	9.68E-2	6.06E-2	2.33E-2	1.34E-2	1.13E-2	1.01E-2	9.08E-3	8.27E-3	6.31E-3
Bone (marrow)	4.15E-2	2.15E-2	1.49E-2	1.02E-2	7.57E-3	7.63E-3	8.56E-3	8.88E-3	8.24E-3	7.50E-3	6.85E-3	5.08E-3
Brain	1.13E-3	1.94E-3	3.21E-3	5.88E-3	6.49E-3	5.57E-3	5.66E-3	5.76E-3	5.41E-3	5.03E-3	4.71E-3	3.86E-3
Breast	9.07E-6	2.07E-4	7.15E-4	1.60E-3	1.99E-3	1.92E-3	2.07E-3	2.26E-3	2.27E-3	2.20E-3	2.06E-3	1.75E-3
Esophagus	1.75E-3	3.60E-3	5.18E-3	7.52E-3	7.97E-3	7.12E-3	7.24E-3	7.25E-3	6.75E-3	6.32E-3	5.90E-3	4.75E-3
Gall bladder	0.00E+0	0.00E+0	9.46E-5	8.55E-4	2.43E-3	2.92E-3	3.02E-3	2.91E-3	2.68E-3	2.69E-3	2.49E-3	2.14E-3
Heart	2.46E-5	3.52E-4	1.35E-3	3.79E-3	4.97E-3	4.44E-3	4.32E-3	4.24E-3	3.95E-3	3.71E-3	3.48E-3	2.94E-3
Kidney	6.03E-6	8.45E-5	4.79E-4	2.12E-3	4.28E-3	4.79E-3	4.71E-3	4.58E-3	4.32E-3	4.04E-3	3.78E-3	3.21E-3
Liver	8.65E-6	1.50E-4	5.46E-4	1.72E-3	3.05E-3	3.30E-3	3.25E-3	3.23E-3	3.07E-3	2.90E-3	2.76E-3	2.36E-3
Lower large intestine	3.09E-6	1.05E-4	5.63E-4	2.41E-3	4.51E-3	4.82E-3	4.70E-3	4.55E-3	4.21E-3	3.94E-3	3.73E-3	3.17E-3
Lung	8.57E-4	2.26E-3	4.08E-3	6.08E-3	5.82E-3	4.83E-3	4.75E-3	4.70E-3	4.37E-3	4.06E-3	3.78E-3	3.14E-3
Muscle	6.63E-4	1.18E-3	1.82E-3	2.97E-3	3.57E-3	3.47E-3	3.62E-3	3.75E-3	3.59E-3	3.38E-3	3.18E-3	2.66E-3
Pancreas	0.00E+0	2.31E-5	2.04E-4	1.35E-3	3.26E-3	3.75E-3	3.62E-3	3.50E-3	3.26E-3	3.10E-3	2.92E-3	2.51E-3
Skin	8.77E-5	3.69E-4	7.82E-4	1.51E-3	1.89E-3	2.02E-3	2.32E-3	2.57E-3	2.48E-3	2.30E-3	2.15E-3	1.79E-3
Small Intestine	1.60E-6	2.75E-5	1.84E-4	1.27E-3	3.23E-3	3.82E-3	3.71E-3	3.57E-3	3.33E-3	3.16E-3	2.99E-3	2.54E-3
Spleen	7.56E-6	1.50E-4	5.94E-4	1.97E-3	3.43E-3	3.57E-3	3.46E-3	3.41E-3	3.24E-3	3.09E-3	2.91E-3	2.49E-3
Stomach	0.00E+0	5.25E-5	2.98E-4	1.21E-3	2.47E-3	2.74E-3	2.67E-3	2.66E-3	2.58E-3	2.43E-3	2.32E-3	1.99E-3
Testis	0.00E+0	2.70E-6	3.97E-5	4.60E-4	1.32E-3	1.66E-3	1.76E-3	1.84E-3	1.90E-3	1.84E-3	1.78E-3	1.52E-3
Thymus	4.48E-4	1.58E-3	3.30E-3	5.59E-3	5.59E-3	4.71E-3	4.75E-3	4.77E-3	4.40E-3	4.22E-3	3.90E-3	3.29E-3
Thyroid	8.37E-6	2.03E-4	1.06E-3	3.57E-3	5.01E-3	4.73E-3	4.80E-3	4.89E-3	4.62E-3	4.37E-3	4.02E-3	3.34E-3
Upper large intestine	9.12E-6	1.46E-4	4.20E-4	1.23E-3	2.51E-3	3.01E-3	2.97E-3	2.97E-3	2.83E-3	2.69E-3	2.58E-3	2.22E-3
Whole body	1.52E-2	1.52E-2	1.49E-2	1.38E-2	1.01E-2	5.89E-3	4.95E-3	4.84E-3	4.54E-3	4.21E-3	3.92E-3	3.18E-3

Table E-54 SAFs (kg^{-1}) for 25 target organs and for skin as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.28E-2	1.52E-2	1.30E-2	8.20E-3	4.25E-3	2.98E-3	3.23E-3	3.57E-3	3.49E-3	3.28E-3	3.06E-3	2.42E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	4.19E-4	1.40E-3	1.69E-3	1.81E-3	1.97E-3	1.97E-3	1.91E-3	1.85E-3	1.61E-3
Bladder	0.00E+0	0.00E+0	1.81E-4	8.84E-4	1.49E-3	1.67E-3	1.80E-3	2.00E-3	2.03E-3	1.98E-3	1.91E-3	1.70E-3
Bone (hard bone)	4.12E-4	2.65E-3	6.43E-3	1.28E-2	1.33E-2	6.42E-3	3.76E-3	3.20E-3	3.01E-3	2.83E-3	2.68E-3	2.31E-3
Bone (marrow)	7.03E-5	2.32E-4	4.69E-4	9.22E-4	1.29E-3	1.57E-3	1.86E-3	2.09E-3	2.10E-3	2.03E-3	1.94E-3	1.64E-3
Brain	0.00E+0	0.00E+0	1.99E-5	5.16E-4	1.43E-3	1.54E-3	1.70E-3	1.88E-3	1.88E-3	1.78E-3	1.70E-3	1.45E-3
Breast	1.94E-2	2.23E-2	1.86E-2	1.04E-2	4.52E-3	3.03E-3	3.40E-3	3.83E-3	3.74E-3	3.46E-3	3.18E-3	2.44E-3
Esophagus	2.42E-5	3.28E-5	1.55E-4	7.83E-4	1.69E-3	1.74E-3	1.84E-3	1.98E-3	1.96E-3	1.89E-3	1.82E-3	1.56E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	1.20E-3	2.04E-3	1.88E-3	1.95E-3	2.07E-3	2.11E-3	2.08E-3	1.91E-3	1.80E-3
Heart	0.00E+0	1.01E-5	1.67E-4	1.16E-3	2.05E-3	1.91E-3	1.97E-3	2.10E-3	2.07E-3	1.98E-3	1.89E-3	1.61E-3
Kidney	0.00E+0	0.00E+0	4.81E-5	8.34E-4	1.83E-3	1.87E-3	1.92E-3	2.06E-3	2.09E-3	2.00E-3	1.96E-3	1.73E-3
Liver	0.00E+0	3.95E-5	4.27E-4	1.80E-3	2.53E-3	2.20E-3	2.23E-3	2.39E-3	2.38E-3	2.28E-3	2.18E-3	1.90E-3
Lower large intestine	0.00E+0	1.72E-5	2.32E-4	1.17E-3	1.88E-3	1.86E-3	1.96E-3	2.14E-3	2.16E-3	2.11E-3	2.05E-3	1.77E-3
Lung	1.06E-5	7.60E-5	6.04E-4	2.20E-3	2.67E-3	2.21E-3	2.27E-3	2.44E-3	2.39E-3	2.27E-3	2.16E-3	1.85E-3
Muscle	1.61E-3	3.35E-3	4.86E-3	5.03E-3	3.37E-3	2.48E-3	2.64E-3	2.91E-3	2.87E-3	2.73E-3	2.59E-3	2.19E-3
Pancreas	0.00E+0	0.00E+0	3.13E-5	6.34E-4	1.69E-3	1.80E-3	1.82E-3	1.95E-3	1.98E-3	1.92E-3	1.86E-3	1.61E-3
Skin	2.15E-1	1.07E-1	5.77E-2	2.22E-2	7.92E-3	5.27E-3	6.00E-3	6.29E-3	5.18E-3	4.22E-3	3.58E-3	2.38E-3
Small Intestine	0.00E+0	3.52E-5	3.48E-4	1.35E-3	1.91E-3	1.83E-3	1.90E-3	2.08E-3	2.09E-3	2.05E-3	1.97E-3	1.74E-3
Spleen	0.00E+0	2.53E-5	4.54E-4	2.25E-3	3.04E-3	2.52E-3	2.55E-3	2.70E-3	2.67E-3	2.54E-3	2.45E-3	2.10E-3
Stomach	0.00E+0	7.55E-5	6.02E-4	1.92E-3	2.45E-3	2.12E-3	2.16E-3	2.33E-3	2.30E-3	2.24E-3	2.18E-3	1.86E-3
Testis	1.62E-3	8.83E-3	1.27E-2	1.01E-2	5.25E-3	3.43E-3	3.62E-3	3.90E-3	3.82E-3	3.64E-3	3.44E-3	2.77E-3
Thymus	0.00E+0	0.00E+0	2.51E-4	1.35E-3	2.06E-3	1.94E-3	2.01E-3	2.21E-3	2.25E-3	2.05E-3	1.99E-3	1.65E-3
Thyroid	0.00E+0	7.82E-4	2.60E-3	3.65E-3	2.68E-3	2.12E-3	2.27E-3	2.54E-3	2.52E-3	2.38E-3	2.28E-3	1.97E-3
Upper large intestine	0.00E+0	1.38E-4	7.92E-4	2.22E-3	2.49E-3	2.12E-3	2.17E-3	2.36E-3	2.40E-3	2.28E-3	2.21E-3	1.93E-3
Whole body	1.20E-2	1.00E-2	8.71E-3	6.89E-3	4.67E-3	3.07E-3	2.96E-3	3.15E-3	3.05E-3	2.86E-3	2.69E-3	2.20E-3

Table E-55 SAFs (kg^{-1}) for 25 target organs and for small intestine as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	9.15E-3	1.53E-2	1.82E-2	1.77E-2	1.24E-2	8.55E-3	8.15E-3	8.09E-3	7.59E-3	7.06E-3	6.60E-3	5.37E-3
Adrenal	0.00E+0	0.00E+0	3.87E-4	4.85E-3	1.04E-2	1.04E-2	9.87E-3	9.21E-3	8.65E-3	8.09E-3	7.61E-3	6.36E-3
Bladder	1.06E-3	5.16E-3	1.40E-2	3.21E-2	3.41E-2	2.49E-2	2.25E-2	2.12E-2	1.93E-2	1.79E-2	1.66E-2	1.36E-2
Bone (hard bone)	2.36E-6	8.82E-5	8.34E-4	6.38E-3	1.47E-2	1.09E-2	6.10E-3	3.97E-3	3.39E-3	3.12E-3	2.93E-3	2.53E-3
Bone (marrow)	1.69E-6	2.57E-5	1.54E-4	9.14E-4	2.23E-3	3.09E-3	3.41E-3	3.43E-3	3.24E-3	3.07E-3	2.91E-3	2.46E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.35E-6	1.07E-5	2.78E-5	5.14E-5	6.97E-5	8.09E-5	1.08E-4
Breast	0.00E+0	0.00E+0	0.00E+0	1.12E-5	1.62E-4	3.64E-4	4.73E-4	6.69E-4	8.20E-4	8.76E-4	9.00E-4	8.89E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	1.23E-4	6.98E-4	1.12E-3	1.22E-3	1.31E-3	1.37E-3	1.37E-3	1.38E-3	1.24E-3
Gall bladder	0.00E+0	0.00E+0	1.95E-3	1.38E-2	2.11E-2	1.71E-2	1.51E-2	1.40E-2	1.28E-2	1.20E-2	1.14E-2	9.45E-3
Heart	0.00E+0	0.00E+0	0.00E+0	7.86E-5	6.56E-4	1.09E-3	1.18E-3	1.32E-3	1.43E-3	1.45E-3	1.44E-3	1.34E-3
Kidney	5.39E-3	1.82E-2	3.43E-2	5.20E-2	4.55E-2	3.19E-2	2.86E-2	2.68E-2	2.44E-2	2.24E-2	2.09E-2	1.69E-2
Liver	0.00E+0	1.23E-5	3.51E-4	3.58E-3	7.94E-3	7.70E-3	7.11E-3	6.89E-3	6.55E-3	6.18E-3	5.87E-3	4.99E-3
Lower large intestine	8.79E-3	3.26E-2	5.57E-2	6.95E-2	5.25E-2	3.48E-2	3.18E-2	3.03E-2	2.77E-2	2.54E-2	2.36E-2	1.91E-2
Lung	0.00E+0	0.00E+0	0.00E+0	1.14E-4	7.32E-4	1.12E-3	1.22E-3	1.38E-3	1.47E-3	1.47E-3	1.45E-3	1.33E-3
Muscle	1.84E-3	2.98E-3	4.31E-3	5.79E-3	5.36E-3	4.38E-3	4.27E-3	4.28E-3	4.09E-3	3.86E-3	3.66E-3	3.10E-3
Pancreas	9.86E-3	2.05E-2	3.25E-2	4.30E-2	3.72E-2	2.63E-2	2.35E-2	2.21E-2	2.02E-2	1.85E-2	1.73E-2	1.40E-2
Skin	0.00E+0	3.21E-5	3.14E-4	1.19E-3	1.66E-3	1.62E-3	1.76E-3	1.97E-3	1.97E-3	1.88E-3	1.79E-3	1.54E-3
Small Intestine	1.52E+0	1.04E+0	7.52E-1	4.37E-1	2.06E-1	1.21E-1	1.17E-1	1.16E-1	1.04E-1	9.15E-2	8.17E-2	5.88E-2
Spleen	0.00E+0	0.00E+0	2.27E-4	3.02E-3	7.56E-3	7.51E-3	6.92E-3	6.67E-3	6.28E-3	5.96E-3	5.67E-3	4.83E-3
Stomach	2.14E-3	1.24E-2	2.48E-2	3.70E-2	3.25E-2	2.26E-2	2.03E-2	1.94E-2	1.79E-2	1.65E-2	1.55E-2	1.27E-2
Testis	0.00E+0	0.00E+0	0.00E+0	5.52E-4	2.51E-3	3.27E-3	3.45E-3	3.85E-3	3.93E-3	3.89E-3	3.76E-3	3.38E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.46E-4	4.18E-4	5.34E-4	6.37E-4	7.30E-4	6.95E-4	7.16E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.13E-4	1.56E-4	2.17E-4	2.65E-4	3.12E-4	3.33E-4	3.55E-4
Upper large intestine	1.12E-2	3.69E-2	6.40E-2	8.44E-2	6.42E-2	4.13E-2	3.74E-2	3.58E-2	3.27E-2	3.01E-2	2.79E-2	2.25E-2
Whole body	1.35E-2	1.30E-2	1.28E-2	1.22E-2	9.86E-3	7.18E-3	6.43E-3	6.16E-3	5.74E-3	5.34E-3	4.99E-3	4.09E-3

Table E-56 SAFs (kg^{-1}) for 25 target organs and for small intestine content as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.11E-3	9.66E-3	1.48E-2	1.65E-2	1.21E-2	8.35E-3	7.90E-3	7.83E-3	7.35E-3	6.86E-3	6.43E-3	5.29E-3
Adrenal	0.00E+0	0.00E+0	7.21E-4	7.32E-3	1.43E-2	1.36E-2	1.24E-2	1.16E-2	1.06E-2	9.77E-3	9.10E-3	7.82E-3
Bladder	9.54E-5	2.20E-3	7.57E-3	1.93E-2	2.31E-2	1.81E-2	1.65E-2	1.55E-2	1.43E-2	1.32E-2	1.25E-2	1.02E-2
Bone (hard bone)	0.00E+0	2.45E-5	5.64E-4	5.56E-3	1.37E-2	1.04E-2	5.85E-3	3.80E-3	3.25E-3	2.99E-3	2.81E-3	2.44E-3
Bone (marrow)	0.00E+0	6.77E-6	9.85E-5	7.64E-4	2.03E-3	2.90E-3	3.21E-3	3.25E-3	3.08E-3	2.91E-3	2.77E-3	2.35E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.32E-6	1.28E-5	3.18E-5	5.71E-5	7.62E-5	8.95E-5	1.18E-4
Breast	0.00E+0	0.00E+0	0.00E+0	1.57E-5	2.22E-4	4.64E-4	5.86E-4	8.01E-4	9.65E-4	1.05E-3	1.04E-3	9.97E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	1.91E-4	9.79E-4	1.48E-3	1.52E-3	1.64E-3	1.67E-3	1.63E-3	1.59E-3	1.48E-3
Gall bladder	0.00E+0	0.00E+0	2.28E-3	1.74E-2	2.63E-2	2.08E-2	1.82E-2	1.68E-2	1.56E-2	1.41E-2	1.30E-2	1.11E-2
Heart	0.00E+0	0.00E+0	0.00E+0	1.24E-4	9.22E-4	1.41E-3	1.48E-3	1.61E-3	1.70E-3	1.71E-3	1.69E-3	1.55E-3
Kidney	1.22E-3	1.33E-2	3.70E-2	6.46E-2	5.58E-2	3.80E-2	3.40E-2	3.18E-2	2.88E-2	2.64E-2	2.46E-2	2.00E-2
Liver	0.00E+0	1.35E-5	4.34E-4	4.65E-3	1.00E-2	9.33E-3	8.51E-3	8.16E-3	7.67E-3	7.23E-3	6.82E-3	5.79E-3
Lower large intestine	1.58E-3	1.33E-2	3.20E-2	5.03E-2	4.26E-2	2.94E-2	2.65E-2	2.51E-2	2.30E-2	2.11E-2	1.97E-2	1.61E-2
Lung	0.00E+0	0.00E+0	1.50E-6	1.74E-4	9.90E-4	1.43E-3	1.50E-3	1.66E-3	1.73E-3	1.71E-3	1.67E-3	1.52E-3
Muscle	4.19E-4	1.45E-3	3.02E-3	5.02E-3	5.01E-3	4.14E-3	4.02E-3	4.03E-3	3.86E-3	3.66E-3	3.47E-3	2.96E-3
Pancreas	7.13E-3	2.61E-2	4.78E-2	6.56E-2	5.31E-2	3.56E-2	3.18E-2	2.99E-2	2.73E-2	2.50E-2	2.33E-2	1.87E-2
Skin	0.00E+0	2.08E-5	2.71E-4	1.16E-3	1.67E-3	1.63E-3	1.77E-3	1.97E-3	1.97E-3	1.88E-3	1.79E-3	1.54E-3
Small Intestine	5.44E-1	6.81E-1	6.07E-1	3.98E-1	1.95E-1	1.14E-1	1.09E-1	1.09E-1	9.97E-2	8.99E-2	8.14E-2	5.92E-2
Spleen	0.00E+0	0.00E+0	2.69E-4	4.48E-3	1.02E-2	9.70E-3	8.77E-3	8.26E-3	7.72E-3	7.26E-3	6.89E-3	5.81E-3
Stomach	4.08E-4	1.15E-2	3.32E-2	5.45E-2	4.55E-2	3.01E-2	2.70E-2	2.58E-2	2.35E-2	2.17E-2	2.02E-2	1.66E-2
Testis	0.00E+0	0.00E+0	0.00E+0	4.06E-4	1.88E-3	2.54E-3	2.77E-3	3.14E-3	3.27E-3	3.25E-3	3.15E-3	2.85E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.32E-4	5.19E-4	6.46E-4	7.34E-4	7.95E-4	8.32E-4	7.91E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.39E-4	1.88E-4	2.56E-4	3.11E-4	3.57E-4	3.75E-4	4.09E-4
Upper large intestine	3.49E-3	2.98E-2	6.83E-2	9.83E-2	7.37E-2	4.67E-2	4.21E-2	4.02E-2	3.66E-2	3.37E-2	3.13E-2	2.54E-2
Whole body	4.69E-3	8.22E-3	1.03E-2	1.13E-2	9.58E-3	7.02E-3	6.26E-3	5.99E-3	5.60E-3	5.23E-3	4.91E-3	4.05E-3

Table E-57 SAFs (kg^{-1}) for 25 target organs and for spleen as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.04E-3	6.83E-3	9.99E-3	1.16E-2	8.62E-3	6.08E-3	5.87E-3	5.92E-3	5.62E-3	5.26E-3	4.94E-3	4.09E-3
Adrenal	2.37E-4	1.26E-2	4.73E-2	8.51E-2	6.56E-2	4.44E-2	4.11E-2	3.95E-2	3.61E-2	3.32E-2	3.05E-2	2.53E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.02E-4	8.57E-4	1.09E-3	1.37E-3	1.48E-3	1.53E-3	1.50E-3	1.40E-3
Bone (hard bone)	1.78E-5	7.04E-4	3.42E-3	1.17E-2	1.79E-2	1.12E-2	6.21E-3	4.40E-3	3.82E-3	3.50E-3	3.28E-3	2.83E-3
Bone (marrow)	7.37E-6	1.56E-4	5.09E-4	1.18E-3	1.85E-3	2.37E-3	2.54E-3	2.56E-3	2.62E-3	2.58E-3	2.47E-3	2.09E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.21E-6	5.14E-5	9.44E-5	1.74E-4	2.47E-4	2.81E-4	3.00E-4	3.10E-4
Breast	0.00E+0	0.00E+0	1.73E-5	7.56E-4	2.30E-3	2.60E-3	2.74E-3	2.96E-3	2.94E-3	2.84E-3	2.71E-3	2.31E-3
Esophagus	0.00E+0	0.00E+0	8.77E-4	7.75E-3	1.20E-2	1.00E-2	9.34E-3	8.77E-3	8.08E-3	7.49E-3	7.05E-3	5.88E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	1.27E-3	6.05E-3	7.93E-3	7.57E-3	7.30E-3	6.74E-3	6.45E-3	6.09E-3	5.06E-3
Heart	0.00E+0	9.32E-6	3.93E-4	4.29E-3	8.49E-3	7.73E-3	7.08E-3	6.70E-3	6.25E-3	5.85E-3	5.52E-3	4.63E-3
Kidney	6.05E-5	8.70E-3	4.25E-2	8.56E-2	6.60E-2	4.22E-2	3.83E-2	3.64E-2	3.33E-2	3.06E-2	2.84E-2	2.32E-2
Liver	0.00E+0	6.05E-6	2.27E-4	3.14E-3	7.79E-3	8.51E-3	8.11E-3	7.83E-3	7.40E-3	7.00E-3	6.64E-3	5.66E-3
Lower large intestine	1.42E-3	1.24E-2	2.79E-2	4.06E-2	3.01E-2	1.94E-2	1.77E-2	1.72E-2	1.59E-2	1.47E-2	1.37E-2	1.12E-2
Lung	1.85E-3	8.73E-3	1.71E-2	2.35E-2	1.78E-2	1.21E-2	1.11E-2	1.07E-2	9.83E-3	9.07E-3	8.44E-3	6.92E-3
Muscle	2.04E-4	1.12E-3	2.80E-3	5.22E-3	5.03E-3	3.94E-3	3.85E-3	3.91E-3	3.75E-3	3.54E-3	3.35E-3	2.85E-3
Pancreas	4.76E-4	9.99E-3	3.16E-2	5.86E-2	5.28E-2	3.64E-2	3.25E-2	3.04E-2	2.76E-2	2.54E-2	2.36E-2	1.94E-2
Skin	0.00E+0	2.52E-5	4.62E-4	2.17E-3	2.71E-3	2.31E-3	2.41E-3	2.60E-3	2.53E-3	2.37E-3	2.23E-3	1.88E-3
Small Intestine	0.00E+0	5.35E-6	2.26E-4	3.03E-3	7.48E-3	7.51E-3	6.98E-3	6.69E-3	6.33E-3	5.97E-3	5.68E-3	4.85E-3
Spleen	6.66E+0	5.70E+0	4.39E+0	2.30E+0	8.77E-1	4.87E-1	5.01E-1	5.17E-1	4.66E-1	4.12E-1	3.65E-1	2.48E-1
Stomach	1.12E-2	5.00E-2	8.80E-2	1.07E-1	7.61E-2	4.82E-2	4.42E-2	4.29E-2	3.95E-2	3.62E-2	3.36E-2	2.70E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.32E-4	2.13E-4	3.70E-4	4.93E-4	5.82E-4	5.96E-4	6.19E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	5.31E-4	2.24E-3	2.77E-3	2.64E-3	2.64E-3	2.62E-3	2.50E-3	2.49E-3	2.17E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.19E-4	1.14E-3	1.24E-3	1.37E-3	1.41E-3	1.36E-3	1.35E-3	1.15E-3
Upper large intestine	0.00E+0	3.19E-5	1.08E-3	7.37E-3	1.15E-2	9.89E-3	9.01E-3	8.61E-3	8.07E-3	7.55E-3	7.14E-3	6.01E-3
Whole body	1.53E-2	1.52E-2	1.48E-2	1.34E-2	1.00E-2	6.88E-3	6.20E-3	6.04E-3	5.65E-3	5.24E-3	4.89E-3	3.98E-3

Table E-58 SAFs (kg^{-1}) for 25 target organs and for stomach as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	7.30E-3	1.08E-2	1.21E-2	1.20E-2	8.83E-3	6.25E-3	6.00E-3	6.05E-3	5.73E-3	5.35E-3	5.02E-3	4.11E-3
Adrenal	3.66E-5	5.64E-3	2.52E-2	5.15E-2	4.78E-2	3.49E-2	3.18E-2	2.98E-2	2.74E-2	2.51E-2	2.28E-2	1.92E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	9.88E-5	9.74E-4	1.67E-3	1.84E-3	2.04E-3	2.16E-3	2.12E-3	2.03E-3	1.92E-3
Bone (hard bone)	1.40E-6	2.59E-4	1.69E-3	6.77E-3	1.19E-2	8.30E-3	4.68E-3	3.19E-3	2.78E-3	2.57E-3	2.43E-3	2.12E-3
Bone (marrow)	6.21E-7	6.06E-5	2.70E-4	7.90E-4	1.48E-3	2.01E-3	2.22E-3	2.28E-3	2.27E-3	2.20E-3	2.12E-3	1.81E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.54E-6	3.55E-5	6.58E-5	1.21E-4	1.74E-4	2.06E-4	2.22E-4	2.51E-4
Breast	0.00E+0	0.00E+0	5.26E-5	1.01E-3	2.60E-3	2.82E-3	2.97E-3	3.30E-3	3.40E-3	3.34E-3	3.23E-3	2.83E-3
Esophagus	7.72E-3	1.42E-2	1.74E-2	1.94E-2	1.55E-2	1.13E-2	1.07E-2	1.03E-2	9.61E-3	8.90E-3	8.32E-3	6.81E-3
Gall bladder	0.00E+0	6.52E-5	2.64E-3	2.05E-2	3.08E-2	2.36E-2	2.09E-2	1.92E-2	1.76E-2	1.63E-2	1.52E-2	1.25E-2
Heart	3.33E-6	5.77E-4	3.06E-3	9.10E-3	1.16E-2	9.39E-3	8.55E-3	8.25E-3	7.77E-3	7.32E-3	6.88E-3	5.82E-3
Kidney	0.00E+0	1.88E-4	4.35E-3	2.52E-2	3.39E-2	2.57E-2	2.26E-2	2.09E-2	1.90E-2	1.75E-2	1.63E-2	1.35E-2
Liver	8.96E-4	7.29E-3	1.74E-2	3.08E-2	2.98E-2	2.17E-2	1.97E-2	1.88E-2	1.73E-2	1.61E-2	1.50E-2	1.24E-2
Lower large intestine	1.68E-2	2.92E-2	3.40E-2	3.56E-2	2.63E-2	1.77E-2	1.63E-2	1.60E-2	1.48E-2	1.36E-2	1.27E-2	1.02E-2
Lung	6.61E-3	1.60E-2	2.03E-2	1.94E-2	1.37E-2	9.56E-3	8.88E-3	8.64E-3	8.02E-3	7.43E-3	6.95E-3	5.67E-3
Muscle	9.37E-4	1.97E-3	2.89E-3	3.95E-3	3.82E-3	3.15E-3	3.10E-3	3.17E-3	3.07E-3	2.92E-3	2.77E-3	2.37E-3
Pancreas	3.63E-2	9.52E-2	1.60E-1	1.96E-1	1.32E-1	8.07E-2	7.30E-2	6.97E-2	6.36E-2	5.80E-2	5.35E-2	4.28E-2
Skin	5.95E-8	7.91E-5	5.86E-4	1.78E-3	2.13E-3	1.91E-3	2.03E-3	2.23E-3	2.18E-3	2.07E-3	1.95E-3	1.66E-3
Small Intestine	2.27E-3	1.29E-2	2.52E-2	3.71E-2	3.25E-2	2.26E-2	2.04E-2	1.95E-2	1.79E-2	1.66E-2	1.55E-2	1.27E-2
Spleen	1.18E-2	5.16E-2	8.93E-2	1.07E-1	7.54E-2	4.81E-2	4.42E-2	4.28E-2	3.93E-2	3.62E-2	3.37E-2	2.70E-2
Stomach	5.17E+0	3.12E+0	1.94E+0	9.05E-1	3.58E-1	2.09E-1	2.14E-1	2.17E-1	1.89E-1	1.61E-1	1.39E-1	9.15E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.75E-5	2.77E-4	3.70E-4	5.95E-4	7.18E-4	8.20E-4	8.90E-4	8.58E-4
Thymus	0.00E+0	0.00E+0	1.99E-5	5.62E-4	2.09E-3	2.50E-3	2.45E-3	2.51E-3	2.59E-3	2.47E-3	2.45E-3	2.18E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	9.61E-5	5.15E-4	8.07E-4	8.95E-4	9.80E-4	1.04E-3	1.06E-3	1.01E-3	9.64E-4
Upper large intestine	2.53E-2	6.65E-2	9.37E-2	9.57E-2	6.17E-2	3.86E-2	3.58E-2	3.49E-2	3.21E-2	2.95E-2	2.73E-2	2.18E-2
Whole body	1.27E-2	1.11E-2	1.06E-2	1.02E-2	8.39E-3	6.06E-3	5.45E-3	5.30E-3	4.96E-3	4.62E-3	4.33E-3	3.56E-3

Table E-59 SAFs (kg^{-1}) for 25 target organs and for stomach content as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	4.38E-4	2.64E-3	5.88E-3	9.38E-3	8.13E-3	5.85E-3	5.54E-3	5.53E-3	5.24E-3	4.93E-3	4.64E-3	3.89E-3
Adrenal	0.00E+0	1.81E-3	1.56E-2	4.65E-2	4.86E-2	3.49E-2	3.16E-2	2.96E-2	2.72E-2	2.50E-2	2.29E-2	1.90E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.42E-4	1.54E-3	1.71E-3	1.92E-3	2.04E-3	2.06E-3	1.99E-3	1.80E-3
Bone (hard bone)	0.00E+0	7.63E-5	1.03E-3	6.28E-3	1.22E-2	8.56E-3	4.82E-3	3.26E-3	2.83E-3	2.62E-3	2.47E-3	2.15E-3
Bone (marrow)	0.00E+0	2.03E-5	1.82E-4	7.56E-4	1.51E-3	2.04E-3	2.23E-3	2.28E-3	2.27E-3	2.20E-3	2.11E-3	1.80E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.09E-6	4.03E-5	7.50E-5	1.34E-4	1.92E-4	2.25E-4	2.44E-4	2.69E-4
Breast	0.00E+0	0.00E+0	6.27E-5	1.29E-3	3.11E-3	3.21E-3	3.31E-3	3.66E-3	3.67E-3	3.59E-3	3.43E-3	2.97E-3
Esophagus	6.09E-4	4.91E-3	1.08E-2	1.83E-2	1.67E-2	1.22E-2	1.13E-2	1.08E-2	9.94E-3	9.37E-3	8.75E-3	7.26E-3
Gall bladder	0.00E+0	0.00E+0	8.64E-4	1.27E-2	2.51E-2	2.01E-2	1.77E-2	1.64E-2	1.48E-2	1.37E-2	1.29E-2	1.08E-2
Heart	0.00E+0	3.12E-4	2.69E-3	1.01E-2	1.32E-2	1.04E-2	9.41E-3	9.04E-3	8.47E-3	7.92E-3	7.49E-3	6.28E-3
Kidney	0.00E+0	5.71E-5	2.75E-3	2.24E-2	3.29E-2	2.52E-2	2.21E-2	2.03E-2	1.85E-2	1.71E-2	1.59E-2	1.31E-2
Liver	4.81E-5	1.90E-3	8.86E-3	2.41E-2	2.69E-2	2.01E-2	1.81E-2	1.72E-2	1.59E-2	1.47E-2	1.37E-2	1.14E-2
Lower large intestine	7.61E-4	6.92E-3	1.76E-2	3.02E-2	2.56E-2	1.71E-2	1.56E-2	1.50E-2	1.39E-2	1.29E-2	1.20E-2	9.88E-3
Lung	8.77E-4	7.93E-3	1.73E-2	2.22E-2	1.62E-2	1.09E-2	1.00E-2	9.67E-3	8.93E-3	8.29E-3	7.75E-3	6.40E-3
Muscle	4.41E-5	4.43E-4	1.41E-3	3.21E-3	3.68E-3	3.09E-3	3.01E-3	3.06E-3	2.96E-3	2.82E-3	2.69E-3	2.31E-3
Pancreas	2.17E-3	2.34E-2	7.91E-2	1.50E-1	1.17E-1	7.23E-2	6.42E-2	6.04E-2	5.48E-2	5.01E-2	4.65E-2	3.77E-2
Skin	0.00E+0	2.07E-5	3.21E-4	1.52E-3	2.09E-3	1.90E-3	2.01E-3	2.19E-3	2.15E-3	2.04E-3	1.93E-3	1.64E-3
Small Intestine	8.75E-5	2.96E-3	1.22E-2	2.77E-2	2.80E-2	2.00E-2	1.78E-2	1.69E-2	1.56E-2	1.45E-2	1.35E-2	1.12E-2
Spleen	1.08E-3	1.70E-2	5.61E-2	1.04E-1	8.28E-2	5.22E-2	4.71E-2	4.50E-2	4.13E-2	3.80E-2	3.53E-2	2.87E-2
Stomach	4.78E-1	7.51E-1	7.95E-1	5.72E-1	2.71E-1	1.54E-1	1.49E-1	1.50E-1	1.38E-1	1.26E-1	1.15E-1	8.59E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.42E-4	3.44E-4	5.38E-4	6.98E-4	7.84E-4	8.14E-4	8.29E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	6.11E-4	2.35E-3	2.82E-3	2.67E-3	2.70E-3	2.70E-3	2.62E-3	2.63E-3	2.34E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.69E-4	9.37E-4	1.03E-3	1.10E-3	1.17E-3	1.14E-3	1.15E-3	1.04E-3
Upper large intestine	1.92E-3	1.68E-2	4.33E-2	6.65E-2	5.02E-2	3.21E-2	2.92E-2	2.80E-2	2.57E-2	2.37E-2	2.22E-2	1.80E-2
Whole body	1.08E-3	2.79E-3	5.12E-3	8.14E-3	7.93E-3	5.80E-3	5.13E-3	4.92E-3	4.63E-3	4.35E-3	4.09E-3	3.44E-3

Table E-60 SAFs (kg^{-1}) for 25 target organs and for testis as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.50E-3	5.16E-3	8.94E-3	1.07E-2	7.75E-3	5.50E-3	5.49E-3	5.73E-3	5.52E-3	5.20E-3	4.90E-3	4.07E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.71E-4	2.77E-4	4.58E-4	5.96E-4	6.80E-4	6.91E-4	7.19E-4
Bladder	0.00E+0	0.00E+0	5.41E-4	9.93E-3	2.26E-2	2.10E-2	2.03E-2	2.00E-2	1.88E-2	1.75E-2	1.63E-2	1.35E-2
Bone (hard bone)	3.36E-7	1.38E-5	2.37E-4	2.86E-3	7.38E-3	5.60E-3	3.26E-3	2.32E-3	2.09E-3	1.98E-3	1.89E-3	1.67E-3
Bone (marrow)	0.00E+0	1.87E-6	2.54E-5	2.81E-4	8.21E-4	1.25E-3	1.48E-3	1.64E-3	1.65E-3	1.61E-3	1.55E-3	1.35E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.67E-6	8.05E-6	1.43E-5	2.04E-5	3.46E-5
Breast	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.88E-5	4.90E-5	9.23E-5	1.24E-4	1.42E-4	1.87E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.31E-5	8.67E-5	1.51E-4	1.66E-4	1.95E-4	2.30E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.04E-4	4.37E-4	6.08E-4	7.87E-4	8.54E-4	8.81E-4	8.56E-4
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.99E-5	4.10E-5	8.86E-5	1.48E-4	1.84E-4	2.09E-4	2.49E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.12E-4	5.98E-4	7.99E-4	1.05E-3	1.21E-3	1.26E-3	1.26E-3	1.19E-3
Liver	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.13E-5	1.58E-4	2.46E-4	3.97E-4	5.32E-4	5.98E-4	6.27E-4	6.52E-4
Lower large intestine	0.00E+0	0.00E+0	2.19E-5	1.61E-3	6.28E-3	6.98E-3	6.83E-3	6.90E-3	6.66E-3	6.36E-3	6.00E-3	5.14E-3
Lung	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.36E-5	4.71E-5	1.04E-4	1.71E-4	2.10E-4	2.36E-4	2.71E-4
Muscle	3.07E-3	5.54E-3	7.18E-3	8.42E-3	6.79E-3	4.98E-3	4.94E-3	5.14E-3	4.96E-3	4.68E-3	4.42E-3	3.69E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.40E-5	3.12E-4	4.43E-4	6.37E-4	7.68E-4	8.52E-4	8.76E-4	8.53E-4
Skin	1.51E-3	8.12E-3	1.16E-2	9.28E-3	4.83E-3	3.29E-3	3.55E-3	3.82E-3	3.56E-3	3.26E-3	3.01E-3	2.43E-3
Small Intestine	0.00E+0	0.00E+0	6.26E-6	5.64E-4	2.70E-3	3.47E-3	3.64E-3	3.96E-3	4.02E-3	3.92E-3	3.78E-3	3.33E-3
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.45E-4	2.38E-4	3.89E-4	5.27E-4	5.71E-4	6.09E-4	6.34E-4
Stomach	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.07E-4	3.01E-4	4.13E-4	6.08E-4	7.74E-4	8.30E-4	8.59E-4	8.62E-4
Testis	2.39E+1	1.87E+1	1.27E+1	5.53E+0	1.83E+0	1.03E+0	1.12E+0	1.19E+0	1.06E+0	9.18E-1	7.94E-1	4.86E-1
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.69E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	6.53E-5	6.18E-4	1.13E-3	1.36E-3	1.68E-3	1.86E-3	1.89E-3	1.88E-3	1.76E-3
Whole body	1.52E-2	1.45E-2	1.31E-2	1.03E-2	7.12E-3	5.07E-3	4.86E-3	4.98E-3	4.74E-3	4.43E-3	4.14E-3	3.37E-3

Table E-61 SAFs (kg^{-1}) for 25 target organs and for thymus as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.16E-3	2.29E-3	3.31E-3	4.37E-3	4.14E-3	3.37E-3	3.38E-3	3.47E-3	3.31E-3	3.11E-3	2.94E-3	2.45E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.09E-3	3.10E-3	3.05E-3	2.99E-3	3.00E-3	2.89E-3	2.86E-3	2.50E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.16E-5	1.24E-4	1.72E-4	2.53E-4	2.81E-4	2.91E-4	3.42E-4
Bone (hard bone)	1.11E-3	6.52E-3	1.69E-2	3.29E-2	3.06E-2	1.35E-2	7.04E-3	5.17E-3	4.60E-3	4.23E-3	3.95E-3	3.32E-3
Bone (marrow)	4.54E-4	1.36E-3	2.66E-3	4.12E-3	4.17E-3	4.06E-3	4.34E-3	4.44E-3	4.17E-3	3.90E-3	3.64E-3	2.97E-3
Brain	0.00E+0	0.00E+0	0.00E+0	2.43E-6	1.19E-4	4.32E-4	6.19E-4	8.58E-4	1.03E-3	1.09E-3	1.11E-3	1.08E-3
Breast	0.00E+0	2.22E-4	5.05E-3	4.38E-3	4.12E-3	3.37E-3	3.38E-3	3.47E-3	3.31E-3	3.11E-3	2.94E-3	2.45E-3
Esophagus	0.00E+0	2.63E-4	7.50E-3	3.75E-2	4.02E-2	2.83E-2	2.63E-2	2.57E-2	2.39E-2	2.22E-2	2.10E-2	1.73E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.45E-3	2.24E-3	2.12E-3	2.19E-3	2.23E-3	2.20E-3	2.08E-3	1.94E-3
Heart	1.85E-1	3.39E-1	3.98E-1	3.15E-1	1.57E-1	9.14E-2	9.06E-2	9.28E-2	8.63E-2	7.92E-2	7.28E-2	5.60E-2
Kidney	0.00E+0	0.00E+0	8.17E-6	4.94E-5	5.84E-4	1.13E-3	1.21E-3	1.31E-3	1.38E-3	1.41E-3	1.40E-3	1.32E-3
Liver	0.00E+0	0.00E+0	4.06E-5	1.22E-3	3.98E-3	4.28E-3	4.00E-3	3.94E-3	3.81E-3	3.65E-3	3.50E-3	3.03E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.99E-4	3.58E-4	3.90E-4	4.61E-4	5.49E-4	5.74E-4	5.97E-4	6.02E-4
Lung	4.87E-2	9.01E-2	1.07E-1	9.41E-2	5.36E-2	3.18E-2	2.96E-2	2.88E-2	2.63E-2	2.40E-2	2.22E-2	1.75E-2
Muscle	1.22E-5	1.61E-4	7.47E-4	2.21E-3	2.89E-3	2.47E-3	2.47E-3	2.51E-3	2.40E-3	2.26E-3	2.14E-3	1.82E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	1.57E-4	1.58E-3	2.43E-3	2.35E-3	2.38E-3	2.43E-3	2.42E-3	2.39E-3	2.17E-3
Skin	0.00E+0	1.45E-5	2.20E-4	1.18E-3	1.83E-3	1.78E-3	1.95E-3	2.14E-3	2.05E-3	1.90E-3	1.79E-3	1.49E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.35E-4	3.60E-4	4.32E-4	5.41E-4	6.48E-4	7.03E-4	7.22E-4	7.26E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	5.38E-4	2.35E-3	2.82E-3	2.70E-3	2.66E-3	2.65E-3	2.55E-3	2.43E-3	2.16E-3
Stomach	0.00E+0	0.00E+0	1.71E-5	5.45E-4	2.19E-3	2.63E-3	2.50E-3	2.54E-3	2.55E-3	2.54E-3	2.46E-3	2.23E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.20E-4	1.57E-4
Thymus	2.51E+1	1.81E+1	1.17E+1	4.91E+0	1.62E+0	9.25E-1	1.01E+0	1.06E+0	9.37E-1	7.99E-1	6.84E-1	4.05E-1
Thyroid	0.00E+0	7.85E-5	3.70E-3	2.61E-2	3.45E-2	2.66E-2	2.59E-2	2.62E-2	2.49E-2	2.33E-2	2.18E-2	1.81E-2
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.69E-4	7.18E-4	7.94E-4	9.21E-4	1.03E-3	1.08E-3	1.10E-3	1.07E-3
Whole body	1.53E-2	1.51E-2	1.47E-2	1.33E-2	9.55E-3	5.88E-3	5.16E-3	5.03E-3	4.69E-3	4.33E-3	4.03E-3	3.24E-3

Table E-62 SAFs (kg^{-1}) for 25 target organs and for thyroid as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	6.36E-3	1.15E-2	1.39E-2	1.16E-2	6.88E-3	4.88E-3	5.00E-3	5.19E-3	4.93E-3	4.59E-3	4.28E-3	3.46E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.31E-3	1.40E-3	1.48E-3	1.49E-3	1.45E-3	1.45E-3	1.27E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.45E-4	1.76E-4	2.18E-4	2.29E-4	2.48E-4	2.45E-4	2.39E-4
Bone (hard bone)	2.55E-5	8.99E-4	5.84E-3	2.25E-2	2.94E-2	1.47E-2	7.76E-3	5.67E-3	5.10E-3	4.73E-3	4.44E-3	3.77E-3
Bone (marrow)	7.39E-6	1.66E-4	7.99E-4	2.42E-3	3.40E-3	3.71E-3	4.05E-3	4.16E-3	3.92E-3	3.66E-3	3.45E-3	2.84E-3
Brain	0.00E+0	0.00E+0	0.00E+0	5.19E-5	8.12E-4	1.92E-3	2.40E-3	2.90E-3	3.10E-3	3.09E-3	3.02E-3	2.73E-3
Breast	0.00E+0	2.12E-6	2.64E-5	6.04E-4	2.66E-3	3.32E-3	3.52E-3	4.01E-3	4.22E-3	4.17E-3	4.12E-3	3.67E-3
Esophagus	2.15E-2	1.46E-1	2.83E-1	2.57E-1	1.25E-1	7.29E-2	7.11E-2	7.09E-2	6.53E-2	5.96E-2	5.50E-2	4.43E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.19E-4	7.65E-4	9.13E-4	9.43E-4	1.01E-3	9.85E-4	8.71E-4
Heart	0.00E+0	1.76E-4	3.42E-3	1.63E-2	1.89E-2	1.44E-2	1.35E-2	1.33E-2	1.25E-2	1.18E-2	1.10E-2	9.22E-3
Kidney	3.39E-4	3.85E-4	2.97E-4	1.54E-4	2.47E-4	4.79E-4	5.59E-4	6.64E-4	7.27E-4	7.42E-4	7.60E-4	7.14E-4
Liver	3.18E-5	3.70E-5	2.98E-5	1.95E-4	9.79E-4	1.43E-3	1.49E-3	1.56E-3	1.57E-3	1.53E-3	1.48E-3	1.32E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.65E-5	1.44E-4	1.79E-4	2.30E-4	2.78E-4	3.02E-4	3.21E-4	3.26E-4
Lung	6.00E-5	1.13E-3	8.37E-3	2.13E-2	1.92E-2	1.38E-2	1.30E-2	1.26E-2	1.16E-2	1.06E-2	9.86E-3	8.14E-3
Muscle	3.00E-3	6.93E-3	9.37E-3	8.38E-3	5.39E-3	3.99E-3	4.07E-3	4.22E-3	4.01E-3	3.76E-3	3.52E-3	2.89E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.31E-4	7.34E-4	7.85E-4	8.27E-4	8.75E-4	9.00E-4	9.04E-4	8.79E-4
Skin	1.21E-5	7.14E-4	2.38E-3	3.29E-3	2.43E-3	2.01E-3	2.22E-3	2.43E-3	2.34E-3	2.17E-3	2.03E-3	1.69E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.42E-5	1.25E-4	1.69E-4	2.23E-4	2.80E-4	3.12E-4	3.34E-4	3.62E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	1.34E-4	8.21E-4	1.23E-3	1.32E-3	1.43E-3	1.45E-3	1.43E-3	1.36E-3	1.20E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	9.55E-5	5.74E-4	8.99E-4	9.46E-4	1.00E-3	1.04E-3	1.07E-3	1.04E-3	9.76E-4
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.55E-5
Thymus	0.00E+0	8.81E-5	3.76E-3	2.63E-2	3.45E-2	2.66E-2	2.60E-2	2.63E-2	2.49E-2	2.31E-2	2.18E-2	1.80E-2
Thyroid	3.65E+1	2.59E+1	1.64E+1	6.74E+0	2.18E+0	1.23E+0	1.34E+0	1.41E+0	1.24E+0	1.05E+0	8.89E-1	5.10E-1
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.31E-5	2.51E-4	3.10E-4	3.98E-4	4.75E-4	5.01E-4	5.30E-4	5.33E-4
Whole body	1.52E-2	1.50E-2	1.45E-2	1.26E-2	9.23E-3	5.97E-3	5.31E-3	5.24E-3	4.91E-3	4.55E-3	4.23E-3	3.41E-3

Table E-63 SAFs (kg^{-1}) for 25 target organs and for trachea as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.39E-2	1.68E-2	1.50E-2	1.07E-2	6.61E-3	4.89E-3	4.95E-3	5.06E-3	4.75E-3	4.38E-3	4.06E-3	3.21E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	4.09E-4	1.77E-3	2.49E-3	2.57E-3	2.52E-3	2.55E-3	2.39E-3	2.24E-3	1.95E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.87E-5	1.24E-4	1.73E-4	2.26E-4	2.52E-4	2.52E-4	2.72E-4
Bone (hard bone)	6.56E-5	2.13E-3	1.00E-2	3.05E-2	3.52E-2	1.68E-2	8.65E-3	6.23E-3	5.52E-3	5.07E-3	4.74E-3	3.98E-3
Bone (marrow)	2.30E-5	5.21E-4	1.58E-3	3.60E-3	4.47E-3	4.66E-3	5.00E-3	5.05E-3	4.68E-3	4.34E-3	4.05E-3	3.31E-3
Brain	0.00E+0	0.00E+0	0.00E+0	3.51E-5	4.91E-4	1.26E-3	1.62E-3	2.02E-3	2.20E-3	2.22E-3	2.20E-3	2.00E-3
Breast	0.00E+0	1.81E-6	2.56E-4	4.37E-3	7.97E-3	7.07E-3	7.11E-3	7.42E-3	7.18E-3	6.77E-3	6.38E-3	5.33E-3
Esophagus	4.44E-1	1.15E+0	1.17E+0	6.64E-1	2.60E-1	1.50E-1	1.52E-1	1.56E-1	1.44E-1	1.31E-1	1.19E-1	8.36E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.47E-3	1.42E-3	1.42E-3	1.42E-3	1.49E-3	1.39E-3	1.24E-3
Heart	8.69E-2	2.28E-1	2.69E-1	2.01E-1	9.71E-2	5.76E-2	5.66E-2	5.72E-2	5.31E-2	4.87E-2	4.48E-2	3.40E-2
Kidney	2.08E-4	1.73E-4	1.20E-4	1.01E-4	4.85E-4	8.87E-4	9.88E-4	1.10E-3	1.16E-3	1.17E-3	1.16E-3	1.05E-3
Liver	1.57E-5	1.58E-5	5.66E-5	9.19E-4	2.54E-3	2.86E-3	2.74E-3	2.66E-3	2.54E-3	2.41E-3	2.31E-3	1.98E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.18E-4	2.39E-4	2.80E-4	3.38E-4	3.95E-4	4.24E-4	4.30E-4	4.52E-4
Lung	9.89E-3	4.11E-2	6.71E-2	7.03E-2	4.21E-2	2.60E-2	2.41E-2	2.32E-2	2.10E-2	1.92E-2	1.77E-2	1.41E-2
Muscle	2.21E-3	4.97E-3	6.03E-3	5.73E-3	4.52E-3	3.62E-3	3.63E-3	3.68E-3	3.48E-3	3.24E-3	3.04E-3	2.50E-3
Pancreas	0.00E+0	0.00E+0	0.00E+0	8.32E-5	8.47E-4	1.43E-3	1.44E-3	1.44E-3	1.47E-3	1.46E-3	1.45E-3	1.33E-3
Skin	2.36E-6	1.71E-4	6.75E-4	1.48E-3	1.78E-3	1.72E-3	1.89E-3	2.07E-3	2.00E-3	1.86E-3	1.75E-3	1.46E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.35E-5	2.33E-4	2.92E-4	3.65E-4	4.35E-4	4.81E-4	4.95E-4	5.06E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	3.62E-4	1.64E-3	2.12E-3	2.13E-3	2.18E-3	2.14E-3	2.05E-3	1.96E-3	1.71E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	2.66E-4	1.16E-3	1.59E-3	1.57E-3	1.57E-3	1.59E-3	1.57E-3	1.52E-3	1.40E-3
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Thymus	0.00E+0	6.66E-3	6.06E-2	1.35E-1	9.48E-2	5.90E-2	5.63E-2	5.63E-2	5.27E-2	4.88E-2	4.50E-2	3.66E-2
Thyroid	3.44E-1	1.34E+0	1.66E+0	1.07E+0	4.31E-1	2.40E-1	2.41E-1	2.48E-1	2.29E-1	2.08E-1	1.92E-1	1.42E-1
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.18E-4	4.72E-4	5.34E-4	6.33E-4	7.07E-4	7.30E-4	7.42E-4	7.30E-4
Whole body	6.48E-3	1.12E-2	1.31E-2	1.32E-2	1.02E-2	6.50E-3	5.59E-3	5.38E-3	5.00E-3	4.63E-3	4.31E-3	3.47E-3

Table E-64 SAFs (kg^{-1}) for 25 target organs and for upper large intestine as a source region in the JM2 phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	8.74E-3	1.26E-2	1.41E-2	1.39E-2	9.97E-3	7.00E-3	6.71E-3	6.74E-3	6.37E-3	5.96E-3	5.57E-3	4.55E-3
Adrenal	0.00E+0	0.00E+0	1.39E-3	1.27E-2	2.17E-2	1.83E-2	1.65E-2	1.53E-2	1.39E-2	1.32E-2	1.22E-2	9.96E-3
Bladder	0.00E+0	0.00E+0	1.21E-4	2.34E-3	6.40E-3	6.91E-3	6.71E-3	6.54E-3	6.20E-3	5.87E-3	5.62E-3	4.81E-3
Bone (hard bone)	1.94E-5	5.35E-4	2.02E-3	7.01E-3	1.25E-2	8.84E-3	4.97E-3	3.29E-3	2.85E-3	2.64E-3	2.50E-3	2.17E-3
Bone (marrow)	3.09E-6	5.05E-5	1.78E-4	7.70E-4	1.81E-3	2.51E-3	2.82E-3	2.93E-3	2.82E-3	2.67E-3	2.53E-3	2.15E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.31E-6	2.14E-5	4.94E-5	8.52E-5	1.09E-4	1.26E-4	1.54E-4
Breast	0.00E+0	0.00E+0	0.00E+0	4.01E-5	3.99E-4	7.16E-4	8.75E-4	1.12E-3	1.31E-3	1.40E-3	1.40E-3	1.32E-3
Esophagus	0.00E+0	0.00E+0	0.00E+0	2.90E-4	1.54E-3	2.05E-3	2.05E-3	2.16E-3	2.21E-3	2.11E-3	2.04E-3	1.82E-3
Gall bladder	2.03E-2	9.29E-2	1.66E-1	1.85E-1	1.13E-1	6.76E-2	6.25E-2	6.03E-2	5.50E-2	5.06E-2	4.68E-2	3.74E-2
Heart	0.00E+0	0.00E+0	0.00E+0	2.88E-4	1.59E-3	2.12E-3	2.13E-3	2.26E-3	2.33E-3	2.30E-3	2.24E-3	2.02E-3
Kidney	1.01E-2	3.55E-2	6.91E-2	9.58E-2	7.15E-2	4.61E-2	4.15E-2	3.95E-2	3.59E-2	3.28E-2	3.05E-2	2.47E-2
Liver	3.52E-3	1.23E-2	2.22E-2	3.39E-2	3.13E-2	2.22E-2	2.00E-2	1.92E-2	1.77E-2	1.64E-2	1.53E-2	1.26E-2
Lower large intestine	7.81E-3	2.09E-2	3.01E-2	3.06E-2	2.27E-2	1.64E-2	1.53E-2	1.48E-2	1.38E-2	1.27E-2	1.19E-2	9.67E-3
Lung	0.00E+0	0.00E+0	7.59E-6	4.26E-4	1.75E-3	2.14E-3	2.14E-3	2.28E-3	2.32E-3	2.27E-3	2.19E-3	1.95E-3
Muscle	1.08E-3	2.41E-3	3.58E-3	4.80E-3	4.54E-3	3.71E-3	3.64E-3	3.71E-3	3.58E-3	3.40E-3	3.23E-3	2.74E-3
Pancreas	7.65E-3	3.23E-2	6.35E-2	9.10E-2	7.06E-2	4.55E-2	4.06E-2	3.83E-2	3.47E-2	3.20E-2	2.97E-2	2.40E-2
Skin	2.14E-6	1.27E-4	7.13E-4	1.92E-3	2.17E-3	1.93E-3	2.05E-3	2.26E-3	2.23E-3	2.11E-3	2.00E-3	1.70E-3
Small Intestine	1.12E-2	3.69E-2	6.40E-2	8.44E-2	6.42E-2	4.16E-2	3.75E-2	3.58E-2	3.28E-2	3.01E-2	2.79E-2	2.25E-2
Spleen	0.00E+0	3.31E-5	1.08E-3	7.32E-3	1.16E-2	9.95E-3	9.03E-3	8.64E-3	8.06E-3	7.58E-3	7.18E-3	6.08E-3
Stomach	2.44E-2	6.51E-2	9.30E-2	9.61E-2	6.23E-2	3.88E-2	3.59E-2	3.49E-2	3.21E-2	2.94E-2	2.73E-2	2.17E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.73E-4	1.08E-3	1.32E-3	1.64E-3	1.86E-3	1.89E-3	1.88E-3	1.73E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.53E-4	6.96E-4	7.80E-4	9.09E-4	1.03E-3	1.07E-3	1.08E-3	1.10E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.24E-4	3.04E-4	3.81E-4	4.53E-4	5.02E-4	5.32E-4	5.35E-4
Upper large intestine	4.40E+0	2.65E+0	1.66E+0	7.63E-1	2.94E-1	1.70E-1	1.75E-1	1.77E-1	1.54E-1	1.31E-1	1.13E-1	7.45E-2
Whole body	1.26E-2	1.13E-2	1.11E-2	1.08E-2	8.80E-3	6.38E-3	5.75E-3	5.58E-3	5.23E-3	4.87E-3	4.56E-3	3.76E-3

Table E-65 SAFs (kg^{-1}) for 25 target organs and for upper large intestine content as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.07E-3	4.45E-3	8.18E-3	1.10E-2	8.98E-3	6.52E-3	6.21E-3	6.21E-3	5.89E-3	5.53E-3	5.21E-3	4.34E-3
Adrenal	0.00E+0	0.00E+0	6.53E-4	7.98E-3	1.54E-2	1.38E-2	1.27E-2	1.18E-2	1.10E-2	1.02E-2	9.51E-3	8.05E-3
Bladder	0.00E+0	0.00E+0	1.15E-4	3.21E-3	8.82E-3	9.25E-3	8.72E-3	8.35E-3	7.84E-3	7.36E-3	6.91E-3	5.87E-3
Bone (hard bone)	2.05E-6	3.18E-4	2.20E-3	9.30E-3	1.51E-2	9.95E-3	5.50E-3	3.64E-3	3.15E-3	2.90E-3	2.74E-3	2.37E-3
Bone (marrow)	2.38E-7	2.55E-5	1.70E-4	9.31E-4	2.10E-3	2.83E-3	3.15E-3	3.27E-3	3.12E-3	2.95E-3	2.80E-3	2.36E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.00E-6	1.66E-5	4.13E-5	7.49E-5	9.79E-5	1.12E-4	1.41E-4
Breast	0.00E+0	0.00E+0	0.00E+0	2.30E-5	2.67E-4	5.20E-4	6.56E-4	8.75E-4	1.04E-3	1.11E-3	1.11E-3	1.10E-3
Esophagus	0.00E+0	0.00E+0	0.00E+0	1.76E-4	1.05E-3	1.48E-3	1.55E-3	1.66E-3	1.69E-3	1.68E-3	1.66E-3	1.52E-3
Gall bladder	2.63E-3	3.62E-2	9.06E-2	1.17E-1	7.86E-2	4.90E-2	4.48E-2	4.29E-2	3.91E-2	3.61E-2	3.34E-2	2.72E-2
Heart	0.00E+0	0.00E+0	0.00E+0	1.68E-4	1.05E-3	1.52E-3	1.58E-3	1.73E-3	1.82E-3	1.83E-3	1.78E-3	1.64E-3
Kidney	5.76E-4	1.06E-2	3.80E-2	7.28E-2	6.09E-2	4.00E-2	3.57E-2	3.36E-2	3.06E-2	2.81E-2	2.61E-2	2.13E-2
Liver	3.48E-4	4.63E-3	1.22E-2	2.30E-2	2.38E-2	1.76E-2	1.59E-2	1.52E-2	1.42E-2	1.32E-2	1.23E-2	1.02E-2
Lower large intestine	6.54E-4	5.83E-3	1.23E-2	1.65E-2	1.60E-2	1.30E-2	1.21E-2	1.17E-2	1.08E-2	1.01E-2	9.48E-3	7.86E-3
Lung	0.00E+0	0.00E+0	3.67E-6	2.52E-4	1.21E-3	1.60E-3	1.65E-3	1.81E-3	1.88E-3	1.86E-3	1.81E-3	1.63E-3
Muscle	1.33E-4	1.01E-3	2.64E-3	4.74E-3	4.78E-3	3.94E-3	3.85E-3	3.91E-3	3.76E-3	3.56E-3	3.39E-3	2.89E-3
Pancreas	2.74E-4	8.07E-3	2.75E-2	5.19E-2	4.58E-2	3.11E-2	2.76E-2	2.59E-2	2.36E-2	2.17E-2	2.02E-2	1.65E-2
Skin	0.00E+0	6.30E-5	5.44E-4	1.78E-3	2.15E-3	1.94E-3	2.07E-3	2.28E-3	2.25E-3	2.13E-3	2.01E-3	1.72E-3
Small Intestine	1.84E-3	1.63E-2	4.36E-2	7.36E-2	6.07E-2	3.99E-2	3.57E-2	3.38E-2	3.09E-2	2.84E-2	2.64E-2	2.15E-2
Spleen	0.00E+0	9.73E-6	4.71E-4	3.72E-3	6.79E-3	6.44E-3	6.00E-3	5.87E-3	5.59E-3	5.32E-3	5.06E-3	4.33E-3
Stomach	6.98E-3	2.89E-2	5.09E-2	5.84E-2	4.00E-2	2.58E-2	2.38E-2	2.32E-2	2.14E-2	1.98E-2	1.84E-2	1.49E-2
Testis	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.21E-4	1.43E-3	1.69E-3	2.05E-3	2.23E-3	2.26E-3	2.22E-3	2.07E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.51E-4	5.16E-4	6.07E-4	7.27E-4	8.52E-4	8.77E-4	9.21E-4	8.91E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.72E-4	2.36E-4	3.38E-4	4.00E-4	4.27E-4	4.57E-4	4.74E-4
Upper large intestine	6.25E-1	8.83E-1	8.33E-1	5.20E-1	2.29E-1	1.31E-1	1.29E-1	1.31E-1	1.21E-1	1.09E-1	9.88E-2	7.15E-2
Whole body	1.73E-3	3.99E-3	6.46E-3	9.02E-3	8.40E-3	6.16E-3	5.46E-3	5.25E-3	4.95E-3	4.64E-3	4.37E-3	3.66E-3

Table E-66 SAFs (kg^{-1}) for 25 target organs and for whole body as a source region in the JM2 phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.48E-2	1.36E-2	1.21E-2	9.11E-3	5.83E-3	4.29E-3	4.38E-3	4.57E-3	4.35E-3	4.06E-3	3.80E-3	3.07E-3
Adrenal	1.42E-2	1.39E-2	1.31E-2	1.18E-2	9.37E-3	7.47E-3	7.30E-3	7.19E-3	6.72E-3	6.09E-3	5.80E-3	4.55E-3
Bladder	1.19E-2	1.03E-2	9.57E-3	8.93E-3	7.52E-3	6.09E-3	5.91E-3	5.96E-3	5.58E-3	5.15E-3	4.78E-3	3.96E-3
Bone (hard bone)	1.48E-2	1.95E-2	2.44E-2	3.10E-2	2.70E-2	1.24E-2	6.86E-3	5.36E-3	4.82E-3	4.42E-3	4.12E-3	3.40E-3
Bone (marrow)	5.57E-3	3.41E-3	2.93E-3	2.94E-3	3.04E-3	3.34E-3	3.72E-3	3.88E-3	3.71E-3	3.48E-3	3.26E-3	2.62E-3
Brain	1.40E-2	1.33E-2	1.21E-2	9.18E-3	5.67E-3	4.01E-3	4.04E-3	4.14E-3	3.89E-3	3.59E-3	3.34E-3	2.68E-3
Breast	1.47E-2	1.31E-2	1.11E-2	8.28E-3	5.15E-3	3.77E-3	3.95E-3	4.27E-3	4.11E-3	3.83E-3	3.62E-3	2.91E-3
Esophagus	1.43E-2	1.45E-2	1.47E-2	1.34E-2	9.79E-3	7.39E-3	7.25E-3	7.17E-3	6.64E-3	6.04E-3	5.76E-3	4.60E-3
Gall bladder	1.15E-2	1.10E-2	1.13E-2	1.16E-2	9.42E-3	6.73E-3	6.49E-3	6.25E-3	5.87E-3	5.42E-3	5.10E-3	4.22E-3
Heart	1.53E-2	1.71E-2	1.82E-2	1.62E-2	1.07E-2	7.45E-3	7.16E-3	7.12E-3	6.58E-3	6.10E-3	5.65E-3	4.53E-3
Kidney	1.43E-2	1.43E-2	1.40E-2	1.25E-2	9.46E-3	7.08E-3	6.79E-3	6.70E-3	6.22E-3	5.81E-3	5.42E-3	4.39E-3
Liver	1.44E-2	1.46E-2	1.45E-2	1.33E-2	9.61E-3	6.88E-3	6.57E-3	6.52E-3	6.10E-3	5.67E-3	5.26E-3	4.28E-3
Lower large intestine	1.19E-2	1.08E-2	1.07E-2	1.04E-2	8.10E-3	6.17E-3	5.93E-3	5.87E-3	5.52E-3	5.11E-3	4.80E-3	3.97E-3
Lung	4.72E-2	4.13E-2	3.33E-2	2.07E-2	1.12E-2	7.36E-3	7.16E-3	7.13E-3	6.53E-3	5.94E-3	5.43E-3	4.19E-3
Muscle	1.43E-2	1.37E-2	1.25E-2	9.48E-3	5.98E-3	4.37E-3	4.45E-3	4.61E-3	4.38E-3	4.08E-3	3.82E-3	3.09E-3
Pancreas	1.43E-2	1.43E-2	1.39E-2	1.27E-2	9.89E-3	7.36E-3	6.87E-3	6.69E-3	6.20E-3	5.75E-3	5.37E-3	4.33E-3
Skin	1.08E-2	8.94E-3	7.45E-3	5.25E-3	3.23E-3	2.54E-3	2.80E-3	3.07E-3	2.90E-3	2.65E-3	2.45E-3	1.97E-3
Small Intestine	1.44E-2	1.44E-2	1.41E-2	1.24E-2	9.01E-3	6.32E-3	6.05E-3	5.98E-3	5.60E-3	5.20E-3	4.87E-3	4.01E-3
Spleen	1.44E-2	1.47E-2	1.46E-2	1.29E-2	9.22E-3	6.64E-3	6.41E-3	6.37E-3	6.00E-3	5.58E-3	5.18E-3	4.22E-3
Stomach	1.23E-2	1.15E-2	1.11E-2	1.05E-2	8.15E-3	5.92E-3	5.65E-3	5.60E-3	5.26E-3	4.91E-3	4.58E-3	3.74E-3
Testis	1.43E-2	1.38E-2	1.26E-2	9.77E-3	6.24E-3	4.48E-3	4.52E-3	4.74E-3	4.53E-3	4.31E-3	4.03E-3	3.25E-3
Thymus	1.66E-2	1.82E-2	1.82E-2	1.49E-2	9.58E-3	6.67E-3	6.54E-3	6.60E-3	6.11E-3	5.68E-3	5.26E-3	4.14E-3
Thyroid	1.44E-2	1.44E-2	1.40E-2	1.11E-2	7.33E-3	5.43E-3	5.54E-3	5.61E-3	5.26E-3	4.91E-3	4.61E-3	3.68E-3
Upper large intestine	1.20E-2	1.09E-2	1.07E-2	1.01E-2	7.81E-3	5.71E-3	5.45E-3	5.46E-3	5.20E-3	4.77E-3	4.52E-3	3.73E-3
Whole body	1.47E-2	1.43E-2	1.36E-2	1.17E-2	8.32E-3	5.31E-3	4.76E-3	4.73E-3	4.46E-3	4.14E-3	3.86E-3	3.13E-3

Table E-67 SAFs (kg^{-1}) for 26 target organs and for adipose as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	6.94E-2	5.24E-2	3.84E-2	2.17E-2	1.05E-2	7.09E-3	7.43E-3	7.89E-3	7.41E-3	6.78E-3	6.21E-3	4.74E-3
Adrenal	1.29E-2	1.77E-2	1.53E-2	1.04E-2	7.12E-3	5.74E-3	5.76E-3	5.96E-3	5.63E-3	5.11E-3	4.97E-3	4.01E-3
Bladder	1.25E-2	1.65E-2	1.79E-2	1.88E-2	1.55E-2	1.17E-2	1.11E-2	1.10E-2	1.02E-2	9.56E-3	8.95E-3	7.22E-3
Bone (hard bone)	2.14E-3	6.98E-3	1.30E-2	2.25E-2	2.29E-2	1.27E-2	6.94E-3	5.52E-3	5.06E-3	4.69E-3	4.41E-3	3.71E-3
Bone (marrow)	7.48E-4	1.18E-3	1.59E-3	2.37E-3	2.94E-3	3.34E-3	3.72E-3	3.95E-3	3.85E-3	3.66E-3	3.46E-3	2.85E-3
Brain	1.62E-5	2.34E-5	4.43E-5	4.25E-4	1.36E-3	1.46E-3	1.56E-3	1.69E-3	1.65E-3	1.57E-3	1.50E-3	1.29E-3
Breast	3.38E-3	5.81E-3	6.62E-3	5.58E-3	3.70E-3	2.73E-3	2.87E-3	3.13E-3	3.09E-3	2.93E-3	2.78E-3	2.32E-3
Esophagus	3.45E-3	5.31E-3	5.84E-3	5.42E-3	4.58E-3	3.71E-3	3.70E-3	3.79E-3	3.63E-3	3.39E-3	3.20E-3	2.66E-3
Gall bladder	3.24E-3	4.95E-3	6.35E-3	7.92E-3	6.24E-3	4.89E-3	4.77E-3	5.00E-3	4.87E-3	4.56E-3	4.43E-3	3.84E-3
Heart	2.46E-3	3.67E-3	4.37E-3	4.89E-3	4.42E-3	3.40E-3	3.34E-3	3.41E-3	3.28E-3	3.08E-3	2.90E-3	2.42E-3
Kidney	2.30E-3	5.18E-3	7.95E-3	9.85E-3	7.73E-3	5.86E-3	5.80E-3	5.94E-3	5.70E-3	5.38E-3	5.04E-3	4.24E-3
Liver	9.22E-4	2.46E-3	4.27E-3	5.98E-3	5.30E-3	4.09E-3	4.05E-3	4.23E-3	4.11E-3	3.90E-3	3.70E-3	3.14E-3
Lower large intestine	1.44E-2	2.11E-2	2.33E-2	2.12E-2	1.46E-2	1.05E-2	1.02E-2	1.03E-2	9.66E-3	9.02E-3	8.32E-3	6.78E-3
Lung	4.10E-3	6.38E-3	7.15E-3	6.58E-3	5.03E-3	3.65E-3	3.60E-3	3.71E-3	3.55E-3	3.31E-3	3.13E-3	2.60E-3
Muscle	6.58E-3	1.08E-2	1.25E-2	1.10E-2	7.14E-3	5.17E-3	5.29E-3	5.59E-3	5.37E-3	5.04E-3	4.74E-3	3.88E-3
Ovary	1.03E-2	1.90E-2	2.35E-2	2.22E-2	1.59E-2	1.18E-2	1.15E-2	1.15E-2	1.07E-2	9.80E-3	9.42E-3	7.64E-3
Pancreas	2.45E-3	5.60E-3	8.12E-3	9.38E-3	7.44E-3	5.87E-3	5.75E-3	5.97E-3	5.67E-3	5.38E-3	5.06E-3	4.22E-3
Skin	1.91E-2	2.26E-2	1.89E-2	1.13E-2	5.54E-3	3.99E-3	4.44E-3	4.87E-3	4.54E-3	4.09E-3	3.72E-3	2.83E-3
Small Intestine	7.98E-3	1.42E-2	1.68E-2	1.62E-2	1.16E-2	8.73E-3	8.55E-3	8.67E-3	8.17E-3	7.59E-3	7.10E-3	5.77E-3
Spleen	3.90E-3	9.26E-3	1.30E-2	1.30E-2	8.59E-3	5.88E-3	5.88E-3	6.12E-3	5.92E-3	5.52E-3	5.24E-3	4.25E-3
Stomach	6.79E-3	1.05E-2	1.19E-2	1.10E-2	7.75E-3	5.70E-3	5.65E-3	5.88E-3	5.68E-3	5.29E-3	5.05E-3	4.16E-3
Thymus	1.50E-3	2.30E-3	3.34E-3	4.13E-3	3.81E-3	2.91E-3	2.89E-3	2.97E-3	2.88E-3	2.69E-3	2.58E-3	2.19E-3
Thyroid	1.59E-3	4.67E-3	6.78E-3	6.28E-3	4.08E-3	3.15E-3	3.33E-3	3.55E-3	3.39E-3	3.21E-3	3.13E-3	2.57E-3
Upper large intestine	1.34E-2	1.75E-2	1.79E-2	1.50E-2	9.90E-3	7.16E-3	7.19E-3	7.50E-3	7.20E-3	6.68E-3	6.31E-3	5.11E-3
Uterus	5.71E-3	1.20E-2	1.83E-2	2.28E-2	1.78E-2	1.26E-2	1.19E-2	1.17E-2	1.10E-2	1.02E-2	9.50E-3	7.75E-3
Whole body	2.21E-2	2.04E-2	1.83E-2	1.45E-2	9.79E-3	6.46E-3	5.81E-3	5.88E-3	5.57E-3	5.17E-3	4.81E-3	3.87E-3

Table E-68 SAFs (kg^{-1}) for 26 target organs and for adrenal as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.29E-2	1.77E-2	1.56E-2	1.05E-2	6.69E-3	5.68E-3	5.72E-3	5.78E-3	5.64E-3	5.28E-3	4.95E-3	3.99E-3
Adrenal	1.14E+2	6.92E+1	3.86E+1	1.39E+1	4.22E+0	2.45E+0	2.71E+0	2.84E+0	2.39E+0	1.92E+0	1.55E+0	7.50E-1
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.75E-4	1.18E-3	1.48E-3	1.50E-3	1.88E-3	1.91E-3	1.87E-3	1.73E-3
Bone (hard bone)	5.35E-4	5.69E-3	1.51E-2	3.08E-2	3.71E-2	2.26E-2	1.18E-2	7.98E-3	7.36E-3	6.76E-3	6.33E-3	5.33E-3
Bone (marrow)	1.26E-4	1.09E-3	2.63E-3	5.12E-3	6.80E-3	7.76E-3	8.40E-3	8.99E-3	7.85E-3	7.27E-3	6.80E-3	5.56E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.57E-6	5.43E-5	9.24E-5	1.49E-4	2.25E-4	2.66E-4	2.87E-4	3.13E-4
Breast	0.00E+0	0.00E+0	6.59E-6	8.11E-4	3.66E-3	4.85E-3	4.88E-3	5.12E-3	5.12E-3	4.91E-3	4.67E-3	4.02E-3
Esophagus	0.00E+0	8.67E-5	2.60E-3	1.49E-2	1.82E-2	1.48E-2	1.35E-2	1.28E-2	1.17E-2	1.09E-2	1.02E-2	8.41E-3
Gall bladder	0.00E+0	2.16E-2	1.34E-1	2.51E-1	1.70E-1	1.04E-1	9.61E-2	9.21E-2	8.29E-2	7.62E-2	6.96E-2	5.71E-2
Heart	0.00E+0	0.00E+0	2.12E-4	4.74E-3	1.02E-2	9.88E-3	9.02E-3	8.70E-3	8.15E-3	7.69E-3	7.29E-3	6.14E-3
Kidney	3.61E-2	1.54E-1	2.63E-1	2.67E-1	1.52E-1	1.00E-1	9.51E-2	9.26E-2	8.49E-2	7.79E-2	7.19E-2	5.72E-2
Liver	3.22E-3	3.18E-2	8.39E-2	1.40E-1	1.04E-1	6.69E-2	6.10E-2	5.87E-2	5.34E-2	4.90E-2	4.54E-2	3.68E-2
Lower large intestine	0.00E+0	0.00E+0	4.61E-5	1.00E-3	2.40E-3	3.82E-3	3.99E-3	3.79E-3	4.20E-3	4.05E-3	3.91E-3	3.46E-3
Lung	0.00E+0	5.12E-5	1.02E-3	7.54E-3	1.13E-2	1.03E-2	9.46E-3	9.04E-3	8.45E-3	7.88E-3	7.39E-3	6.20E-3
Muscle	7.28E-3	1.33E-2	1.44E-2	1.12E-2	7.12E-3	6.08E-3	6.06E-3	6.04E-3	5.85E-3	5.47E-3	5.13E-3	4.18E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.03E-4	1.08E-3	1.45E-3	1.47E-3	1.83E-3	2.00E-3	1.91E-3	1.73E-3
Pancreas	1.88E-2	1.32E-1	2.48E-1	2.80E-1	1.68E-1	1.06E-1	9.94E-2	9.64E-2	8.78E-2	8.03E-2	7.45E-2	5.92E-2
Skin	0.00E+0	0.00E+0	4.97E-5	9.02E-4	1.85E-3	2.17E-3	2.34E-3	2.52E-3	2.52E-3	2.38E-3	2.25E-3	1.91E-3
Small Intestine	0.00E+0	5.10E-5	1.45E-3	8.44E-3	1.24E-2	1.30E-2	1.24E-2	1.17E-2	1.14E-2	1.06E-2	1.00E-2	8.38E-3
Spleen	0.00E+0	7.47E-5	5.44E-3	3.82E-2	4.44E-2	3.57E-2	3.21E-2	3.00E-2	2.79E-2	2.58E-2	2.40E-2	1.98E-2
Stomach	1.15E-2	8.27E-2	1.39E-1	1.47E-1	9.20E-2	6.00E-2	5.60E-2	5.45E-2	5.02E-2	4.61E-2	4.28E-2	3.42E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	3.07E-4	2.14E-3	3.07E-3	2.91E-3	3.03E-3	3.08E-3	3.04E-3	2.95E-3	2.61E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.39E-4	7.30E-4	8.09E-4	8.68E-4	9.84E-4	9.94E-4	1.02E-3	9.79E-4
Upper large intestine	0.00E+0	0.00E+0	3.45E-4	4.68E-3	8.86E-3	9.31E-3	8.96E-3	8.96E-3	8.69E-3	8.25E-3	7.77E-3	6.62E-3
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.74E-4	9.74E-4	1.28E-3	1.25E-3	1.72E-3	1.72E-3	1.71E-3	1.61E-3
Whole body	2.27E-2	2.24E-2	2.17E-2	2.01E-2	1.55E-2	1.11E-2	9.36E-3	8.76E-3	8.23E-3	7.60E-3	7.06E-3	5.70E-3

Table E-69 SAFs (kg^{-1}) for 26 target organs and for bladder as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.26E-2	1.65E-2	1.80E-2	1.88E-2	1.54E-2	1.15E-2	1.09E-2	1.09E-2	1.02E-2	9.45E-3	8.82E-3	7.18E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.14E-4	1.10E-3	1.38E-3	1.75E-3	1.85E-3	1.90E-3	1.86E-3	1.71E-3
Bladder	2.65E+1	1.43E+1	8.25E+0	3.40E+0	1.18E+0	6.77E-1	7.19E-1	7.29E-1	6.09E-1	5.00E-1	4.20E-1	2.56E-1
Bone (hard bone)	9.09E-4	5.48E-3	1.26E-2	2.84E-2	3.42E-2	2.14E-2	1.13E-2	7.90E-3	6.82E-3	6.20E-3	5.78E-3	4.90E-3
Bone (marrow)	0.00E+0	0.00E+0	2.16E-3	3.75E-3	5.02E-3	5.46E-3	5.71E-3	5.69E-3	5.51E-3	5.24E-3	4.95E-3	4.06E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.98E-6	1.01E-5	2.42E-5	3.59E-5	4.63E-5	6.62E-5
Breast	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.31E-5	8.67E-5	1.35E-4	2.31E-4	3.36E-4	3.93E-4	4.26E-4	4.56E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.27E-5	1.14E-4	1.84E-4	2.70E-4	3.74E-4	4.26E-4	4.41E-4	4.64E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.94E-4	1.82E-3	2.14E-3	2.52E-3	2.71E-3	2.65E-3	2.61E-3	2.30E-3
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.98E-5	1.01E-4	1.58E-4	2.64E-4	3.73E-4	4.34E-4	4.61E-4	4.89E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	6.19E-5	7.89E-4	1.85E-3	2.18E-3	2.50E-3	2.62E-3	2.62E-3	2.56E-3	2.32E-3
Liver	0.00E+0	0.00E+0	0.00E+0	1.62E-5	2.68E-4	6.87E-4	8.77E-4	1.14E-3	1.32E-3	1.38E-3	1.39E-3	1.33E-3
Lower large intestine	8.66E-2	1.77E-1	2.53E-1	2.60E-1	1.55E-1	9.26E-2	8.60E-2	8.34E-2	7.63E-2	6.97E-2	6.43E-2	5.06E-2
Lung	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.80E-5	1.25E-4	1.91E-4	3.11E-4	4.21E-4	4.77E-4	5.10E-4	5.35E-4
Muscle	3.77E-3	6.67E-3	8.89E-3	1.04E-2	9.84E-3	8.10E-3	7.78E-3	7.71E-3	7.26E-3	6.78E-3	6.38E-3	5.29E-3
Ovary	5.53E-1	1.17E+0	1.25E+0	8.35E-1	3.75E-1	2.16E-1	2.13E-1	2.13E-1	1.96E-1	1.78E-1	1.62E-1	1.19E-1
Pancreas	0.00E+0	0.00E+0	0.00E+0	1.96E-4	1.67E-3	2.87E-3	3.15E-3	3.42E-3	3.51E-3	3.40E-3	3.28E-3	2.93E-3
Skin	0.00E+0	3.31E-6	8.61E-5	8.22E-4	2.00E-3	2.23E-3	2.40E-3	2.65E-3	2.61E-3	2.47E-3	2.33E-3	1.98E-3
Small Intestine	0.00E+0	3.84E-4	6.64E-3	3.22E-2	3.85E-2	2.81E-2	2.51E-2	2.34E-2	2.14E-2	1.98E-2	1.84E-2	1.52E-2
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.28E-4	9.36E-4	1.15E-3	1.44E-3	1.64E-3	1.68E-3	1.71E-3	1.57E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	7.51E-4	2.99E-3	3.64E-3	3.65E-3	3.85E-3	3.88E-3	3.74E-3	3.63E-3	3.19E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.21E-5	1.20E-4	1.99E-4	2.30E-4	2.70E-4	2.90E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Upper large intestine	0.00E+0	2.01E-4	2.78E-3	1.33E-2	1.86E-2	1.55E-2	1.44E-2	1.39E-2	1.31E-2	1.22E-2	1.14E-2	9.56E-3
Uterus	6.68E-1	1.30E+0	1.48E+0	1.07E+0	4.87E-1	2.74E-1	2.67E-1	2.67E-1	2.46E-1	2.23E-1	2.05E-1	1.53E-1
Whole body	1.80E-2	1.62E-2	1.63E-2	1.70E-2	1.49E-2	1.07E-2	8.96E-3	8.43E-3	7.80E-3	7.22E-3	6.74E-3	5.51E-3

Table E-70 SAFs (kg^{-1}) for 26 target organs and for bladder content as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.47E-3	6.11E-3	1.10E-2	1.61E-2	1.47E-2	1.11E-2	1.05E-2	1.03E-2	9.63E-3	9.04E-3	8.47E-3	6.98E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.20E-4	1.10E-3	1.36E-3	1.42E-3	1.63E-3	1.83E-3	1.83E-3	1.66E-3
Bladder	3.30E+0	4.39E+0	3.91E+0	2.20E+0	8.68E-1	4.85E-1	4.92E-1	5.07E-1	4.65E-1	4.17E-1	3.75E-1	2.61E-1
Bone (hard bone)	1.75E-4	2.75E-3	9.74E-3	2.60E-2	3.27E-2	2.08E-2	1.09E-2	6.79E-3	5.88E-3	5.91E-3	5.52E-3	4.30E-3
Bone (marrow)	9.37E-5	6.80E-4	1.73E-3	3.55E-3	4.81E-3	5.24E-3	5.47E-3	5.79E-3	5.53E-3	5.00E-3	4.74E-3	4.02E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.01E-6	8.11E-6	1.83E-5	3.40E-5	4.55E-5	5.62E-5
Breast	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.28E-5	8.54E-5	1.32E-4	2.18E-4	3.20E-4	3.94E-4	4.26E-4	4.54E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.15E-5	1.09E-4	1.77E-4	2.26E-4	3.03E-4	4.07E-4	4.27E-4	4.06E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.16E-4	1.90E-3	2.10E-3	2.45E-3	2.50E-3	2.73E-3	2.62E-3	2.35E-3
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.93E-5	1.01E-4	1.59E-4	2.38E-4	3.35E-4	4.25E-4	4.51E-4	4.58E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	6.24E-5	7.86E-4	1.83E-3	2.16E-3	2.34E-3	2.52E-3	2.60E-3	2.52E-3	2.25E-3
Liver	0.00E+0	0.00E+0	0.00E+0	1.66E-5	2.68E-4	6.80E-4	8.72E-4	1.09E-3	1.28E-3	1.38E-3	1.39E-3	1.30E-3
Lower large intestine	1.38E-2	7.99E-2	1.76E-1	2.29E-1	1.47E-1	8.81E-2	8.08E-2	7.80E-2	7.10E-2	6.50E-2	6.01E-2	4.83E-2
Lung	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.78E-5	1.23E-4	1.88E-4	2.76E-4	3.83E-4	4.77E-4	5.07E-4	5.08E-4
Muscle	5.26E-4	2.88E-3	6.12E-3	9.24E-3	9.53E-3	7.90E-3	7.55E-3	7.37E-3	6.96E-3	6.58E-3	6.19E-3	5.15E-3
Ovary	3.06E-2	2.60E-1	4.72E-1	4.74E-1	2.61E-1	1.53E-1	1.44E-1	1.40E-1	1.28E-1	1.17E-1	1.09E-1	8.56E-2
Pancreas	0.00E+0	0.00E+0	0.00E+0	2.04E-4	1.71E-3	2.89E-3	3.14E-3	3.34E-3	3.47E-3	3.42E-3	3.31E-3	2.90E-3
Skin	0.00E+0	1.24E-6	6.18E-5	7.85E-4	2.01E-3	2.24E-3	2.40E-3	2.60E-3	2.56E-3	2.46E-3	2.33E-3	1.96E-3
Small Intestine	0.00E+0	2.78E-4	6.22E-3	3.28E-2	3.96E-2	2.88E-2	2.56E-2	2.40E-2	2.19E-2	2.01E-2	1.87E-2	1.54E-2
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.24E-4	9.03E-4	1.13E-3	1.34E-3	1.55E-3	1.67E-3	1.68E-3	1.55E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	7.46E-4	3.06E-3	3.67E-3	3.66E-3	3.84E-3	3.89E-3	3.81E-3	3.64E-3	3.17E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.23E-4	2.64E-4	2.91E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Upper large intestine	0.00E+0	1.08E-4	2.31E-3	1.32E-2	1.90E-2	1.57E-2	1.45E-2	1.41E-2	1.32E-2	1.23E-2	1.15E-2	9.56E-3
Uterus	7.84E-2	5.31E-1	9.87E-1	9.26E-1	4.58E-1	2.57E-1	2.44E-1	2.42E-1	2.22E-1	2.02E-1	1.87E-1	1.48E-1
Whole body	2.25E-3	5.95E-3	1.01E-2	1.46E-2	1.42E-2	1.03E-2	8.53E-3	7.83E-3	7.30E-3	6.91E-3	6.48E-3	5.30E-3

Table E-71 SAFs (kg^{-1}) for 26 target organs and for brain as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.60E-5	2.38E-5	4.42E-5	3.94E-4	1.23E-3	1.38E-3	1.52E-3	1.66E-3	1.63E-3	1.55E-3	1.47E-3	1.25E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Bone (hard bone)	3.62E-3	1.28E-2	2.94E-2	6.02E-2	5.71E-2	2.82E-2	1.45E-2	1.15E-2	1.04E-2	9.55E-3	8.92E-3	7.40E-3
Bone (marrow)	1.57E-3	2.19E-3	2.88E-3	3.49E-3	3.70E-3	3.75E-3	4.04E-3	4.17E-3	3.94E-3	3.68E-3	3.44E-3	2.76E-3
Brain	7.15E-1	6.71E-1	5.95E-1	4.07E-1	2.01E-1	1.20E-1	1.18E-1	1.19E-1	1.08E-1	9.79E-2	8.90E-2	6.68E-2
Breast	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.34E-5	2.37E-4	3.41E-4	5.16E-4	6.43E-4	7.02E-4	7.20E-4	7.11E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.99E-4	8.91E-4	1.12E-3	1.39E-3	1.55E-3	1.61E-3	1.59E-3	1.50E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.28E-4	4.15E-4	5.46E-4	7.44E-4	8.92E-4	9.59E-4	9.69E-4	9.53E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.63E-6	4.90E-5	8.36E-5	1.53E-4	2.24E-4	2.58E-4	2.79E-4	3.01E-4
Liver	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.30E-5	1.01E-4	1.52E-4	2.49E-4	3.27E-4	3.64E-4	3.88E-4	3.95E-4
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.84E-6	2.32E-5	4.31E-5	6.78E-5	7.30E-5	1.04E-4
Lung	0.00E+0	0.00E+0	0.00E+0	5.91E-6	2.07E-4	5.46E-4	7.10E-4	9.50E-4	1.10E-3	1.14E-3	1.14E-3	1.09E-3
Muscle	2.24E-4	2.68E-4	2.77E-4	4.17E-4	9.69E-4	1.15E-3	1.25E-3	1.37E-3	1.37E-3	1.32E-3	1.26E-3	1.09E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Pancreas	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.12E-5	5.20E-5	9.93E-5	1.50E-4	1.74E-4	1.88E-4	2.18E-4
Skin	0.00E+0	0.00E+0	1.29E-5	4.87E-4	1.60E-3	1.88E-3	2.19E-3	2.43E-3	2.32E-3	2.14E-3	1.98E-3	1.64E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.53E-5	3.62E-5	6.48E-5	8.73E-5	1.06E-4	1.29E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.83E-5	8.21E-5	1.29E-4	2.25E-4	3.16E-4	3.31E-4	3.85E-4	3.68E-4
Stomach	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.28E-6	4.84E-5	7.69E-5	1.26E-4	1.83E-4	2.12E-4	2.30E-4	2.48E-4
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.60E-4	5.26E-4	6.88E-4	9.61E-4	1.07E-3	1.19E-3	1.23E-3	1.23E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.33E-3	3.13E-3	3.83E-3	4.57E-3	4.96E-3	4.81E-3	4.58E-3	4.17E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.71E-5	4.12E-5	7.82E-5	9.73E-5	1.16E-4	1.44E-4
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Whole body	2.27E-2	2.27E-2	2.27E-2	2.16E-2	1.53E-2	8.77E-3	6.87E-3	6.57E-3	6.08E-3	5.59E-3	5.17E-3	4.10E-3

Table E-72 SAFs (kg^{-1}) for 26 target organs and for breast as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.38E-3	5.81E-3	6.61E-3	5.55E-3	3.67E-3	2.70E-3	2.83E-3	3.13E-3	3.08E-3	2.91E-3	2.75E-3	2.27E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	8.49E-4	4.39E-3	4.99E-3	4.97E-3	5.35E-3	5.27E-3	5.04E-3	4.74E-3	3.97E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.65E-5	1.35E-4	2.57E-4	3.37E-4	3.97E-4	4.53E-4	4.88E-4
Bone (hard bone)	2.14E-4	2.65E-3	7.80E-3	1.61E-2	1.64E-2	7.66E-3	4.16E-3	3.28E-3	3.03E-3	2.86E-3	2.68E-3	2.31E-3
Bone (marrow)	4.85E-5	3.50E-4	8.60E-4	1.68E-3	2.10E-3	2.29E-3	2.53E-3	2.74E-3	2.72E-3	2.59E-3	2.44E-3	2.03E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.15E-5	2.20E-4	3.14E-4	5.10E-4	6.36E-4	6.81E-4	7.08E-4	7.13E-4
Breast	1.42E+0	1.22E+0	9.46E-1	5.03E-1	1.95E-1	1.12E-1	1.19E-1	1.26E-1	1.15E-1	1.03E-1	9.21E-2	6.47E-2
Esophagus	0.00E+0	0.00E+0	4.71E-4	7.15E-3	1.37E-2	1.12E-2	1.05E-2	1.02E-2	9.52E-3	8.80E-3	8.24E-3	6.79E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.48E-3	3.03E-3	3.27E-3	3.68E-3	3.95E-3	3.93E-3	3.69E-3	3.25E-3
Heart	0.00E+0	9.10E-4	7.49E-3	2.48E-2	2.86E-2	2.01E-2	1.89E-2	1.86E-2	1.72E-2	1.59E-2	1.47E-2	1.20E-2
Kidney	0.00E+0	0.00E+0	0.00E+0	3.75E-4	2.31E-3	2.90E-3	2.98E-3	3.34E-3	3.38E-3	3.33E-3	3.20E-3	2.84E-3
Liver	0.00E+0	8.58E-5	9.67E-4	5.69E-3	1.12E-2	9.32E-3	8.94E-3	9.29E-3	8.91E-3	8.35E-3	7.89E-3	6.67E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.38E-4	2.65E-4	3.26E-4	5.09E-4	6.39E-4	6.81E-4	7.13E-4	7.31E-4
Lung	1.04E-4	4.82E-3	1.77E-2	3.36E-2	2.93E-2	1.90E-2	1.81E-2	1.83E-2	1.69E-2	1.55E-2	1.44E-2	1.19E-2
Muscle	1.95E-3	3.58E-3	4.40E-3	4.27E-3	3.41E-3	2.68E-3	2.77E-3	3.04E-3	2.98E-3	2.82E-3	2.68E-3	2.26E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Pancreas	0.00E+0	0.00E+0	0.00E+0	2.54E-4	1.99E-3	2.64E-3	2.73E-3	3.21E-3	3.36E-3	3.28E-3	3.19E-3	2.86E-3
Skin	2.06E-3	7.86E-3	1.05E-2	8.66E-3	4.80E-3	3.45E-3	3.80E-3	4.20E-3	3.94E-3	3.58E-3	3.30E-3	2.64E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	3.90E-5	3.19E-4	5.73E-4	6.89E-4	9.65E-4	1.15E-3	1.18E-3	1.22E-3	1.19E-3
Spleen	0.00E+0	0.00E+0	0.00E+0	1.06E-3	3.93E-3	4.10E-3	3.99E-3	4.33E-3	4.30E-3	4.14E-3	3.92E-3	3.33E-3
Stomach	0.00E+0	0.00E+0	1.22E-4	1.41E-3	3.85E-3	3.80E-3	3.77E-3	4.16E-3	4.23E-3	4.02E-3	3.90E-3	3.39E-3
Thymus	0.00E+0	3.46E-4	5.30E-3	2.25E-2	2.62E-2	1.83E-2	1.74E-2	1.73E-2	1.58E-2	1.45E-2	1.33E-2	1.08E-2
Thyroid	0.00E+0	0.00E+0	0.00E+0	7.15E-4	2.74E-3	3.13E-3	3.40E-3	3.88E-3	3.96E-3	3.88E-3	3.67E-3	3.22E-3
Upper large intestine	0.00E+0	0.00E+0	2.45E-5	1.71E-4	4.73E-4	6.56E-4	7.66E-4	1.05E-3	1.23E-3	1.28E-3	1.28E-3	1.24E-3
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.77E-5	7.31E-5	1.13E-4	2.05E-4	3.15E-4	3.58E-4	3.84E-4	4.56E-4
Whole body	2.26E-2	2.17E-2	1.95E-2	1.45E-2	9.13E-3	5.69E-3	5.34E-3	5.54E-3	5.26E-3	4.86E-3	4.51E-3	3.60E-3

Table E-73 SAFs (kg^{-1}) for 26 target organs and for bronchi as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	5.61E-4	1.43E-3	2.49E-3	3.86E-3	3.86E-3	2.96E-3	3.02E-3	3.14E-3	3.00E-3	2.81E-3	2.66E-3	2.24E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	3.00E-3	7.35E-3	7.15E-3	7.11E-3	6.92E-3	6.51E-3	6.08E-3	5.71E-3	4.84E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.15E-4	2.41E-4	3.52E-4	3.65E-4	3.99E-4	4.66E-4
Bone (hard bone)	0.00E+0	1.27E-3	8.84E-3	2.96E-2	3.33E-2	1.55E-2	7.91E-3	5.71E-3	5.07E-3	4.66E-3	4.37E-3	3.71E-3
Bone (marrow)	0.00E+0	3.24E-4	1.37E-3	3.56E-3	4.61E-3	4.82E-3	5.12E-3	5.10E-3	4.80E-3	4.50E-3	4.21E-3	3.40E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.34E-4	3.50E-4	5.29E-4	7.97E-4	9.57E-4	9.84E-4	1.00E-3	1.01E-3
Breast	0.00E+0	1.88E-4	3.99E-3	1.81E-2	2.13E-2	1.50E-2	1.43E-2	1.40E-2	1.29E-2	1.19E-2	1.10E-2	8.99E-3
Esophagus	1.42E-1	3.85E-1	5.05E-1	3.92E-1	1.83E-1	1.05E-1	1.04E-1	1.05E-1	9.71E-2	8.85E-2	8.15E-2	6.25E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.74E-3	3.23E-3	3.28E-3	3.56E-3	3.45E-3	3.54E-3	3.21E-3	2.88E-3
Heart	4.29E-1	7.97E-1	7.81E-1	4.86E-1	2.09E-1	1.20E-1	1.22E-1	1.26E-1	1.18E-1	1.07E-1	9.76E-2	7.01E-2
Kidney	0.00E+0	0.00E+0	8.62E-5	1.72E-3	4.42E-3	4.46E-3	4.55E-3	4.69E-3	4.52E-3	4.26E-3	4.09E-3	3.45E-3
Liver	0.00E+0	1.82E-4	2.12E-3	9.15E-3	1.26E-2	9.94E-3	9.22E-3	8.89E-3	8.31E-3	7.77E-3	7.30E-3	6.08E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.39E-4	2.54E-4	3.52E-4	5.35E-4	6.61E-4	6.85E-4	7.13E-4	7.21E-4
Lung	1.33E-1	2.30E-1	2.58E-1	1.88E-1	9.00E-2	5.06E-2	4.87E-2	4.84E-2	4.43E-2	4.04E-2	3.71E-2	2.83E-2
Muscle	8.03E-4	2.76E-3	4.76E-3	6.44E-3	5.92E-3	4.42E-3	4.46E-3	4.55E-3	4.28E-3	3.97E-3	3.73E-3	3.10E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Pancreas	0.00E+0	0.00E+0	0.00E+0	5.84E-4	2.57E-3	3.01E-3	3.15E-3	3.38E-3	3.38E-3	3.31E-3	3.14E-3	2.77E-3
Skin	0.00E+0	6.35E-6	2.28E-4	1.52E-3	2.48E-3	2.22E-3	2.43E-3	2.65E-3	2.51E-3	2.31E-3	2.16E-3	1.80E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	3.10E-5	3.14E-4	5.65E-4	7.18E-4	9.76E-4	1.11E-3	1.14E-3	1.15E-3	1.10E-3
Spleen	0.00E+0	0.00E+0	4.41E-4	4.50E-3	8.10E-3	6.86E-3	6.61E-3	6.52E-3	6.07E-3	5.68E-3	5.31E-3	4.54E-3
Stomach	0.00E+0	4.82E-5	7.40E-4	3.61E-3	5.51E-3	4.71E-3	4.55E-3	4.60E-3	4.41E-3	4.18E-3	4.00E-3	3.40E-3
Thymus	0.00E+0	2.91E-3	4.02E-2	1.23E-1	9.30E-2	5.63E-2	5.37E-2	5.40E-2	5.08E-2	4.70E-2	4.37E-2	3.54E-2
Thyroid	0.00E+0	0.00E+0	1.41E-3	9.21E-3	1.23E-2	9.80E-3	9.91E-3	1.01E-2	9.52E-3	8.94E-3	8.34E-3	6.74E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	4.66E-5	3.61E-4	5.77E-4	7.12E-4	9.28E-4	1.08E-3	1.14E-3	1.14E-3	1.08E-3
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.58E-5	1.08E-4	2.18E-4	2.96E-4	3.45E-4	3.63E-4	4.14E-4
Whole body	7.09E-3	1.36E-2	1.68E-2	1.74E-2	1.32E-2	7.85E-3	6.75E-3	6.53E-3	6.07E-3	5.60E-3	5.22E-3	4.21E-3

Table E-74 SAFs (kg^{-1}) for 26 target organs and for esophagus as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.45E-3	5.29E-3	5.80E-3	5.36E-3	4.40E-3	3.41E-3	3.54E-3	3.68E-3	3.53E-3	3.34E-3	3.12E-3	2.58E-3
Adrenal	0.00E+0	0.00E+0	2.59E-3	1.48E-2	1.84E-2	1.41E-2	1.32E-2	1.28E-2	1.19E-2	1.10E-2	1.01E-2	8.46E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.54E-5	1.37E-4	2.37E-4	3.11E-4	3.92E-4	3.87E-4	4.22E-4
Bone (hard bone)	2.29E-3	8.97E-3	1.79E-2	3.76E-2	4.09E-2	1.93E-2	1.01E-2	7.72E-3	6.93E-3	6.37E-3	5.94E-3	4.96E-3
Bone (marrow)	0.00E+0	0.00E+0	2.37E-3	4.17E-3	5.42E-3	5.94E-3	6.38E-3	6.65E-3	6.31E-3	6.01E-3	5.56E-3	4.56E-3
Brain	0.00E+0	0.00E+0	0.00E+0	5.24E-6	2.86E-4	6.82E-4	9.68E-4	1.25E-3	1.41E-3	1.54E-3	1.48E-3	1.41E-3
Breast	0.00E+0	2.91E-6	4.59E-4	6.98E-3	1.32E-2	1.06E-2	1.02E-2	1.01E-2	9.45E-3	8.81E-3	8.22E-3	6.77E-3
Esophagus	1.60E+1	1.09E+1	6.67E+0	2.67E+0	8.73E-1	5.05E-1	5.49E-1	5.76E-1	5.04E-1	4.24E-1	3.58E-1	2.03E-1
Gall bladder	0.00E+0	0.00E+0	0.00E+0	1.99E-3	5.51E-3	5.39E-3	5.36E-3	5.30E-3	5.03E-3	4.79E-3	4.66E-3	3.97E-3
Heart	1.37E-1	2.71E-1	3.31E-1	2.68E-1	1.36E-1	7.98E-2	7.85E-2	7.95E-2	7.37E-2	6.74E-2	6.22E-2	4.79E-2
Kidney	0.00E+0	9.43E-6	4.78E-4	4.53E-3	8.03E-3	7.10E-3	6.96E-3	6.94E-3	6.57E-3	6.14E-3	5.82E-3	4.89E-3
Liver	6.65E-3	1.49E-2	2.36E-2	3.27E-2	2.68E-2	1.83E-2	1.70E-2	1.65E-2	1.52E-2	1.40E-2	1.30E-2	1.06E-2
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	3.12E-5	2.17E-4	3.60E-4	4.43E-4	5.98E-4	7.06E-4	7.76E-4	7.64E-4	7.54E-4
Lung	1.73E-2	5.25E-2	8.77E-2	9.75E-2	5.97E-2	3.59E-2	3.38E-2	3.28E-2	2.98E-2	2.72E-2	2.53E-2	2.04E-2
Muscle	5.13E-2	3.99E-2	2.90E-2	1.61E-2	8.98E-3	6.38E-3	6.69E-3	6.91E-3	6.42E-3	5.89E-3	5.37E-3	4.14E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Pancreas	0.00E+0	0.00E+0	1.33E-4	2.56E-3	5.85E-3	5.40E-3	5.27E-3	5.30E-3	5.04E-3	4.81E-3	4.56E-3	3.95E-3
Skin	8.34E-7	9.00E-5	4.30E-4	1.42E-3	2.29E-3	2.17E-3	2.41E-3	2.63E-3	2.51E-3	2.35E-3	2.18E-3	1.82E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	1.03E-4	5.91E-4	8.62E-4	1.00E-3	1.22E-3	1.34E-3	1.37E-3	1.35E-3	1.27E-3
Spleen	0.00E+0	0.00E+0	5.93E-4	7.25E-3	1.20E-2	9.48E-3	8.91E-3	8.62E-3	8.00E-3	7.52E-3	6.95E-3	5.77E-3
Stomach	1.72E-2	1.98E-2	1.97E-2	1.86E-2	1.41E-2	9.87E-3	9.39E-3	9.32E-3	8.76E-3	8.03E-3	7.53E-3	6.15E-3
Thymus	0.00E+0	6.25E-4	1.50E-2	6.02E-2	5.53E-2	3.61E-2	3.41E-2	3.41E-2	3.20E-2	2.94E-2	2.75E-2	2.25E-2
Thyroid	1.72E-1	5.26E-1	6.60E-1	4.27E-1	1.75E-1	1.01E-1	1.04E-1	1.08E-1	1.01E-1	9.18E-2	8.42E-2	6.40E-2
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	1.07E-4	5.98E-4	8.34E-4	9.61E-4	1.18E-3	1.32E-3	1.34E-3	1.34E-3	1.26E-3
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.70E-5	1.18E-4	1.99E-4	2.74E-4	3.26E-4	3.24E-4	3.80E-4
Whole body	4.03E-2	3.38E-2	2.81E-2	2.18E-2	1.54E-2	9.29E-3	8.11E-3	7.91E-3	7.30E-3	6.70E-3	6.16E-3	4.84E-3

Table E-75 SAFs (kg^{-1}) for 26 target organs and for gall bladder as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.31E-3	4.88E-3	6.40E-3	7.61E-3	6.17E-3	4.74E-3	4.70E-3	5.04E-3	4.89E-3	4.60E-3	4.36E-3	3.67E-3
Adrenal	0.00E+0	2.17E-2	1.35E-1	2.52E-1	1.72E-1	1.04E-1	9.60E-2	9.14E-2	8.34E-2	7.60E-2	7.12E-2	5.74E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.68E-4	1.84E-3	2.06E-3	2.51E-3	2.65E-3	2.69E-3	2.60E-3	2.37E-3
Bone (hard bone)	0.00E+0	1.11E-4	1.61E-3	9.66E-3	1.85E-2	1.22E-2	6.63E-3	4.49E-3	4.00E-3	3.70E-3	3.54E-3	3.05E-3
Bone (marrow)	0.00E+0	0.00E+0	3.87E-4	2.05E-3	4.00E-3	5.09E-3	5.78E-3	6.01E-3	5.45E-3	5.03E-3	4.63E-3	3.85E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.74E-6	2.85E-5	5.14E-5	1.10E-4	1.70E-4	1.99E-4	2.18E-4	2.54E-4
Breast	0.00E+0	0.00E+0	0.00E+0	3.27E-4	2.26E-3	2.90E-3	3.07E-3	3.64E-3	3.81E-3	3.74E-3	3.64E-3	3.24E-3
Esophagus	0.00E+0	0.00E+0	4.47E-5	2.01E-3	5.63E-3	5.55E-3	5.25E-3	5.32E-3	5.07E-3	4.88E-3	4.61E-3	3.96E-3
Gall bladder	1.49E+2	8.45E+1	4.79E+1	1.78E+1	5.49E+0	3.14E+0	3.46E+0	3.57E+0	2.95E+0	2.39E+0	1.96E+0	1.04E+0
Heart	0.00E+0	0.00E+0	7.34E-6	9.85E-4	4.09E-3	4.54E-3	4.38E-3	4.58E-3	4.54E-3	4.39E-3	4.24E-3	3.69E-3
Kidney	0.00E+0	1.57E-3	2.34E-2	7.95E-2	7.40E-2	5.00E-2	4.53E-2	4.36E-2	3.97E-2	3.65E-2	3.39E-2	2.77E-2
Liver	9.87E-2	2.04E-1	2.60E-1	2.35E-1	1.35E-1	7.99E-2	7.59E-2	7.53E-2	6.94E-2	6.35E-2	5.86E-2	4.58E-2
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	3.79E-4	2.40E-3	3.58E-3	3.63E-3	4.21E-3	4.29E-3	4.09E-3	3.95E-3	3.52E-3
Lung	0.00E+0	0.00E+0	2.43E-5	1.48E-3	4.57E-3	4.64E-3	4.46E-3	4.69E-3	4.58E-3	4.38E-3	4.18E-3	3.61E-3
Muscle	6.87E-3	8.98E-3	9.95E-3	9.05E-3	6.29E-3	4.73E-3	4.68E-3	4.97E-3	4.79E-3	4.48E-3	4.22E-3	3.53E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.35E-4	1.67E-3	1.84E-3	2.39E-3	2.43E-3	2.54E-3	2.33E-3	2.26E-3
Pancreas	1.06E-1	4.45E-1	7.24E-1	6.50E-1	3.22E-1	1.82E-1	1.75E-1	1.75E-1	1.60E-1	1.47E-1	1.36E-1	1.07E-1
Skin	0.00E+0	1.57E-4	1.20E-3	2.98E-3	2.96E-3	2.50E-3	2.66E-3	3.00E-3	2.92E-3	2.71E-3	2.54E-3	2.15E-3
Small Intestine	2.40E-2	6.67E-2	9.16E-2	8.64E-2	5.33E-2	3.44E-2	3.29E-2	3.30E-2	3.06E-2	2.82E-2	2.62E-2	2.08E-2
Spleen	0.00E+0	0.00E+0	0.00E+0	1.59E-3	7.78E-3	9.25E-3	8.64E-3	9.11E-3	8.65E-3	8.26E-3	7.76E-3	6.72E-3
Stomach	5.98E-2	9.90E-2	1.23E-1	1.18E-1	7.49E-2	4.73E-2	4.50E-2	4.49E-2	4.15E-2	3.82E-2	3.53E-2	2.80E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.04E-3	1.55E-3	1.64E-3	1.88E-3	2.01E-3	2.04E-3	2.07E-3	1.95E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.61E-4	3.62E-4	4.63E-4	5.76E-4	7.08E-4	7.06E-4	6.72E-4	7.54E-4
Upper large intestine	0.00E+0	1.09E-4	3.02E-3	1.79E-2	2.29E-2	1.72E-2	1.62E-2	1.63E-2	1.54E-2	1.45E-2	1.36E-2	1.14E-2
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.84E-4	1.48E-3	1.68E-3	2.14E-3	2.29E-3	2.27E-3	2.24E-3	2.04E-3
Whole body	1.95E-2	1.93E-2	1.96E-2	1.78E-2	1.30E-2	8.84E-3	7.91E-3	7.82E-3	7.33E-3	6.78E-3	6.33E-3	5.15E-3

Table E-76 SAFs (kg^{-1}) for 26 target organs and for gall bladder content as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.00E-3	3.40E-3	5.58E-3	7.35E-3	6.10E-3	4.71E-3	4.75E-3	4.98E-3	4.85E-3	4.60E-3	4.33E-3	3.67E-3
Adrenal	0.00E+0	1.20E-2	1.07E-1	2.29E-1	1.65E-1	1.00E-1	9.23E-2	8.81E-2	8.03E-2	7.37E-2	6.77E-2	5.48E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.89E-4	1.90E-3	2.17E-3	2.56E-3	2.73E-3	2.68E-3	2.61E-3	2.33E-3
Bone (hard bone)	0.00E+0	7.82E-5	1.47E-3	9.42E-3	1.84E-2	1.22E-2	6.60E-3	4.47E-3	3.98E-3	3.71E-3	3.51E-3	3.04E-3
Bone (marrow)	0.00E+0	0.00E+0	3.56E-4	1.95E-3	3.98E-3	5.09E-3	5.77E-3	5.99E-3	5.43E-3	4.99E-3	4.64E-3	3.84E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.92E-6	2.85E-5	5.58E-5	1.12E-4	1.70E-4	2.03E-4	2.17E-4	2.55E-4
Breast	0.00E+0	0.00E+0	0.00E+0	3.24E-4	2.23E-3	2.88E-3	3.13E-3	3.62E-3	3.80E-3	3.75E-3	3.62E-3	3.23E-3
Esophagus	0.00E+0	0.00E+0	4.03E-5	1.90E-3	5.51E-3	5.47E-3	5.25E-3	5.26E-3	4.99E-3	4.80E-3	4.54E-3	3.91E-3
Gall bladder	5.60E+1	5.77E+1	3.88E+1	1.57E+1	4.96E+0	2.79E+0	3.04E+0	3.25E+0	2.97E+0	2.58E+0	2.20E+0	1.17E+0
Heart	0.00E+0	0.00E+0	0.00E+0	9.46E-4	4.03E-3	4.49E-3	4.37E-3	4.53E-3	4.53E-3	4.35E-3	4.19E-3	3.68E-3
Kidney	0.00E+0	1.20E-3	2.18E-2	7.85E-2	7.39E-2	4.99E-2	4.56E-2	4.33E-2	3.97E-2	3.64E-2	3.37E-2	2.76E-2
Liver	2.01E-2	1.35E-1	2.22E-1	2.24E-1	1.32E-1	7.81E-2	7.38E-2	7.30E-2	6.73E-2	6.18E-2	5.74E-2	4.56E-2
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	3.91E-4	2.39E-3	3.59E-3	3.90E-3	4.27E-3	4.26E-3	4.21E-3	3.93E-3	3.54E-3
Lung	0.00E+0	0.00E+0	2.17E-5	1.43E-3	4.50E-3	4.60E-3	4.48E-3	4.66E-3	4.56E-3	4.35E-3	4.16E-3	3.60E-3
Muscle	1.95E-3	5.54E-3	8.05E-3	8.42E-3	6.12E-3	4.63E-3	4.66E-3	4.85E-3	4.68E-3	4.42E-3	4.16E-3	3.50E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.57E-4	1.63E-3	2.03E-3	2.40E-3	2.48E-3	2.55E-3	2.43E-3	2.31E-3
Pancreas	2.68E-2	3.23E-1	6.52E-1	6.32E-1	3.18E-1	1.79E-1	1.72E-1	1.71E-1	1.57E-1	1.44E-1	1.33E-1	1.06E-1
Skin	0.00E+0	1.15E-4	1.09E-3	2.93E-3	2.95E-3	2.49E-3	2.69E-3	2.99E-3	2.90E-3	2.71E-3	2.54E-3	2.14E-3
Small Intestine	1.02E-2	5.00E-2	8.14E-2	8.33E-2	5.27E-2	3.40E-2	3.26E-2	3.24E-2	3.01E-2	2.78E-2	2.58E-2	2.07E-2
Spleen	0.00E+0	0.00E+0	0.00E+0	1.52E-3	7.65E-3	9.14E-3	9.03E-3	9.04E-3	8.73E-3	8.18E-3	7.76E-3	6.63E-3
Stomach	1.33E-2	6.01E-2	9.95E-2	1.10E-1	7.25E-2	4.59E-2	4.36E-2	4.32E-2	3.99E-2	3.69E-2	3.43E-2	2.76E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.03E-3	1.60E-3	1.66E-3	1.86E-3	2.02E-3	2.08E-3	1.98E-3	1.91E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.53E-4	3.63E-4	4.66E-4	5.60E-4	6.50E-4	6.59E-4	6.75E-4	7.11E-4
Upper large intestine	0.00E+0	8.21E-5	2.76E-3	1.76E-2	2.28E-2	1.72E-2	1.62E-2	1.62E-2	1.53E-2	1.45E-2	1.36E-2	1.13E-2
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.91E-4	1.50E-3	1.80E-3	2.15E-3	2.30E-3	2.30E-3	2.23E-3	2.07E-3
Whole body	6.55E-3	1.29E-2	1.66E-2	1.69E-2	1.28E-2	8.70E-3	7.81E-3	7.65E-3	7.20E-3	6.71E-3	6.26E-3	5.14E-3

Table E-77 SAFs (kg^{-1}) for 26 target organs and for heart as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	2.47E-3	3.67E-3	4.36E-3	4.83E-3	4.26E-3	3.26E-3	3.27E-3	3.38E-3	3.25E-3	3.06E-3	2.87E-3	2.40E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	4.63E-3	1.05E-2	9.72E-3	8.98E-3	8.66E-3	8.46E-3	7.61E-3	7.31E-3	6.07E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.76E-5	1.50E-4	2.55E-4	3.71E-4	3.92E-4	4.27E-4	4.99E-4
Bone (hard bone)	1.84E-04	2.33E-03	9.42E-03	2.68E-02	2.94E-2	1.38E-2	7.04E-3	5.12E-3	4.57E-3	4.22E-3	3.95E-03	3.37E-3
Bone (marrow)	1.16E-04	6.85E-04	1.72E-03	3.54E-03	4.27E-3	4.38E-3	4.65E-3	4.70E-3	4.47E-3	4.20E-3	3.88E-03	3.22E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.10E-4	3.52E-4	5.02E-4	7.08E-4	8.63E-4	9.28E-4	9.31E-4	9.32E-4
Breast	2.03E-6	9.12E-4	7.48E-3	2.45E-2	2.78E-2	1.96E-2	1.87E-2	1.85E-2	1.71E-2	1.58E-2	1.47E-2	1.20E-2
Esophagus	1.37E-1	2.71E-1	3.31E-1	2.68E-1	1.36E-1	7.99E-2	7.85E-2	7.95E-2	7.36E-2	6.76E-2	6.21E-2	4.80E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	9.96E-4	4.04E-3	4.51E-3	4.41E-3	4.57E-3	4.47E-3	4.40E-3	4.30E-3	3.73E-3
Heart	2.87E+0	2.04E+0	1.38E+0	6.85E-1	2.71E-1	1.58E-1	1.64E-1	1.70E-1	1.53E-1	1.34E-1	1.17E-1	7.91E-2
Kidney	0.00E+0	0.00E+0	9.86E-5	1.94E-3	5.15E-3	5.31E-3	5.16E-3	5.23E-3	5.04E-3	4.81E-3	4.58E-3	3.92E-3
Liver	2.65E-4	2.98E-3	9.74E-3	2.20E-2	2.24E-2	1.61E-2	1.47E-2	1.43E-2	1.34E-2	1.25E-2	1.17E-2	9.68E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.76E-4	3.33E-4	4.36E-4	5.93E-4	7.17E-4	7.80E-4	7.72E-4	7.79E-4
Lung	4.43E-2	1.12E-1	1.50E-1	1.31E-1	7.07E-2	4.07E-2	3.82E-2	3.76E-2	3.45E-2	3.16E-2	2.93E-2	2.31E-2
Muscle	1.21E-3	2.56E-3	3.90E-3	5.27E-3	5.06E-3	3.96E-3	3.93E-3	3.99E-3	3.78E-3	3.55E-3	3.33E-3	2.79E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Pancreas	0.00E+0	0.00E+0	0.00E+0	1.13E-3	4.09E-3	4.44E-3	4.33E-3	4.48E-3	4.42E-3	4.35E-3	4.15E-3	3.59E-3
Skin	0.00E+0	2.14E-5	2.98E-4	1.55E-3	2.55E-3	2.33E-3	2.50E-3	2.70E-3	2.57E-3	2.38E-3	2.21E-3	1.85E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	5.12E-5	4.60E-4	7.79E-4	9.19E-4	1.16E-3	1.30E-3	1.34E-3	1.35E-3	1.28E-3
Spleen	0.00E+0	0.00E+0	3.61E-4	4.46E-3	8.73E-3	7.62E-3	7.08E-3	6.95E-3	6.55E-3	6.19E-3	5.92E-3	4.89E-3
Stomach	0.00E+0	1.88E-4	1.68E-3	6.54E-3	8.73E-3	7.04E-3	6.57E-3	6.53E-3	6.24E-3	5.88E-3	5.64E-3	4.86E-3
Thymus	2.57E-1	4.99E-1	5.56E-1	4.07E-1	1.90E-1	1.10E-1	1.10E-1	1.15E-1	1.08E-1	9.85E-2	9.02E-2	6.81E-2
Thyroid	0.00E+0	1.43E-4	2.95E-3	1.34E-2	1.47E-2	1.13E-2	1.12E-2	1.15E-2	1.10E-2	1.03E-2	9.61E-3	8.27E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	6.20E-5	4.80E-4	7.48E-4	8.58E-4	1.09E-3	1.25E-3	1.30E-3	1.31E-3	1.24E-3
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.38E-5	1.31E-4	2.27E-4	3.14E-4	3.87E-4	3.74E-4	4.29E-4
Whole body	2.09E-2	1.90E-2	1.81E-2	1.68E-2	1.26E-2	7.70E-3	6.66E-3	6.47E-3	6.02E-3	5.55E-3	5.14E-3	4.14E-3

Table E-78 SAFs (kg^{-1}) for 26 target organs and for heart content as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	9.27E-5	7.50E-4	1.97E-3	3.78E-3	3.82E-3	3.08E-3	3.14E-3	3.20E-3	3.09E-3	2.95E-3	2.80E-3	2.36E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	5.29E-3	1.30E-2	1.19E-2	1.09E-2	1.07E-2	9.74E-3	9.26E-3	8.60E-3	7.27E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.85E-5	2.00E-4	2.76E-4	3.96E-4	5.02E-4	5.24E-4	5.03E-4
Bone (hard bone)	0.00E+0	4.23E-4	3.95E-3	1.89E-2	2.56E-2	1.29E-2	6.95E-3	4.61E-3	4.07E-3	3.97E-3	3.73E-3	3.07E-3
Bone (marrow)	0.00E+0	1.31E-4	7.75E-4	2.58E-3	3.76E-3	4.00E-3	4.14E-3	4.30E-3	4.06E-3	3.69E-3	3.47E-3	2.95E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.76E-5	2.11E-4	3.76E-4	4.98E-4	6.28E-4	7.35E-4	7.57E-4	7.44E-4
Breast	0.00E+0	1.84E-4	3.69E-3	2.08E-2	2.67E-2	2.01E-2	1.93E-2	1.90E-2	1.76E-2	1.63E-2	1.52E-2	1.25E-2
Esophagus	1.66E-3	4.50E-2	1.34E-1	1.90E-1	1.18E-1	6.98E-2	6.62E-2	6.57E-2	6.07E-2	5.60E-2	5.16E-2	4.21E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	1.12E-3	5.00E-3	5.30E-3	5.34E-3	5.54E-3	5.40E-3	5.29E-3	5.08E-3	4.30E-3
Heart	2.09E-1	4.27E-1	5.23E-1	4.29E-1	2.12E-1	1.22E-1	1.20E-1	1.22E-1	1.13E-1	1.04E-1	9.54E-2	7.34E-2
Kidney	0.00E+0	0.00E+0	6.53E-5	2.02E-3	5.86E-3	6.10E-3	6.05E-3	6.01E-3	5.81E-3	5.55E-3	5.25E-3	4.50E-3
Liver	5.22E-5	1.53E-3	8.29E-3	2.60E-2	2.84E-2	2.01E-2	1.83E-2	1.77E-2	1.65E-2	1.53E-2	1.44E-2	1.19E-2
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.92E-4	3.56E-4	5.12E-4	6.39E-4	7.70E-4	8.68E-4	9.00E-4	8.70E-4
Lung	4.10E-4	1.52E-2	5.27E-2	8.72E-2	5.96E-2	3.57E-2	3.26E-2	3.17E-2	2.90E-2	2.66E-2	2.48E-2	2.04E-2
Muscle	9.64E-5	6.41E-4	1.83E-3	3.93E-3	4.25E-3	3.53E-3	3.58E-3	3.59E-3	3.43E-3	3.25E-3	3.08E-3	2.59E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.77E-4	2.50E-4	0.00E+0	0.00E+0	0.00E+0	5.34E-4
Pancreas	0.00E+0	0.00E+0	0.00E+0	1.38E-3	5.04E-3	5.41E-3	5.34E-3	5.44E-3	5.33E-3	5.13E-3	4.90E-3	4.32E-3
Skin	0.00E+0	5.29E-6	1.46E-4	1.23E-3	2.22E-3	2.19E-3	2.42E-3	2.58E-3	2.47E-3	2.32E-3	2.17E-3	1.80E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	5.78E-5	5.30E-4	8.87E-4	1.12E-3	1.32E-3	1.48E-3	1.53E-3	1.55E-3	1.46E-3
Spleen	0.00E+0	0.00E+0	1.90E-4	4.27E-3	9.54E-3	8.52E-3	7.99E-3	7.80E-3	7.43E-3	6.91E-3	6.68E-3	5.60E-3
Stomach	0.00E+0	6.61E-5	1.24E-3	7.21E-3	1.06E-2	8.55E-3	7.97E-3	7.88E-3	7.54E-3	7.10E-3	6.73E-3	5.74E-3
Thymus	8.17E-3	1.11E-1	2.46E-1	2.70E-1	1.47E-1	8.55E-2	8.36E-2	8.51E-2	7.94E-2	7.33E-2	6.85E-2	5.51E-2
Thyroid	0.00E+0	0.00E+0	7.62E-4	5.11E-3	7.52E-3	6.62E-3	6.71E-3	6.91E-3	6.70E-3	6.38E-3	6.14E-3	5.43E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	7.43E-5	5.41E-4	8.52E-4	1.02E-3	1.25E-3	1.40E-3	1.47E-3	1.48E-3	1.41E-3
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.01E-5	1.61E-4	2.32E-4	3.38E-4	4.24E-4	4.80E-4	4.58E-4
Whole body	1.41E-3	3.79E-3	7.17E-3	1.19E-2	1.10E-2	7.07E-3	6.11E-3	5.78E-3	5.41E-3	5.08E-3	4.77E-3	3.95E-3

Table E-79 SAFs (kg^{-1}) for 26 target organs and for kidney as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	2.29E-3	5.18E-3	7.94E-3	9.75E-3	7.26E-3	5.47E-3	5.73E-3	5.82E-3	5.61E-3	5.35E-3	5.04E-3	4.18E-3
Adrenal	3.60E-2	1.54E-1	2.63E-1	2.66E-1	1.51E-1	9.71E-2	9.53E-2	9.28E-2	8.45E-2	7.73E-2	7.27E-2	5.71E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.73E-4	1.56E-3	2.25E-3	2.38E-3	2.59E-3	2.61E-3	2.57E-3	2.30E-3
Bone (hard bone)	1.84E-4	2.33E-3	9.42E-3	2.68E-2	2.85E-2	1.69E-2	1.03E-2	6.59E-3	5.83E-3	5.79E-3	5.41E-3	4.26E-3
Bone (marrow)	1.16E-4	6.85E-4	1.72E-3	3.54E-3	4.24E-3	5.40E-3	5.51E-3	5.94E-3	5.83E-3	5.20E-3	4.92E-3	4.19E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.38E-6	3.43E-5	7.99E-5	1.35E-4	2.00E-4	2.52E-4	2.72E-4	2.84E-4
Breast	0.00E+0	0.00E+0	3.14E-6	3.60E-4	1.89E-3	2.59E-3	2.97E-3	3.25E-3	3.35E-3	3.29E-3	3.20E-3	2.78E-3
Esophagus	0.00E+0	0.00E+0	4.90E-4	4.55E-3	7.72E-3	7.08E-3	7.18E-3	6.94E-3	6.55E-3	6.18E-3	5.77E-3	4.88E-3
Gall bladder	0.00E+0	1.62E-3	2.34E-2	7.96E-2	7.15E-2	4.95E-2	4.55E-2	4.33E-2	3.94E-2	3.62E-2	3.38E-2	2.78E-2
Heart	0.00E+0	0.00E+0	9.82E-5	1.93E-3	4.93E-3	5.18E-3	5.22E-3	5.21E-3	5.04E-3	4.80E-3	4.59E-3	3.93E-3
Kidney	4.35E+0	3.71E+0	2.81E+0	1.42E+0	5.28E-1	3.00E-1	3.11E-1	3.20E-1	2.89E-1	2.55E-1	2.26E-1	1.52E-1
Liver	9.65E-3	3.16E-2	5.84E-2	7.72E-2	5.62E-2	3.76E-2	3.55E-2	3.47E-2	3.20E-2	2.95E-2	2.74E-2	2.23E-2
Lower large intestine	2.17E-3	6.99E-3	1.19E-2	1.37E-2	9.57E-3	7.60E-3	8.41E-3	8.25E-3	7.94E-3	7.73E-3	7.30E-3	6.02E-3
Lung	4.29E-5	4.05E-4	1.57E-3	5.64E-3	7.48E-3	6.52E-3	6.57E-3	6.45E-3	6.14E-3	5.85E-3	5.53E-3	4.66E-3
Muscle	1.73E-3	4.37E-3	7.62E-3	9.86E-3	7.32E-3	5.53E-3	5.77E-3	5.78E-3	5.52E-3	5.25E-3	4.96E-3	4.10E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.00E-4	1.38E-3	2.22E-3	2.32E-3	2.44E-3	2.63E-3	2.59E-3	2.20E-3
Pancreas	2.79E-2	8.49E-2	1.36E-1	1.50E-1	9.59E-2	6.27E-2	6.09E-2	5.88E-2	5.39E-2	4.94E-2	4.58E-2	3.67E-2
Skin	0.00E+0	1.86E-5	4.50E-4	2.26E-3	2.73E-3	2.43E-3	2.71E-3	2.93E-3	2.85E-3	2.69E-3	2.53E-3	2.12E-3
Small Intestine	1.19E-3	6.01E-3	1.26E-2	2.04E-2	1.88E-2	1.54E-2	1.61E-2	1.53E-2	1.43E-2	1.37E-2	1.28E-2	1.04E-2
Spleen	1.98E-2	1.02E-1	2.15E-1	2.52E-1	1.42E-1	8.24E-2	7.90E-2	7.81E-2	7.19E-2	6.62E-2	6.10E-2	4.91E-2
Stomach	6.20E-3	2.94E-2	5.87E-2	8.01E-2	5.75E-2	3.81E-2	3.66E-2	3.53E-2	3.26E-2	3.03E-2	2.83E-2	2.28E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.24E-3	1.81E-3	1.94E-3	2.12E-3	2.25E-3	2.23E-3	2.18E-3	1.92E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.58E-4	4.32E-4	6.79E-4	8.24E-4	9.22E-4	1.00E-3	9.71E-4	8.67E-4
Upper large intestine	1.02E-2	2.85E-2	4.31E-2	4.52E-2	2.93E-2	1.97E-2	1.95E-2	1.94E-2	1.82E-2	1.70E-2	1.59E-2	1.29E-2
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.67E-4	1.30E-3	2.00E-3	2.10E-3	2.28E-3	2.39E-3	2.40E-3	2.04E-3
Whole body	2.27E-2	2.27E-2	2.26E-2	2.07E-2	1.42E-2	9.56E-3	8.78E-3	8.31E-3	7.77E-3	7.29E-3	6.78E-3	5.41E-3

Table E-80 SAFs (kg^{-1}) for 26 target organs and for liver as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	9.22E-4	2.45E-3	4.26E-3	5.91E-3	4.97E-3	3.84E-3	4.01E-3	4.16E-3	4.06E-3	3.89E-3	3.69E-3	3.09E-3
Adrenal	3.18E-3	3.18E-2	8.35E-2	1.41E-1	1.04E-1	6.60E-2	6.10E-2	5.87E-2	5.40E-2	4.90E-2	4.55E-2	3.71E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.51E-4	5.99E-4	9.12E-4	1.13E-3	1.32E-3	1.41E-3	1.40E-3	1.29E-3
Bone (hard bone)	1.06E-4	1.25E-3	4.55E-3	1.44E-2	2.01E-2	1.15E-2	6.53E-3	4.25E-3	3.78E-3	3.71E-3	3.50E-3	2.87E-3
Bone (marrow)	0.00E+0	2.20E-4	6.97E-4	2.11E-3	3.35E-3	4.02E-3	4.14E-3	4.62E-3	4.34E-3	3.79E-3	3.57E-3	3.12E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.46E-5	7.27E-5	1.46E-4	2.23E-4	3.07E-4	3.59E-4	3.78E-4	3.85E-4
Breast	0.00E+0	8.77E-5	9.68E-4	5.56E-3	9.63E-3	8.69E-3	8.90E-3	9.11E-3	8.80E-3	8.37E-3	7.90E-3	6.58E-3
Esophagus	6.67E-3	1.50E-2	2.36E-2	3.26E-2	2.64E-2	1.82E-2	1.70E-2	1.65E-2	1.53E-2	1.40E-2	1.30E-2	1.07E-2
Gall bladder	9.90E-2	2.04E-1	2.60E-1	2.35E-1	1.34E-1	8.00E-2	7.59E-2	7.53E-2	6.85E-2	6.38E-2	5.84E-2	4.58E-2
Heart	2.66E-4	2.98E-3	9.76E-3	2.20E-2	2.20E-2	1.58E-2	1.47E-2	1.43E-2	1.34E-2	1.25E-2	1.17E-2	9.71E-3
Kidney	9.65E-3	3.16E-2	5.84E-2	7.72E-2	5.61E-2	3.74E-2	3.57E-2	3.48E-2	3.20E-2	2.97E-2	2.75E-2	2.23E-2
Liver	8.10E-1	7.43E-1	6.40E-1	4.21E-1	2.00E-1	1.16E-1	1.13E-1	1.15E-1	1.05E-1	9.41E-2	8.54E-2	6.30E-2
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	1.60E-4	8.32E-4	1.37E-3	1.88E-3	2.03E-3	2.20E-3	2.33E-3	2.29E-3	2.02E-3
Lung	2.26E-3	1.08E-2	2.04E-2	2.79E-2	2.15E-2	1.45E-2	1.36E-2	1.33E-2	1.23E-2	1.14E-2	1.06E-2	8.76E-3
Muscle	1.44E-3	2.94E-3	4.38E-3	5.65E-3	4.81E-3	3.81E-3	3.98E-3	4.06E-3	3.92E-3	3.75E-3	3.55E-3	2.98E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.71E-4	5.21E-4	9.13E-4	1.05E-3	1.21E-3	1.40E-3	1.35E-3	1.33E-3
Pancreas	2.21E-3	1.16E-2	2.98E-2	5.77E-2	5.07E-2	3.44E-2	3.22E-2	3.12E-2	2.88E-2	2.66E-2	2.47E-2	2.04E-2
Skin	1.15E-6	2.53E-4	1.23E-3	2.90E-3	3.05E-3	2.63E-3	2.89E-3	3.13E-3	3.01E-3	2.82E-3	2.64E-3	2.18E-3
Small Intestine	7.09E-4	2.61E-3	4.78E-3	7.80E-3	8.48E-3	7.13E-3	7.40E-3	7.51E-3	7.32E-3	7.01E-3	6.63E-3	5.63E-3
Spleen	0.00E+0	0.00E+0	3.93E-4	6.20E-3	1.22E-2	1.13E-2	1.13E-2	1.10E-2	1.06E-2	1.01E-2	9.47E-3	7.93E-3
Stomach	1.92E-2	3.75E-2	4.78E-2	5.17E-2	3.78E-2	2.54E-2	2.45E-2	2.44E-2	2.28E-2	2.11E-2	1.97E-2	1.58E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	1.77E-3	5.00E-3	5.05E-3	4.84E-3	4.88E-3	4.80E-3	4.59E-3	4.50E-3	3.94E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.86E-4	1.13E-3	1.31E-3	1.50E-3	1.59E-3	1.45E-3	1.48E-3	1.39E-3
Upper large intestine	3.02E-3	5.77E-3	7.37E-3	8.66E-3	8.31E-3	6.72E-3	6.88E-3	7.21E-3	7.10E-3	6.76E-3	6.48E-3	5.49E-3
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.75E-4	4.83E-4	7.92E-4	9.61E-4	1.13E-3	1.28E-3	1.26E-3	1.18E-3
Whole body	2.27E-2	2.25E-2	2.19E-2	1.90E-2	1.31E-2	8.55E-3	7.87E-3	7.66E-3	7.17E-3	6.67E-3	6.21E-3	4.96E-3

Table E-81 SAFs (kg^{-1}) for 26 target organs and for lower large intestine as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.44E-2	2.11E-2	2.33E-2	2.10E-2	1.39E-2	9.98E-3	1.01E-2	1.01E-2	9.57E-3	8.94E-3	8.35E-3	6.72E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	1.05E-3	2.37E-3	2.93E-3	3.91E-3	3.79E-3	4.00E-3	4.04E-3	3.84E-3	3.29E-3
Bladder	8.66E-2	1.77E-1	2.53E-1	2.59E-1	1.53E-1	9.22E-2	8.61E-2	8.37E-2	7.62E-2	6.98E-2	6.40E-2	5.07E-2
Bone (hard bone)	1.15E-4	1.69E-3	6.40E-3	2.06E-2	2.95E-2	1.72E-2	1.02E-2	6.59E-3	5.75E-3	5.67E-3	5.30E-3	4.26E-3
Bone (marrow)	7.83E-5	5.16E-4	1.29E-3	3.08E-3	4.72E-3	5.66E-3	5.75E-3	6.03E-3	5.66E-3	5.14E-3	4.84E-3	4.10E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.47E-6	8.11E-6	1.96E-5	3.84E-5	5.96E-5	7.31E-5	8.99E-5
Breast	0.00E+0	0.00E+0	0.00E+0	2.22E-5	1.12E-4	2.23E-4	3.41E-4	4.70E-4	6.05E-4	6.89E-4	7.26E-4	7.13E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.04E-4	3.57E-4	5.18E-4	5.88E-4	7.01E-4	8.13E-4	8.02E-4	7.69E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.07E-3	3.14E-3	3.97E-3	4.25E-3	4.22E-3	4.15E-3	3.85E-3	3.35E-3
Heart	0.00E+0	0.00E+0	0.00E+0	1.95E-5	1.65E-4	3.13E-4	4.50E-4	5.68E-4	6.86E-4	7.87E-4	8.10E-4	7.77E-4
Kidney	2.18E-3	7.00E-3	1.19E-2	1.37E-2	9.63E-3	7.57E-3	8.24E-3	8.21E-3	7.96E-3	7.66E-3	7.29E-3	6.01E-3
Liver	0.00E+0	0.00E+0	0.00E+0	1.62E-4	8.36E-4	1.38E-3	1.81E-3	2.01E-3	2.20E-3	2.29E-3	2.27E-3	2.03E-3
Lower large intestine	4.72E+0	2.75E+0	1.74E+0	8.30E-1	3.26E-1	1.90E-1	1.94E-1	1.96E-1	1.70E-1	1.45E-1	1.26E-1	8.53E-2
Lung	0.00E+0	0.00E+0	0.00E+0	5.44E-5	2.41E-4	3.84E-4	5.38E-4	6.69E-4	7.96E-4	8.90E-4	9.01E-4	8.60E-4
Muscle	3.90E-3	5.80E-3	7.72E-3	9.20E-3	7.65E-3	6.25E-3	6.47E-3	6.44E-3	6.13E-3	5.81E-3	5.47E-3	4.54E-3
Ovary	2.42E-4	2.07E-2	8.73E-2	1.54E-1	1.08E-1	6.88E-2	6.26E-2	5.97E-2	5.45E-2	4.95E-2	4.62E-2	3.72E-2
Pancreas	0.00E+0	9.52E-5	1.12E-3	4.97E-3	7.47E-3	7.21E-3	7.87E-3	7.69E-3	7.47E-3	7.23E-3	6.88E-3	5.73E-3
Skin	1.95E-5	3.07E-4	9.38E-4	1.96E-3	2.21E-3	2.16E-3	2.51E-3	2.74E-3	2.70E-3	2.57E-3	2.42E-3	2.02E-3
Small Intestine	1.06E-2	4.08E-2	7.13E-2	9.17E-2	6.62E-2	4.33E-2	4.12E-2	3.90E-2	3.57E-2	3.35E-2	3.10E-2	2.46E-2
Spleen	0.00E+0	5.93E-5	1.15E-3	5.45E-3	6.48E-3	5.30E-3	5.58E-3	5.70E-3	5.61E-3	5.57E-3	5.27E-3	4.48E-3
Stomach	0.00E+0	9.66E-5	1.65E-3	8.71E-3	1.16E-2	9.46E-3	9.34E-3	9.28E-3	8.95E-3	8.51E-3	8.02E-3	6.74E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.32E-5	1.15E-4	1.84E-4	2.40E-4	3.30E-4	4.16E-4	4.41E-4	4.41E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Upper large intestine	1.08E-2	3.79E-2	5.41E-2	5.35E-2	3.58E-2	2.45E-2	2.40E-2	2.38E-2	2.22E-2	2.06E-2	1.91E-2	1.54E-2
Uterus	1.62E-1	2.97E-1	3.51E-1	3.01E-1	1.65E-1	9.80E-2	9.25E-2	9.07E-2	8.30E-2	7.57E-2	6.96E-2	5.35E-2
Whole body	1.81E-2	1.62E-2	1.60E-2	1.59E-2	1.30E-2	9.01E-3	8.14E-3	7.63E-3	7.12E-3	6.70E-3	6.26E-3	5.06E-3

Table E-82 SAFs (kg^{-1}) for 26 target organs and for lower large intestine content as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	2.11E-3	9.37E-3	1.59E-2	1.85E-2	1.34E-2	9.70E-3	9.70E-3	9.73E-3	9.19E-3	8.59E-3	8.07E-3	6.65E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	7.06E-4	1.77E-3	2.40E-3	3.16E-3	3.34E-3	3.44E-3	3.23E-3	3.32E-3	2.83E-3
Bladder	1.26E-2	7.90E-2	1.74E-1	2.26E-1	1.45E-1	8.82E-2	8.14E-2	7.81E-2	7.11E-2	6.52E-2	6.00E-2	4.86E-2
Bone (hard bone)	2.39E-5	1.10E-3	5.77E-3	2.08E-2	3.01E-2	1.76E-2	9.53E-3	6.63E-3	5.79E-3	5.30E-3	4.99E-3	4.28E-3
Bone (marrow)	0.00E+0	3.24E-4	1.17E-3	3.23E-3	4.87E-3	5.78E-3	6.24E-3	6.23E-3	5.89E-3	5.51E-3	5.13E-3	4.24E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.00E-6	6.49E-6	1.70E-5	3.39E-5	4.81E-5	5.89E-5	8.40E-5
Breast	0.00E+0	0.00E+0	0.00E+0	1.55E-5	8.37E-5	1.82E-4	2.83E-4	4.13E-4	5.41E-4	6.03E-4	6.48E-4	6.63E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.52E-4	2.86E-4	4.20E-4	5.14E-4	6.04E-4	6.51E-4	7.04E-4	7.01E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.67E-3	2.80E-3	3.50E-3	3.82E-3	3.80E-3	3.71E-3	3.64E-3	3.30E-3
Heart	0.00E+0	0.00E+0	0.00E+0	1.31E-5	1.19E-4	2.54E-4	3.70E-4	4.90E-4	6.12E-4	6.77E-4	6.94E-4	7.15E-4
Kidney	3.11E-4	3.13E-3	6.98E-3	9.05E-3	6.83E-3	5.92E-3	6.63E-3	6.76E-3	6.63E-3	6.34E-3	6.00E-3	5.15E-3
Liver	0.00E+0	0.00E+0	0.00E+0	1.15E-4	6.60E-4	1.20E-3	1.59E-3	1.84E-3	2.02E-3	2.07E-3	2.06E-3	1.91E-3
Lower large intestine	8.30E-1	1.13E+0	1.04E+0	6.47E-1	2.82E-1	1.62E-1	1.61E-1	1.63E-1	1.50E-1	1.35E-1	1.22E-1	8.79E-2
Lung	0.00E+0	0.00E+0	0.00E+0	3.78E-5	1.76E-4	3.14E-4	4.50E-4	5.92E-4	7.16E-4	7.79E-4	8.03E-4	7.98E-4
Muscle	7.75E-4	2.76E-3	5.41E-3	8.12E-3	7.32E-3	6.09E-3	6.26E-3	6.25E-3	5.96E-3	5.61E-3	5.30E-3	4.46E-3
Ovary	0.00E+0	9.44E-3	6.14E-2	1.39E-1	1.08E-1	6.83E-2	6.23E-2	5.92E-2	5.29E-2	4.87E-2	4.48E-2	3.68E-2
Pancreas	0.00E+0	5.21E-5	7.36E-4	3.45E-3	5.68E-3	5.99E-3	6.65E-3	6.66E-3	6.43E-3	6.20E-3	5.87E-3	5.09E-3
Skin	1.85E-6	1.33E-4	6.38E-4	1.69E-3	2.08E-3	2.10E-3	2.42E-3	2.68E-3	2.64E-3	2.48E-3	2.35E-3	1.98E-3
Small Intestine	2.78E-3	2.20E-2	5.18E-2	7.84E-2	6.03E-2	4.01E-2	3.74E-2	3.58E-2	3.28E-2	3.01E-2	2.81E-2	2.28E-2
Spleen	0.00E+0	3.95E-5	7.54E-4	3.70E-3	4.62E-3	4.09E-3	4.42E-3	4.62E-3	4.71E-3	4.56E-3	4.37E-3	3.83E-3
Stomach	0.00E+0	4.64E-5	1.06E-3	6.29E-3	9.14E-3	7.85E-3	7.91E-3	7.92E-3	7.68E-3	7.28E-3	6.93E-3	5.89E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.55E-5	1.43E-4	2.01E-4	3.04E-4	3.44E-4	3.86E-4	4.24E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Upper large intestine	2.79E-3	1.81E-2	3.34E-2	3.87E-2	2.91E-2	2.09E-2	2.03E-2	2.01E-2	1.88E-2	1.75E-2	1.63E-2	1.34E-2
Uterus	2.26E-2	1.25E-1	2.32E-1	2.63E-1	1.59E-1	9.48E-2	8.79E-2	8.51E-2	7.76E-2	7.09E-2	6.58E-2	5.26E-2
Whole body	3.11E-3	7.08E-3	1.08E-2	1.41E-2	1.26E-2	8.79E-3	7.71E-3	7.31E-3	6.85E-3	6.40E-3	6.01E-3	5.00E-3

Table E-83 SAFs (kg^{-1}) for 26 target organs and for lung as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.68E-3	5.71E-3	6.40E-3	5.89E-3	4.28E-3	3.34E-3	3.54E-3	3.66E-3	3.51E-3	3.31E-3	3.10E-3	2.52E-3
Adrenal	0.00E+0	0.00E+0	9.04E-4	6.87E-3	1.06E-2	9.58E-3	9.30E-3	9.07E-3	8.50E-3	7.94E-3	7.39E-3	6.19E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.82E-5	2.02E-4	2.89E-4	3.98E-4	4.92E-4	5.15E-4	5.10E-4
Bone (hard bone)	2.56E-3	1.23E-2	2.67E-2	4.24E-2	3.48E-2	1.46E-2	8.50E-3	5.90E-3	5.28E-3	5.31E-3	4.94E-3	3.77E-3
Bone (marrow)	8.76E-4	2.17E-3	3.49E-3	4.64E-3	4.59E-3	4.62E-3	4.70E-3	5.04E-3	4.74E-3	4.28E-3	3.99E-3	3.29E-3
Brain	0.00E+0	0.00E+0	0.00E+0	5.28E-6	1.39E-4	4.33E-4	7.05E-4	9.03E-4	1.05E-3	1.15E-3	1.15E-3	1.05E-3
Breast	9.39E-5	4.32E-3	1.59E-2	3.03E-2	2.53E-2	1.80E-2	1.80E-2	1.81E-2	1.68E-2	1.55E-2	1.44E-2	1.17E-2
Esophagus	1.55E-2	4.71E-2	7.88E-2	8.78E-2	5.37E-2	3.49E-2	3.36E-2	3.27E-2	2.99E-2	2.71E-2	2.51E-2	1.99E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	1.36E-3	4.14E-3	4.37E-3	4.56E-3	4.64E-3	4.63E-3	4.37E-3	4.24E-3	3.61E-3
Heart	3.97E-2	1.00E-1	1.34E-1	1.18E-1	6.43E-2	3.96E-2	3.80E-2	3.77E-2	3.46E-2	3.15E-2	2.90E-2	2.25E-2
Kidney	3.87E-5	3.64E-4	1.41E-3	5.19E-3	7.05E-3	6.39E-3	6.52E-3	6.46E-3	6.18E-3	5.85E-3	5.51E-3	4.58E-3
Liver	2.02E-3	9.66E-3	1.83E-2	2.53E-2	2.01E-2	1.43E-2	1.35E-2	1.33E-2	1.23E-2	1.13E-2	1.06E-2	8.62E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	4.80E-5	2.31E-4	3.80E-4	5.60E-4	6.86E-4	7.94E-4	9.11E-4	9.00E-4	8.38E-4
Lung	7.26E-1	5.91E-1	4.27E-1	2.09E-1	8.21E-2	4.72E-2	4.71E-2	4.72E-2	4.19E-2	3.67E-2	3.24E-2	2.19E-2
Muscle	1.14E-3	3.37E-3	5.44E-3	6.70E-3	5.49E-3	4.40E-3	4.61E-3	4.68E-3	4.43E-3	4.16E-3	3.89E-3	3.19E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.29E-4
Pancreas	0.00E+0	0.00E+0	7.80E-5	1.63E-3	4.11E-3	4.27E-3	4.46E-3	4.56E-3	4.46E-3	4.28E-3	4.07E-3	3.47E-3
Skin	4.26E-6	2.67E-4	1.15E-3	2.73E-3	2.91E-3	2.61E-3	2.95E-3	3.17E-3	3.00E-3	2.77E-3	2.57E-3	2.10E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	7.65E-5	4.83E-4	7.92E-4	1.04E-3	1.23E-3	1.38E-3	1.45E-3	1.45E-3	1.30E-3
Spleen	7.11E-4	6.92E-3	1.56E-2	2.28E-2	1.72E-2	1.21E-2	1.20E-2	1.18E-2	1.11E-2	1.02E-2	9.50E-3	7.70E-3
Stomach	2.01E-3	8.00E-3	1.25E-2	1.40E-2	1.06E-2	7.76E-3	7.67E-3	7.69E-3	7.28E-3	6.83E-3	6.36E-3	5.27E-3
Thymus	5.34E-2	1.27E-1	1.56E-1	1.27E-1	6.62E-2	4.03E-2	3.90E-2	3.88E-2	3.62E-2	3.28E-2	3.00E-2	2.29E-2
Thyroid	0.00E+0	7.97E-4	6.36E-3	1.59E-2	1.40E-2	1.11E-2	1.16E-2	1.18E-2	1.09E-2	9.98E-3	9.48E-3	7.84E-3
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	1.56E-4	6.02E-4	8.24E-4	1.01E-3	1.24E-3	1.38E-3	1.43E-3	1.43E-3	1.31E-3
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.58E-5	7.91E-5	1.84E-4	2.65E-4	3.55E-4	4.68E-4	4.80E-4	4.71E-4
Whole body	2.26E-2	2.24E-2	2.16E-2	1.85E-2	1.23E-2	7.33E-3	6.57E-3	6.28E-3	5.82E-3	5.43E-3	5.02E-3	3.93E-3

Table E-84 SAFs (kg^{-1}) for 26 target organs and for muscle as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	6.83E-3	1.11E-2	1.28E-2	1.12E-2	7.18E-3	5.20E-3	5.33E-3	5.64E-3	5.42E-3	5.08E-3	4.76E-3	3.88E-3
Adrenal	7.28E-3	1.35E-2	1.45E-2	1.11E-2	7.60E-3	6.17E-3	6.17E-3	6.06E-3	5.79E-3	5.51E-3	5.16E-3	4.08E-3
Bladder	3.56E-3	6.17E-3	8.37E-3	1.01E-2	9.78E-3	8.15E-3	7.80E-3	7.73E-3	7.20E-3	6.67E-3	6.35E-3	5.31E-3
Bone (hard bone)	4.31E-3	1.09E-2	1.88E-2	2.96E-2	2.82E-2	1.48E-2	8.01E-3	6.37E-3	5.81E-3	5.37E-3	5.02E-3	4.19E-3
Bone (marrow)	1.40E-3	1.59E-3	1.88E-3	2.76E-3	3.29E-3	3.69E-3	4.09E-3	4.31E-3	4.16E-3	3.93E-3	3.70E-3	3.02E-3
Brain	2.23E-4	2.68E-4	2.77E-4	4.28E-4	1.03E-3	1.19E-3	1.27E-3	1.38E-3	1.36E-3	1.32E-3	1.26E-3	1.10E-3
Breast	1.95E-3	3.58E-3	4.41E-3	4.27E-3	3.39E-3	2.68E-3	2.78E-3	3.00E-3	2.97E-3	2.81E-3	2.69E-3	2.24E-3
Esophagus	4.08E-3	7.76E-3	9.23E-3	8.28E-3	6.59E-3	5.34E-3	5.25E-3	5.32E-3	5.04E-3	4.66E-3	4.45E-3	3.59E-3
Gall bladder	6.93E-3	9.08E-3	1.00E-2	9.12E-3	6.38E-3	4.82E-3	4.73E-3	5.12E-3	4.74E-3	4.48E-3	4.12E-3	3.41E-3
Heart	8.12E-4	1.76E-3	2.92E-3	4.54E-3	4.85E-3	3.92E-3	3.78E-3	3.80E-3	3.59E-3	3.38E-3	3.20E-3	2.66E-3
Kidney	1.73E-3	4.37E-3	7.64E-3	9.89E-3	7.83E-3	5.90E-3	5.81E-3	5.90E-3	5.60E-3	5.24E-3	4.98E-3	4.12E-3
Liver	1.42E-3	2.90E-3	4.31E-3	5.62E-3	5.06E-3	4.03E-3	3.96E-3	4.08E-3	3.92E-3	3.71E-3	3.51E-3	2.98E-3
Lower large intestine	3.90E-3	5.79E-3	7.68E-3	9.17E-3	8.17E-3	6.74E-3	6.56E-3	6.52E-3	6.22E-3	5.83E-3	5.44E-3	4.58E-3
Lung	1.22E-3	3.61E-3	5.80E-3	7.17E-3	6.32E-3	4.69E-3	4.58E-3	4.64E-3	4.39E-3	4.10E-3	3.83E-3	3.20E-3
Muscle	5.09E-2	4.34E-2	3.52E-2	2.18E-2	1.12E-2	7.56E-3	7.77E-3	8.11E-3	7.60E-3	6.97E-3	6.42E-3	4.99E-3
Ovary	4.33E-3	9.00E-3	1.13E-2	1.14E-2	1.01E-2	8.50E-3	8.45E-3	8.30E-3	7.83E-3	7.28E-3	6.88E-3	5.59E-3
Pancreas	3.93E-3	6.45E-3	7.97E-3	8.10E-3	6.26E-3	5.09E-3	5.02E-3	5.15E-3	4.92E-3	4.60E-3	4.41E-3	3.64E-3
Skin	2.51E-3	5.39E-3	7.18E-3	6.67E-3	4.27E-3	3.29E-3	3.60E-3	3.96E-3	3.74E-3	3.43E-3	3.19E-3	2.57E-3
Small Intestine	4.79E-3	7.18E-3	8.55E-3	8.80E-3	7.13E-3	5.94E-3	5.81E-3	5.88E-3	5.59E-3	5.24E-3	4.93E-3	4.07E-3
Spleen	2.36E-3	4.80E-3	7.31E-3	8.86E-3	6.96E-3	5.02E-3	4.98E-3	5.13E-3	4.96E-3	4.60E-3	4.36E-3	3.63E-3
Stomach	5.94E-3	7.35E-3	7.47E-3	7.01E-3	5.52E-3	4.36E-3	4.31E-3	4.46E-3	4.32E-3	4.08E-3	3.84E-3	3.22E-3
Thymus	2.79E-4	7.86E-4	1.79E-3	3.58E-3	4.20E-3	3.41E-3	3.36E-3	3.43E-3	3.25E-3	3.02E-3	2.81E-3	2.36E-3
Thyroid	1.23E-2	2.09E-2	2.23E-2	1.59E-2	8.75E-3	6.29E-3	6.58E-3	7.01E-3	6.61E-3	6.18E-3	5.68E-3	4.50E-3
Upper large intestine	4.38E-3	7.35E-3	8.91E-3	8.76E-3	6.62E-3	5.16E-3	5.19E-3	5.35E-3	5.20E-3	4.84E-3	4.61E-3	3.82E-3
Uterus	3.41E-3	5.99E-3	8.14E-3	1.05E-2	1.03E-2	8.30E-3	7.86E-3	7.75E-3	7.27E-3	6.82E-3	6.33E-3	5.24E-3
Whole body	2.21E-2	2.17E-2	2.04E-2	1.65E-2	1.11E-2	7.15E-3	6.30E-3	6.31E-3	5.95E-3	5.51E-3	5.12E-3	4.10E-3

Table E-85 SAFs (kg^{-1}) for 26 target organs and for ovary as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.03E-2	1.92E-2	2.37E-2	2.21E-2	1.52E-2	1.13E-2	1.13E-2	1.12E-2	1.05E-2	9.80E-3	9.16E-3	7.43E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.14E-4	7.30E-4	1.25E-3	1.46E-3	1.60E-3	1.67E-3	1.72E-3	1.61E-3
Bladder	5.53E-1	1.17E+0	1.25E+0	8.35E-1	3.73E-1	2.16E-1	2.12E-1	2.13E-1	1.96E-1	1.78E-1	1.63E-1	1.20E-1
Bone (hard bone)	2.70E-4	5.35E-3	1.73E-2	3.87E-2	4.39E-2	2.29E-2	1.24E-2	8.99E-3	7.83E-3	7.13E-3	6.74E-3	5.61E-3
Bone (marrow)	9.38E-5	8.97E-4	2.15E-3	4.27E-3	5.82E-3	6.76E-3	7.32E-3	7.26E-3	7.01E-3	6.62E-3	6.17E-3	4.97E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.99E-6	9.23E-6	2.18E-5	3.25E-5	4.16E-5	6.32E-5
Breast	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.49E-5	6.46E-5	1.24E-4	2.08E-4	3.05E-4	3.69E-4	4.01E-4	4.39E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.50E-5	7.88E-5	1.58E-4	2.30E-4	3.19E-4	3.66E-4	4.08E-4	4.33E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.44E-4	1.43E-3	1.91E-3	2.18E-3	2.38E-3	2.58E-3	2.38E-3	2.17E-3
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.37E-5	7.36E-5	1.49E-4	2.31E-4	3.31E-4	3.86E-4	4.19E-4	4.59E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	4.45E-5	5.14E-4	1.37E-3	2.04E-3	2.27E-3	2.43E-3	2.48E-3	2.42E-3	2.21E-3
Liver	0.00E+0	0.00E+0	0.00E+0	1.27E-5	1.96E-4	5.36E-4	8.13E-4	1.05E-3	1.24E-3	1.31E-3	1.32E-3	1.27E-3
Lower large intestine	2.45E-4	2.07E-2	8.78E-2	1.54E-1	1.09E-1	6.87E-2	6.29E-2	6.00E-2	5.45E-2	4.98E-2	4.62E-2	3.75E-2
Lung	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.87E-5	9.11E-5	1.81E-4	2.70E-4	3.80E-4	4.39E-4	4.73E-4	5.02E-4
Muscle	4.87E-2	3.69E-2	2.71E-2	1.72E-2	1.11E-2	9.02E-3	9.34E-3	9.30E-3	8.65E-3	7.95E-3	7.37E-3	5.87E-3
Ovary	1.10E+2	6.89E+1	3.90E+1	1.41E+1	4.26E+0	2.47E+0	2.73E+0	2.86E+0	2.43E+0	1.97E+0	1.59E+0	7.70E-1
Pancreas	0.00E+0	0.00E+0	0.00E+0	1.25E-4	1.14E-3	2.12E-3	2.77E-3	3.03E-3	3.14E-3	3.14E-3	3.05E-3	2.70E-3
Skin	0.00E+0	0.00E+0	4.62E-5	6.93E-4	1.57E-3	1.94E-3	2.28E-3	2.50E-3	2.48E-3	2.36E-3	2.23E-3	1.90E-3
Small Intestine	0.00E+0	2.30E-5	1.65E-3	1.55E-2	2.36E-2	1.97E-2	1.82E-2	1.71E-2	1.56E-2	1.45E-2	1.35E-2	1.12E-2
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.84E-4	6.45E-4	1.06E-3	1.24E-3	1.44E-3	1.52E-3	1.55E-3	1.47E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	3.91E-4	1.94E-3	2.65E-3	3.02E-3	3.23E-3	3.26E-3	3.23E-3	3.13E-3	2.76E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.10E-4	2.54E-4	2.75E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Upper large intestine	0.00E+0	3.45E-5	9.90E-4	6.80E-3	1.17E-2	1.13E-2	1.14E-2	1.11E-2	1.05E-2	9.87E-3	9.25E-3	7.77E-3
Uterus	1.04E+0	1.70E+0	1.61E+0	9.97E-1	4.33E-1	2.48E-1	2.45E-1	2.48E-1	2.27E-1	2.06E-1	1.87E-1	1.34E-1
Whole body	3.95E-2	3.28E-2	2.76E-2	2.22E-2	1.66E-2	1.12E-2	9.86E-3	9.36E-3	8.64E-3	7.94E-3	7.37E-3	5.87E-3

Table E-86 SAFs (kg^{-1}) for 26 target organs and for pancreas as a source region in the JF phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	2.46E-3	5.61E-3	8.10E-3	9.32E-3	7.02E-3	5.60E-3	5.67E-3	5.84E-3	5.62E-3	5.32E-3	5.02E-3	4.18E-3
Adrenal	1.89E-2	1.32E-1	2.48E-1	2.80E-1	1.67E-1	1.05E-1	9.91E-2	9.64E-2	8.81E-2	8.01E-2	7.47E-2	5.95E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	1.99E-4	1.57E-3	2.81E-3	3.24E-3	3.44E-3	3.49E-3	3.40E-3	3.33E-3	2.92E-3
Bone (hard bone)	2.10E-4	1.70E-3	6.03E-3	1.82E-2	2.98E-2	1.58E-2	9.23E-3	6.21E-3	5.48E-3	5.21E-3	4.90E-3	4.05E-3
Bone (marrow)	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.65E-3	6.17E-3	6.40E-3	6.02E-3	5.41E-3	5.09E-3	4.37E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.28E-6	2.14E-5	4.60E-5	8.69E-5	1.35E-4	1.69E-4	1.91E-4	2.18E-4
Breast	0.00E+0	0.00E+0	0.00E+0	2.47E-4	1.62E-3	2.45E-3	2.72E-3	3.12E-3	3.30E-3	3.29E-3	3.18E-3	2.82E-3
Esophagus	0.00E+0	0.00E+0	1.32E-4	2.61E-3	5.70E-3	5.60E-3	5.34E-3	5.26E-3	5.15E-3	4.80E-3	4.58E-3	3.94E-3
Gall bladder	1.06E-1	4.47E-1	7.24E-1	6.52E-1	3.20E-1	1.81E-1	1.75E-1	1.75E-1	1.60E-1	1.47E-1	1.35E-1	1.06E-1
Heart	0.00E+0	0.00E+0	1.67E-5	1.14E-3	3.95E-3	4.45E-3	4.35E-3	4.47E-3	4.45E-3	4.28E-3	4.12E-3	3.59E-3
Kidney	2.79E-2	8.49E-2	1.35E-1	1.50E-1	9.60E-2	6.42E-2	6.06E-2	5.89E-2	5.40E-2	4.94E-2	4.57E-2	3.66E-2
Liver	2.21E-3	1.16E-2	2.99E-2	5.78E-2	5.08E-2	3.48E-2	3.21E-2	3.11E-2	2.88E-2	2.66E-2	2.48E-2	2.03E-2
Lower large intestine	0.00E+0	9.46E-5	1.14E-3	4.95E-3	7.49E-3	7.83E-3	7.94E-3	7.89E-3	7.60E-3	7.22E-3	6.88E-3	5.79E-3
Lung	0.00E+0	0.00E+0	8.39E-5	1.78E-3	4.32E-3	4.51E-3	4.44E-3	4.57E-3	4.48E-3	4.27E-3	4.07E-3	3.51E-3
Muscle	3.93E-3	6.46E-3	7.99E-3	8.07E-3	5.86E-3	4.85E-3	4.96E-3	5.07E-3	4.87E-3	4.61E-3	4.36E-3	3.63E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.14E-3	2.39E-3	2.98E-3	3.16E-3	3.07E-3	3.06E-3	3.10E-3	2.75E-3
Pancreas	9.01E+0	6.99E+0	4.88E+0	2.30E+0	8.34E-1	4.73E-1	4.93E-1	5.10E-1	4.56E-1	3.96E-1	3.46E-1	2.22E-1
Skin	4.73E-7	1.00E-4	7.57E-4	2.29E-3	2.51E-3	2.32E-3	2.54E-3	2.80E-3	2.74E-3	2.59E-3	2.43E-3	2.05E-3
Small Intestine	2.32E-2	7.67E-2	1.20E-1	1.21E-1	7.29E-2	4.72E-2	4.56E-2	4.45E-2	4.09E-2	3.82E-2	3.53E-2	2.79E-2
Spleen	2.52E-2	6.96E-2	1.00E-1	9.87E-2	6.24E-2	4.09E-2	3.88E-2	3.82E-2	3.53E-2	3.24E-2	3.02E-2	2.41E-2
Stomach	1.56E-1	3.28E-1	3.93E-1	3.22E-1	1.67E-1	9.86E-2	9.50E-2	9.53E-2	8.78E-2	8.03E-2	7.39E-2	5.69E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.23E-4	1.40E-3	1.50E-3	1.71E-3	1.84E-3	1.87E-3	1.86E-3	1.73E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.14E-4	2.98E-4	4.24E-4	4.94E-4	6.21E-4	6.15E-4	6.33E-4	6.35E-4
Upper large intestine	3.83E-3	1.08E-2	2.11E-2	3.81E-2	3.39E-2	2.40E-2	2.26E-2	2.24E-2	2.09E-2	1.94E-2	1.82E-2	1.49E-2
Uterus	0.00E+0	0.00E+0	0.00E+0	1.06E-4	1.05E-3	2.26E-3	2.66E-3	2.92E-3	2.94E-3	2.96E-3	2.86E-3	2.55E-3
Whole body	2.26E-2	2.17E-2	2.04E-2	1.77E-2	1.35E-2	9.19E-3	8.26E-3	7.93E-3	7.41E-3	6.90E-3	6.43E-3	5.17E-3

Table E-87 SAFs (kg^{-1}) for 26 target organs and for skeleton（hard bone + bone marrow）as a source region in the JF phantom.

Target organs	Photon energy（MeV）											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	4.77E-4	9.56E-4	1.53E-3	2.57E-3	3.42E-3	3.82E-3	4.26E-3	4.55E-3	4.41E-3	4.16E-3	3.92E-3	3.27E-3
Adrenal	0.00E+0	7.31E-4	1.77E-3	3.59E-3	5.90E-3	7.30E-3	7.76E-3	7.84E-3	7.45E-3	7.03E-3	6.42E-3	5.58E-3
Bladder	2.12E-4	7.35E-4	1.55E-3	3.46E-3	5.58E-3	6.34E-3	6.58E-3	6.49E-3	6.10E-3	5.69E-3	5.23E-3	4.41E-3
Bone (hard bone)	1.38E-1	1.41E-1	1.36E-1	1.16E-1	7.26E-2	2.77E-2	1.60E-2	1.38E-2	1.24E-2	1.11E-2	1.01E-2	7.66E-3
Bone (marrow)	5.41E-2	2.73E-2	1.87E-2	1.32E-2	1.01E-2	1.05E-2	1.17E-2	1.20E-2	1.12E-2	1.02E-2	9.20E-3	6.81E-3
Brain	9.33E-4	1.79E-3	3.27E-3	6.71E-3	8.03E-3	7.25E-3	7.55E-3	7.74E-3	7.28E-3	6.76E-3	6.34E-3	5.20E-3
Breast	3.84E-5	3.46E-4	9.38E-4	1.97E-3	2.53E-3	2.56E-3	2.78E-3	3.00E-3	2.94E-3	2.81E-3	2.68E-3	2.27E-3
Esophagus	4.80E-4	1.19E-3	2.18E-3	4.41E-3	6.25E-3	6.59E-3	6.95E-3	7.21E-3	6.80E-3	6.37E-3	5.96E-3	4.97E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	1.20E-3	3.14E-3	4.37E-3	4.51E-3	4.68E-3	4.43E-3	4.29E-3	3.93E-3	3.28E-3
Heart	5.26E-5	3.55E-4	1.20E-3	3.43E-3	4.84E-3	4.74E-3	4.83E-3	4.85E-3	4.61E-3	4.31E-3	4.06E-3	3.40E-3
Kidney	6.31E-6	1.27E-4	6.14E-4	2.28E-3	4.56E-3	5.68E-3	6.03E-3	6.06E-3	5.75E-3	5.40E-3	5.11E-3	4.27E-3
Liver	2.56E-5	1.79E-4	5.70E-4	1.85E-3	3.39E-3	3.91E-3	4.07E-3	4.15E-3	3.99E-3	3.77E-3	3.57E-3	3.03E-3
Lower large intestine	3.25E-5	2.55E-4	7.93E-4	2.56E-3	4.89E-3	5.86E-3	6.12E-3	6.13E-3	5.72E-3	5.37E-3	5.07E-3	4.22E-3
Lung	6.25E-4	1.90E-3	3.59E-3	5.69E-3	5.87E-3	5.28E-3	5.43E-3	5.51E-3	5.20E-3	4.82E-3	4.53E-3	3.75E-3
Muscle	8.48E-4	1.34E-3	2.02E-3	3.25E-3	4.06E-3	4.32E-3	4.76E-3	5.03E-3	4.82E-3	4.53E-3	4.27E-3	3.55E-3
Ovary	0.00E+0	7.51E-4	2.01E-3	4.42E-3	6.71E-3	7.80E-3	8.28E-3	8.16E-3	7.75E-3	6.95E-3	6.62E-3	5.50E-3
Pancreas	3.71E-5	2.11E-4	6.80E-4	2.01E-3	4.09E-3	5.40E-3	5.83E-3	5.93E-3	5.55E-3	5.24E-3	5.05E-3	4.18E-3
Skin	1.15E-4	4.78E-4	9.48E-4	1.72E-3	2.22E-3	2.57E-3	3.06E-3	3.43E-3	3.27E-3	3.02E-3	2.82E-3	2.32E-3
Small Intestine	5.40E-5	2.32E-4	6.17E-4	2.00E-3	4.37E-3	5.71E-3	6.04E-3	6.03E-3	5.66E-3	5.35E-3	5.05E-3	4.22E-3
Spleen	4.16E-5	2.50E-4	6.90E-4	1.83E-3	3.21E-3	3.71E-3	3.92E-3	4.07E-3	3.86E-3	3.70E-3	3.45E-3	2.97E-3
Stomach	0.00E+0	6.49E-5	2.97E-4	1.27E-3	2.87E-3	3.74E-3	3.96E-3	4.07E-3	3.93E-3	3.74E-3	3.51E-3	3.00E-3
Thymus	0.00E+0	3.74E-4	1.49E-3	3.95E-3	4.93E-3	4.50E-3	4.67E-3	4.72E-3	4.54E-3	4.19E-3	4.02E-3	3.31E-3
Thyroid	0.00E+0	3.92E-4	1.37E-3	3.70E-3	5.21E-3	5.39E-3	5.98E-3	6.33E-3	6.05E-3	5.82E-3	5.40E-3	4.39E-3
Upper large intestine	3.88E-5	1.89E-4	5.05E-4	1.66E-3	3.30E-3	4.12E-3	4.41E-3	4.55E-3	4.35E-3	4.15E-3	3.91E-3	3.29E-3
Uterus	0.00E+0	1.34E-4	6.12E-4	2.41E-3	4.75E-3	5.59E-3	5.70E-3	5.58E-3	5.25E-3	4.92E-3	4.60E-3	3.90E-3
Whole body	2.25E-2	2.22E-2	2.17E-2	1.97E-2	1.41E-2	7.85E-3	6.54E-3	6.44E-3	6.05E-3	5.59E-3	5.20E-3	4.19E-3

Table E-88 SAFs (kg^{-1}) for 26 target organs and for skin as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	2.06E-2	2.44E-2	2.06E-2	1.23E-2	5.87E-3	4.04E-3	4.46E-3	4.97E-3	4.84E-3	4.51E-3	4.18E-3	3.23E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	1.07E-3	2.15E-3	2.28E-3	2.44E-3	2.71E-3	2.62E-3	2.63E-3	2.48E-3	2.20E-3
Bladder	0.00E+0	0.00E+0	9.51E-5	9.45E-4	2.06E-3	2.27E-3	2.48E-3	2.77E-3	2.69E-3	2.64E-3	2.57E-3	2.24E-3
Bone (hard bone)	7.35E-4	4.15E-3	9.15E-3	1.69E-2	1.65E-2	7.67E-3	3.90E-3	3.90E-3	3.65E-3	3.50E-3	3.21E-3	2.84E-3
Bone (marrow)	1.29E-4	4.30E-4	7.98E-4	1.44E-3	1.88E-3	2.29E-3	2.97E-3	2.97E-3	2.95E-3	2.84E-3	2.74E-3	2.26E-3
Brain	0.00E+0	0.00E+0	1.41E-5	5.91E-4	1.78E-3	1.98E-3	2.23E-3	2.48E-3	2.44E-3	2.33E-3	2.22E-3	1.88E-3
Breast	2.22E-3	8.54E-3	1.16E-2	9.52E-3	5.10E-3	3.53E-3	3.85E-3	4.29E-3	4.21E-3	4.00E-3	3.77E-3	3.06E-3
Esophagus	0.00E+0	9.79E-5	4.66E-4	1.61E-3	2.44E-3	2.37E-3	2.51E-3	2.70E-3	2.69E-3	2.59E-3	2.47E-3	2.13E-3
Gall bladder	0.00E+0	1.85E-4	1.38E-3	3.36E-3	3.26E-3	2.68E-3	2.80E-3	3.13E-3	3.23E-3	3.00E-3	2.88E-3	2.46E-3
Heart	0.00E+0	2.32E-5	3.33E-4	1.78E-3	2.73E-3	2.47E-3	2.58E-3	2.78E-3	2.74E-3	2.60E-3	2.45E-3	2.08E-3
Kidney	0.00E+0	2.04E-5	5.02E-4	2.57E-3	3.14E-3	2.63E-3	2.77E-3	3.04E-3	3.03E-3	2.92E-3	2.80E-3	2.42E-3
Liver	1.26E-6	2.76E-4	1.36E-3	3.27E-3	3.49E-3	2.85E-3	2.97E-3	3.25E-3	3.21E-3	3.08E-3	2.95E-3	2.52E-3
Lower large intestine	2.12E-5	3.31E-4	1.03E-3	2.21E-3	2.50E-3	2.36E-3	2.58E-3	2.89E-3	2.91E-3	2.83E-3	2.67E-3	2.34E-3
Lung	5.10E-6	3.22E-4	1.41E-3	3.37E-3	3.51E-3	2.86E-3	3.01E-3	3.27E-3	3.17E-3	3.02E-3	2.86E-3	2.44E-3
Muscle	2.26E-3	5.29E-3	7.35E-3	7.04E-3	4.39E-3	3.24E-3	3.52E-3	3.91E-3	3.85E-3	3.66E-3	3.46E-3	2.89E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	7.81E-4	1.79E-3	2.10E-3	2.38E-3	2.59E-3	2.70E-3	2.65E-3	2.56E-3	2.17E-3
Pancreas	0.00E+0	1.10E-4	8.31E-4	2.59E-3	2.85E-3	2.46E-3	2.61E-3	2.92E-3	2.90E-3	2.82E-3	2.72E-3	2.38E-3
Skin	2.77E-1	1.36E-1	7.26E-2	2.79E-2	9.90E-3	6.65E-3	7.65E-3	8.05E-3	6.60E-3	5.35E-3	4.53E-3	3.00E-3
Small Intestine	3.59E-6	2.50E-4	1.00E-3	2.39E-3	2.58E-3	2.32E-3	2.51E-3	2.82E-3	2.85E-3	2.76E-3	2.67E-3	2.31E-3
Spleen	0.00E+0	3.75E-4	2.26E-3	5.03E-3	4.42E-3	3.31E-3	3.44E-3	3.72E-3	3.63E-3	3.51E-3	3.37E-3	2.85E-3
Stomach	4.28E-5	1.29E-3	3.25E-3	4.64E-3	3.72E-3	2.87E-3	3.03E-3	3.36E-3	3.39E-3	3.23E-3	3.08E-3	2.62E-3
Thymus	0.00E+0	6.70E-5	5.76E-4	2.02E-3	2.73E-3	2.42E-3	2.63E-3	2.83E-3	2.76E-3	2.54E-3	2.51E-3	2.18E-3
Thyroid	5.69E-4	4.37E-3	8.03E-3	7.48E-3	4.10E-3	3.08E-3	3.43E-3	3.84E-3	3.60E-3	3.71E-3	3.42E-3	2.87E-3
Upper large intestine	9.66E-5	1.72E-3	3.99E-3	5.15E-3	3.75E-3	2.89E-3	3.14E-3	3.49E-3	3.48E-3	3.36E-3	3.24E-3	2.76E-3
Uterus	0.00E+0	0.00E+0	1.78E-4	1.36E-3	2.42E-3	2.45E-3	2.58E-3	2.80E-3	2.84E-3	2.69E-3	2.60E-3	2.26E-3
Whole body	1.74E-2	1.45E-2	1.27E-2	9.92E-3	6.47E-3	4.10E-3	3.87E-3	4.21E-3	4.05E-3	3.79E-3	3.54E-3	2.88E-3

Table E-89 SAFs (kg^{-1}) for 26 target organs and for small intestine as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	7.98E-3	1.41E-2	1.69E-2	1.62E-2	1.10E-2	8.07E-3	8.23E-3	8.33E-3	7.92E-3	7.44E-3	6.95E-3	5.68E-3
Adrenal	0.00E+0	0.00E+0	1.44E-3	8.30E-3	1.23E-2	1.16E-2	1.19E-2	1.17E-2	1.13E-2	1.05E-2	9.59E-3	8.23E-3
Bladder	0.00E+0	3.81E-4	6.53E-3	3.22E-2	3.76E-2	2.77E-2	2.51E-2	2.36E-2	2.17E-2	1.99E-2	1.83E-2	1.52E-2
Bone (hard bone)	1.92E-4	1.53E-3	4.96E-3	1.65E-2	2.68E-2	1.68E-2	9.21E-3	6.41E-3	5.65E-3	5.15E-3	4.88E-3	4.10E-3
Bone (marrow)	1.20E-4	4.13E-4	9.62E-4	2.52E-3	4.44E-3	5.68E-3	6.25E-3	6.25E-3	5.91E-3	5.59E-3	5.37E-3	4.28E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.35E-6	1.25E-5	3.00E-5	5.76E-5	8.13E-5	8.97E-5	1.20E-4
Breast	0.00E+0	0.00E+0	0.00E+0	3.70E-5	2.58E-4	4.96E-4	6.82E-4	9.17E-4	1.09E-3	1.18E-3	1.19E-3	1.16E-3
Esophagus	0.00E+0	0.00E+0	0.00E+0	1.06E-4	5.76E-4	8.82E-4	1.07E-3	1.22E-3	1.36E-3	1.42E-3	1.35E-3	1.28E-3
Gall bladder	2.41E-2	6.65E-2	9.20E-2	8.65E-2	5.25E-2	3.41E-2	3.33E-2	3.30E-2	3.02E-2	2.81E-2	2.57E-2	2.06E-2
Heart	0.00E+0	0.00E+0	0.00E+0	5.09E-5	4.38E-4	7.54E-4	9.34E-4	1.14E-3	1.28E-3	1.34E-3	1.34E-3	1.27E-3
Kidney	1.19E-3	6.02E-3	1.27E-2	2.04E-2	1.89E-2	1.54E-2	1.57E-2	1.53E-2	1.43E-2	1.35E-2	1.25E-2	1.05E-2
Liver	7.10E-4	2.61E-3	4.78E-3	7.82E-3	8.52E-3	7.21E-3	7.28E-3	7.50E-3	7.30E-3	6.96E-3	6.60E-3	5.61E-3
Lower large intestine	1.07E-2	4.09E-2	7.12E-2	9.15E-2	6.61E-2	4.32E-2	4.05E-2	3.90E-2	3.57E-2	3.28E-2	3.05E-2	2.45E-2
Lung	0.00E+0	0.00E+0	0.00E+0	8.32E-5	5.04E-4	7.98E-4	1.02E-3	1.21E-3	1.37E-3	1.41E-3	1.39E-3	1.31E-3
Muscle	4.79E-3	7.18E-3	8.55E-3	8.75E-3	6.64E-3	5.36E-3	5.61E-3	5.67E-3	5.44E-3	5.16E-3	4.83E-3	4.04E-3
Ovary	0.00E+0	0.00E+0	1.65E-3	1.52E-2	2.33E-2	1.94E-2	1.83E-2	1.70E-2	1.59E-2	1.48E-2	1.33E-2	1.11E-2
Pancreas	2.32E-2	7.67E-2	1.20E-1	1.21E-1	7.28E-2	4.65E-2	4.51E-2	4.45E-2	4.09E-2	3.75E-2	3.49E-2	2.79E-2
Skin	3.17E-6	2.28E-4	9.01E-4	2.10E-3	2.26E-3	2.12E-3	2.42E-3	2.70E-3	2.65E-3	2.51E-3	2.36E-3	2.00E-3
Small Intestine	1.89E+0	1.35E+0	9.78E-1	5.50E-1	2.43E-1	1.43E-1	1.43E-1	1.43E-1	1.28E-1	1.13E-1	1.01E-1	7.17E-2
Spleen	0.00E+0	0.00E+0	7.16E-5	1.82E-3	4.66E-3	5.21E-3	5.69E-3	5.79E-3	5.71E-3	5.52E-3	5.32E-3	4.56E-3
Stomach	1.59E-2	5.75E-2	8.86E-2	9.65E-2	6.09E-2	3.81E-2	3.67E-2	3.64E-2	3.37E-2	3.12E-2	2.91E-2	2.31E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.05E-4	2.45E-4	3.56E-4	4.76E-4	6.25E-4	6.64E-4	7.12E-4	7.32E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Upper large intestine	2.25E-2	7.95E-2	1.26E-1	1.40E-1	8.88E-2	5.48E-2	5.21E-2	5.15E-2	4.76E-2	4.37E-2	4.06E-2	3.24E-2
Uterus	0.00E+0	2.90E-5	1.68E-3	1.58E-2	2.43E-2	1.96E-2	1.80E-2	1.68E-2	1.54E-2	1.42E-2	1.33E-2	1.10E-2
Whole body	2.05E-2	1.90E-2	1.81E-2	1.63E-2	1.27E-2	8.92E-3	7.98E-3	7.65E-3	7.16E-3	6.66E-3	6.21E-3	5.05E-3

Table E-90 SAFs (kg^{-1}) for 26 target organs and for small intestine content as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.30E-3	6.78E-3	1.22E-2	1.47E-2	1.11E-2	8.09E-3	7.93E-3	8.06E-3	7.66E-3	7.16E-3	6.74E-3	5.61E-3
Adrenal	0.00E+0	0.00E+0	9.33E-4	7.13E-3	1.20E-2	1.13E-2	1.12E-2	1.13E-2	1.05E-2	9.87E-3	9.12E-3	7.85E-3
Bladder	0.00E+0	1.18E-4	4.26E-3	2.92E-2	3.82E-2	2.82E-2	2.51E-2	2.35E-2	2.14E-2	1.96E-2	1.84E-2	1.51E-2
Bone (hard bone)	2.31E-5	6.08E-4	3.01E-3	1.36E-2	2.45E-2	1.59E-2	8.70E-3	6.00E-3	5.22E-3	4.76E-3	4.55E-3	3.89E-3
Bone (marrow)	0.00E+0	1.65E-4	5.44E-4	2.04E-3	3.97E-3	5.22E-3	5.72E-3	5.75E-3	5.45E-3	5.11E-3	4.86E-3	4.00E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.19E-6	1.22E-5	3.15E-5	5.83E-5	7.57E-5	8.88E-5	1.22E-4
Breast	0.00E+0	0.00E+0	0.00E+0	3.45E-5	2.79E-4	5.12E-4	6.56E-4	8.95E-4	1.07E-3	1.13E-3	1.16E-3	1.13E-3
Esophagus	0.00E+0	0.00E+0	0.00E+0	8.43E-5	5.66E-4	8.87E-4	1.02E-3	1.21E-3	1.32E-3	1.29E-3	1.31E-3	1.22E-3
Gall bladder	5.84E-3	3.41E-2	6.77E-2	7.77E-2	5.01E-2	3.20E-2	3.08E-2	3.04E-2	2.87E-2	2.66E-2	2.38E-2	1.99E-2
Heart	0.00E+0	0.00E+0	0.00E+0	4.52E-5	4.34E-4	7.54E-4	8.87E-4	1.10E-3	1.24E-3	1.30E-3	1.29E-3	1.24E-3
Kidney	6.45E-5	2.54E-3	9.24E-3	1.86E-2	1.87E-2	1.53E-2	1.48E-2	1.45E-2	1.36E-2	1.26E-2	1.19E-2	9.96E-3
Liver	6.66E-5	1.62E-3	4.46E-3	7.87E-3	8.48E-3	7.12E-3	7.03E-3	7.27E-3	7.07E-3	6.71E-3	6.40E-3	5.49E-3
Lower large intestine	3.93E-3	2.17E-2	5.33E-2	8.58E-2	6.70E-2	4.38E-2	4.01E-2	3.85E-2	3.51E-2	3.23E-2	2.99E-2	2.44E-2
Lung	0.00E+0	0.00E+0	0.00E+0	7.32E-5	5.15E-4	8.21E-4	9.65E-4	1.19E-3	1.33E-3	1.35E-3	1.35E-3	1.28E-3
Muscle	7.17E-4	3.30E-3	6.07E-3	7.90E-3	6.75E-3	5.42E-3	5.39E-3	5.50E-3	5.27E-3	4.95E-3	4.69E-3	3.97E-3
Ovary	0.00E+0	0.00E+0	1.20E-3	1.38E-2	2.36E-2	1.96E-2	1.80E-2	1.70E-2	1.54E-2	1.42E-2	1.34E-2	1.11E-2
Pancreas	4.18E-3	3.89E-2	8.64E-2	1.02E-1	6.58E-2	4.22E-2	4.02E-2	3.95E-2	3.64E-2	3.35E-2	3.12E-2	2.54E-2
Skin	0.00E+0	1.34E-4	7.86E-4	2.10E-3	2.37E-3	2.20E-3	2.42E-3	2.72E-3	2.67E-3	2.49E-3	2.35E-3	2.00E-3
Small Intestine	5.54E-1	7.89E-1	7.49E-1	4.97E-1	2.34E-1	1.36E-1	1.33E-1	1.34E-1	1.23E-1	1.11E-1	1.01E-1	7.40E-2
Spleen	0.00E+0	0.00E+0	4.65E-5	1.57E-3	4.74E-3	5.35E-3	5.35E-3	5.66E-3	5.57E-3	5.31E-3	5.11E-3	4.43E-3
Stomach	2.01E-3	2.82E-2	6.36E-2	8.37E-2	5.70E-2	3.59E-2	3.39E-2	3.34E-2	3.11E-2	2.86E-2	2.67E-2	2.18E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.05E-4	2.59E-4	3.29E-4	4.62E-4	5.86E-4	6.51E-4	7.20E-4	7.02E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Upper large intestine	4.34E-3	4.73E-2	1.08E-1	1.39E-1	9.06E-2	5.56E-2	5.23E-2	5.15E-2	4.75E-2	4.37E-2	4.07E-2	3.29E-2
Uterus	0.00E+0	0.00E+0	1.18E-3	1.46E-2	2.46E-2	2.00E-2	1.79E-2	1.67E-2	1.53E-2	1.41E-2	1.32E-2	1.08E-2
Whole body	5.44E-3	1.03E-2	1.34E-2	1.46E-2	1.24E-2	8.72E-3	7.61E-3	7.32E-3	6.88E-3	6.39E-3	6.01E-3	4.96E-3

Table E-91 SAFs (kg^{-1}) for 26 target organs and for spleen as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	3.90E-3	9.28E-3	1.29E-2	1.29E-2	8.21E-3	5.62E-3	5.80E-3	6.04E-3	5.82E-3	5.49E-3	5.17E-3	4.23E-3
Adrenal	0.00E+0	0.00E+0	5.44E-3	3.82E-2	4.44E-2	3.33E-2	3.17E-2	3.02E-2	2.77E-2	2.58E-2	2.43E-2	1.98E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.55E-4	7.33E-4	1.15E-3	1.39E-3	1.58E-3	1.70E-3	1.67E-3	1.58E-3
Bone (hard bone)	1.19E-4	1.52E-3	4.90E-3	1.37E-2	1.97E-2	1.18E-2	7.39E-3	4.85E-3	4.34E-3	4.47E-3	4.19E-3	3.27E-3
Bone (marrow)	1.09E-4	5.39E-4	1.03E-3	1.62E-3	2.14E-3	2.74E-3	2.96E-3	2.93E-3	3.18E-3	3.10E-3	2.98E-3	2.47E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.19E-5	5.97E-5	1.27E-4	2.08E-4	2.89E-4	3.39E-4	3.63E-4	3.60E-4
Breast	0.00E+0	0.00E+0	2.69E-5	1.03E-3	3.38E-3	3.73E-3	3.98E-3	4.25E-3	4.25E-3	4.08E-3	3.91E-3	3.33E-3
Esophagus	0.00E+0	0.00E+0	5.97E-4	7.23E-3	1.15E-2	9.49E-3	9.00E-3	8.67E-3	8.08E-3	7.50E-3	6.99E-3	5.75E-3
Gall bladder	0.00E+0	0.00E+0	0.00E+0	1.49E-3	6.44E-3	8.51E-3	8.86E-3	8.86E-3	8.81E-3	8.58E-3	7.85E-3	6.85E-3
Heart	0.00E+0	4.75E-6	3.56E-4	4.50E-3	8.41E-3	7.44E-3	7.07E-3	6.94E-3	6.59E-3	6.22E-3	5.88E-3	4.91E-3
Kidney	1.98E-2	1.02E-1	2.15E-1	2.53E-1	1.42E-1	8.24E-2	7.88E-2	7.80E-2	7.19E-2	6.60E-2	6.12E-2	4.91E-2
Liver	0.00E+0	3.07E-6	3.94E-4	6.24E-3	1.22E-2	1.14E-2	1.11E-2	1.10E-2	1.05E-2	9.96E-3	9.44E-3	7.93E-3
Lower large intestine	0.00E+0	6.14E-5	1.15E-3	5.44E-3	6.43E-3	5.31E-3	5.56E-3	5.72E-3	5.67E-3	5.53E-3	5.28E-3	4.52E-3
Lung	7.97E-4	7.71E-3	1.74E-2	2.50E-2	1.85E-2	1.24E-2	1.19E-2	1.18E-2	1.09E-2	1.02E-2	9.50E-3	7.85E-3
Muscle	2.34E-3	4.82E-3	7.32E-3	8.84E-3	6.55E-3	4.78E-3	4.93E-3	5.07E-3	4.87E-3	4.62E-3	4.36E-3	3.62E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.81E-4	6.56E-4	1.11E-3	1.32E-3	1.51E-3	1.70E-3	1.66E-3	1.47E-3
Pancreas	2.53E-2	6.95E-2	1.00E-1	9.89E-2	6.25E-2	4.00E-2	3.86E-2	3.81E-2	3.52E-2	3.24E-2	3.01E-2	2.40E-2
Skin	3.94E-7	3.41E-4	2.05E-3	4.50E-3	3.94E-3	3.09E-3	3.36E-3	3.61E-3	3.46E-3	3.21E-3	2.99E-3	2.46E-3
Small Intestine	0.00E+0	0.00E+0	7.15E-5	1.81E-3	4.65E-3	5.15E-3	5.66E-3	5.84E-3	5.74E-3	5.61E-3	5.35E-3	4.60E-3
Spleen	1.62E+1	1.31E+1	9.36E+0	4.35E+0	1.51E+0	8.44E-1	8.92E-1	9.34E-1	8.38E-1	7.29E-1	6.37E-1	4.05E-1
Stomach	4.19E-2	1.15E-1	1.65E-1	1.61E-1	9.43E-2	5.67E-2	5.44E-2	5.45E-2	5.06E-2	4.64E-2	4.31E-2	3.40E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	5.23E-4	2.27E-3	2.70E-3	2.73E-3	2.83E-3	2.93E-3	2.74E-3	2.75E-3	2.45E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.62E-4	7.99E-4	9.87E-4	1.20E-3	1.26E-3	1.33E-3	1.18E-3	1.12E-3
Upper large intestine	2.64E-3	8.46E-3	1.56E-2	2.07E-2	1.48E-2	1.00E-2	1.00E-2	1.03E-2	9.85E-3	9.28E-3	8.77E-3	7.26E-3
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.83E-4	6.22E-4	1.04E-3	1.24E-3	1.44E-3	1.59E-3	1.59E-3	1.45E-3
Whole body	2.26E-2	2.22E-2	2.10E-2	1.73E-2	1.17E-2	7.76E-3	7.27E-3	7.08E-3	6.67E-3	6.27E-3	5.84E-3	4.64E-3

Table E-92 SAFs (kg^{-1}) for 26 target organs and for stomach as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	6.76E-3	1.05E-2	1.18E-2	1.10E-2	7.58E-3	5.46E-3	5.54E-3	5.82E-3	5.62E-3	5.30E-3	4.98E-3	4.09E-3
Adrenal	1.15E-2	8.27E-2	1.39E-1	1.47E-1	9.29E-2	5.89E-2	5.60E-2	5.49E-2	5.01E-2	4.59E-2	4.29E-2	3.42E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	7.43E-4	2.98E-3	3.58E-3	3.65E-3	3.87E-3	3.93E-3	3.73E-3	3.63E-3	3.20E-3
Bone (hard bone)	2.16E-5	4.80E-4	2.37E-3	1.00E-2	1.76E-2	1.15E-2	6.44E-3	4.64E-3	4.12E-3	3.81E-3	3.59E-3	3.11E-3
Bone (marrow)	0.00E+0	8.65E-5	3.41E-4	1.08E-3	2.30E-3	3.18E-3	3.52E-3	3.60E-3	3.62E-3	3.50E-3	3.34E-3	2.80E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.69E-6	3.60E-5	6.53E-5	1.19E-4	1.72E-4	2.01E-4	2.20E-4	2.49E-4
Breast	0.00E+0	2.79E-6	1.19E-4	1.39E-3	3.67E-3	3.62E-3	3.74E-3	4.10E-3	4.15E-3	4.05E-3	3.87E-3	3.38E-3
Esophagus	1.73E-2	1.98E-2	1.97E-2	1.87E-2	1.41E-2	1.00E-2	9.47E-3	9.39E-3	8.74E-3	8.08E-3	7.50E-3	6.08E-3
Gall bladder	5.99E-2	9.86E-2	1.22E-1	1.18E-1	7.44E-2	4.66E-2	4.52E-2	4.50E-2	4.18E-2	3.81E-2	3.52E-2	2.80E-2
Heart	0.00E+0	1.89E-4	1.68E-3	6.49E-3	8.67E-3	7.00E-3	6.54E-3	6.55E-3	6.29E-3	5.93E-3	5.66E-3	4.81E-3
Kidney	6.20E-3	2.94E-2	5.87E-2	8.00E-2	5.83E-2	3.85E-2	3.62E-2	3.54E-2	3.27E-2	3.03E-2	2.81E-2	2.28E-2
Liver	1.92E-2	3.75E-2	4.78E-2	5.17E-2	3.80E-2	2.57E-2	2.44E-2	2.44E-2	2.28E-2	2.11E-2	1.97E-2	1.59E-2
Lower large intestine	0.00E+0	1.00E-4	1.64E-3	8.64E-3	1.19E-2	9.72E-3	9.29E-3	9.41E-3	8.97E-3	8.48E-3	8.01E-3	6.77E-3
Lung	2.24E-3	8.95E-3	1.39E-2	1.55E-2	1.16E-2	8.04E-3	7.64E-3	7.69E-3	7.29E-3	6.81E-3	6.42E-3	5.34E-3
Muscle	6.01E-3	7.39E-3	7.51E-3	7.05E-3	5.39E-3	4.17E-3	4.24E-3	4.45E-3	4.30E-3	4.07E-3	3.84E-3	3.21E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.00E-3	2.80E-3	2.99E-3	3.34E-3	3.36E-3	3.19E-3	3.03E-3	2.73E-3
Pancreas	1.56E-1	3.28E-1	3.93E-1	3.22E-1	1.68E-1	9.84E-2	9.52E-2	9.53E-2	8.79E-2	8.03E-2	7.38E-2	5.68E-2
Skin	3.96E-5	1.18E-3	2.96E-3	4.17E-3	3.40E-3	2.72E-3	2.95E-3	3.26E-3	3.14E-3	2.92E-3	2.72E-3	2.26E-3
Small Intestine	1.59E-2	5.75E-2	8.86E-2	9.67E-2	6.15E-2	3.85E-2	3.67E-2	3.64E-2	3.38E-2	3.11E-2	2.90E-2	2.32E-2
Spleen	4.19E-2	1.15E-1	1.65E-1	1.61E-1	9.48E-2	5.69E-2	5.44E-2	5.44E-2	5.05E-2	4.63E-2	4.30E-2	3.41E-2
Stomach	5.35E+0	2.99E+0	1.79E+0	8.01E-1	3.04E-1	1.76E-1	1.84E-1	1.88E-1	1.61E-1	1.36E-1	1.17E-1	7.70E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	4.72E-4	1.85E-3	2.09E-3	2.07E-3	2.23E-3	2.36E-3	2.40E-3	2.26E-3	2.05E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.07E-4	5.15E-4	5.88E-4	7.39E-4	7.95E-4	8.07E-4	8.49E-4	8.42E-4
Upper large intestine	1.88E-2	3.70E-2	4.94E-2	5.51E-2	3.81E-2	2.47E-2	2.38E-2	2.41E-2	2.26E-2	2.10E-2	1.96E-2	1.59E-2
Uterus	0.00E+0	0.00E+0	0.00E+0	3.74E-4	2.02E-3	2.73E-3	2.86E-3	3.13E-3	3.16E-3	3.10E-3	3.01E-3	2.65E-3
Whole body	1.82E-2	1.58E-2	1.47E-2	1.34E-2	1.04E-2	7.26E-3	6.54E-3	6.46E-3	6.09E-3	5.68E-3	5.31E-3	4.35E-3

Table E-93 SAFs (kg^{-1}) for 26 target organs and for stomach content as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	4.77E-4	2.80E-3	5.75E-3	8.19E-3	6.55E-3	4.84E-3	4.97E-3	5.17E-3	5.00E-3	4.74E-3	4.48E-3	3.77E-3
Adrenal	1.45E-3	3.13E-2	9.29E-2	1.41E-1	9.68E-2	6.09E-2	5.74E-2	5.60E-2	5.07E-2	4.62E-2	4.31E-2	3.55E-2
Bladder	0.00E+0	0.00E+0	0.00E+0	5.12E-4	2.15E-3	2.64E-3	2.91E-3	3.17E-3	3.22E-3	3.12E-3	3.04E-3	2.64E-3
Bone (hard bone)	0.00E+0	1.69E-4	1.65E-3	9.67E-3	1.79E-2	1.16E-2	7.10E-3	5.04E-3	4.42E-3	4.08E-3	3.83E-3	3.31E-3
Bone (marrow)	0.00E+0	0.00E+0	2.17E-4	1.01E-3	2.17E-3	2.95E-3	3.33E-3	3.40E-3	3.39E-3	3.28E-3	3.13E-3	2.65E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.75E-6	4.14E-5	8.59E-5	1.49E-4	2.08E-4	2.44E-4	2.61E-4	2.86E-4
Breast	0.00E+0	1.74E-6	1.24E-4	1.87E-3	4.46E-3	4.49E-3	4.72E-3	5.02E-3	4.99E-3	4.78E-3	4.56E-3	3.92E-3
Esophagus	2.03E-3	4.61E-3	8.82E-3	1.72E-2	1.63E-2	1.15E-2	1.08E-2	1.04E-2	9.63E-3	8.98E-3	8.41E-3	6.90E-3
Gall bladder	1.85E-3	7.26E-3	1.82E-2	3.78E-2	3.73E-2	2.68E-2	2.54E-2	2.52E-2	2.32E-2	2.17E-2	2.02E-2	1.64E-2
Heart	0.00E+0	1.35E-4	1.82E-3	8.67E-3	1.15E-2	8.99E-3	8.37E-3	8.22E-3	7.80E-3	7.36E-3	6.97E-3	5.86E-3
Kidney	6.93E-4	1.23E-2	4.45E-2	8.43E-2	6.42E-2	4.15E-2	3.90E-2	3.78E-2	3.47E-2	3.21E-2	2.98E-2	2.44E-2
Liver	1.61E-3	1.23E-2	2.94E-2	4.76E-2	3.89E-2	2.63E-2	2.47E-2	2.44E-2	2.27E-2	2.11E-2	1.97E-2	1.62E-2
Lower large intestine	0.00E+0	3.28E-5	9.28E-4	6.55E-3	9.57E-3	7.89E-3	7.91E-3	8.01E-3	7.63E-3	7.22E-3	6.90E-3	5.83E-3
Lung	3.58E-4	4.64E-3	1.23E-2	1.95E-2	1.53E-2	1.03E-2	9.77E-3	9.65E-3	9.03E-3	8.41E-3	7.91E-3	6.59E-3
Muscle	4.36E-4	1.93E-3	3.67E-3	5.54E-3	4.90E-3	3.87E-3	4.03E-3	4.17E-3	4.04E-3	3.83E-3	3.64E-3	3.09E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.41E-3	2.02E-3	2.49E-3	2.73E-3	2.67E-3	2.78E-3	2.78E-3	2.40E-3
Pancreas	8.64E-3	7.83E-2	1.63E-1	1.98E-1	1.22E-1	7.35E-2	6.94E-2	6.81E-2	6.28E-2	5.74E-2	5.33E-2	4.29E-2
Skin	3.48E-6	3.85E-4	1.60E-3	3.29E-3	3.13E-3	2.60E-3	2.86E-3	3.14E-3	3.02E-3	2.81E-3	2.63E-3	2.20E-3
Small Intestine	1.43E-3	1.74E-2	4.39E-2	6.26E-2	4.36E-2	2.79E-2	2.69E-2	2.66E-2	2.47E-2	2.29E-2	2.14E-2	1.74E-2
Spleen	3.78E-3	4.03E-2	1.13E-1	1.73E-1	1.16E-1	6.90E-2	6.44E-2	6.33E-2	5.83E-2	5.36E-2	4.98E-2	4.06E-2
Stomach	4.75E-1	6.87E-1	6.85E-1	4.70E-1	2.17E-1	1.23E-1	1.22E-1	1.25E-1	1.15E-1	1.05E-1	9.53E-2	7.08E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	6.29E-4	2.34E-3	2.59E-3	2.55E-3	2.77E-3	2.75E-3	2.74E-3	2.65E-3	2.40E-3
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.09E-4	6.17E-4	7.56E-4	8.75E-4	9.12E-4	9.87E-4	9.93E-4	9.16E-4
Upper large intestine	1.03E-3	8.67E-3	2.09E-2	3.48E-2	2.79E-2	1.86E-2	1.79E-2	1.80E-2	1.71E-2	1.59E-2	1.49E-2	1.23E-2
Uterus	0.00E+0	0.00E+0	0.00E+0	2.60E-4	1.45E-3	2.02E-3	2.35E-3	2.57E-3	2.67E-3	2.63E-3	2.55E-3	2.26E-3
Whole body	1.53E-3	4.09E-3	7.18E-3	1.06E-2	9.72E-3	6.84E-3	6.20E-3	6.02E-3	5.69E-3	5.33E-3	5.02E-3	4.20E-3

Table E-94 SAFs (kg^{-1}) for 26 target organs and for thymus as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.54E-3	2.33E-3	3.42E-3	4.37E-3	3.67E-3	2.79E-3	2.82E-3	2.94E-3	2.83E-3	2.66E-3	2.51E-3	2.11E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.19E-3	3.00E-3	2.98E-3	3.07E-3	3.15E-3	3.15E-3	3.05E-3	2.60E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.10E-5	1.20E-4	1.98E-4	2.56E-4	2.59E-4	3.16E-4
Bone (hard bone)	3.25E-5	2.55E-3	1.18E-2	2.99E-2	2.93E-2	1.27E-2	6.48E-3	4.82E-3	4.35E-3	4.04E-3	3.79E-3	3.24E-3
Bone (marrow)	2.25E-5	8.07E-4	2.49E-3	4.55E-3	4.63E-3	4.43E-3	4.73E-3	4.81E-3	4.49E-3	4.19E-3	3.91E-3	3.20E-3
Brain	0.00E+0	0.00E+0	0.00E+0	3.79E-6	1.37E-4	4.52E-4	6.44E-4	9.07E-4	1.11E-3	1.19E-3	1.22E-3	1.20E-3
Breast	0.00E+0	3.58E-4	5.71E-3	2.42E-2	2.56E-2	1.80E-2	1.73E-2	1.71E-2	1.57E-2	1.44E-2	1.34E-2	1.08E-2
Esophagus	0.00E+0	6.32E-4	1.49E-2	6.06E-2	5.52E-2	3.61E-2	3.40E-2	3.40E-2	3.19E-2	2.96E-2	2.79E-2	2.28E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.02E-3	1.61E-3	1.62E-3	1.86E-3	2.01E-3	1.96E-3	2.10E-3	1.94E-3
Heart	2.57E-1	4.99E-1	5.55E-1	4.09E-1	1.91E-1	1.10E-1	1.11E-1	1.15E-1	1.07E-1	9.84E-2	9.05E-2	6.82E-2
Kidney	0.00E+0	0.00E+0	0.00E+0	1.74E-4	1.30E-3	1.87E-3	1.93E-3	2.13E-3	2.23E-3	2.20E-3	2.16E-3	1.97E-3
Liver	0.00E+0	0.00E+0	5.75E-5	1.80E-3	5.29E-3	5.16E-3	4.83E-3	4.89E-3	4.83E-3	4.64E-3	4.46E-3	3.88E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.53E-5	1.17E-4	1.66E-4	2.59E-4	3.52E-4	4.08E-4	4.32E-4	4.67E-4
Lung	5.94E-2	1.42E-1	1.74E-1	1.42E-1	7.28E-2	4.13E-2	3.92E-2	3.90E-2	3.59E-2	3.29E-2	3.05E-2	2.38E-2
Muscle	2.74E-4	7.98E-4	1.94E-3	4.02E-3	4.23E-3	3.39E-3	3.37E-3	3.46E-3	3.30E-3	3.10E-3	2.93E-3	2.46E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Pancreas	0.00E+0	0.00E+0	0.00E+0	7.36E-5	8.68E-4	1.40E-3	1.49E-3	1.70E-3	1.88E-3	1.91E-3	1.88E-3	1.73E-3
Skin	0.00E+0	7.02E-5	6.13E-4	2.13E-3	2.61E-3	2.32E-3	2.51E-3	2.73E-3	2.58E-3	2.38E-3	2.21E-3	1.83E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.08E-4	2.69E-4	3.47E-4	4.96E-4	6.16E-4	6.85E-4	7.17E-4	7.39E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	5.45E-4	2.36E-3	2.75E-3	2.70E-3	2.82E-3	2.82E-3	2.78E-3	2.69E-3	2.40E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	4.65E-4	1.85E-3	2.11E-3	2.08E-3	2.24E-3	2.33E-3	2.33E-3	2.27E-3	2.07E-3
Thymus	4.27E+1	3.01E+1	1.89E+1	7.61E+0	2.42E+0	1.39E+0	1.53E+0	1.62E+0	1.43E+0	1.20E+0	1.01E+0	5.75E-1
Thyroid	0.00E+0	0.00E+0	1.01E-3	1.36E-2	1.98E-2	1.57E-2	1.55E-2	1.65E-2	1.64E-2	1.54E-2	1.46E-2	1.21E-2
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.28E-4	2.71E-4	3.39E-4	4.79E-4	6.12E-4	6.65E-4	7.01E-4	7.35E-4
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.11E-5	1.06E-4	1.62E-4	2.01E-4	2.47E-4	2.81E-4
Whole body	2.26E-2	2.17E-2	2.03E-2	1.77E-2	1.20E-2	7.08E-3	6.19E-3	6.10E-3	5.69E-3	5.24E-3	4.86E-3	3.87E-3

Table E-95 SAFs (kg^{-1}) for 26 target organs and for thyroid as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.59E-3	4.70E-3	6.88E-3	6.41E-3	3.84E-3	3.12E-3	3.29E-3	3.49E-3	3.38E-3	3.21E-3	3.02E-3	2.47E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.58E-4	7.82E-4	8.53E-4	9.83E-4	1.02E-3	1.08E-3	1.05E-3	1.06E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.48E-4
Bone (hard bone)	1.74E-4	2.99E-3	1.21E-2	3.19E-2	3.54E-2	1.86E-2	9.78E-3	7.07E-3	6.47E-3	6.67E-3	6.26E-3	4.79E-3
Bone (marrow)	2.21E-5	3.70E-4	1.36E-3	3.20E-3	4.11E-3	4.56E-3	5.04E-3	5.28E-3	5.05E-3	4.68E-3	4.39E-3	3.61E-3
Brain	0.00E+0	0.00E+0	0.00E+0	7.96E-5	8.82E-4	3.23E-3	3.88E-3	4.38E-3	4.66E-3	4.80E-3	4.68E-3	4.03E-3
Breast	0.00E+0	0.00E+0	1.86E-5	7.58E-4	2.34E-3	3.25E-3	3.48E-3	3.82E-3	3.91E-3	3.87E-3	3.71E-3	3.16E-3
Esophagus	1.72E-1	5.26E-1	6.61E-1	4.29E-1	1.72E-1	1.01E-1	1.04E-1	1.08E-1	1.00E-1	9.19E-2	8.45E-2	6.44E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.92E-4
Heart	0.00E+0	1.46E-4	2.99E-3	1.37E-2	1.44E-2	1.18E-2	1.13E-2	1.16E-2	1.11E-2	1.04E-2	9.75E-3	8.12E-3
Kidney	0.00E+0	0.00E+0	0.00E+0	2.92E-5	2.76E-4	5.94E-4	6.90E-4	8.43E-4	9.38E-4	9.70E-4	9.55E-4	9.19E-4
Liver	0.00E+0	0.00E+0	2.22E-6	2.00E-4	8.62E-4	1.29E-3	1.37E-3	1.52E-3	1.58E-3	1.55E-3	1.51E-3	1.37E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.54E-6	4.08E-5	6.42E-5	1.01E-4	1.51E-4	1.93E-4	2.13E-4	2.39E-4
Lung	1.18E-6	8.92E-4	7.11E-3	1.83E-2	1.53E-2	1.21E-2	1.18E-2	1.19E-2	1.11E-2	1.02E-2	9.53E-3	7.91E-3
Muscle	1.28E-2	2.25E-2	2.44E-2	1.74E-2	8.84E-3	6.58E-3	6.87E-3	7.19E-3	6.83E-3	6.37E-3	5.93E-3	4.68E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Pancreas	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.30E-4	3.55E-4	4.20E-4	5.18E-4	5.95E-4	6.56E-4	6.65E-4	6.86E-4
Skin	5.22E-4	4.02E-3	7.35E-3	6.82E-3	3.80E-3	3.08E-3	3.43E-3	3.74E-3	3.52E-3	3.25E-3	3.01E-3	2.43E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.88E-5	7.87E-5	1.15E-4	1.67E-4	2.34E-4	2.72E-4	3.01E-4	3.27E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	8.68E-5	5.35E-4	9.35E-4	1.05E-3	1.23E-3	1.29E-3	1.28E-3	1.23E-3	1.17E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	5.79E-5	3.21E-4	5.73E-4	6.28E-4	7.41E-4	8.14E-4	8.33E-4	8.47E-4	8.10E-4
Thymus	0.00E+0	0.00E+0	1.04E-3	1.36E-2	1.89E-2	1.62E-2	1.59E-2	1.68E-2	1.61E-2	1.51E-2	1.46E-2	1.22E-2
Thyroid	1.01E+2	6.33E+1	3.63E+1	1.34E+1	4.08E+0	2.35E+0	2.61E+0	2.74E+0	2.34E+0	1.90E+0	1.55E+0	7.91E-1
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.72E-5	8.66E-5	1.24E-4	1.94E-4	2.66E-4	3.07E-4	3.29E-4	3.59E-4
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.06E-4	1.19E-4	1.32E-4
Whole body	2.24E-2	2.15E-2	2.01E-2	1.66E-2	1.13E-2	7.42E-3	6.39E-3	6.26E-3	5.90E-3	5.58E-3	5.18E-3	4.06E-3

Table E-96 SAFs (kg^{-1}) for 26 target organs and for trachea as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	8.21E-3	1.11E-2	1.06E-2	7.75E-3	4.49E-3	3.42E-3	3.63E-3	3.83E-3	3.65E-3	3.40E-3	3.17E-3	2.54E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.19E-3	1.67E-3	1.81E-3	1.93E-3	1.97E-3	1.89E-3	1.87E-3	1.77E-3
Bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.52E-5	1.29E-4	1.50E-4	1.73E-4	2.07E-4
Bone (hard bone)	2.96E-4	3.92E-3	1.43E-2	3.72E-2	3.92E-2	1.75E-2	9.11E-3	7.00E-3	6.34E-3	7.00E-3	5.53E-3	4.68E-3
Bone (marrow)	6.61E-5	7.80E-4	2.13E-3	4.43E-3	5.22E-3	5.41E-3	5.84E-3	6.03E-3	5.62E-3	6.03E-3	4.98E-3	4.00E-3
Brain	0.00E+0	0.00E+0	0.00E+0	4.80E-5	4.84E-4	1.51E-3	2.08E-3	2.64E-3	2.89E-3	2.93E-3	2.88E-3	2.63E-3
Breast	0.00E+0	4.62E-6	4.63E-4	5.57E-3	8.50E-3	7.37E-3	7.39E-3	7.58E-3	7.19E-3	6.70E-3	6.31E-3	5.23E-3
Esophagus	7.04E-1	1.37E+0	1.26E+0	6.67E-1	2.50E-1	1.45E-1	1.51E-1	1.58E-1	1.46E-1	1.33E-1	1.20E-1	8.18E-2
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.96E-4	9.12E-4	8.94E-4	1.09E-3	1.17E-3	1.22E-3	1.14E-3	1.09E-3
Heart	1.97E-1	3.72E-1	3.83E-1	2.53E-1	1.12E-1	6.59E-2	6.68E-2	6.89E-2	6.41E-2	5.86E-2	5.36E-2	3.95E-2
Kidney	0.00E+0	0.00E+0	0.00E+0	1.41E-4	7.97E-4	1.20E-3	1.34E-3	1.54E-3	1.62E-3	1.61E-3	1.58E-3	1.41E-3
Liver	0.00E+0	0.00E+0	3.38E-5	8.82E-4	2.53E-3	2.78E-3	2.73E-3	2.80E-3	2.76E-3	2.66E-3	2.57E-3	2.26E-3
Lower large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.33E-5	6.54E-5	1.04E-4	1.67E-4	2.30E-4	2.73E-4	3.02E-4	3.33E-4
Lung	1.17E-2	5.01E-2	8.36E-2	8.49E-2	4.66E-2	2.83E-2	2.73E-2	2.68E-2	2.46E-2	2.25E-2	2.08E-2	1.68E-2
Muscle	5.21E-3	1.14E-2	1.35E-2	1.15E-2	7.06E-3	5.41E-3	5.65E-3	5.86E-3	5.54E-3	5.15E-3	4.80E-3	3.87E-3
Ovary	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Pancreas	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.96E-4	7.38E-4	8.38E-4	9.85E-4	1.08E-3	1.13E-3	1.15E-3	1.09E-3
Skin	7.63E-5	1.29E-3	2.64E-3	3.33E-3	2.66E-3	2.41E-3	2.73E-3	3.01E-3	2.85E-3	2.62E-3	2.43E-3	2.01E-3
Small Intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.09E-5	1.45E-4	2.04E-4	2.96E-4	3.90E-4	4.37E-4	4.60E-4	4.90E-4
Spleen	0.00E+0	0.00E+0	0.00E+0	3.59E-4	1.42E-3	1.78E-3	1.92E-3	2.09E-3	2.15E-3	2.07E-3	2.00E-3	1.75E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	2.26E-4	9.00E-4	1.16E-3	1.21E-3	1.34E-3	1.41E-3	1.41E-3	1.40E-3	1.30E-3
Thymus	0.00E+0	1.14E-2	9.41E-2	1.83E-1	1.13E-1	6.79E-2	6.68E-2	6.82E-2	6.38E-2	5.90E-2	5.47E-2	4.45E-2
Thyroid	1.22E+0	3.12E+0	3.02E+0	1.61E+0	5.80E-1	3.27E-1	3.44E-1	3.61E-1	3.34E-1	3.05E-1	2.78E-1	1.88E-1
Upper large intestine	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.74E-5	1.57E-4	2.17E-4	3.18E-4	4.09E-4	4.59E-4	4.81E-4	5.11E-4
Uterus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.22E-5	6.50E-5	1.01E-4	1.24E-4	1.51E-4	1.89E-4
Whole body	6.75E-3	1.37E-2	1.69E-2	1.73E-2	1.25E-2	7.50E-3	6.46E-3	6.35E-3	5.95E-3	5.71E-3	5.15E-3	4.16E-3

Table E-97 SAFs (kg^{-1}) for 26 target organs and for upper large intestine as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.34E-2	1.75E-2	1.79E-2	1.51E-2	9.78E-3	7.10E-3	7.16E-3	7.47E-3	7.16E-3	6.71E-3	6.28E-3	5.10E-3
Adrenal	0.00E+0	0.00E+0	3.13E-4	4.67E-3	9.19E-3	9.20E-3	9.07E-3	8.99E-3	8.69E-3	8.25E-3	7.75E-3	6.48E-3
Bladder	0.00E+0	2.00E-4	2.73E-3	1.35E-2	1.89E-2	1.57E-2	1.45E-2	1.41E-2	1.31E-2	1.24E-2	1.15E-2	9.55E-3
Bone (hard bone)	1.59E-4	1.31E-3	4.29E-3	1.38E-2	2.06E-2	1.40E-2	7.52E-3	5.33E-3	4.71E-3	4.36E-3	4.10E-3	3.52E-3
Bone (marrow)	2.90E-5	1.31E-4	4.09E-4	1.46E-3	2.90E-3	3.78E-3	4.14E-3	4.28E-3	4.14E-3	3.93E-3	3.73E-3	3.12E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.74E-7	7.42E-6	1.61E-5	4.07E-5	7.38E-5	9.70E-5	1.12E-4	1.44E-4
Breast	0.00E+0	0.00E+0	2.68E-5	1.75E-4	4.49E-4	6.48E-4	7.84E-4	1.04E-3	1.23E-3	1.28E-3	1.29E-3	1.23E-3
Esophagus	0.00E+0	0.00E+0	0.00E+0	1.12E-4	6.05E-4	9.31E-4	1.03E-3	1.22E-3	1.37E-3	1.35E-3	1.34E-3	1.27E-3
Gall bladder	0.00E+0	0.00E+0	2.92E-3	1.78E-2	2.29E-2	1.72E-2	1.64E-2	1.62E-2	1.53E-2	1.44E-2	1.37E-2	1.16E-2
Heart	0.00E+0	0.00E+0	0.00E+0	6.71E-5	4.87E-4	7.87E-4	8.92E-4	1.10E-3	1.27E-3	1.29E-3	1.31E-3	1.25E-3
Kidney	1.01E-2	2.85E-2	4.31E-2	4.53E-2	2.99E-2	2.03E-2	1.96E-2	1.96E-2	1.83E-2	1.71E-2	1.59E-2	1.30E-2
Liver	3.02E-3	5.77E-3	7.36E-3	8.67E-3	8.48E-3	6.95E-3	6.87E-3	7.25E-3	7.13E-3	6.82E-3	6.48E-3	5.49E-3
Lower large intestine	1.08E-2	3.79E-2	5.41E-2	5.35E-2	3.65E-2	2.52E-2	2.41E-2	2.39E-2	2.22E-2	2.06E-2	1.92E-2	1.55E-2
Lung	0.00E+0	0.00E+0	4.60E-6	1.72E-4	6.67E-4	9.20E-4	1.02E-3	1.25E-3	1.40E-3	1.42E-3	1.42E-3	1.33E-3
Muscle	4.40E-3	7.36E-3	8.92E-3	8.85E-3	6.51E-3	5.10E-3	5.14E-3	5.35E-3	5.16E-3	4.87E-3	4.60E-3	3.84E-3
Ovary	0.00E+0	0.00E+0	9.69E-4	6.89E-3	1.23E-2	1.21E-2	1.16E-2	1.14E-2	1.04E-2	1.00E-2	9.35E-3	7.76E-3
Pancreas	3.85E-3	1.08E-2	2.11E-2	3.81E-2	3.43E-2	2.42E-2	2.26E-2	2.24E-2	2.10E-2	1.94E-2	1.81E-2	1.50E-2
Skin	9.00E-5	1.58E-3	3.61E-3	4.67E-3	3.47E-3	2.81E-3	3.07E-3	3.42E-3	3.28E-3	3.05E-3	2.84E-3	2.37E-3
Small Intestine	2.25E-2	7.96E-2	1.26E-1	1.41E-1	8.98E-2	5.60E-2	5.31E-2	5.24E-2	4.84E-2	4.44E-2	4.11E-2	3.25E-2
Spleen	2.63E-3	8.48E-3	1.56E-2	2.07E-2	1.51E-2	1.04E-2	1.01E-2	1.04E-2	9.93E-3	9.41E-3	8.82E-3	7.36E-3
Stomach	1.89E-2	3.70E-2	4.94E-2	5.51E-2	3.82E-2	2.49E-2	2.40E-2	2.42E-2	2.27E-2	2.11E-2	1.96E-2	1.59E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.30E-4	2.84E-4	3.56E-4	4.92E-4	5.86E-4	6.57E-4	7.19E-4	7.06E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.02E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Upper large intestine	4.57E+0	2.63E+0	1.62E+0	7.35E-1	2.76E-1	1.59E-1	1.67E-1	1.71E-1	1.48E-1	1.26E-1	1.09E-1	7.17E-2
Uterus	0.00E+0	0.00E+0	3.37E-4	5.10E-3	1.12E-2	1.08E-2	1.01E-2	9.84E-3	9.31E-3	8.79E-3	8.21E-3	6.95E-3
Whole body	1.82E-2	1.61E-2	1.51E-2	1.36E-2	1.05E-2	7.53E-3	6.64E-3	6.53E-3	6.17E-3	5.75E-3	5.38E-3	4.41E-3

Table E-98 SAFs (kg^{-1}) for 26 target organs and for upper large intestine content as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	1.80E-3	6.89E-3	1.13E-2	1.27E-2	9.14E-3	6.70E-3	6.73E-3	7.01E-3	6.75E-3	6.35E-3	5.99E-3	4.98E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	3.05E-3	7.16E-3	7.53E-3	7.63E-3	7.70E-3	7.69E-3	7.26E-3	6.67E-3	5.84E-3
Bladder	0.00E+0	8.37E-5	1.93E-3	1.26E-2	1.96E-2	1.63E-2	1.52E-2	1.46E-2	1.36E-2	1.26E-2	1.18E-2	9.81E-3
Bone (hard bone)	1.35E-5	6.02E-4	3.49E-3	1.40E-2	2.13E-2	1.27E-2	6.99E-3	4.97E-3	4.40E-3	4.07E-3	3.84E-3	3.31E-3
Bone (marrow)	1.69E-6	5.22E-5	2.97E-4	1.39E-3	2.95E-3	3.93E-3	4.41E-3	4.59E-3	4.42E-3	4.20E-3	3.97E-3	3.30E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.17E-7	5.63E-6	1.32E-5	3.55E-5	6.61E-5	9.06E-5	1.08E-4	1.35E-4
Breast	0.00E+0	0.00E+0	1.53E-5	1.36E-4	3.70E-4	5.36E-4	6.64E-4	9.11E-4	1.08E-3	1.16E-3	1.17E-3	1.12E-3
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.47E-4	7.30E-4	8.31E-4	1.04E-3	1.17E-3	1.19E-3	1.20E-3	1.15E-3
Gall bladder	0.00E+0	0.00E+0	1.71E-3	1.49E-2	2.11E-2	1.62E-2	1.53E-2	1.52E-2	1.45E-2	1.38E-2	1.29E-2	1.09E-2
Heart	0.00E+0	0.00E+0	0.00E+0	3.78E-5	3.56E-4	6.18E-4	7.33E-4	9.48E-4	1.11E-3	1.16E-3	1.18E-3	1.14E-3
Kidney	9.14E-4	8.40E-3	1.85E-2	2.65E-2	2.13E-2	1.53E-2	1.48E-2	1.48E-2	1.39E-2	1.30E-2	1.22E-2	1.02E-2
Liver	5.29E-4	2.83E-3	5.16E-3	7.53E-3	7.85E-3	6.46E-3	6.41E-3	6.79E-3	6.70E-3	6.41E-3	6.12E-3	5.24E-3
Lower large intestine	2.33E-3	1.71E-2	3.24E-2	3.85E-2	3.01E-2	2.17E-2	2.06E-2	2.03E-2	1.89E-2	1.75E-2	1.64E-2	1.35E-2
Lung	0.00E+0	0.00E+0	1.77E-6	9.29E-5	4.76E-4	7.13E-4	8.31E-4	1.07E-3	1.21E-3	1.26E-3	1.26E-3	1.20E-3
Muscle	6.26E-4	3.07E-3	5.95E-3	7.77E-3	6.29E-3	4.92E-3	4.98E-3	5.18E-3	5.00E-3	4.74E-3	4.49E-3	3.80E-3
Ovary	0.00E+0	0.00E+0	6.64E-4	7.06E-3	1.30E-2	1.29E-2	1.23E-2	1.20E-2	1.11E-2	1.03E-2	9.61E-3	8.45E-3
Pancreas	4.49E-4	3.26E-3	9.59E-3	2.58E-2	2.75E-2	2.02E-2	1.90E-2	1.87E-2	1.75E-2	1.64E-2	1.53E-2	1.27E-2
Skin	9.93E-6	7.20E-4	2.56E-3	4.11E-3	3.30E-3	2.70E-3	2.96E-3	3.30E-3	3.18E-3	2.96E-3	2.77E-3	2.31E-3
Small Intestine	4.67E-3	4.04E-2	9.22E-2	1.27E-1	8.67E-2	5.38E-2	5.03E-2	4.93E-2	4.54E-2	4.17E-2	3.87E-2	3.13E-2
Spleen	3.40E-4	2.02E-3	4.83E-3	8.13E-3	7.28E-3	5.74E-3	5.75E-3	6.10E-3	5.96E-3	5.72E-3	5.45E-3	4.71E-3
Stomach	1.76E-3	1.27E-2	2.60E-2	3.73E-2	2.93E-2	1.97E-2	1.89E-2	1.91E-2	1.80E-2	1.68E-2	1.57E-2	1.30E-2
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.98E-5	2.41E-4	3.04E-4	4.23E-4	5.53E-4	6.54E-4	6.51E-4	7.06E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Upper large intestine	7.30E-1	9.81E-1	9.03E-1	5.49E-1	2.32E-1	1.32E-1	1.34E-1	1.38E-1	1.28E-1	1.15E-1	1.04E-1	7.51E-2
Uterus	0.00E+0	0.00E+0	2.31E-4	4.95E-3	1.17E-2	1.13E-2	1.07E-2	1.03E-2	9.72E-3	9.06E-3	8.50E-3	7.20E-3
Whole body	2.78E-3	6.33E-3	9.50E-3	1.17E-2	1.01E-2	7.00E-3	6.21E-3	6.11E-3	5.81E-3	5.46E-3	5.14E-3	4.29E-3

Table E-99 SAFs (kg^{-1}) for 26 target organs and for uterus as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	5.69E-3	1.20E-2	1.83E-2	2.29E-2	1.76E-2	1.20E-2	1.16E-2	1.15E-2	1.08E-2	1.00E-2	9.40E-3	7.70E-3
Adrenal	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.35E-4	6.33E-4	9.39E-4	1.23E-3	1.42E-3	1.49E-3	1.45E-3	1.44E-3
Bladder	6.69E-1	1.30E+0	1.48E+0	1.07E+0	4.87E-1	2.73E-1	2.67E-1	2.68E-1	2.46E-1	2.23E-1	2.04E-1	1.53E-1
Bone (hard bone)	1.63E-5	8.90E-4	5.00E-3	1.92E-2	2.87E-2	1.69E-2	9.04E-3	6.20E-3	5.36E-3	4.91E-3	4.63E-3	3.92E-3
Bone (marrow)	1.02E-5	2.19E-4	8.21E-4	2.51E-3	4.09E-3	4.92E-3	5.21E-3	5.18E-3	5.01E-3	4.69E-3	4.44E-3	3.62E-3
Brain	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.07E-6	7.04E-6	1.64E-5	2.66E-5	3.55E-5	5.34E-5
Breast	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.64E-5	5.52E-5	9.99E-5	1.88E-4	2.89E-4	3.42E-4	3.77E-4	4.18E-4
Esophagus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.54E-5	6.50E-5	1.19E-4	1.92E-4	2.57E-4	3.16E-4	3.36E-4	3.60E-4
Gall bladder	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.14E-4	1.24E-3	1.60E-3	2.02E-3	2.21E-3	2.30E-3	2.24E-3	2.14E-3
Heart	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.43E-5	6.30E-5	1.13E-4	2.03E-4	2.91E-4	3.43E-4	3.76E-4	4.13E-4
Kidney	0.00E+0	0.00E+0	0.00E+0	3.64E-5	5.80E-4	1.22E-3	1.66E-3	2.05E-3	2.25E-3	2.26E-3	2.26E-3	2.07E-3
Liver	0.00E+0	0.00E+0	0.00E+0	9.54E-6	1.88E-4	4.66E-4	6.68E-4	9.29E-4	1.12E-3	1.18E-3	1.21E-3	1.18E-3
Lower large intestine	1.62E-1	2.97E-1	3.51E-1	3.01E-1	1.66E-1	9.74E-2	9.23E-2	9.05E-2	8.30E-2	7.56E-2	6.93E-2	5.35E-2
Lung	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.20E-5	7.82E-5	1.39E-4	2.44E-4	3.50E-4	4.05E-4	4.38E-4	4.71E-4
Muscle	3.82E-3	6.68E-3	8.84E-3	1.12E-2	1.03E-2	7.84E-3	7.69E-3	7.67E-3	7.22E-3	6.75E-3	6.35E-3	5.27E-3
Ovary	1.04E+0	1.70E+0	1.61E+0	9.97E-1	4.34E-1	2.46E-1	2.45E-1	2.47E-1	2.27E-1	2.05E-1	1.86E-1	1.33E-1
Pancreas	0.00E+0	0.00E+0	0.00E+0	1.07E-4	1.15E-3	1.93E-3	2.36E-3	2.76E-3	2.90E-3	2.87E-3	2.76E-3	2.55E-3
Skin	0.00E+0	5.85E-6	1.61E-4	1.26E-3	2.25E-3	2.19E-3	2.39E-3	2.65E-3	2.62E-3	2.47E-3	2.34E-3	1.99E-3
Small Intestine	0.00E+0	2.81E-5	1.71E-3	1.59E-2	2.48E-2	1.95E-2	1.77E-2	1.67E-2	1.54E-2	1.42E-2	1.33E-2	1.10E-2
Spleen	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.58E-4	6.04E-4	8.64E-4	1.17E-3	1.42E-3	1.46E-3	1.48E-3	1.41E-3
Stomach	0.00E+0	0.00E+0	0.00E+0	3.78E-4	2.00E-3	2.54E-3	2.74E-3	3.03E-3	3.09E-3	3.08E-3	2.97E-3	2.66E-3
Thymus	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.65E-4
Thyroid	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Upper large intestine	0.00E+0	0.00E+0	3.26E-4	5.03E-3	1.08E-2	1.01E-2	9.82E-3	9.75E-3	9.27E-3	8.69E-3	8.25E-3	6.93E-3
Uterus	1.74E+1	1.31E+1	8.78E+0	3.93E+0	1.38E+0	7.72E-1	8.14E-1	8.45E-1	7.49E-1	6.46E-1	5.58E-1	3.45E-1
Whole body	2.26E-2	2.15E-2	2.02E-2	1.90E-2	1.54E-2	1.03E-2	9.06E-3	8.67E-3	8.05E-3	7.43E-3	6.93E-3	5.60E-3

Table E-100 SAFs (kg^{-1}) for 26 target organs and for whole body as a source region in the JF phantom.

Target organs	Photon energy (MeV)											
	0.01	0.015	0.02	0.03	0.05	0.1	0.2	0.5	1	1.5	2	4
Adipose	2.23E-2	2.01E-2	1.73E-2	1.22E-2	7.18E-3	5.19E-3	5.41E-3	5.73E-3	5.47E-3	5.09E-3	4.74E-3	3.78E-3
Adrenal	2.17E-2	2.10E-2	1.97E-2	1.63E-2	1.17E-2	8.89E-3	8.70E-3	8.91E-3	8.02E-3	7.54E-3	7.02E-3	5.61E-3
Bladder	1.72E-2	1.50E-2	1.42E-2	1.33E-2	1.06E-2	8.15E-3	7.92E-3	7.87E-3	7.32E-3	6.77E-3	6.39E-3	5.18E-3
Bone (hard bone)	1.92E-2	2.47E-2	3.10E-2	3.90E-2	3.28E-2	1.45E-2	8.05E-3	6.49E-3	5.88E-3	5.42E-3	5.04E-3	4.14E-3
Bone (marrow)	7.40E-3	4.53E-3	3.94E-3	3.99E-3	4.12E-3	4.53E-3	5.06E-3	5.29E-3	5.07E-3	4.76E-3	4.42E-3	3.50E-3
Brain	2.11E-2	2.00E-2	1.80E-2	1.32E-2	7.76E-3	5.36E-3	5.43E-3	5.58E-3	5.24E-3	4.82E-3	4.48E-3	3.56E-3
Breast	2.15E-2	2.07E-2	1.89E-2	1.44E-2	8.55E-3	5.90E-3	6.06E-3	6.39E-3	6.09E-3	5.63E-3	5.24E-3	4.20E-3
Esophagus	2.24E-2	2.34E-2	2.34E-2	2.00E-2	1.30E-2	9.13E-3	8.99E-3	8.99E-3	8.35E-3	7.69E-3	7.13E-3	5.71E-3
Gall bladder	1.85E-2	1.84E-2	1.87E-2	1.61E-2	1.08E-2	7.69E-3	7.33E-3	7.72E-3	7.25E-3	6.78E-3	6.22E-3	5.12E-3
Heart	2.25E-2	2.44E-2	2.50E-2	2.09E-2	1.30E-2	8.75E-3	8.52E-3	8.54E-3	7.95E-3	7.32E-3	6.79E-3	5.39E-3
Kidney	2.15E-2	2.14E-2	2.06E-2	1.71E-2	1.13E-2	8.20E-3	8.13E-3	8.23E-3	7.72E-3	7.20E-3	6.69E-3	5.41E-3
Liver	2.16E-2	2.19E-2	2.15E-2	1.83E-2	1.19E-2	8.16E-3	7.97E-3	8.09E-3	7.60E-3	7.03E-3	6.56E-3	5.28E-3
Lower large intestine	1.74E-2	1.56E-2	1.49E-2	1.32E-2	9.65E-3	7.33E-3	7.24E-3	7.27E-3	6.86E-3	6.35E-3	5.94E-3	4.87E-3
Lung	7.09E-2	6.07E-2	4.75E-2	2.82E-2	1.43E-2	9.07E-3	8.94E-3	9.02E-3	8.28E-3	7.48E-3	6.83E-3	5.19E-3
Muscle	2.18E-2	2.06E-2	1.84E-2	1.34E-2	7.91E-3	5.67E-3	5.86E-3	6.14E-3	5.82E-3	5.41E-3	5.03E-3	4.04E-3
Ovary	2.17E-2	2.10E-2	1.91E-2	1.52E-2	1.09E-2	8.50E-3	8.40E-3	8.48E-3	8.04E-3	7.47E-3	6.64E-3	5.54E-3
Pancreas	2.15E-2	2.07E-2	1.90E-2	1.52E-2	1.03E-2	7.65E-3	7.57E-3	7.69E-3	7.28E-3	6.79E-3	6.33E-3	5.11E-3
Skin	1.60E-2	1.31E-2	1.08E-2	7.42E-3	4.35E-3	3.37E-3	3.75E-3	4.11E-3	3.85E-3	3.48E-3	3.20E-3	2.53E-3
Small Intestine	1.96E-2	1.82E-2	1.70E-2	1.41E-2	9.68E-3	7.30E-3	7.21E-3	7.30E-3	6.88E-3	6.41E-3	5.99E-3	4.89E-3
Spleen	2.16E-2	2.16E-2	2.07E-2	1.68E-2	1.06E-2	7.36E-3	7.33E-3	7.50E-3	7.08E-3	6.55E-3	6.05E-3	4.90E-3
Stomach	1.76E-2	1.57E-2	1.48E-2	1.28E-2	8.96E-3	6.50E-3	6.43E-3	6.56E-3	6.28E-3	5.81E-3	5.43E-3	4.49E-3
Thymus	2.49E-2	2.87E-2	2.80E-2	2.17E-2	1.26E-2	8.30E-3	8.16E-3	8.29E-3	7.70E-3	7.21E-3	6.57E-3	5.17E-3
Thyroid	2.18E-2	2.13E-2	1.92E-2	1.33E-2	8.04E-3	5.81E-3	6.26E-3	6.58E-3	6.29E-3	5.96E-3	5.49E-3	4.16E-3
Upper large intestine	1.75E-2	1.55E-2	1.43E-2	1.18E-2	7.93E-3	5.90E-3	5.95E-3	6.18E-3	5.91E-3	5.53E-3	5.17E-3	4.24E-3
Uterus	2.15E-2	2.04E-2	1.88E-2	1.61E-2	1.18E-2	8.69E-3	8.31E-3	8.33E-3	7.81E-3	7.19E-3	6.62E-3	5.39E-3
Whole body	2.21E-2	2.12E-2	2.00E-2	1.68E-2	1.14E-2	6.90E-3	6.13E-3	6.14E-3	5.78E-3	5.35E-3	4.98E-3	3.99E-3

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国際単位系（SI）

表１．SI 基本単位

基本量	SI 基本単位	
	名称	記号
長さ	メートル	m
質量	キログラム	kg
時間	秒	s
電流	アンペア	A
熱力学温度	ケルビン	K
物質量	モル	mol
光度	カンデラ	cd

表２．基本単位を用いて表されるSI組立単位の例

組立量	SI 基本単位	
	名称	記号
面積	平方メートル	m^2
体積	立法メートル	m^3
速さ，速度	メートル毎秒	m/s
加速度	メートル毎秒毎秒	m/s^2
波数	毎メートル	m^{-1}
密度，質量密度	キログラム毎立方メートル	kg/m^3
面積密度	キログラム毎平方メートル	kg/m^2
比体積	立方メートル毎キログラム	m^3/kg
電流密度	アンペア毎平方メートル	A/m^2
磁界の強さ	アンペア毎メートル	A/m
量濃度[a]，濃度	モル毎立方メートル	mol/m^3
質量濃度	キログラム毎立法メートル	kg/m^3
輝度	カンデラ毎平方メートル	cd/m^2
屈折率[b]	（数字の） 1	1
比透磁率[b]	（数字の） 1	1

(a) 量濃度（amount concentration）は臨床化学の分野では物質濃度（substance concentration）ともよばれる。
(b) これらは無次元量あるいは次元１をもつ量であるが、そのことを表す単位記号である数字の１は通常は表記しない。

表３．固有の名称と記号で表されるSI組立単位

組立量	SI 組立単位			
	名称	記号	他のSI単位による表し方	SI基本単位による表し方
平面角	ラジアン[b]	rad	1 [b]	m/m
立体角	ステラジアン[b]	sr[c]	1 [b]	m^2/m^2
周波数	ヘルツ[d]	Hz		s^{-1}
力	ニュートン	N		$m\ kg\ s^{-2}$
圧力，応力	パスカル	Pa	N/m^2	$m^{-1}\ kg\ s^{-2}$
エネルギー，仕事，熱量	ジュール	J	N m	$m^2\ kg\ s^{-2}$
仕事率，工率，放射束	ワット	W	J/s	$m^2\ kg\ s^{-3}$
電荷，電気量	クーロン	C		s A
電位差（電圧），起電力	ボルト	V	W/A	$m^2\ kg\ s^{-3}\ A^{-1}$
静電容量	ファラド	F	C/V	$m^{-2}\ kg^{-1}\ s^4\ A^2$
電気抵抗	オーム	Ω	V/A	$m^2\ kg\ s^{-3}\ A^{-2}$
コンダクタンス	ジーメンス	S	A/V	$m^{-2}\ kg^{-1}\ s^3\ A^2$
磁束	ウエーバ	Wb	Vs	$m^2\ kg\ s^{-2}\ A^{-1}$
磁束密度	テスラ	T	Wb/m^2	$kg\ s^{-2}\ A^{-1}$
インダクタンス	ヘンリー	H	Wb/A	$m^2\ kg\ s^{-2}\ A^{-2}$
セルシウス温度	セルシウス度[e]	℃		K
光束	ルーメン	lm	cd sr[c]	cd
照度	ルクス	lx	lm/m^2	$m^{-2}\ cd$
放射性核種の放射能[f]	ベクレル[d]	Bq		s^{-1}
吸収線量, 比エネルギー分与, カーマ	グレイ	Gy	J/kg	$m^2\ s^{-2}$
線量当量, 周辺線量当量, 方向性線量当量, 個人線量当量	シーベルト[g]	Sv	J/kg	$m^2\ s^{-2}$
酸素活性	カタール	kat		$s^{-1}\ mol$

(a)SI接頭語は固有の名称と記号を持つ組立単位と組み合わせても使用できる。しかし接頭語を付した単位はもはやコヒーレントではない。
(b)ラジアンとステラジアンは数字の１に対する単位の特別な名称で、量についての情報をつたえるために使われる。実際には、使用する時には記号rad及びsrが用いられるが、習慣として組立単位としての記号である数字の１は明示されない。
(c)測光学ではステラジアンという名称と記号srを単位の表し方の中に、そのまま維持している。
(d)ヘルツは周期現象についてのみ、ベクレルは放射性核種の統計的過程についてのみ使用される。
(e)セルシウス度はケルビンの特別な名称で、セルシウス温度を表すために使用される。セルシウス度とケルビンの単位の大きさは同一である。したがって、温度差や温度間隔を表す数値はどちらの単位で表しても同じである。
(f)放射性核種の放射能（activity referred to a radionuclide）は、しばしば誤った用語で"radioactivity"と記される。
(g)単位シーベルト（PV,2002,70,205）についてはCIPM勧告2（CI-2002）を参照。

表４．単位の中に固有の名称と記号を含むSI組立単位の例

組立量	SI 組立単位		
	名称	記号	SI 基本単位による表し方
粘度	パスカル秒	Pa s	$m^{-1}\ kg\ s^{-1}$
力のモーメント	ニュートンメートル	N m	$m^2\ kg\ s^{-2}$
表面張力	ニュートン毎メートル	N/m	$kg\ s^{-2}$
角速度	ラジアン毎秒	rad/s	$m\ m^{-1}\ s^{-1}=s^{-1}$
角加速度	ラジアン毎秒毎秒	rad/s^2	$m\ m^{-1}\ s^{-2}=s^{-2}$
熱流密度，放射照度	ワット毎平方メートル	W/m^2	$kg\ s^{-3}$
熱容量，エントロピー	ジュール毎ケルビン	J/K	$m^2\ kg\ s^{-2}\ K^{-1}$
比熱容量，比エントロピー	ジュール毎キログラム毎ケルビン	J/(kg K)	$m^2\ s^{-2}\ K^{-1}$
比エネルギー	ジュール毎キログラム	J/kg	$m^2\ s^{-2}$
熱伝導率	ワット毎メートル毎ケルビン	W/(m K)	$m\ kg\ s^{-3}\ K^{-1}$
体積エネルギー	ジュール毎立方メートル	J/m^3	$m^{-1}\ kg\ s^{-2}$
電界の強さ	ボルト毎メートル	V/m	$m\ kg\ s^{-3}\ A^{-1}$
電荷密度	クーロン毎立方メートル	C/m^3	$m^{-3}\ sA$
表面電荷	クーロン毎平方メートル	C/m^2	$m^{-2}\ sA$
電束密度，電気変位	クーロン毎平方メートル	C/m^2	$m^{-2}\ sA$
誘電率	ファラド毎メートル	F/m	$m^{-3}\ kg^{-1}\ s^4\ A^2$
透磁率	ヘンリー毎メートル	H/m	$m\ kg\ s^{-2}\ A^{-2}$
モルエネルギー	ジュール毎モル	J/mol	$m^2\ kg\ s^{-2}\ mol^{-1}$
モルエントロピー, モル熱容量	ジュール毎モル毎ケルビン	J/(mol K)	$m^2\ kg\ s^{-2}\ K^{-1}\ mol^{-1}$
照射線量（X線及びγ線）	クーロン毎キログラム	C/kg	$kg^{-1}\ sA$
吸収線量率	グレイ毎秒	Gy/s	$m^2\ s^{-3}$
放射強度	ワット毎ステラジアン	W/sr	$m^4\ m^{-2}\ kg\ s^{-3}=m^2\ kg\ s^{-3}$
放射輝度	ワット毎平方メートル毎ステラジアン	$W/(m^2\ sr)$	$m^2\ m^{-2}\ kg\ s^{-3}=kg\ s^{-3}$
酵素活性濃度	カタール毎立方メートル	kat/m^3	$m^{-3}\ s^{-1}\ mol$

表５．SI 接頭語

乗数	接頭語	記号	乗数	接頭語	記号
10^{24}	ヨタ	Y	10^{-1}	デシ	d
10^{21}	ゼタ	Z	10^{-2}	センチ	c
10^{18}	エクサ	E	10^{-3}	ミリ	m
10^{15}	ペタ	P	10^{-6}	マイクロ	μ
10^{12}	テラ	T	10^{-9}	ナノ	n
10^{9}	ギガ	G	10^{-12}	ピコ	p
10^{6}	メガ	M	10^{-15}	フェムト	f
10^{3}	キロ	k	10^{-18}	アト	a
10^{2}	ヘクト	h	10^{-21}	ゼプト	z
10^{1}	デカ	da	10^{-24}	ヨクト	y

表６．SIに属さないが、SIと併用される単位

名称	記号	SI 単位による値
分	min	1 min=60s
時	h	1h =60 min=3600 s
日	d	1 d=24 h=86 400 s
度	°	1°=(π/180) rad
分	’	1’=(1/60)°=(π/10800) rad
秒	”	1”=(1/60)’=(π/648000) rad
ヘクタール	ha	$1ha=1hm^2=10^4m^2$
リットル	L, l	$1L=1l=1dm^3=10^3cm^3=10^{-3}m^3$
トン	t	$1t=10^3$ kg

表７．SIに属さないが、SIと併用される単位で、SI単位で表される数値が実験的に得られるもの

名称	記号	SI 単位で表される数値
電子ボルト	eV	$1eV=1.602\ 176\ 53(14)\times10^{-19}J$
ダルトン	Da	$1Da=1.660\ 538\ 86(28)\times10^{-27}kg$
統一原子質量単位	u	1u=1 Da
天文単位	ua	$1ua=1.495\ 978\ 706\ 91(6)\times10^{11}m$

表８．SIに属さないが、SIと併用されるその他の単位

名称	記号	SI 単位で表される数値
バール	bar	$1\ bar=0.1MPa=100kPa=10^5Pa$
水銀柱ミリメートル	mmHg	1mmHg=133.322Pa
オングストローム	Å	$1\ Å=0.1nm=100pm=10^{-10}m$
海里	M	1 M=1852m
バーン	b	$1\ b=100fm^2=(10^{-12}cm)2=10^{-28}m^2$
ノット	kn	1 kn=(1852/3600)m/s
ネーパ	Np	SI単位との数値的な関係は、対数量の定義に依存。
ベル	B	
デジベル	dB	

表９．固有の名称をもつCGS組立単位

名称	記号	SI 単位で表される数値
エルグ	erg	$1\ erg=10^{-7}\ J$
ダイン	dyn	$1\ dyn=10^{-5}N$
ポアズ	P	$1\ P=1\ dyn\ s\ cm^{-2}=0.1Pa\ s$
ストークス	St	$1\ St\ =1cm^2\ s^{-1}=10^{-4}m^2\ s^{-1}$
スチルブ	sb	$1\ sb\ =1cd\ cm^{-2}=10^4cd\ m^{-2}$
フォト	ph	$1\ ph=1cd\ sr\ cm^{-2}\ 10^4lx$
ガル	Gal	$1\ Gal\ =1cm\ s^{-2}=10^{-2}ms^{-2}$
マクスウェル	Mx	$1\ Mx = 1G\ cm^2=10^{-8}Wb$
ガウス	G	$1\ G\ =1Mx\ cm^{-2}\ =10^{-4}T$
エルステッド[c]	Oe	$1\ Oe \triangleq (10^3/4\pi)A\ m^{-1}$

(c) ３元系のCGS単位系とSIでは直接比較できないため、等号「 ≙ 」は対応関係を示すものである。

表10．SIに属さないその他の単位の例

名称	記号	SI 単位で表される数値
キュリー	Ci	$1\ Ci=3.7\times10^{10}Bq$
レントゲン	R	$1\ R = 2.58\times10^{-4}C/kg$
ラド	rad	$1\ rad=1cGy=10^{-2}Gy$
レム	rem	$1\ rem=1\ cSv=10^{-2}Sv$
ガンマ	γ	1 γ =1 nT=10-9T
フェルミ		1フェルミ=1 fm=10-15m
メートル系カラット		1メートル系カラット = 200 mg = 2×10-4kg
トル	Torr	1 Torr = (101 325/760) Pa
標準大気圧	atm	1 atm = 101 325 Pa
カロリー	cal	1cal=4.1858J（「15℃」カロリー），4.1868J（「IT」カロリー）4.184J（「熱化学」カロリー）
ミクロン	μ	1 μ =1μm=10^{-6}m

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