

JAERI-M

84-163

NEANDC (J) 104/U

INDC (JPN) 90/L

NEUTRON NUCLEAR DATA OF  $^7\text{Li}$   
ADOPTED IN JENDL-2

August 1984

Keiichi SHIBATA

日本原子力研究所  
Japan Atomic Energy Research Institute

JAERI-M レポートは、日本原子力研究所が不定期に公刊している研究報告書です。  
人手の問合せは、日本原子力研究所技術情報部情報資料課（〒319-11 茨城県那珂郡東海村）  
あて、お申しこしください。なお、このほかに財団法人原子力弘済会資料センター（〒319-11 茨城  
県那珂郡東海村日本原子力研究所内）で複写による実費頒布をおこなっております。

JAERI-M reports are issued irregularly.  
Inquiries about availability of the reports should be addressed to Information Section, Division  
of Technical Information, Japan Atomic Energy Research Institute, Tokai-mura, Naka-gun,  
Ibaraki-ken 319-11, Japan.

© Japan Atomic Energy Research Institute, 1984

---

編集兼発行 日本原子力研究所  
印 刷 山田軽印刷所

JAERI-M 84-163

Neutron Nuclear Data of  $^7\text{Li}$  Adopted in JENDL-2

Keiichi SHIBATA

Department of Physics

Tokai Research Establishment, JAERI

( Received August 15, 1984 )

Neutron nuclear data of  $^7\text{Li}$  were evaluated for JENDL-2 in the energy range from  $10^{-5}$  eV to 20 MeV. Evaluated quantities are the total, elastic and inelastic scattering,  $(n,\gamma)$ ,  $(n,n')$  at reaction cross sections and the angular distributions of neutrons. The present evaluation was completely based on available experimental data.

Keywords: Evaluation, Neutron Nuclear Data, Lithium-7, Cross Section, JENDL-2,  $10^{-5}$  eV ~ 20 MeV

JENDL-2に採用された<sup>7</sup>Liの中性子核データ

日本原子力研究所東海研究所物理部

柴田 恵一

(1984年8月15日受理)

JENDL-2のために<sup>7</sup>Liの中性子核データを10<sup>-5</sup> eVから20 MeVのエネルギーにわたくって評価した。評価した量は全断面積、弾性散乱断面積、非弾性散乱断面積、(n, r)反応断面積、(n, n')αt反応断面積および中性子の角度分布である。今回の評価は全面的に実験値に基づいて行われた。

## Contents

1. Introduction .....	1
2. Total Cross Section .....	2
3. Elastic Scattering .....	3
4. Inelastic Scattering .....	3
5. The $(n, n')$ at Reaction .....	4
6. The $(n, \gamma)$ Reaction.....	4
7. Other Quantities .....	5
8. Concluding Remarks.....	5
Acknowledgments .....	6
References .....	7
Appendix .....	21

## 目 次

1. 序 論.....	1
2. 全断面積.....	2
3. 弹性散乱.....	3
4. 非弾性散乱.....	3
5. $(n, n')$ at 反応.....	4
6. $(n, \gamma)$ 反応 .....	4
7. 他の諸量.....	5
8. 結 言.....	5
謝 辞.....	6
参考文献.....	7
付 錄.....	21

## 1. Introduction

Neutron nuclear data of  $^7\text{Li}$  are important for fusion neutronics calculations. In particular the  $(n,n')$ at reaction cross section has much influence on the tritium breeding ratio in fusion blankets. However the data of  $^7\text{Li}$  were not included in the first version of Japanese Evaluated Nuclear Data Library (JENDL-1) which was released in autumn 1977. The data of  $^7\text{Li}$  in ENDF/B-IV are mainly based on the evaluation by Pendlebury<sup>1)</sup> which was made in 1964. The ENDF/B-V data, which are not available in the countries other than USA and Canada, are known<sup>2)</sup> to be almost the same as those of ENDF/B-IV. Thus, in such a situation, the evaluation of  $^7\text{Li}$  for the second version of JENDL (JENDL-2) was planned in spring 1982, and was completed in July 1982. The present evaluation was completely based on available experimental data.

This report describes the evaluation methods and results. The problems left for future work are also written. The presently evaluated data are listed in Appendix.

## 2. Total Cross Section

For the evaluation the following experimental data are available:

Hibdon and Langsdorf, Jr. <sup>3)</sup>	(1954),	1 keV $\sim$ 0.34 MeV,
Hibdon and Mooring <sup>4)</sup>	(1968),	10 keV $\sim$ 1.2 MeV,
Meadows and Whalen <sup>5)</sup>	(1970),	0.1 MeV $\sim$ 1.5 MeV,
Foster, Jr. and Glasgow <sup>6)</sup>	(1971),	2.5 MeV $\sim$ 15 MeV,
Goulding et al. <sup>7)</sup>	(1972),	0.7 MeV $\sim$ 30 MeV,
Lamaze et al. <sup>8)</sup>	(1979),	3 MeV $\sim$ 50 MeV.

As seen in Fig. 1, the data of Meadows and Whalen<sup>5)</sup> are inconsistent with those of Hibdon and Langsdorf, Jr.<sup>3)</sup> and of Hibdon and Mooring<sup>4)</sup> in the resonance region around 260 keV, but are consistent in the off-resonance region. The reason for this difference is not obvious. In the two earlier measurements, the total cross sections of natural Li and <sup>6</sup>Li (99.3% purity) were measured and then that of <sup>7</sup>Li was deduced. On the other hand, Meadows and Whalen<sup>5)</sup> measured the total cross section using 99.991% <sup>7</sup>Li samples. Moreover they made correction for the background due to the in-scattering, and estimated possible errors. Hence, in the present evaluation, the data of Meadows and Whalen<sup>5)</sup> were adopted in the resonance region around 260 keV. In the other energy region there is no remarkable difference among the above experimental data.

The evaluated data were obtained with a least-squares fit using the spline function. This operation was performed by using Neutron Data Evaluation System (NDES)<sup>9)</sup>. Below 1 keV where no experimental data are available, the cross section was given by

$$\sigma_{\text{tot}} = 1.04894 + \sigma_{n,\gamma} \text{ ( barns) },$$

where  $\sigma_{n,\gamma}$  is the radiative capture cross section described in the following section.

The results are shown in Figs. 2-4. The peak values of the P-wave resonance around 260 keV are given as follows:

JENDL-2	262 keV	12.0 barns,
ENDF/B-IV	258 keV	10.9 barns.

It should be noted that ENDF/B-IV took account of the data of Meadows and Whalen<sup>5)</sup> in the energy region from 0.5 to 1.3 MeV, but did not in the resonance region around 260 keV.

### 3. Elastic Scattering

In the present evaluation the elastic scattering cross section was obtained by subtracting the reaction cross section from the total cross section. Figure 5 shows the result.

The elastic angular distribution was assumed to be isotropic in the center-of-mass system below 50 keV. Between 50 keV and 14 MeV the Legendre coefficients were obtained from the experimental data of Lane et al.<sup>10)</sup>, Hogue et al.<sup>11)</sup> and Knox et al.<sup>12)</sup>. Above 14 MeV no experimental data are available, and the optical-model calculation was performed. In the calculation the optical potential parameters of Watson et al.<sup>13)</sup> were used, and they are given in Table 1. Figure 6 shows the present results at four incident energies.

### 4. Inelastic Scattering

In JENDL-2, only the first excited level (0.477 MeV) was taken into consideration as a discrete level, because other levels contribute to the  $(n, n')$ <sub>at</sub> reaction. The first level is known to decay by emitting  $\gamma$ -rays which have isotropic angular distributions, and the  $(n, n'\gamma)$  data are available for the evaluation. In the present work we adopted the  $(n, n'\gamma)$  data measured by Presser and Bass<sup>14)</sup> and by Benveniste et

The results are shown in Figs. 2-4. The peak values of the P-wave resonance around 260 keV are given as follows:

JENDL-2	262 keV	12.0 barns,
ENDF/B-IV	258 keV	10.9 barns.

It should be noted that ENDF/B-IV took account of the data of Meadows and Whalen<sup>5)</sup> in the energy region from 0.5 to 1.3 MeV, but did not in the resonance region around 260 keV.

### 3. Elastic Scattering

In the present evaluation the elastic scattering cross section was obtained by subtracting the reaction cross section from the total cross section. Figure 5 shows the result.

The elastic angular distribution was assumed to be isotropic in the center-of-mass system below 50 keV. Between 50 keV and 14 MeV the Legendre coefficients were obtained from the experimental data of Lane et al.<sup>10)</sup>, Hogue et al.<sup>11)</sup> and Knox et al.<sup>12)</sup>. Above 14 MeV no experimental data are available, and the optical-model calculation was performed. In the calculation the optical potential parameters of Watson et al.<sup>13)</sup> were used, and they are given in Table 1. Figure 6 shows the present results at four incident energies.

### 4. Inelastic Scattering

In JENDL-2, only the first excited level (0.477 MeV) was taken into consideration as a discrete level, because other levels contribute to the  $(n, n')$  $\alpha t$  reaction. The first level is known to decay by emitting  $\gamma$ -rays which have isotropic angular distributions, and the  $(n, n'\gamma)$  data are available for the evaluation. In the present work we adopted the  $(n, n'\gamma)$  data measured by Presser and Bass<sup>14)</sup> and by Benveniste et

The results are shown in Figs. 2-4. The peak values of the P-wave resonance around 260 keV are given as follows:

JENDL-2	262 keV	12.0 barns,
ENDF/B-IV	258 keV	10.9 barns.

It should be noted that ENDF/B-IV took account of the data of Meadows and Whalen<sup>5)</sup> in the energy region from 0.5 to 1.3 MeV, but did not in the resonance region around 260 keV.

### 3. Elastic Scattering

In the present evaluation the elastic scattering cross section was obtained by subtracting the reaction cross section from the total cross section. Figure 5 shows the result.

The elastic angular distribution was assumed to be isotropic in the center-of-mass system below 50 keV. Between 50 keV and 14 MeV the Legendre coefficients were obtained from the experimental data of Lane et al.<sup>10)</sup>, Hogue et al.<sup>11)</sup> and Knox et al.<sup>12)</sup>. Above 14 MeV no experimental data are available, and the optical-model calculation was performed. In the calculation the optical potential parameters of Watson et al.<sup>13)</sup> were used, and they are given in Table 1. Figure 6 shows the present results at four incident energies.

### 4. Inelastic Scattering

In JENDL-2, only the first excited level (0.477 MeV) was taken into consideration as a discrete level, because other levels contribute to the  $(n, n')$  $\alpha t$  reaction. The first level is known to decay by emitting  $\gamma$ -rays which have isotropic angular distributions, and the  $(n, n'\gamma)$  data are available for the evaluation. In the present work we adopted the  $(n, n'\gamma)$  data measured by Presser and Bass<sup>14)</sup> and by Benveniste et

al.<sup>15)</sup>, which were smoothly joined with each other. Figure 7 shows the result.

The neutrons from the inelastic scattering to the first excited level cannot be identified experimentally, because the excitation energy is small. Thus we have no experimental information on the angular distribution of the neutrons. In the evaluation, it was assumed to be isotropic in the center-of-mass system.

### 5. The (n,n')<sub>at</sub> Reaction

The experimental data given in Table 2 were available when the evaluation was made. The data of Rosen and Stewart<sup>18)</sup>, Batchelor and Towle<sup>20)</sup>, Cookson et al.<sup>21)</sup> and Swinhoe et al.<sup>23)</sup> deviate from the other data. Disregarding these four measurements, we evaluated the (n,n')<sub>at</sub> cross section by the eye-guide method. As seen in Fig. 8, the present result is by 10% smaller than the ENDF/B-IV data at 10 MeV. After the present evaluation, the activation data measured by Liskien et al.<sup>28)</sup> became available. It should be noted that their data show smaller values than those of JENDL-2 around 14 MeV. We should take account of their data in the next evaluation for the third version (JENDL-3).

The angular distribution of neutrons from the (n,n')<sub>at</sub> reaction was assumed to be isotropic in the laboratory system.

### 6. The (n, $\gamma$ ) Reaction

As the thermal cross section we adopted a value of 45.4 mb measured by Jurney<sup>29)</sup>. The same value is also recommended by Mughabghab et al.<sup>30)</sup> The cross section was extrapolated by assuming a form of  $1/v$  up to 20 MeV, i.e.,

$$\sigma_{n,\gamma} = 7.22 \times 10^{-3} [E_n(\text{eV})]^{-1/2} \text{ barns.}$$

al.<sup>15)</sup>, which were smoothly joined with each other. Figure 7 shows the result.

The neutrons from the inelastic scattering to the first excited level cannot be identified experimentally, because the excitation energy is small. Thus we have no experimental information on the angular distribution of the neutrons. In the evaluation, it was assumed to be isotropic in the center-of-mass system.

### 5. The (n,n')<sub>at</sub> Reaction

The experimental data given in Table 2 were available when the evaluation was made. The data of Rosen and Stewart<sup>18)</sup>, Batchelor and Towle<sup>20)</sup>, Cookson et al.<sup>21)</sup> and Swinhoe et al.<sup>23)</sup> deviate from the other data. Disregarding these four measurements, we evaluated the (n,n')<sub>at</sub> cross section by the eye-guide method. As seen in Fig. 8, the present result is by 10% smaller than the ENDF/B-IV data at 10 MeV. After the present evaluation, the activation data measured by Liskien et al.<sup>28)</sup> became available. It should be noted that their data show smaller values than those of JENDL-2 around 14 MeV. We should take account of their data in the next evaluation for the third version (JENDL-3).

The angular distribution of neutrons from the (n,n')<sub>at</sub> reaction was assumed to be isotropic in the laboratory system.

### 6. The (n, $\gamma$ ) Reaction

As the thermal cross section we adopted a value of 45.4 mb measured by Jurney<sup>29)</sup>. The same value is also recommended by Mughabghab et al.<sup>30)</sup> The cross section was extrapolated by assuming a form of  $1/v$  up to 20 MeV, i.e.,

$$\sigma_{n,\gamma} = 7.22 \times 10^{-3} [E_n(\text{eV})]^{-1/2} \text{ barns.}$$

al.<sup>15)</sup>, which were smoothly joined with each other. Figure 7 shows the result.

The neutrons from the inelastic scattering to the first excited level cannot be identified experimentally, because the excitation energy is small. Thus we have no experimental information on the angular distribution of the neutrons. In the evaluation, it was assumed to be isotropic in the center-of-mass system.

### 5. The (n,n')<sub>at</sub> Reaction

The experimental data given in Table 2 were available when the evaluation was made. The data of Rosen and Stewart<sup>18)</sup>, Batchelor and Towle<sup>20)</sup>, Cookson et al.<sup>21)</sup> and Swinhoe et al.<sup>23)</sup> deviate from the other data. Disregarding these four measurements, we evaluated the (n,n')<sub>at</sub> cross section by the eye-guide method. As seen in Fig. 8, the present result is by 10% smaller than the ENDF/B-IV data at 10 MeV. After the present evaluation, the activation data measured by Liskien et al.<sup>28)</sup> became available. It should be noted that their data show smaller values than those of JENDL-2 around 14 MeV. We should take account of their data in the next evaluation for the third version (JENDL-3).

The angular distribution of neutrons from the (n,n')<sub>at</sub> reaction was assumed to be isotropic in the laboratory system.

### 6. The (n, $\gamma$ ) Reaction

As the thermal cross section we adopted a value of 45.4 mb measured by Jurney<sup>29)</sup>. The same value is also recommended by Mughabghab et al.<sup>30)</sup> The cross section was extrapolated by assuming a form of  $1/v$  up to 20 MeV, i.e.,

$$\sigma_{n,\gamma} = 7.22 \times 10^{-3} [E_n(\text{eV})]^{-1/2} \text{ barns.}$$

In higher energy region this evaluation is not appropriate naturally. However, the cross section is expected to be extremely small in that region, and thus no problem arises practically. The result is shown in Fig. 9.

## 7. Other Quantities

As to the  $(n,2n)$ ,  $(n,2n\alpha)$  and  $(n,d)$  reactions, experimental data are very scarce. Thus, at this time, the ENDF/B-IV data were recommended for these reactions. The nuclear temperatures which specify the neutron spectra from the  $(n,2n)$ ,  $(n,2n\alpha)$  and  $(n,n')$ at reactions were also taken from ENDF/B-IV.

## 8. Concluding Remarks

Evaluation of neutron nuclear data for  $^7\text{Li}$  was performed in the energy range from  $10^{-5}$  eV to 20 MeV, and the result was adopted in JENDL-2. The present evaluation was completely based on available experimental data.

There remain some problems in the present evaluation as follows:

- 1) For the inelastic scattering only the first excited level was treated as a discrete level. For transport calculations, however, it is required to include the second excited level.
- 2) As to the  $(n,n')$ at reaction the most recent experimental data of Liskien et al.<sup>28)</sup> were not taken into consideration, because they were published after the present evaluation.
- 3) Concerning the  $(n,2n)$ ,  $(n,2n\alpha)$  and  $(n,d)$  reactions, we took the cross sections from ENDF/B-IV without any examinations.

These problems should be resolved in the next evaluation for JENDL-3.

In higher energy region this evaluation is not appropriate naturally. However, the cross section is expected to be extremely small in that region, and thus no problem arises practically. The result is shown in Fig. 9.

## 7. Other Quantities

As to the  $(n,2n)$ ,  $(n,2n\alpha)$  and  $(n,d)$  reactions, experimental data are very scarce. Thus, at this time, the ENDF/B-IV data were recommended for these reactions. The nuclear temperatures which specify the neutron spectra from the  $(n,2n)$ ,  $(n,2n\alpha)$  and  $(n,n')$ at reactions were also taken from ENDF/B-IV.

## 8. Concluding Remarks

Evaluation of neutron nuclear data for  $^7\text{Li}$  was performed in the energy range from  $10^{-5}$  eV to 20 MeV, and the result was adopted in JENDL-2. The present evaluation was completely based on available experimental data.

There remain some problems in the present evaluation as follows:

- 1) For the inelastic scattering only the first excited level was treated as a discrete level. For transport calculations, however, it is required to include the second excited level.
- 2) As to the  $(n,n')$ at reaction the most recent experimental data of Liskien et al.<sup>28)</sup> were not taken into consideration, because they were published after the present evaluation.
- 3) Concerning the  $(n,2n)$ ,  $(n,2n\alpha)$  and  $(n,d)$  reactions, we took the cross sections from ENDF/B-IV without any examinations.

These problems should be resolved in the next evaluation for JENDL-3.

In higher energy region this evaluation is not appropriate naturally. However, the cross section is expected to be extremely small in that region, and thus no problem arises practically. The result is shown in Fig. 9.

## 7. Other Quantities

As to the  $(n,2n)$ ,  $(n,2n\alpha)$  and  $(n,d)$  reactions, experimental data are very scarce. Thus, at this time, the ENDF/B-IV data were recommended for these reactions. The nuclear temperatures which specify the neutron spectra from the  $(n,2n)$ ,  $(n,2n\alpha)$  and  $(n,n')$ at reactions were also taken from ENDF/B-IV.

## 8. Concluding Remarks

Evaluation of neutron nuclear data for  $^7\text{Li}$  was performed in the energy range from  $10^{-5}$  eV to 20 MeV, and the result was adopted in JENDL-2. The present evaluation was completely based on available experimental data.

There remain some problems in the present evaluation as follows:

- 1) For the inelastic scattering only the first excited level was treated as a discrete level. For transport calculations, however, it is required to include the second excited level.
- 2) As to the  $(n,n')$ at reaction the most recent experimental data of Liskien et al.<sup>28)</sup> were not taken into consideration, because they were published after the present evaluation.
- 3) Concerning the  $(n,2n)$ ,  $(n,2n\alpha)$  and  $(n,d)$  reactions, we took the cross sections from ENDF/B-IV without any examinations.

These problems should be resolved in the next evaluation for JENDL-3.

Acknowledgments

The author wishes to acknowledge valuable discussion with Dr. S. Igarasi. He also thanks Mr. T. Narita for his aid in making graphs. He is also grateful to Miss T. Maejima for her typewriting.

## References

- 1) Pendlebury E.D.: "Neutron Cross Sections of Li-7 in the Energy Range 0.001 eV - 15 MeV", AWRE O-61/64 (1964).
- 2) Compiled by Kinsey R.: "ENDF/B Summary Documentation", BNL-NCS-17541 (1979), 3rd edition.
- 3) Hibdon C.T. and Langsdorf, Jr. A.: "Total Neutron Cross Sections in the keV Region", ANL-5175, 7 (1954).
- 4) Hibdon C.T. and Mooring F.P.: "Total Neutron Cross Sections of  $^{6}\text{Li}$ ,  $^{7}\text{Li}$  and Lithium from 10 to 1236 keV", Proc. Int. Conf. Neutron Cross Sections and Technology, Washington D.C. 1968, 159 (1968).
- 5) Meadows J.W. and Whalen J.F.: Nucl. Sci. Eng., 41, 351 (1970).
- 6) Foster, Jr. D.G. and Glasgow D.W.: Phys. Rev., C3, 576 (1971).
- 7) Goulding C.A., Clement J.M. and Stoler P.: taken from EXFOR10251.002 (1972).
- 8) Lamaze G.P., Kellie J.D. and Schwartz R.B.: Bull. Am. Phys. Soc., 24, 862 (1979).
- 9) Nakagawa T.: J. At. Energy Soc. Jpn., 22, 559 (1980) [in Japanese].
- 10) Lane R.O., Langsdorf, Jr., Monahan J.E. and Elwyn A.J.: Ann. Phys., 12, 135 (1961).
- 11) Hogue H.H., von Behren P.L., Glasgow D.W., Glendinning S.G., Lisowski P.W., Nelson C.E., Purser F.O., Tornow W., Gould C.R. and Seagondollar L.W.: Nucl. Sci. Eng., 69, 22 (1979).
- 12) Knox H.D., White R.M. and Lane R.O.: Nucl. Sci. Eng., 69, 223 (1979).
- 13) Watson B.A., Singh P.P. and Segel R.E.: Phys. Rev., 182, 977 (1969).
- 14) Presser G. and Bass R.: Nucl. Phys., A182, 321 (1972).

- 15) Benveniste J., Mitchell A.C., Schrader C.D. and Zenger J.H.: Nucl. Phys., 38, 300 (1962).
- 16) Wyman M.E. and Thorpe M.M.: "A Measurement of The  $^7\text{Li}(n,n'\alpha)t$  Cross Section for Several Neutron Energies", LA-2235 (1958).
- 17) Osborn A.R. and Wilson H.W.: "Production of Tritium in Li-7 by MeV Neutrons", AWRE-NR/C-1, 61 (1961).
- 18) Rosen L. and Stewart L.: Phys. Rev., 126, 1150 (1962).
- 19) Brown F., James R.H., Perkin J.L. and Barry J.: J. Nucl. Energy Parts A/B, 17, 137 (1963).
- 20) Batchelor R. and Towle J.H.: Nucl. Phys., 47, 385 (1963).
- 21) Cookson J.A., Dandy D. and Hopkins J.C.: Nucl. Phys., A91, 273 (1967).
- 22) Hopkins J.C., Drake D.M. and Condé H.: Nucl. Phys., A107, 139 (1968).
- 23) Swinhoe M.T. and Uttley C.A.: "Tritium Breeding in Fusion", Proc. Int. Conf. Nuclear Cross Sections for Technology, Knoxville 1979, 246 (1980).
- 24) Baba M., Hayashi N., Sakase T., Iwasaki T., Kamata S. and Momota T.: "Neutron Scattering from  $^7\text{Li}$  at Incident Energies of 5.1, 6.6 and 15.4 MeV", ibid., p.43.
- 25) Lisowski P.W., Auchampaugh G.F., Drake D.M., Drosg M., Haouat G., Hill N.W. and Nilsson L.: "Cross Sections for Neutron-Induced, Neutron-Producing Reactions in  $^6\text{Li}$  and  $^7\text{Li}$  at 5.96 and 9.83 MeV", LA-8342 (1980).
- 26) Liskien H. and Paulsen A.: "Tritium Breeding from  $^7\text{Li}$ ", NEANDC(E)222"U", INDC(EUR)014/G, 14 (1980).
- 27) Smith D.L., Bretscher M.M. and Meadows J.W.: Nucl. Sci. Eng., 78, 359 (1981).

- 28) Liskien H., Wölfle R. and Qaim S.M.: "Determination of  $^7\text{Li}(n,n't)^4\text{He}$  Cross Sections", Proc. Int. Conf. Nuclear Data for Science and Technology, Antwerp 1982, D. Reidel Publishing Company, 349 (1983).
- 29) Jurney E.T.: "Thermal Capture Cross Sections for  $^6\text{Li}$  and  $^7\text{Li}"$ , USNDC-9, 109 (1973).
- 30) Mughabghab S.F., Divadeenam M. and Holden N.E.: "Neutron Cross Sections Vol.1", Academic Press, 1981.

Table 1 Optical potential parameters used in the calculation  
of the elastic angular distribution above 14 MeV.

$$\begin{aligned}
 V &= 56.14 - 0.3 \times E_{CM} & (\text{MeV}) \\
 W_s &= 8.17 - 0.06 \times E_{CM} & (\text{MeV}) \\
 V_{so} &= 5.5 & (\text{MeV}) \\
 r_0 &= r_s = 1.15 - 0.001 \times E_{CM} & (\text{fm}) \\
 a &= 0.57 & (\text{fm}) \\
 b &= 0.5 & (\text{fm})
 \end{aligned}$$

The potential form is given by the following expression:

$$U(r) = -V/(1 + f_v(r)) - 4iW_s f_w(r)/(1 + f_w(r))^2$$

$$- (\hbar/m_\pi c)^2 V_{so} (r_0 A^{1/3})^{-1} a^{-1} f_v(r)/(1 + f_v(r))^2 \vec{\ell} \cdot \vec{\sigma},$$

where  $f_v(r) = \exp\{(r - r_0 A^{1/3})/a\}$ ,

and  $f_w(r) = \exp\{(r - r_s A^{1/3})/b\}$ .

Table 2 Measurements of the  $(n, n')$  cross section.

Author	Year	Energy(MeV)	Method
Wyman and Thorpe <sup>16)</sup>	1958	4 ~ 14.8	Activation
Osborn and Wilson <sup>17)</sup>	1961	14	Activation
Rosen and Stewart <sup>18)</sup>	1961	5 ~ 14	Detection of $\alpha$ -t stars
Brown et al. <sup>19)</sup>	1963	3.5 ~ 15	Activation
Batchelor and Towle <sup>20)</sup>	1963	1.5 ~ 7.5	Detection of neutrons
Cookson et al. <sup>21)</sup>	1967	10	Detection of neutrons
Hopkins et al. <sup>22)</sup>	1968	4.83, 5.74, 7.5	Detection of neutrons
Swinhoe and Uttley <sup>23)</sup>	1980	4 ~ 14	Activation
Baba et al. <sup>24)</sup>	1980	5.1, 6.6, 15.4	Detection of neutrons
Lisowski et al. <sup>25)</sup>	1980	5.96, 9.83	Detection of neutrons
Liskien and Paulsen <sup>26)</sup>	1980	6 ~ 10	Direct detection of tritons
Smith et al. <sup>27)</sup>	1981	6.89, 7.86, 8.88	Activation

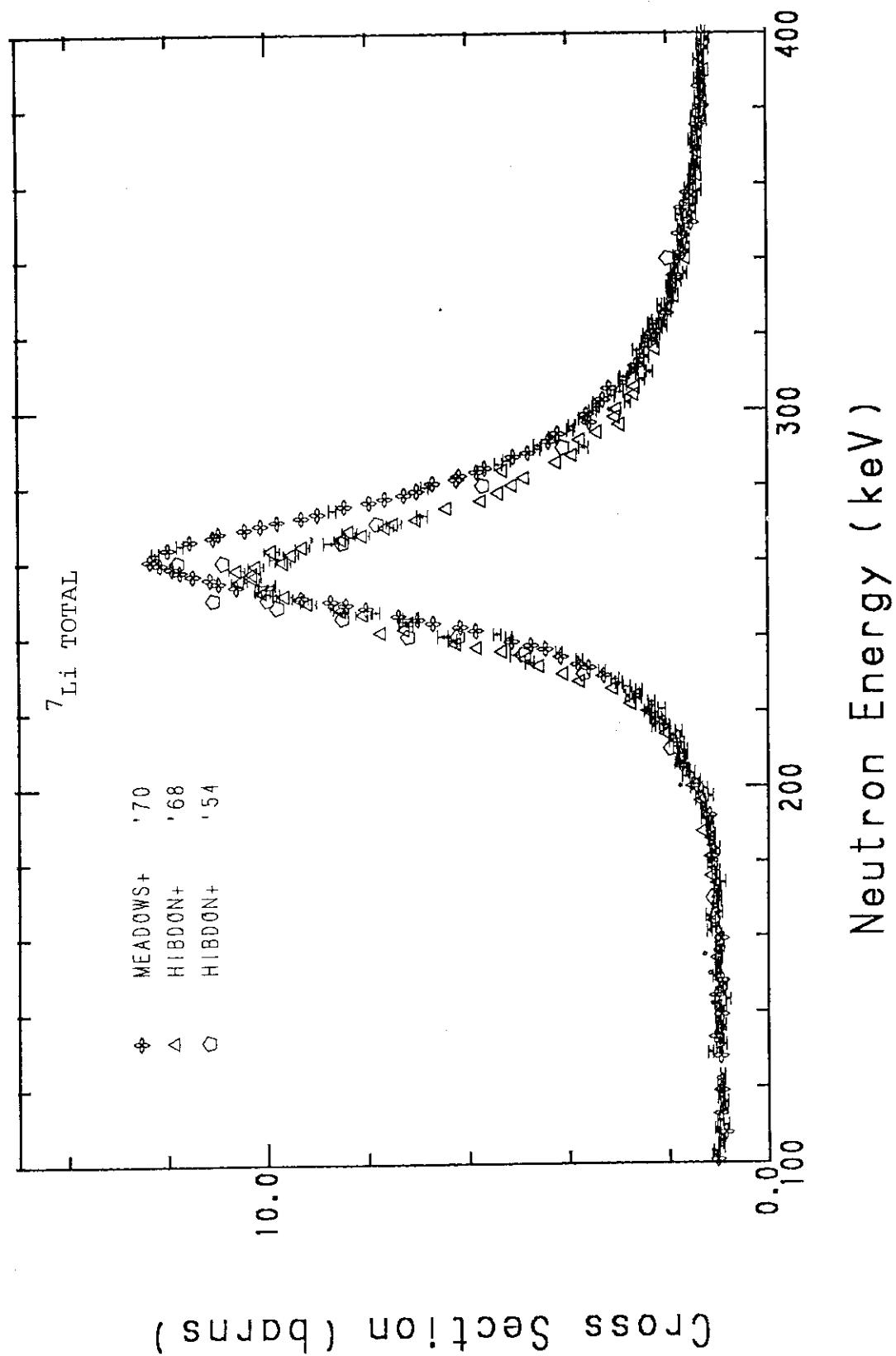


Fig. 1 Measurements of the total cross section between 100 keV and 400 keV.

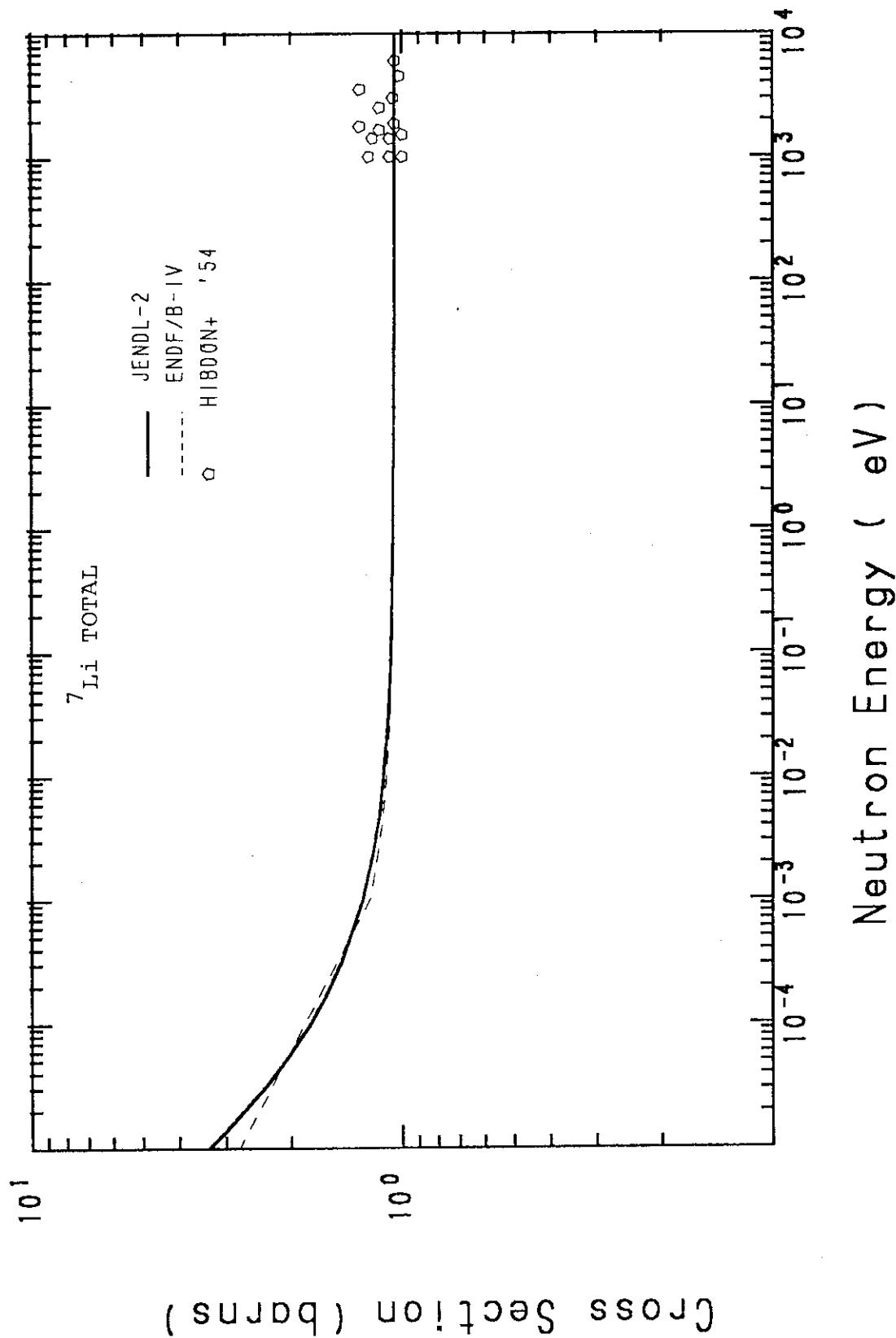


Fig. 2 Measured and evaluated total cross sections from  $10^{-5}$  eV to  $10^4$  eV.

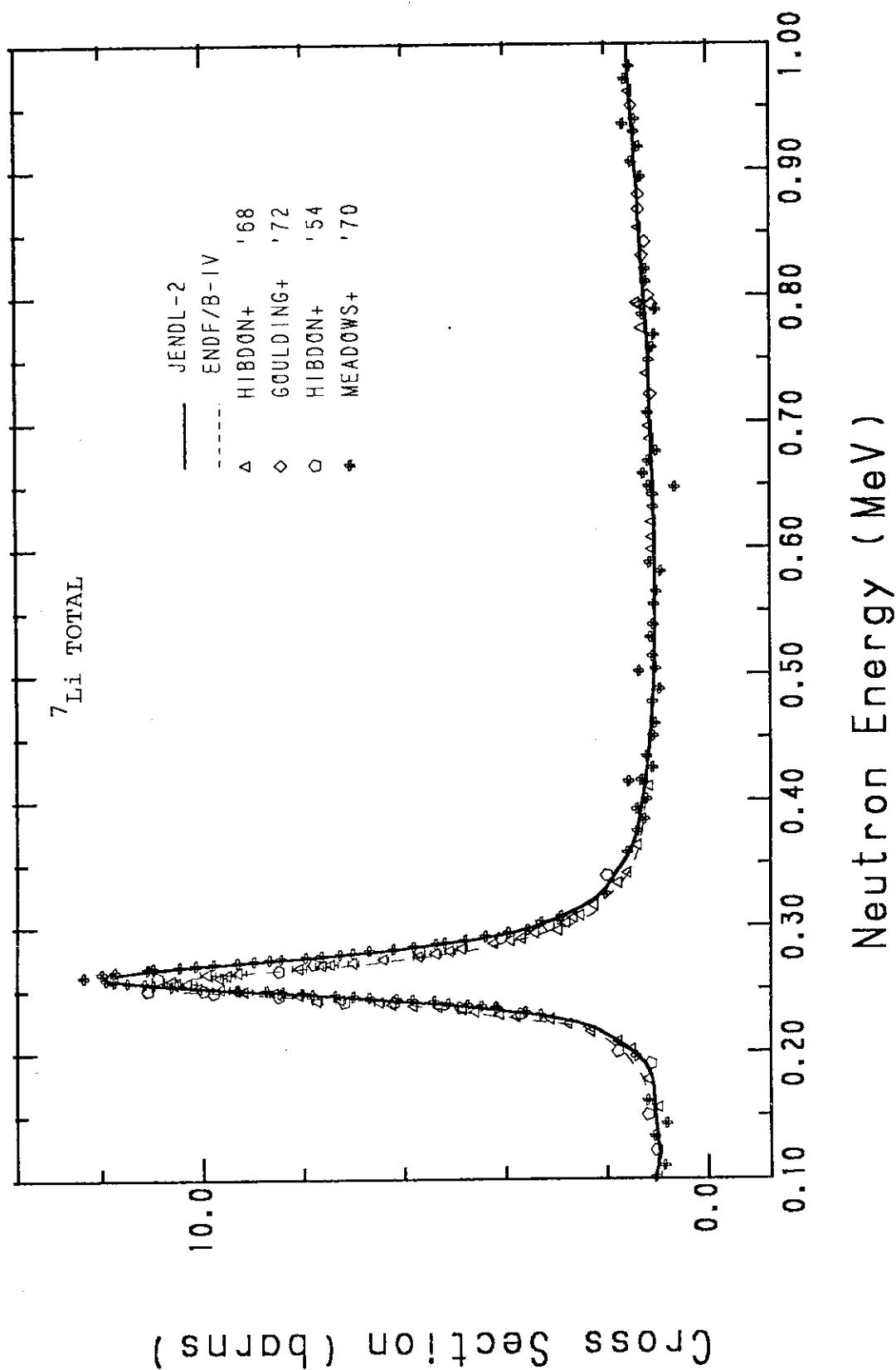


Fig. 3 Measured and evaluated total cross sections from 0.1 MeV to 1 MeV.

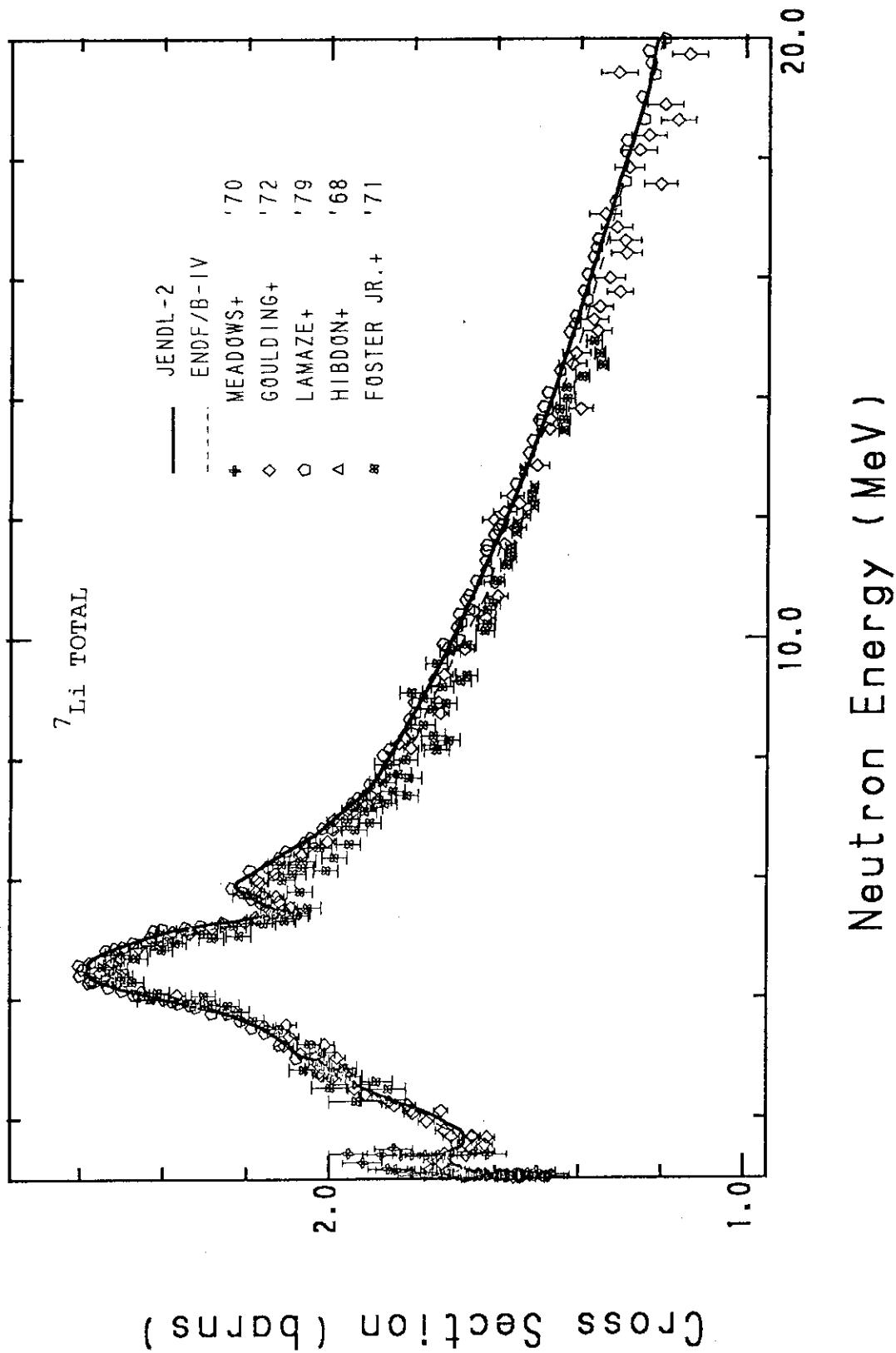


Fig. 4 Measured and evaluated total cross sections from 1 MeV to 20 MeV.

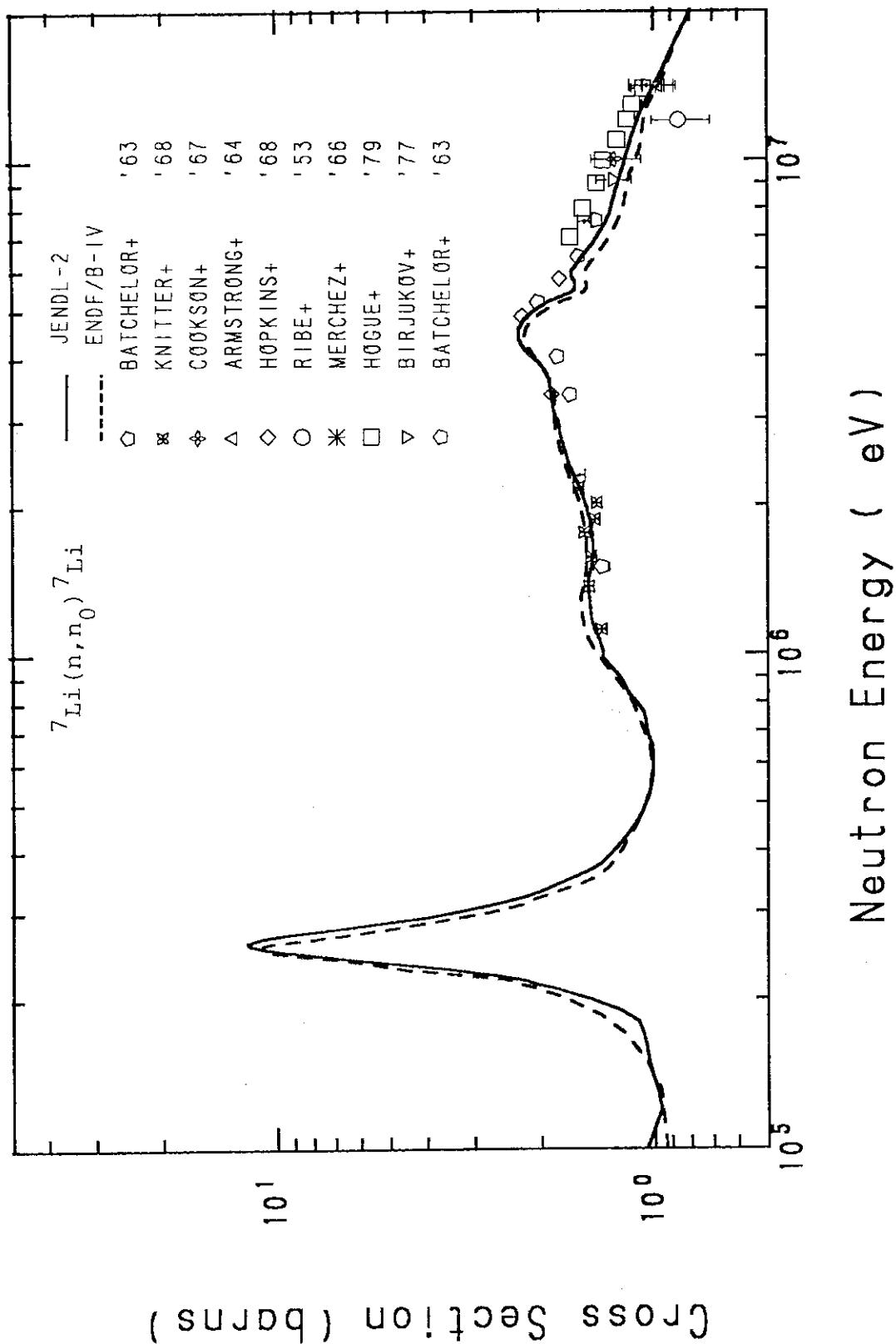


Fig. 5 Measured and evaluated elastic scattering cross sections from  
0.1 MeV to 20 MeV.

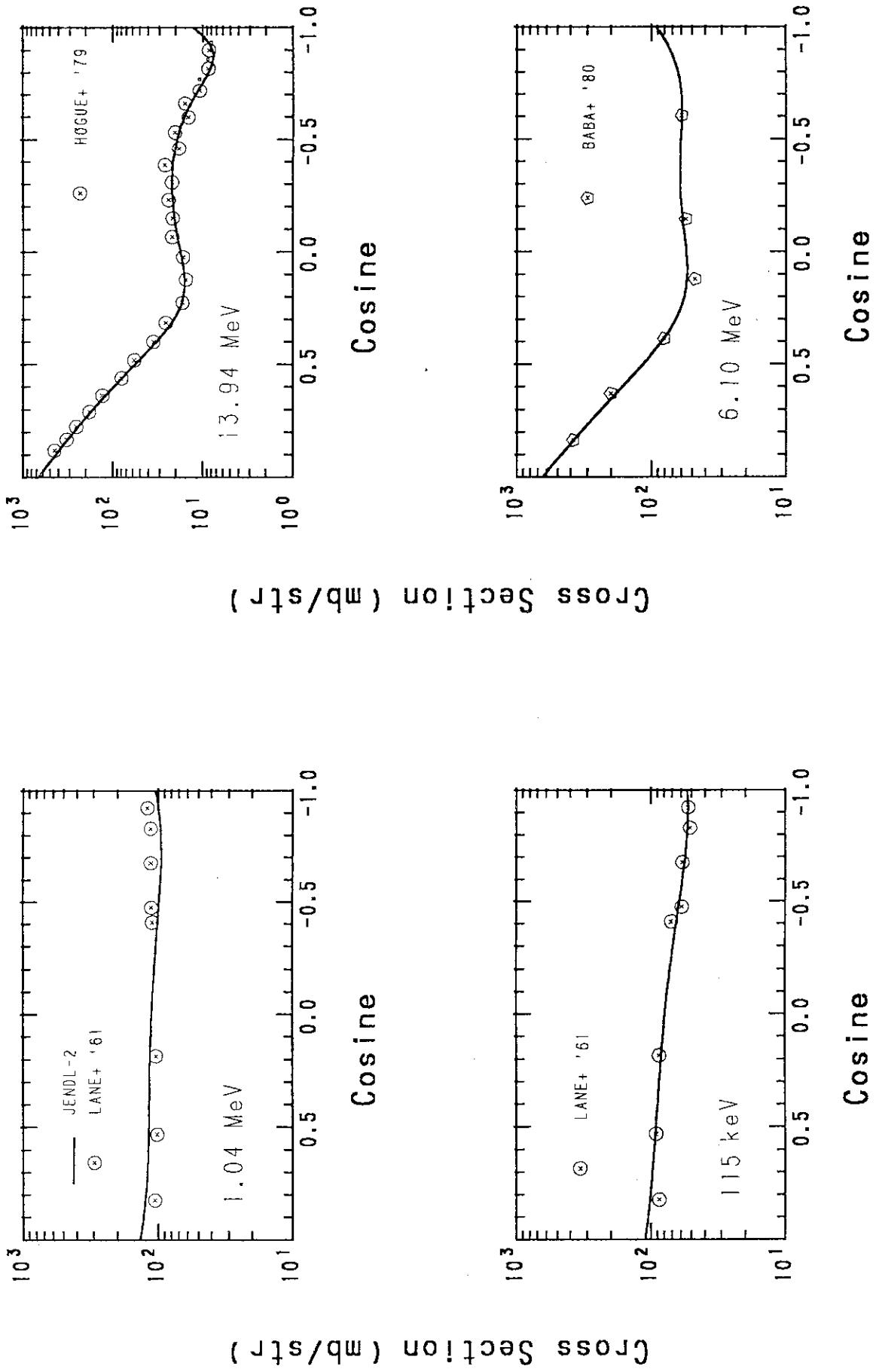


Fig. 6 Measured and evaluated elastic angular distributions.

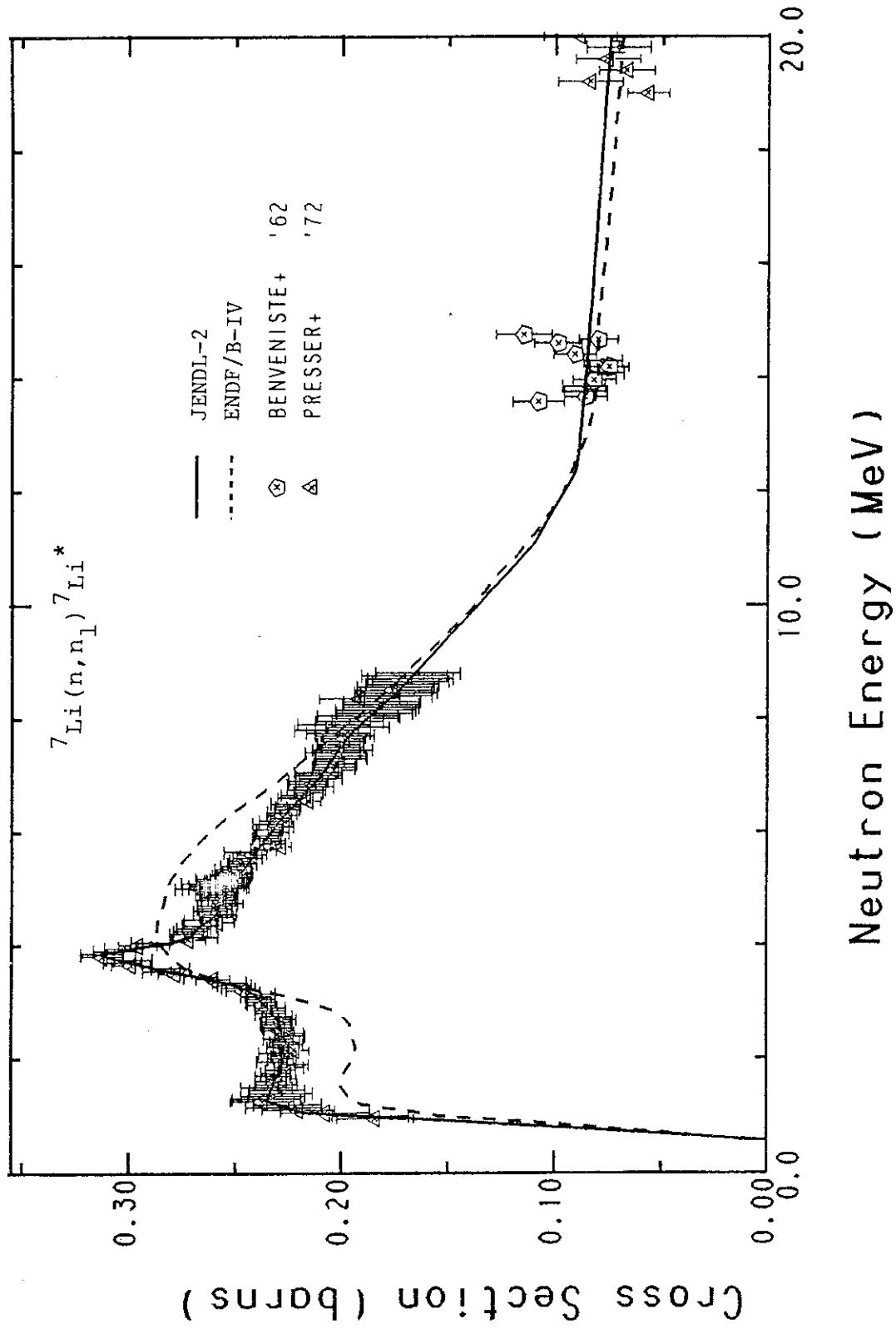
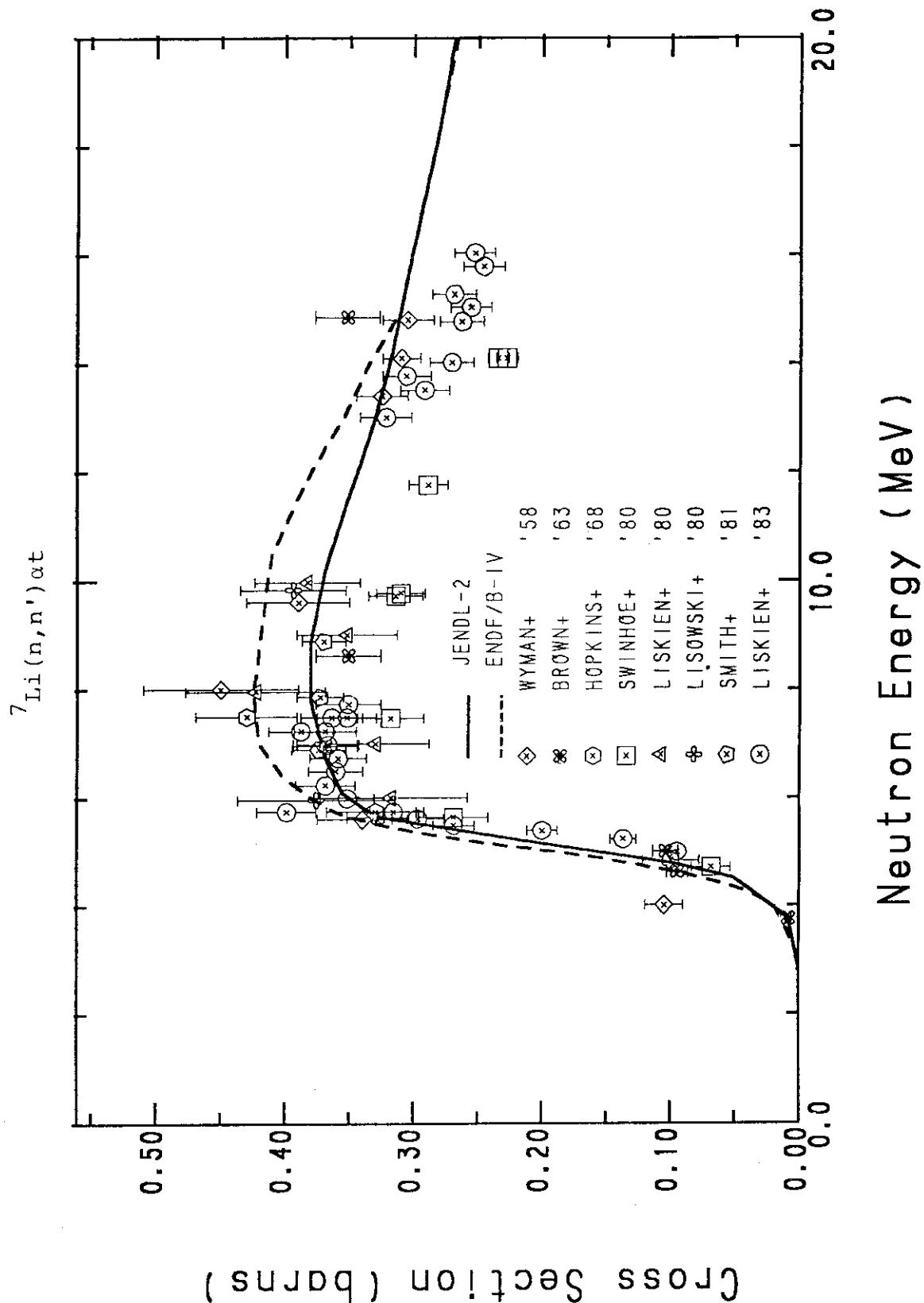


Fig. 7 Measured and evaluated  $(n, n_1)$  cross sections.

Fig. 8 Measured and evaluated  $(n, n')$  at cross sections.

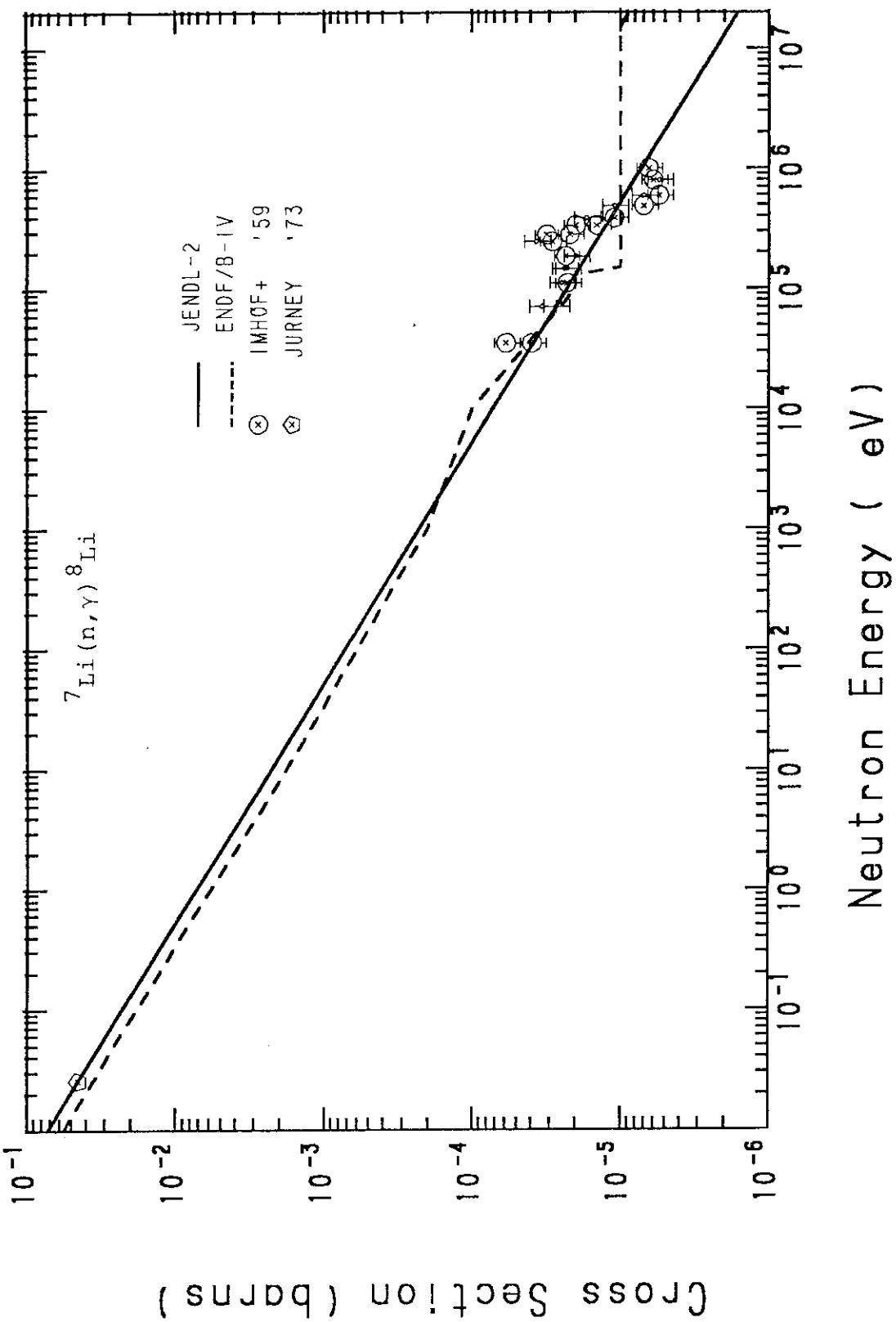


Fig. 9 Measured and evaluated  $(n,\gamma)$  cross sections.

Appendix

List with ENDF/B-IV format

.....10.....20.....30.....40.....50.....60.....	MAT	MF	MT	SEQ
3.00700+ 3 6.95573+ 0	0	0	0	202032 1451 1
0.0 + 0 0.0 + 0	0	0	80	02032 1451 2
3-LI- 7 JAERI	EVAL-JUL82 K.SHIBATA			2032 1451 3
	DIST-MAR83 REV1-NOV83			2032 1451 4
HISTORY				2032 1451 5
82-01 NEW EVALUATION FOR JENDL-2 BY K.SHIBATA.				2032 1451 6
83-11 MF=2 WAS ADDED. SOME Q VALUES AND TRANSFORMATION MATRIX OF				2032 1451 7
MT=2 IN MF=4 WERE MODIFIED.				2032 1451 8
				2032 1451 9
MF=1 GENERAL INFORMATION				2032 1451 10
MT=451 DESCRIPTIVE DATA AND DICTIONARY				2032 1451 11
				2032 1451 12
MF=2 RESONANCE PARAMETERS				2032 1451 13
MT=151 SCATTERING RADIUS ONLY				2032 1451 14
				2032 1451 15
2200-M/S CROSS SECTIONS AND CALCULATED RES. INTEGRALS.				2032 1451 16
2200-M/S RES. INTEG.				2032 1451 17
ELASTIC 1.049 B	-			2032 1451 18
CAPTURE 0.0454 B	0.0204 B			2032 1451 19
TOTAL 1.094 B	-			2032 1451 20
				2032 1451 21
MF=3 NEUTRON CROSS SECTIONS				2032 1451 22
MT=1 TOTAL				2032 1451 23
BELLOW 1 KEV, TOTAL = 1.04894 + CAPTURE (B).				2032 1451 24
ABOVE 1 KEV, DATA LISTED IN /1/-/6/ WERE USED.				2032 1451 25
MT=2 ELASTIC				2032 1451 26
ELASTIC = TOTAL - REACTION.				2032 1451 27
MT=4 TOTAL INELASTIC				2032 1451 28
SUM OF MT=51 AND 91.				2032 1451 29
MT=16 (N,2N)Li-6				2032 1451 30
ENDF/B-IV RECOMMENDED.				2032 1451 31
MT=24 (N,2N)ALPHA-D				2032 1451 32
ENDF/B-IV RECOMMENDED.				2032 1451 33
MT=51 (N,N')				2032 1451 34
LEADING TO THE 1ST LEVEL (0.47748 MEV) IN Li-7.				2032 1451 35
DATA LISTED IN /7/,/8/ WERE USED.				2032 1451 36
MT=91 (N,N')ALPHA-T				2032 1451 37
DATA LISTED IN /9/-/14/ WERE USED.				2032 1451 38
MT=102 CAPTURE				2032 1451 39
1/V FORM NORMALIZED TO THE DATA OF JURNEY /15/.				2032 1451 40
MT=104 (N,D)He-6				2032 1451 41
ENDF/B-IV RECOMMENDED.				2032 1451 42
MT=251 MU-BAR				2032 1451 43
CALCULATED FROM THE DATA IN FILE4.				2032 1451 44
				2032 1451 45
MF=4 ANGULAR DISTRIBUTIONS OF SECONDARY NEUTRONS				2032 1451 46
MT=2				2032 1451 47
1.0E-5 EV TO 40 KEV : ISOTROPIC.				2032 1451 48
50 KEV TO 14 MEV : DATA LISTED IN /16/-/18/ USED.				2032 1451 49

.....10.....20.....30.....40.....50.....60.....	MAT	MF	MT	SEQ
14 MEV TO 20 MEV : OPTICAL MODEL CALCULATION	2032	1451	50	
WITH PARAMETERS OF /19/.	2032	1451	51	
MT=16,24,91	2032	1451	52	
ISOTROPIC IN THE LABORATORY SYSTEM.	2032	1451	53	
MT=51	2032	1451	54	
ISOTROPIC IN THE CENTER OF MASS SYSTEM.	2032	1451	55	
MF=5 ENERGY DISTRIBUTIONS OF SECONDARY NEUTRONS	2032	1451	57	
MT=16,24,91	2032	1451	58	
EVAPORATION SPECTRUM.	2032	1451	59	
VALUES OF NUCLEAR TEMPERATURE TAKEN FROM ENDF/B-IV.	2032	1451	60	
	2032	1451	61	
REFERENCES	2032	1451	62	
1) HIBDON, C.T. AND LANGSDORF, JR., A. : ANL-5171, P.7 (1954).	2032	1451	63	
2) HIBDON, C.T. AND MOORING, F.P. : '68 WASHINGTON CONF.	2032	1451	64	
3) MEADOWS, J.W. AND WHALEN, J.F. : NUCL. SCI. ENG. 41(1970)351.	2032	1451	65	
4) FOSTER, JR., D.G. AND GLASGOW, D.W. : PHYS. REV. C3(1971)576.	2032	1451	66	
5) GOULDING, C.A. ET AL. : PRIVATE COMMUNICATION (1972).	2032	1451	67	
6) LAMAZE, G.P. ET AL. : BULL. AM. PHYS. SOC. 24 (1979) 862.	2032	1451	68	
7) BENVENISTE ET AL. : NUCL. PHYS. 38 (1962) 300.	2032	1451	69	
8) PRESSER, G. AND BASS, R. : NUCL. PHYS. A182 (1972) 321.	2032	1451	70	
9) WYMAN, M.E. AND THORPE, M.M. : LA-2235 (1958).	2032	1451	71	
10) BROWN, F. ET AL. : J. NUCL. ENERGY PARTS A/B 17 (1963) 137.	2032	1451	72	
11) HOPKINS, J.C. ET AL. : NUCL. PHYS. A107 (1968) 139.	2032	1451	73	
12) LISOWSKI, P.W. ET AL. : LA-8342 (1980).	2032	1451	74	
13) SMITH, D.L. ET AL. : NUCL. SCI. ENG. 78 (1981) 359.	2032	1451	75	
14) LISKIEN, H. AND PAULSEN, A. : INDC(EUR) 014/G, P.14 (1980).	2032	1451	76	
15) JURNEY, E.T. : USNDC-9, P.109 (1973).	2032	1451	77	
16) LANE, R.O. ET AL. : ANN. PHYS. 12 (1961) 135.	2032	1451	78	
17) HOGUE, H.H. ET AL. : NUCL. SCI. ENG. 69 (1979) 22.	2032	1451	79	
18) KNOX, H.D. ET AL. : NUCL. SCI. ENG. 69 (1979) 223.	2032	1451	80	
19) WATSON, B.A. ET AL. : PHYS. REV. 182 (1969) 977.	2032	1451	81	
	2032	1451	82	
1        451        102	2032	1451	83	
2        151        4	2032	1451	84	
3        1        80	2032	1451	85	
3        2        80	2032	1451	86	
3        4        20	2032	1451	87	
3        16        8	2032	1451	88	
3        24        7	2032	1451	89	
3        51        15	2032	1451	90	
3        91        9	2032	1451	91	
3        102        8	2032	1451	92	
3        104        8	2032	1451	93	
3        251        25	2032	1451	94	
4        2        156	2032	1451	95	
4        16        10	2032	1451	96	
4        24        10	2032	1451	97	
4        51        10	2032	1451	98	
4        91        10	2032	1451	99	
5        16        7	2032	1451	100	
5        24        7	2032	1451	101	
5        91        8	2032	1451	102	

							MAT	MF	MT	SEQ		
.....	10.....	20.....	30.....	40.....	50.....	60.....						
							2032	1	0	103		
							2032	0	0	104		
3.00700+	3	6.95573+	0	0	0	1	02032	2151	105			
3.00700+	3	1.00000+	0	0	0	1	02032	2151	106			
1.00000-	5	2.00000+	7	0	0	0	02032	2151	107			
1.50000+	0	2.89000-	1	0	0	0	02032	2151	108			
							2032	2	0	109		
							2032	0	0	110		
3.00700+	3	6.95573+	0	0	99	0	02032	3	1	111		
0.0	+ 0	0.0	+ 0	0	0	1	2292032	3	1	112		
229		5		0	0	0	02032	3	1	113		
1.00000-	5	3.33252+	0	1.33352-	5	3.02644+ 0 1.77827-	5	2.76139+	02032	3	1	114
3.16227-	5	2.33309+	0	5.62339-	5	2.01192+ 0 1.00000-	4	1.77107+	02032	3	1	115
1.77828-	4	1.59046+	0	3.16227-	4	1.45502+ 0 1.00000-	3	1.27730+	02032	3	1	116
2.24274-	3	1.20142+	0	5.02990-	3	1.15076+ 0 2.53000-	2	1.09434+	02032	3	1	117
1.00000-	1	1.07178+	0	1.00000+	0	1.05616+ 0 1.00000+	1	1.05122+	02032	3	1	118
1.00000+	2	1.04966+	0	1.00000+	3	1.04917+ 0 1.00000+	4	1.04894+	02032	3	1	119
1.00000+	5	1.04894+	0	1.20000+	5	9.58032- 1 1.31000+	5	9.83367-	12032	3	1	120
1.45000+	5	1.02390+	0	1.60000+	5	1.04894+ 0 1.70000+	5	1.07028+	02032	3	1	121
1.80000+	5	1.10298+	0	1.90000+	5	1.22796+ 0 2.00000+	5	1.47772+	02032	3	1	122
2.10000+	5	1.82240+	0	2.15109+	5	2.06423+ 0 2.18045+	5	2.18972+	02032	3	1	123
2.20981+	5	2.37640+	0	2.23918+	5	2.63618+ 0 2.26854+	5	2.98093+	02032	3	1	124
2.29791+	5	3.42261+	0	2.32727+	5	3.97311+ 0 2.35663+	5	4.64435+	02032	3	1	125
2.38719+	5	5.43440+	0	2.41774+	5	6.29896+ 0 2.44829+	5	7.27571+	02032	3	1	126
2.47884+	5	8.40237+	0	2.51352+	5	9.80158+ 0 2.54820+	5	1.10518+	12032	3	1	127
2.58288+	5	1.18663+	1	2.61755+	5	1.19579+ 1 2.66500+	5	1.10052+	12032	3	1	128
2.71245+	5	9.45139+	0	2.75991+	5	7.75242+ 0 2.80736+	5	6.36439+	02032	3	1	129
2.85242+	5	5.39258+	0	2.89748+	5	4.55663+ 0 2.94254+	5	3.89766+	02032	3	1	130
2.98760+	5	3.45675+	0	3.06707+	5	2.93736+ 0 3.14654+	5	2.51159+	02032	3	1	131
3.22602+	5	2.19455+	0	3.30549+	5	2.00135+ 0 3.42232+	5	1.80932+	02032	3	1	132
3.53914+	5	1.62273+	0	3.65597+	5	1.46909+ 0 3.77279+	5	1.37589+	02032	3	1	133
3.96196+	5	1.29600+	0	4.15112+	5	1.22903+ 0 4.34029+	5	1.17263+	02032	3	1	134
4.52946+	5	1.12442+	0	4.69963+	5	1.09023+ 0 4.86981+	5	1.06593+	02032	3	1	135
5.03998+	5	1.04783+	0	5.21016+	5	1.03224+ 0 5.45928+	5	1.01994+	02032	3	1	136
5.46130+	5	1.01996+	0	5.70840+	5	1.02284+ 0 5.95752+	5	1.03230+	02032	3	1	137
6.20664+	5	1.03967+	0	6.48197+	5	1.05558+ 0 6.75729+	5	1.08591+	02032	3	1	138
7.03262+	5	1.11600+	0	7.30794+	5	1.13114+ 0 7.64051+	5	1.15915+	02032	3	1	139
7.97307+	5	1.21947+	0	8.30563+	5	1.28660+ 0 8.63819+	5	1.33502+	02032	3	1	140
8.91489+	5	1.37066+	0	9.19160+	5	1.42079+ 0 9.46830+	5	1.47659+	02032	3	1	141
9.74501+	5	1.52923+	0	9.89130+	5	1.55151+ 0 1.00000+	6	1.55551+	02032	3	1	142
1.00450+	6	1.55717+	0	1.05795+	6	1.60492+ 0 1.06140+	6	1.60778+	02032	3	1	143
1.11141+	6	1.64879+	0	1.16486+	6	1.68256+ 0 1.21832+	6	1.70001+	02032	3	1	144
1.26410+	6	1.70795+	0	1.28178+	6	1.71095+ 0 1.34524+	6	1.72089+	02032	3	1	145
1.40871+	6	1.72128+	0	1.47217+	6	1.70352+ 0 1.53665+	6	1.68282+	02032	3	1	146
1.60113+	6	1.67644+	0	1.66561+	6	1.67736+ 0 1.73009+	6	1.67860+	02032	3	1	147
1.79467+	6	1.68476+	0	1.85925+	6	1.70061+ 0 1.92384+	6	1.71940+	02032	3	1	148
1.93970+	6	1.72311+	0	1.98842+	6	1.73439+ 0 2.09089+	6	1.76165+	02032	3	1	149
2.19335+	6	1.80250+	0	2.29436+	6	1.84658+ 0 2.29582+	6	1.84721+	02032	3	1	150
2.39828+	6	1.88603+	0	2.48015+	6	1.91166+ 0 2.53815+	6	1.92952+	02032	3	1	151
2.66594+	6	1.96554+	0	2.67802+	6	1.96889+ 0 2.81789+	6	2.00107+	02032	3	1	152
2.81910+	6	2.00127+	0	2.85173+	6	2.00647+ 0 2.95776+	6	2.02306+	02032	3	1	153
2.99530+	6	2.04308+	0	3.05044+	6	2.07241+ 0 3.13886+	6	2.08821+	02032	3	1	154
3.20745+	6	2.10025+	0	3.28243+	6	2.11384+ 0 3.36446+	6	2.12847+	02032	3	1	155

									MAT	MF	MT	SEQ		
.....10.....	.....20.....	.....30.....	.....40.....	.....50.....	.....60.....									
3.42600+	6	2.14292+	0	3.51889+	6	2.16444+	0	3.52147+	6	2.16503+	02032	3	1	156
3.61179+	6	2.19555+	0	3.67848+	6	2.21786+	0	3.70468+	6	2.23065+	02032	3	1	157
3.76380+	6	2.25949+	0	3.77642+	6	2.26563+	0	3.79758+	6	2.27839+	02032	3	1	158
3.87435+	6	2.32469+	0	3.89047+	6	2.33506+	0	3.97229+	6	2.38776+	02032	3	1	159
3.98337+	6	2.39452+	0	4.07022+	6	2.44752+	0	4.07627+	6	2.45084+	02032	3	1	160
4.16162+	6	2.49764+	0	4.16916+	6	2.50119+	0	4.25303+	6	2.54051+	02032	3	1	161
4.27050+	6	2.54629+	0	4.34443+	6	2.57066+	0	4.37184+	6	2.57428+	02032	3	1	162
4.43583+	6	2.58268+	0	4.47318+	6	2.58285+	0	4.50697+	6	2.58299+	02032	3	1	163
4.51724+	6	2.58304+	0	4.57453+	6	2.58038+	0	4.59864+	6	2.57928+	02032	3	1	164
4.68005+	6	2.56725+	0	4.68431+	6	2.56597+	0	4.76145+	6	2.54286+	02032	3	1	165
4.77721+	6	2.53666+	0	4.85531+	6	2.50646+	0	4.94917+	6	2.46872+	02032	3	1	166
5.01370+	6	2.43932+	0	5.04304+	6	2.42620+	0	5.13690+	6	2.37549+	02032	3	1	167
5.21635+	6	2.30969+	0	5.22421+	6	2.30333+	0	5.31153+	6	2.21504+	02032	3	1	168
5.39884+	6	2.14675+	0	5.48615+	6	2.13462+	0	5.56466+	6	2.15666+	02032	3	1	169
5.64316+	6	2.17492+	0	5.65549+	6	2.17779+	0	5.72166+	6	2.19318+	02032	3	1	170
5.80016+	6	2.21518+	0	5.88316+	6	2.22746+	0	5.96615+	6	2.21836+	02032	3	1	171
6.04915+	6	2.19861+	0	6.09464+	6	2.18781+	0	6.12840+	6	2.17988+	02032	3	1	172
6.13214+	6	2.17900+	0	6.33886+	6	2.13327+	0	6.54558+	6	2.08148+	02032	3	1	173
6.75231+	6	2.03239+	0	6.80402+	6	2.02281+	0	6.90540+	6	2.00430+	02032	3	1	174
6.95903+	6	1.99471+	0	7.14430+	6	1.96562+	0	7.32958+	6	1.93402+	02032	3	1	175
7.51485+	6	1.90536+	0	7.70012+	6	1.88507+	0	7.78370+	6	1.87815+	02032	3	1	176
7.81743+	6	1.87542+	0	8.21694+	6	1.84383+	0	8.30000+	6	1.83678+	02032	3	1	177
8.69570+	6	1.80450+	0	8.73375+	6	1.80150+	0	8.86462+	6	1.79076+	02032	3	1	178
8.88000+	6	1.78951+	0	9.00000+	6	1.77987+	0	9.25057+	6	1.76032+	02032	3	1	179
9.76738+	6	1.72247+	0	1.00000+	7	1.70611+	0	1.01145+	7	1.69819+	02032	3	1	180
1.05000+	7	1.67267+	0	1.06168+	7	1.66519+	0	1.10000+	7	1.63972+	02032	3	1	181
1.10270+	7	1.63792+	0	1.13981+	7	1.61448+	0	1.14663+	7	1.61039+	02032	3	1	182
1.15000+	7	1.60825+	0	1.20000+	7	1.57753+	0	1.23157+	7	1.55909+	02032	3	1	183
1.23780+	7	1.55546+	0	1.25000+	7	1.54853+	0	1.27493+	7	1.53445+	02032	3	1	184
1.30000+	7	1.52100+	0	1.31652+	7	1.51225+	0	1.35000+	7	1.49466+	02032	3	1	185
1.40000+	7	1.46956+	0	1.40668+	7	1.46625+	0	1.42690+	7	1.45647+	02032	3	1	186
1.45000+	7	1.44574+	0	1.46600+	7	1.43837+	0	1.50000+	7	1.42198+	02032	3	1	187
1.54518+	7	1.40109+	0	1.61547+	7	1.37024+	0	1.69381+	7	1.33465+	02032	3	1	188
1.76495+	7	1.30432+	0	1.83231+	7	1.27296+	0	1.91443+	7	1.23704+	02032	3	1	189
2.00000+	7	1.21500+	0							2032	3	1	190	
										2032	3	0	191	
3.00700+	3	6.95573+	0		0		0			02032	3	2	192	
0.0	+ 0	0.0	+ 0		0		0	1		2292032	3	2	193	
229	5		0		0		0	0		02032	3	2	194	
1.00000-	5	1.04894+	0	1.33352-	5	1.04894+	0	1.77827-	5	1.04894+	02032	3	2	195
3.16227-	5	1.04894+	0	5.62339-	5	1.04894+	0	1.00000-	4	1.04894+	02032	3	2	196
1.77828-	4	1.04894+	0	3.16227-	4	1.04894+	0	1.00000-	3	1.04894+	02032	3	2	197
2.24274-	3	1.04894+	0	5.02990-	3	1.04894+	0	2.53000-	2	1.04894+	02032	3	2	198
1.00000-	1	1.04894+	0	1.00000+	0	1.04894+	0	1.00000+	1	1.04894+	02032	3	2	199
1.00000+	2	1.04894+	0	1.00000+	3	1.04894+	0	1.00000+	4	1.04887+	02032	3	2	200
1.00000+	5	1.04892+	0	1.20000+	5	9.58011-	1	1.31000+	5	9.83347-	12032	3	2	201
1.45000+	5	1.02388+	0	1.60000+	5	1.04892+	0	1.70000+	5	1.07026+	02032	3	2	202
1.80000+	5	1.10296+	0	1.90000+	5	1.22794+	0	2.00000+	5	1.47770+	02032	3	2	203
2.10000+	5	1.82238+	0	2.15109+	5	2.06421+	0	2.18045+	5	2.18970+	02032	3	2	204
2.20981+	5	2.37638+	0	2.23918+	5	2.63616+	0	2.26854+	5	2.98092+	02032	3	2	205
2.29791+	5	3.42260+	0	2.32727+	5	3.97310+	0	2.35663+	5	4.64434+	02032	3	2	206
2.38719+	5	5.43439+	0	2.41774+	5	6.29895+	0	2.44829+	5	7.27570+	02032	3	2	207
2.47884+	5	8.40236+	0	2.51352+	5	9.80157+	0	2.54820+	5	1.10518+	12032	3	2	208

										MAT	MF	MT	SEQ
.....	10.....	20.....	30.....	40.....	50.....	60.....							
2.58288+	5	1.18663+	1	2.61755+	5	1.19579+	1	2.66500+	5	1.10052+	12032	3	2
2.71245+	5	9.45138+	0	2.75991+	5	7.75241+	0	2.80736+	5	6.36438+	02032	3	2
2.85242+	5	5.39257+	0	2.89748+	5	4.55662+	0	2.94254+	5	3.89765+	02032	3	2
2.98760+	5	3.45674+	0	3.06707+	5	2.93735+	0	3.14654+	5	2.51158+	02032	3	2
3.22602+	5	2.19454+	0	3.30549+	5	2.00134+	0	3.42232+	5	1.80931+	02032	3	2
3.53914+	5	1.62272+	0	3.65597+	5	1.46908+	0	3.77279+	5	1.37588+	02032	3	2
3.96196+	5	1.29599+	0	4.15112+	5	1.22902+	0	4.34029+	5	1.17262+	02032	3	2
4.52946+	5	1.12441+	0	4.69963+	5	1.09022+	0	4.86981+	5	1.06592+	02032	3	2
5.03998+	5	1.04782+	0	5.21016+	5	1.03223+	0	5.45928+	5	1.01993+	02032	3	2
5.46130+	5	1.01995+	0	5.70840+	5	1.01233+	0	5.95752+	5	1.01121+	02032	3	2
6.20664+	5	1.00799+	0	6.48197+	5	1.01220+	0	6.75729+	5	1.03084+	02032	3	2
7.03262+	5	1.04923+	0	7.30794+	5	1.05267+	0	7.64051+	5	1.06655+	02032	3	2
7.97307+	5	1.11274+	0	8.30563+	5	1.16574+	0	8.63819+	5	1.20003+	02032	3	2
8.91489+	5	1.22391+	0	9.19160+	5	1.26228+	0	9.46830+	5	1.30632+	02032	3	2
9.74501+	5	1.34721+	0	9.89130+	5	1.36327+	0	1.00000+	6	1.36265+	02032	3	2
1.00450+	6	1.36240+	0	1.05795+	6	1.38744+	0	1.06140+	6	1.38883+	02032	3	2
1.11141+	6	1.42584+	0	1.16486+	6	1.45533+	0	1.21832+	6	1.46851+	02032	3	2
1.26410+	6	1.47278+	0	1.28178+	6	1.47598+	0	1.34524+	6	1.48662+	02032	3	2
1.40871+	6	1.48771+	0	1.47217+	6	1.47064+	0	1.53665+	6	1.45065+	02032	3	2
1.60113+	6	1.44498+	0	1.66561+	6	1.44661+	0	1.73009+	6	1.44856+	02032	3	2
1.79467+	6	1.45543+	0	1.85925+	6	1.47199+	0	1.92384+	6	1.49149+	02032	3	2
1.93970+	6	1.49538+	0	1.98842+	6	1.50676+	0	2.09089+	6	1.53422+	02032	3	2
2.19335+	6	1.57528+	0	2.29436+	6	1.61957+	0	2.29582+	6	1.62020+	02032	3	2
2.39828+	6	1.65876+	0	2.48015+	6	1.68419+	0	2.53815+	6	1.70139+	02032	3	2
2.66594+	6	1.73596+	0	2.67802+	6	1.73904+	0	2.81789+	6	1.76801+	02032	3	2
2.81910+	6	1.76818+	0	2.85173+	6	1.77235+	0	2.95776+	6	1.78573+	02032	3	2
2.99530+	6	1.80462+	0	3.05044+	6	1.83213+	0	3.13886+	6	1.84502+	02032	3	2
3.20745+	6	1.85266+	0	3.28243+	6	1.86145+	0	3.36446+	6	1.86593+	02032	3	2
3.42600+	6	1.87277+	0	3.51889+	6	1.88050+	0	3.52147+	6	1.88076+	02032	3	2
3.61179+	6	1.89971+	0	3.67848+	6	1.91393+	0	3.70468+	6	1.92355+	02032	3	2
3.76380+	6	1.94483+	0	3.77642+	6	1.94873+	0	3.79758+	6	1.95773+	02032	3	2
3.87435+	6	1.99918+	0	3.89047+	6	2.00853+	0	3.97229+	6	2.06913+	02032	3	2
3.98337+	6	2.07696+	0	4.07022+	6	2.14113+	0	4.07627+	6	2.14523+	02032	3	2
4.16162+	6	2.19486+	0	4.16916+	6	2.19866+	0	4.25303+	6	2.23437+	02032	3	2
4.27050+	6	2.23940+	0	4.34443+	6	2.26199+	0	4.37184+	6	2.26495+	02032	3	2
4.43583+	6	2.27211+	0	4.47318+	6	2.27155+	0	4.50697+	6	2.27071+	02032	3	2
4.51724+	6	2.26929+	0	4.57453+	6	2.25845+	0	4.59864+	6	2.25336+	02032	3	2
4.68005+	6	2.22788+	0	4.68431+	6	2.22589+	0	4.76145+	6	2.19065+	02032	3	2
4.77721+	6	2.18197+	0	4.85531+	6	2.13205+	0	4.94917+	6	2.07061+	02032	3	2
5.01370+	6	2.02492+	0	5.04304+	6	2.00451+	0	5.13690+	6	1.93050+	02032	3	2
5.21635+	6	1.84497+	0	5.22421+	6	1.83675+	0	5.31153+	6	1.72778+	02032	3	2
5.39884+	6	1.63882+	0	5.48615+	6	1.60602+	0	5.56466+	6	1.60947+	02032	3	2
5.64316+	6	1.60914+	0	5.65549+	6	1.60909+	0	5.72166+	6	1.62164+	02032	3	2
5.80016+	6	1.64027+	0	5.88316+	6	1.64899+	0	5.96615+	6	1.63633+	02032	3	2
6.04915+	6	1.61302+	0	6.09464+	6	1.60026+	0	6.12840+	6	1.59231+	02032	3	2
6.13214+	6	1.59145+	0	6.33886+	6	1.54662+	0	6.54558+	6	1.49573+	02032	3	2
6.75231+	6	1.44754+	0	6.80402+	6	1.43818+	0	6.90540+	6	1.42113+	02032	3	2
6.95903+	6	1.41203+	0	7.14430+	6	1.38465+	0	7.32958+	6	1.35477+	02032	3	2
7.51485+	6	1.32782+	0	7.70012+	6	1.30923+	0	7.78370+	6	1.30309+	02032	3	2
7.81743+	6	1.30102+	0	8.21694+	6	1.28127+	0	8.30000+	6	1.27668+	02032	3	2
8.69570+	6	1.25545+	0	8.73375+	6	1.25332+	0	8.86462+	6	1.24558+	02032	3	2
8.88000+	6	1.24480+	0	9.00000+	6	1.23809+	0	9.25057+	6	1.22545+	02032	3	2
9.76738+	6	1.20007+	0	1.00000+	7	1.18807+	0	1.01145+	7	1.18245+	02032	3	2

										MAT	MF	MT	SEQ	
.....	10	.....	20	.....	30	.....	40	.....	50	.....	60	.....		
1.05000+	7	1.16605+	0	1.06168+	7	1.16187+	0	1.10000+	7	1.14612+	02032	3	2	262
1.10270+	7	1.14508+	0	1.13981+	7	1.12811+	0	1.14663+	7	1.12515+	02032	3	2	263
1.15000+	7	1.12355+	0	1.20000+	7	1.10061+	0	1.23157+	7	1.08714+	02032	3	2	264
1.23780+	7	1.08442+	0	1.25000+	7	1.07759+	0	1.27493+	7	1.06448+	02032	3	2	265
1.30000+	7	1.05106+	0	1.31652+	7	1.04243+	0	1.35000+	7	1.02474+	02032	3	2	266
1.40000+	7	9.99657-	1	1.40668+	7	9.96439-	1	1.42690+	7	9.86312-	12032	3	2	267
1.45000+	7	9.74918-	1	1.46600+	7	9.67261-	1	1.50000+	7	9.50093-	12032	3	2	268
1.54518+	7	9.35022-	1	1.61547+	7	9.13265-	1	1.69381+	7	8.87816-	12032	3	2	269
1.76495+	7	8.66638-	1	1.83231+	7	8.43944-	1	1.91443+	7	8.17330-	12032	3	2	270
2.00000+	7	8.04990-	1							2032	3	2	271	
										2032	3	0	272	
3.00700+	3	6.95573+	0		0	99		0		02032	3	4	273	
0.0	+ 0-4.77484+	5		0	0	0		1		512032	3	4	274	
51	2		0	0	0	0		0		02032	3	4	275	
5.46130+	5	0.0	+ 0	1.06140+	6	2.18940-	1	1.26410+	6	2.35160-	12032	3	4	276
1.93970+	6	2.27730-	-1	2.29436+	6	2.27005-	-1	2.48015+	6	2.27465-	12032	3	4	277
2.66594+	6	2.29572-	-1	2.81910+	6	2.33088-	-1	2.85173+	6	2.34119-	12032	3	4	278
2.99530+	6	2.38459-	-1	3.13886+	6	2.43188-	-1	3.28243+	6	2.52392-	12032	3	4	279
3.42600+	6	2.70150-	-1	3.51889+	6	2.83933-	-1	3.61179+	6	2.95835-	12032	3	4	280
3.70468+	6	3.07101-	-1	3.76380+	6	3.14655-	-1	3.79758+	6	3.20659-	12032	3	4	281
3.89047+	6	3.26523-	-1	3.98337+	6	3.17554-	-1	4.07627+	6	3.05608-	12032	3	4	282
4.16916+	6	3.02532-	-1	4.27050+	6	3.06888-	-1	4.37184+	6	3.09330-	12032	3	4	283
4.47318+	6	3.11298-	-1	4.50697+	6	3.12278-	-1	4.57453+	6	3.21931-	12032	3	4	284
4.68431+	6	3.40075-	-1	4.77721+	6	3.54688-	-1	5.01370+	6	4.14400-	12032	3	4	285
5.21635+	6	4.64719-	-1	5.65549+	6	5.68695-	-1	6.09464+	6	5.87543-	12032	3	4	286
6.12840+	6	5.87564-	-1	6.80402+	6	5.84624-	-1	6.90540+	6	5.83170-	12032	3	4	287
7.78370+	6	5.75063-	-1	7.81743+	6	5.74400-	-1	8.69570+	6	5.48370-	12032	3	4	288
8.86462+	6	5.44209-	-1	1.01145+	7	5.03291-	-1	1.10270+	7	4.68569-	12032	3	4	289
1.13981+	7	4.57834-	-1	1.23780+	7	4.28679-	-1	1.27493+	7	4.22459-	12032	3	4	290
1.40668+	7	4.03964-	-1	1.42690+	7	4.01682-	-1	1.54518+	7	3.89066-	12032	3	4	291
1.69381+	7	3.73087-	-1	1.83231+	7	3.58314-	-1	2.00000+	7	3.42991-	12032	3	4	292
										2032	3	0	293	
3.00700+	3	6.95573+	0		0	99		0		02032	3	16	294	
0.0	+ 0-7.25673+	6		0	0	0		3		152032	3	16	295	
2	2		14	5	5	15				22032	3	16	296	
8.30000+	6	0.0	+ 0	8.88000+	6	1.00000-	3	9.00000+	6	2.00000-	32032	3	16	297
1.00000+	7	1.00000-	-2	1.05000+	7	1.40000-	-2	1.10000+	7	1.60000-	22032	3	16	298
1.15000+	7	1.77000-	-2	1.20000+	7	1.90000-	-2	1.25000+	7	2.00000-	22032	3	16	299
1.30000+	7	2.10000-	-2	1.35000+	7	2.16000-	-2	1.40000+	7	2.20000-	22032	3	16	300
1.45000+	7	2.26000-	-2	1.50000+	7	2.30000-	-2	2.00000+	7	1.97610-	22032	3	16	301
										2032	3	0	302	
3.00700+	3	6.95573+	0		0	99		0		02032	3	24	303	
0.0	+ 0-8.74304+	6		0	0	0		3		122032	3	24	304	
2	2		11	5	5	12				22032	3	24	305	
1.00000+	7	0.0	+ 0	1.05000+	7	2.00000-	3	1.10000+	7	5.00000-	32032	3	24	306
1.15000+	7	8.60000-	-3	1.20000+	7	1.30000-	-2	1.25000+	7	1.75000-	22032	3	24	307
1.30000+	7	2.20000-	-2	1.35000+	7	2.74000-	-2	1.40000+	7	3.30000-	22032	3	24	308
1.45000+	7	3.80000-	-2	1.50000+	7	4.30000-	-2	2.00000+	7	3.69450-	22032	3	24	309
										2032	3	0	310	
3.00700+	3	6.95573+	0		0	1		0		02032	3	51	311	
0.0	+ 0-4.77484+	5		0	0	0		1		342032	3	51	312	
34	2		0	0	0	0		0		02032	3	51	313	
5.46130+	5	0.0	+ 0	1.06140+	6	2.18940-	-1	1.26410+	6	2.35160-	12032	3	51	314

										MAT	MF	MT	SEQ		
.....	10	.....	20	.....	30	.....	40	.....	50	.....	60	.....			
1.93970+	6	2.27730-	1	2.29436+	6	2.27005-	1	2.48015+	6	2.27465-	12032	3	51	315	
2.66594+	6	2.29572-	1	2.85173+	6	2.33837-	1	2.99530+	6	2.36933-	12032	3	51	316	
3.13886+	6	2.40420-	1	3.28243+	6	2.48380-	1	3.42600+	6	2.64895-	12032	3	51	317	
3.51889+	6	2.77874-	1	3.61179+	6	2.88972-	1	3.70468+	6	2.99433-	12032	3	51	318	
3.79758+	6	3.10499-	1	3.89047+	6	3.10916-	1	3.98337+	6	2.96500-	12032	3	51	319	
4.07627+	6	2.79106-	1	4.16916+	6	2.70584-	1	4.27050+	6	2.68998-	12032	3	51	320	
4.37184+	6	2.65497-	1	4.47318+	6	2.61523-	1	4.57453+	6	2.58521-	12032	3	51	321	
4.68431+	6	2.57728-	1	5.01370+	6	2.52720-	1	6.12840+	6	2.31110-	12032	3	51	322	
6.90540+	6	2.12190-	1	7.78370+	6	1.95300-	1	8.69570+	6	1.68270-	12032	3	51	323	
1.10270+	7	1.10850-	1	1.23780+	7	8.99039-	2	1.42690+	7	8.51750-	22032	3	51	324	
2.00000+	7	7.43650-	2								2032	3	51	325	
											2032	3	0	326	
3.00700+	3	6.95573+	0		0		98		0		02032	3	91	327	
0.0	+ 0	-2.46475+	6		0		0		1		182032	3	91	328	
18		2			0		0		0		02032	3	91	329	
2.81910+	6	0.0	+ 0	3.76380+	6	8.17962-	3	4.50697+	6	5.17562-	22032	3	91	330	
4.77721+	6	9.83729-	2	5.21635+	6	2.15928-	1	5.65549+	6	3.28417-	12032	3	91	331	
6.09464+	6	3.55779-	1	6.80402+	6	3.69966-	1	7.81743+	6	3.80100-	12032	3	91	332	
8.86462+	6	3.80100-	1	1.01145+	7	3.69966-	1	1.13981+	7	3.52738-	12032	3	91	333	
1.27493+	7	3.33484-	1	1.40668+	7	3.18283-	1	1.54518+	7	3.06122-	12032	3	91	334	
1.69381+	7	2.92947-	1	1.83231+	7	2.80786-	1	2.00000+	7	2.68626-	12032	3	91	335	
											2032	3	0	336	
3.00700+	3	6.95573+	0		0		99		0		02032	3102	337		
0.0	+ 0	2.03300+	6		0		0		1		142032	3102	338		
14		5			0		0		0		02032	3102	339		
1.00000-	5	2.28358+	0	1.00000-	4	7.22131-	1	1.00000-	3	2.28358-	12032	3102	340		
2.53000-	2	4.54000-	2	1.00000-	1	2.28358-	2	1.00000+	0	7.22131-	32032	3102	341		
1.00000+	1	2.28358-	3	1.00000+	2	7.22131-	4	1.00000+	3	2.28358-	42032	3102	342		
1.00000+	4	7.22131-	5	1.00000+	5	2.28358-	5	1.00000+	6	7.22131-	62032	3102	343		
1.00000+	7	2.28358-	6	2.00000+	7	1.61473-	6				2032	3102	344		
											2032	3	0	345	
3.00700+	3	6.95573+	0		0		99		0		02032	3104	346		
0.0	+ 0	-7.76382+	6		0		0		3		142032	3104	347		
3		2			13		5		14		22032	3104	348		
8.88000+	6	0.0	+ 0	9.00000+	6	0.0	+ 0	1.00000+	7	1.00000-	32032	3104	349		
1.05000+	7	2.00000-	3	1.10000+	7	3.00000-	3	1.15000+	7	3.60000-	32032	3104	350		
1.20000+	7	5.00000-	3	1.25000+	7	6.80000-	3	1.30000+	7	8.00000-	32032	3104	351		
1.35000+	7	9.00000-	3	1.40000+	7	1.00000-	2	1.45000+	7	1.10000-	22032	3104	352		
1.50000+	7	1.20000-	2	2.00000+	7	1.03100-	2				2032	3104	353		
											2032	3	0	354	
3.00700+	3	6.95573+	0		0		0		0		02032	3251	355		
0.0	+ 0	0.0	+ 0		0		0		1		662032	3251	356		
66		2			0		0		0		02032	3251	357		
1.00000-	5	9.56665-	2	1.00000-	4	9.56665-	2	1.00000-	3	9.56665-	22032	3251	358		
2.53000-	2	9.56665-	2	1.00000-	1	9.56665-	2	1.00000+	0	9.56665-	22032	3251	359		
1.00000+	1	9.56665-	2	1.00000+	2	9.56665-	2	1.00000+	3	9.56665-	22032	3251	360		
1.00000+	4	9.56665-	2	4.00000+	4	9.56665-	2	5.00000+	4	1.67115-	12032	3251	361		
7.00000+	4	1.78072-	1	8.50000+	4	2.06725-	1	1.00000+	5	2.07095-	12032	3251	362		
1.20000+	5	2.23745-	1	2.07000+	5	4.67142-	1	2.57000+	5	2.73338-	12032	3251	363		
3.07000+	5	5.73441-	2	3.57000+	5	-7.11497-	2	4.07000+	5	-7.21089-	22032	3251	364		
4.30000+	5	-4.78710-	2	4.57000+	5	-6.19093-	2	5.07000+	5	-5.33020-	22032	3251	365		
5.30000+	5	-4.88582-	2	6.30000+	5	-1.65423-	3	7.30000+	5	5.68853-	22032	3251	366		
8.30000+	5	9.45490-	2	9.30000+	5	1.26220-	1	1.04000+	6	1.47888-	12032	3251	367		

.....10.....20.....30.....40.....50.....60.....MAT MF MT SEQ										
1.14000+	6	1.82715-	1	1.24000+	6	1.80384-	1	1.34000+	6	1.87263- 12032 3251 368
1.44000+	6	1.91232-	1	1.54000+	6	1.96400-	1	1.65000+	6	2.02884- 12032 3251 369
1.75000+	6	2.14513-	1	1.85000+	6	2.12933-	1	1.95000+	6	2.22634- 12032 3251 370
2.25000+	6	2.36603-	1	4.08000+	6	2.06686-	1	4.26000+	6	2.19447- 12032 3251 371
4.57000+	6	2.57713-	1	4.83000+	6	3.16061-	1	5.05000+	6	3.19910- 12032 3251 372
5.29000+	6	3.44803-	1	5.54000+	6	3.79034-	1	5.74000+	6	4.37308- 12032 3251 373
6.05000+	6	4.74042-	1	6.37000+	6	5.06844-	1	6.66000+	6	5.14650- 12032 3251 374
6.94000+	6	5.29589-	1	6.97000+	6	5.23785-	1	7.97000+	6	5.53646- 12032 3251 375
8.96000+	6	5.89747-	1	9.96000+	6	6.32777-	1	1.09500+	7	6.51730- 12032 3251 376
1.20400+	7	6.72309-	1	1.29400+	7	7.03481-	1	1.39400+	7	7.19514- 12032 3251 377
1.50000+	7	7.50406-	1	1.60000+	7	7.62380-	1	1.70000+	7	7.73449- 12032 3251 378
1.80000+	7	7.84974-	1	1.90000+	7	7.94312-	1	2.00000+	7	8.02947- 12032 3251 379
										2032 3 0 380
										2032 0 0 381
3.00700+	3	6.95573+ 0		1		1		0		02032 4 2 382
0.0 + 0	6.95573+ 0			0		2		81		82032 4 2 383
1.00000+	0	9.58442- 2	4.14604-	3	4.20187-14	0.0	+ 0	0.0	+ 0	02032 4 2 384
0.0 + 0	0.0	+ 0	0.0	+ 0	0:0	+ 0	9.87599-	1	1.71497- 12032 4 2 385	
1.41729-	2	5.69216-	4	1.21917-	5-4.26374-	7	0.0	+ 0	0.0	+ 02032 4 2 386
0.0 + 0	-9.41463-	2	9.67704-	1	2.42495-	1	2.93164-	2	2.05700- 32032 4 2 387	
8.99586-	5	1.45003-	6	1.53502-	7	0.0	+ 0	1.21639-	2-1.67004- 12032 4 2 388	
9.37457-	1	3.09449-	1	4.92299-	2	4.80782-	3	3.13488-	4	1.25821- 52032 4 2 389
0.0 + 0	-1.66448-	3	2.74452-	2-2.33650-	1	8.97772-	1	3.71857-	12032 4 2 390	
7.35196-	2	9.13548-	3	7.85108-	4	0.0	+ 0	2.32578-	4-4.38476- 32032 4 2 391	
4.68300-	2-2	2.94968-	1	8.49307-	1	4.28961-	1	1.01717-	1	1.53161- 22032 4 2 392
0.0 + 0	-3.28230-	5	6.87761-	4-8.58502-	3	7.00335-	2-3.50555-	12032 4 2 393		
7.92820-	1	4.79983-	1	1.33274-	1	0.0	+ 0	4.65781-	6-1.06487- 42032 4 2 394	
1.49694-	3-1	1.45237-	2	9.65710-	2-3.99796-	1	7.29186-	1	5.24206- 12032 4 2 395	
0.0 + 0	-6.63208-	7	1.62643-	5-2.52727-	4	2.79148-	3-2.23973-	22032 4 2 396		
										2032 4 2 397
1.25860-	1-4	4.42076-	1	6.59383-	1					
0.0 + 0	0.0	+ 0	0	0	0	0	1			662032 4 2 398
	66		2	0	0	0	0			02032 4 2 399
0.0 + 0	1.00000-	5	0	0	0	0	2			02032 4 2 400
0.0 + 0	0.0	+ 0								2032 4 2 401
0.0 + 0	1.00000-	4	0	0	0	2				02032 4 2 402
0.0 + 0	0.0	+ 0								2032 4 2 403
0.0 + 0	1.00000-	3	0	0	0	2				02032 4 2 404
0.0 + 0	0.0	+ 0								2032 4 2 405
0.0 + 0	2.53000-	2	0	0	0	2				02032 4 2 406
0.0 + 0	0.0	+ 0								2032 4 2 407
0.0 + 0	1.00000-	1	0	0	0	2				02032 4 2 408
0.0 + 0	0.0	+ 0								2032 4 2 409
0.0 + 0	1.00000+	0	0	0	0	2				02032 4 2 410
0.0 + 0	0.0	+ 0								2032 4 2 411
0.0 + 0	1.00000+	1	0	0	0	2				02032 4 2 412
0.0 + 0	0.0	+ 0								2032 4 2 413
0.0 + 0	1.00000+	2	0	0	0	2				02032 4 2 414
0.0 + 0	0.0	+ 0								2032 4 2 415
0.0 + 0	1.00000+	3	0	0	0	2				02032 4 2 416
0.0 + 0	0.0	+ 0								2032 4 2 417
0.0 + 0	1.00000+	4	0	0	0	2				02032 4 2 418
0.0 + 0	0.0	+ 0								2032 4 2 419
0.0 + 0	4.00000+	4	0	0	0	2				02032 4 2 420

							MAT	MF	MT	SEQ
.....	10.....	20.....	30.....	40.....	50.....	60.....				
0.0	+ 0 0.0	+ 0					2032	4	2	421
0.0	+ 0 5.00000+ 4		0	0		4	02032	4	2	422
7.17054-	2-7.26744-	3-1.03821-	3	1.01744-	2		2032	4	2	423
0.0	+ 0 7.00000+ 4		0	0		4	02032	4	2	424
8.28516-	2-5.78035-	3 2.68373-	3	4.97752-	3		2032	4	2	425
0.0	+ 0 8.50000+ 4		0	0		4	02032	4	2	426
1.12245-	1-1.45773-	3 3.95669-	3	3.37253-	3		2032	4	2	427
0.0	+ 0 1.00000+ 5		0	0		4	02032	4	2	428
1.12099-	1-5.92593-	3 8.25397-	3	1.31687-	3		2032	4	2	429
0.0	+ 0 1.20000+ 5		0	0		4	02032	4	2	430
1.30224-	1 4.37318-	3-5.62266-	3	6.15484-	3		2032	4	2	431
0.0	+ 0 2.07000+ 5		0	0		4	02032	4	2	432
3.84688-	1 9.05482-	2 1.01269-	2	3.57068-	3		2032	4	2	433
0.0	+ 0 2.57000+ 5		0	0		4	02032	4	2	434
1.87587-	1 8.20995-	2 1.33696-	2	1.73310-	3		2032	4	2	435
0.0	+ 0 3.07000+ 5		0	0		4	02032	4	2	436
-3.47086-	2 4.54486-	2 1.67930-	2	5.31180-	3		2032	4	2	437
0.0	+ 0 3.57000+ 5		0	0		4	02032	4	2	438
-1.67959-	1 1.08527-	2 6.42303-	3	2.41171-	3		2032	4	2	439
0.0	+ 0 4.07000+ 5		0	0		4	02032	4	2	440
-1.71076-	1-1.37566-	2-3.47695-	3	9.99412-	3		2032	4	2	441
0.0	+ 0 4.30000+ 5		0	0		4	02032	4	2	442
-1.47547-	1-2.17259-	2 9.28209-	3-7.89622-	4			2032	4	2	443
0.0	+ 0 4.57000+ 5		0	0		4	02032	4	2	444
-1.63314-	1-3.85799-	2 7.60778-	3 2.36686-	3			2032	4	2	445
0.0	+ 0 5.07000+ 5		0	0		4	02032	4	2	446
-1.52829-	1-1.93309-	2 1.11524-	2 1.07394-	2			2032	4	2	447
0.0	+ 0 5.30000+ 5		0	0		4	02032	4	2	448
-1.48764-	1-2.60870-	2-7.30727-	4 0.0	+ 0			2032	4	2	449
0.0	+ 0 6.30000+ 5		0	0		4	02032	4	2	450
-1.00785-	1-2.38220-	2-3.73972-	4 1.45433-	4			2032	4	2	451
0.0	+ 0 7.30000+ 5		0	0		4	02032	4	2	452
-4.08576-	2-1.77184-	2-4.16089-	3 7.95577-	3			2032	4	2	453
0.0	+ 0 8.30000+ 5		0	0		4	02032	4	2	454
-2.86123-	3-1.84549-	2-1.53280-	3 2.74201-	3			2032	4	2	455
0.0	+ 0 9.30000+ 5		0	0		4	02032	4	2	456
2.98977-	2-1.07692-	2 1.09890-	3 4.16667-	3			2032	4	2	457
0.0	+ 0 1.04000+ 6		0	0		4	02032	4	2	458
5.33923-	2 4.60177-	3-2.40202-	3 8.16126-	3			2032	4	2	459
0.0	+ 0 1.14000+ 6		0	0		4	02032	4	2	460
8.86403-	2 6.19621-	3 6.02410-	3 3.82482-	3			2032	4	2	461
0.0	+ 0 1.24000+ 6		0	0		4	02032	4	2	462
8.70668-	2 1.38631-	2 3.86427-	3 5.72931-	3			2032	4	2	463
0.0	+ 0 1.34000+ 6		0	0		4	02032	4	2	464
9.45315-	2 1.92910-	2 5.41750-	3 6.32042-	3			2032	4	2	465
0.0	+ 0 1.44000+ 6		0	0		4	02032	4	2	466
9.95636-	2 2.96236-	2 3.97475-	3 5.09183-	3			2032	4	2	467
0.0	+ 0 1.54000+ 6		0	0		4	02032	4	2	468
1.05833-	1 4.06667-	2 5.95238-	3 6.11111-	3			2032	4	2	469
0.0	+ 0 1.65000+ 6		0	0		4	02032	4	2	470
1.11844-	1 3.42951-	2 1.53103-	3 3.29761-	3			2032	4	2	471
0.0	+ 0 1.75000+ 6		0	0		4	02032	4	2	472
1.24548-	1 4.57048-	2 1.16764-	2 3.52145-	3			2032	4	2	473

									MAT	MF	MT	SEQ
.....	10.....	20.....	30.....	40.....	50.....	60.....						
0.0	+ 0	1.85000+ 6		0	0	4		02032	4	2	474	
1.23678-	1	5.22376- 2	8.13670-	3	1.03969- 2			2032	4	2	475	
0.0	+ 0	1.95000+ 6		0	0	4		02032	4	2	476	
1.34621-	1	6.41995- 2	9.53913-	3	8.31322- 3			2032	4	2	477	
0.0	+ 0	2.25000+ 6		0	0	4		02032	4	2	478	
1.49555-	1	7.34034- 2	1.60527-	2	9.43142- 3			2032	4	2	479	
0.0	+ 0	4.08000+ 6		0	0	4		02032	4	2	480	
1.32046-	1	2.09190- 1	4.32900-	2	3.01518- 2			2032	4	2	481	
0.0	+ 0	4.26000+ 6		0	0	4		02032	4	2	482	
1.45365-	1	2.14938- 1	5.58305-	2	3.35275- 2			2032	4	2	483	
0.0	+ 0	4.57000+ 6		0	0	4		02032	4	2	484	
1.85408-	1	2.32106- 1	8.32671-	2	3.78551- 2			2032	4	2	485	
0.0	+ 0	4.83000+ 6		0	0	4		02032	4	2	486	
2.45571-	1	2.44539- 1	1.00001- 1	5.34423- 2				2032	4	2	487	
0.0	+ 0	5.05000+ 6		0	0	4		02032	4	2	488	
2.48950-	1	2.41999- 1	1.08894- 1	3.55290- 2				2032	4	2	489	
0.0	+ 0	5.29000+ 6		0	0	4		02032	4	2	490	
2.73461-	1	2.34592- 1	1.05923- 1	3.26698- 2				2032	4	2	491	
0.0	+ 0	5.54000+ 6		0	0	4		02032	4	2	492	
3.08415-	1	2.38876- 1	1.17067- 1	3.83134- 2				2032	4	2	493	
0.0	+ 0	5.74000+ 6		0	0	4		02032	4	2	494	
3.69159-	1	2.58880- 1	1.28136- 1	3.57284- 2				2032	4	2	495	
0.0	+ 0	6.05000+ 6		0	0	4		02032	4	2	496	
4.09533-	1	2.90556- 1	1.29278- 1	5.02029- 2				2032	4	2	497	
0.0	+ 0	6.37000+ 6		0	0	4		02032	4	2	498	
4.42804-	1	2.95634- 1	1.50549- 1	3.99168- 2				2032	4	2	499	
0.0	+ 0	6.66000+ 6		0	0	4		02032	4	2	500	
4.50496-	1	2.92324- 1	1.43388- 1	3.92226- 2				2032	4	2	501	
0.0	+ 0	6.94000+ 6		0	0	4		02032	4	2	502	
4.66897-	1	3.06669- 1	1.54929- 1	4.62866- 2				2032	4	2	503	
0.0	+ 0	6.97000+ 6		0	0	6		02032	4	2	504	
4.61771-	1	3.15216- 1	1.59079- 1	4.77753- 2	3.85383- 3	1.97985- 3		32032	4	2	505	
0.0	+ 0	7.97000+ 6		0	0	6		02032	4	2	506	
4.92375-	1	3.20425- 1	1.67250- 1	5.17429- 2	3.63933- 3	0.0	+ 0	02032	4	2	507	
0.0	+ 0	8.96000+ 6		0	0	6		02032	4	2	508	
5.31612-	1	3.48709- 1	1.76186- 1	5.70891- 2	0.0	+ 0	-1.16446-	32032	4	2	509	
0.0	+ 0	9.96000+ 6		0	0	6		02032	4	2	510	
5.76852-	1	3.69630- 1	2.01323- 1	6.72840- 2	7.57576- 3	3.06268- 3		32032	4	2	511	
0.0	+ 0	1.09500+ 7		0	0	8		02032	4	2	512	
5.96985-	1	3.80302- 1	2.08758- 1	6.90117- 2	5.93878- 3	1.54619- 4		42032	4	2	513	
-1.20603-	3	0.0	+ 0					2032	4	2	514	
0.0	+ 0	1.20400+ 7		0	0	8		02032	4	2	515	
6.20014-	1	4.07265- 1	2.35958- 1	8.98623- 2	1.90365- 2	8.13609- 3		32032	4	2	516	
1.99430-	3	0.0	+ 0					2032	4	2	517	
0.0	+ 0	1.29400+ 7		0	0	6		02032	4	2	518	
6.53392-	1	4.27434- 1	2.47946- 1	9.52557- 2	1.90064- 2	4.76515- 3		32032	4	2	519	
0.0	+ 0	1.39400+ 7		0	0	6		02032	4	2	520	
6.70996-	1	4.42975- 1	2.60584- 1	1.05208- 1	2.23248- 2	6.26646- 3		32032	4	2	521	
0.0	+ 0	1.50000+ 7		0	0	6		02032	4	2	522	
7.04626-	1	4.67632- 1	2.55400- 1	1.00161- 1	2.64489- 2	5.98540- 3		32032	4	2	523	
0.0	+ 0	1.60000+ 7		0	0	6		02032	4	2	524	
7.17631-	1	4.78343- 1	2.68029- 1	1.09354- 1	3.11370- 2	7.46669- 3		32032	4	2	525	
0.0	+ 0	1.70000+ 7		0	0	8		02032	4	2	526	

							MAT	MF	MT	SEQ				
.....	10	.....	20	.....	30	.....	40	.....	50	.....	60	.....		
7.29635-	1	4.89039-	1	2.80047-	1	1.18827-	1	3.62237-	2	9.15646-	32032	4	2	527
1.89916-	3	0.0	+ 0								2032	4	2	528
0.0	+ 0	1.80000+	7		0		0		8		02032	4	2	529
7.42211-	1	4.99881-	1	2.89938-	1	1.26401-	1	4.05877-	2	1.06253-	22032	4	2	530
2.27914-	3	0.0	+ 0								2032	4	2	531
0.0	+ 0	1.90000+	7		0		0		8		02032	4	2	532
7.52553-	1	5.10666-	1	3.01441-	1	1.36314-	1	4.62499-	2	1.26687-	22032	4	2	533
2.84769-	3	0.0	+ 0								2032	4	2	534
0.0	+ 0	2.00000+	7		0		0		8		02032	4	2	535
7.62176-	1	5.21351-	1	3.12649-	1	1.46325-	1	5.21684-	2	1.49034-	22032	4	2	536
3.49192-	3	0.0	+ 0								2032	4	2	537
											2032	4	0	538
3.00700+	3	6.95573+	0		0		2		0		02032	4	16	539
0.0	+ 0	6.95573+	0		0		1		0		02032	4	16	540
0.0	+ 0	0.0	+ 0		0		0		1		22032	4	16	541
2	2			0		0		0			02032	4	16	542
0.0	+ 0	8.30000+	6		0		0		1		22032	4	16	543
2	2			0		0		0			02032	4	16	544
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1				2032	4	16	545
0.0	+ 0	2.00000+	7		0		0		1		22032	4	16	546
2	2			0		0		0			02032	4	16	547
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1				2032	4	16	548
											2032	4	0	549
3.00700+	3	6.95573+	0		0		2		0		02032	4	24	550
0.0	+ 0	6.95573+	0		0		1		0		02032	4	24	551
0.0	+ 0	0.0	+ 0		0		0		1		22032	4	24	552
2	2			0		0		0			02032	4	24	553
0.0	+ 0	1.00000+	7		0		0		1		22032	4	24	554
2	2			0		0		0			02032	4	24	555
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1				2032	4	24	556
0.0	+ 0	2.00000+	7		0		0		1		22032	4	24	557
2	2			0		0		0			02032	4	24	558
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1				2032	4	24	559
											2032	4	0	560
3.00700+	3	6.95573+	0		0		2		0		02032	4	51	561
0.0	+ 0	6.95573+	0		0		2		0		02032	4	51	562
0.0	+ 0	0.0	+ 0		0		0		1		22032	4	51	563
2	2			0		0		0			02032	4	51	564
0.0	+ 0	5.46130+	5		0		0		1		22032	4	51	565
2	2			0		0		0			02032	4	51	566
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1				2032	4	51	567
0.0	+ 0	2.00000+	7		0		0		1		22032	4	51	568
2	2			0		0		0			02032	4	51	569
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1				2032	4	51	570
											2032	4	0	571
3.00700+	3	6.95573+	0		0		2		0		02032	4	91	572
0.0	+ 0	6.95573+	0		0		1		0		02032	4	91	573
0.0	+ 0	0.0	+ 0		0		0		1		22032	4	91	574
2	2			0		0		0			02032	4	91	575
0.0	+ 0	2.81910+	6		0		0		1		22032	4	91	576
2	2			0		0		0			02032	4	91	577
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1				2032	4	91	578
0.0	+ 0	2.00000+	7		0		0		1		22032	4	91	579

							MAT	MF,MT	SEQ
.....	10.....	20.....	30.....	40.....	50.....	60.....			
	2	2	0	0	0	0	02032	4 91	580
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1		
							2032	4 91	581
							2032	4 0	582
							2032	0 0	583
3.00700+	3	6.95573+	0	0	0	1	02032	5 16	584
7.25673+	6	0.0	+ 0	0	9	1	22032	5 16	585
	2			0	0	0	02032	5 16	586
8.30000+	6	1.00000+	0	2.00000+	7	1.00000+	0		
0.0	+ 0	0.0	+ 0	0	0	1	22032	5 16	588
	2			0	0	0	02032	5 16	589
8.30000+	6	6.05000+	5	2.00000+	7	9.39110+	5		
							2032	5 16	590
							2032	5 0	591
3.00700+	3	6.95573+	0	0	0	1	02032	5 24	592
8.74304+	6	0.0	+ 0	0	9	1	22032	5 24	593
	2			0	0	0	02032	5 24	594
1.00000+	7	1.00000+	0	2.00000+	7	1.00000+	0		
0.0	+ 0	0.0	+ 0	0	0	1	22032	5 24	596
	2			0	0	0	02032	5 24	597
1.00000+	7	3.58300+	5	2.00000+	7	5.06660+	5		
							2032	5 24	598
							2032	5 0	599
3.00700+	3	6.95573+	0	0	0	1	02032	5 91	600
2.46475+	6	0.0	+ 0	0	9	1	22032	5 91	601
	2			0	0	0	02032	5 91	602
2.81910+	6	1.00000+	0	2.00000+	7	1.00000+	0		
0.0	+ 0	0.0	+ 0	0	0	1	42032	5 91	604
	4			0	0	0	02032	5 91	605
2.81910+	6	1.00000+	5	5.80000+	6	7.00000+	5	8.00000+ 6 2.80000+	62032 5 91 606
2.00000+	7	7.17140+	6				2032	5 91	607
							2032	5 0	608
							2032	0 0	609
								0 0 0	610
							-1 0	0	0