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IONIZATION CROSS SECTIONS FOR  
ION-ATOM AND ION-MOLECULE  
COLLISIONS, I

(IONIZATION CROSS SECTIONS FOR  
 $H^+$ ,  $H_2^+$ ,  $H_3^+$ ,  $He^+$  AND  $He^{++}$  INCIDENT  
ON H,  $H_2$  AND He)

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and Yohta NAKAI

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Ionization cross sections for ion-atom and ion-molecule collisions, I  
( Ionization cross sections for  $H^+$ ,  $H_2^+$ ,  $H_3^+$ ,  $He^+$  and  $He^{++}$  incident  
on H,  $H_2$  and He )

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A survey has been made systematically of the literature up to the end of 1980. A compilation is presented of experimental ionization cross sections in graphs and tables together with a list of references.

Keywords: Ionization, Hydrogen, Hydrogen Ion, Helium, Helium Ion,  
Ion-atom Collision, Cross Section

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イオン-原子・分子衝突電離断面積・I  
( $H^+$ ,  $H_2^+$ ,  $H_3^+$ ,  $H_e^+$ ,  $H_e^{2+}$ , と  $H$ ,  $H_2$ ,  $H_e$   
との衝突電離断面積)

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1980年末までに発表された文献を系統的に調査し、電離断面積をグラフと数値表にまとめるとともにそれらの文献リストを付けた。

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## INTRODUCTION

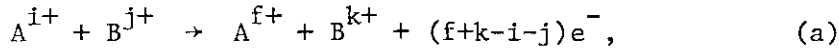
Ionization by positive ions incident on atoms and molecules is one of the basic processes in many fields such as plasma physics, radiation physics, atmospheric physics and so on. Especially in magnetically-confined fusion plasmas, the ionization process is responsible for plasma-cooling due to ejected cold electrons.<sup>1)</sup>

Several compilations available at present<sup>2-4)</sup> are those of the ionization cross sections for proton incident collisions. These compilations are inconvenient for application because of no numerical data table. In order to make a compilation more usable, it is necessary to attach numerical data tables together with.

In this report a compilation is presented in graphs and tables of experimental ionization cross sections. These numerical data stored in a computer are to be evaluated for producing the Japanese Evaluated Atomic and Molecular Data Library (JEAMDL), 1st edition.

Ionization Processes and Experimental Methods

In general ionization and charge changing processes can be represented as follows :



where the superscripts denote net charges. In the case of a neutral target ( $j=0$ ), the ionization cross section  $\sigma_{ion}$  and the charge changing cross section  $\sigma_{if}$  are defined by

$$\sigma_{ion} = \sum_{k>0} \sigma_{if}^{0k} \quad (i=f)$$

and

$$\sigma_{if} = \sum_k \sigma_{if}^{0k} \quad (i \neq f),$$

where  $\sigma_{if}^{0k}$  is the cross section for the process (a). The cross sections for processes occurring in a collision system ( $He^+ - He$ ) are summarized in the following table. It is found from this table that an elementary process to be measured is always accompanied with several simultaneous elementary processes. Therefore it is necessary to evaluate the measured cross sections by taking account of experimental methods, collision partners and impact energies.

	Positive Ion		Negative Ion/ Electron		
	fast	slow	fast	slow	
$He^+ - He \rightarrow$		$He^{++}$	$He^-$		$\sigma_{11}^{02}$ } $\sigma_{11}$
	$He^0$	$He^+$			$\sigma_{10}^{01}$ }
		$He^{++}$	$e^-$		$\sigma_{10}^{02}$ } $\sigma_{10}$
	$He^+$	$He^+$		$e^-$	$\sigma_{11}^{01}$ }
		$He^{++}$		$2e^-$	$\sigma_{11}^{02}$ } $\sigma_{ion}$
	$He^{++}$	$He^0$	$e^-$		$\sigma_{12}^{00}$ }
				$(He^-)$	$\sigma_{12}^{01}$ }
		$He^+$	$e^-$	$e^-$	$\sigma_{12}^{01}$ }
		$He^{++}$	$e^-$	$2e^-$	$\sigma_{12}^{02}$ } $\sigma_{12}$
		$\underbrace{\hspace{10em}}_{\sigma_+}$		$\underbrace{\hspace{10em}}_{\sigma_-}$	



Experimental methods may be classified into the following groups according to their characteristics:

1. Condenser method

Slow ions and electrons are collected to the condenser plates in order to measure the current intensities. The cross sections of  $\sigma_+$  and  $\sigma_-$  are determined from these intensities.

2. Energy loss measurement

When the projectile is a fully stripped ion, the ionization cross section is determined by integrating the energy loss spectrum of the projectile over the region higher than the target ionization energy.

3. Double differential cross section measurement

Secondary electrons produced in the collision are detected by an electron energy analyzer at various angles. The electron production cross section is determined from the double differential cross section. This method enable one to extract the contribution of charge changing processes to the electron spectra.

4. Coincidence detection

The ionization cross section is determined by means of the detection of the ionized target gas in coincidence with the projectile ions emerging from the collision region.

The cross sections for  $H^+$  and  $He^{++}$  incident on H and He are those for pure ionization. For  $H_2$  target, it is to be noted that the pure and dissociative ionization processes occur simultaneously. Therefore the cross sections measured by the methods different from the coincidence detection include some contribution from the dissociative ionization.

Available data for  $H_2^+$  and  $He^+$  projectiles were measured using the condenser method. The collected cross sections include appreciable contribution of electron loss processes in the region of energy higher than about 100 keV.

## Data Compilation

The literatures for the experimental ionization cross sections were searched with use of both bibliographies edited by Hawthorne et al.<sup>5)</sup> and Barnett and Wiese.<sup>6)</sup> In this search covering the period through 1980, major journals and reports of conferences were scanned systematically. Only the data on target ionization were included in this compilation. For the data on electron stripping of projectiles, the compilation<sup>7)</sup> has been completed.

In Table A shown are the searched processes. There were not the experimental cross sections for  $H_2^+$ ,  $H_3^+$ ,  $He^+$ ,  $He^{++}$  incident on H and for  $H_3^+$  on He.

In Table B given is the list of the measurements for various ionization processes, which includes name of authors, year, projectile, target, energy range, experimental method and reference number.

When there is no data table in the original literature, the numerical data have been read from the figures using a computer. The reading error is estimated within 5 % and no correction concerning to this error has been made. The experimental errors cited in graphs and tables are those in original literatures.

## Acknowledgements

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## EXPLANATION OF GRAPHS AND TABLES

## Explanation of Graphs

Energy of incident ion ; in eV  
 Cross section per target atom or molecule; in  $\text{cm}^2$

## Explanation of Tables

E(KEV) Projectile energy ; in keV  
 E(AU) " ; in atomic units  
 V(10(8)\*CM/SEC) Projectile velocity; in  $10^8$  cm/sec  
 SIGMA(CM(2)) Cross section ; in  $\text{cm}^2$   
 SIGMA(AU) " ; in atomic units  
 SIGMA(PI\*AO(2)) " ; in  $\pi a_0^2$   
 ERROR(%) Relative error

--- denotes that the entries are the values from original literature.

Values of errors were cited from original literature. When total errors were not given, they were estimated as the square root of the sum of the squares of the each experimental error.

## Experimental Methods

$C\sigma_-$  Condenser method (electron production)  
 $C\sigma_+$  " (slow ion production)  
 CD Coincidence detection  
 EL Energy loss measurement  
 DDCS Double differential cross section measurement

## GRAPHS AND TABLES

Table A. Compiled Processes

No.	Projectiles		Targets	Remarks
(1)	$H^+$	-	H	
(2)		-	$H_2$	
(3)		-	He	
	$H_2^+$	-	H	No Data
(4)		-	$H_2$	
(5)		-	He	
	$H_3^+$	-	H	No Data
(6)		-	$H_2$	
		-	He	No Data
	$He^+$	-	H	No Data
(7)		-	$H_2$	
(8)		-	He	
	$He^{++}$	-	H	No Data
(9)		-	$H_2$	
(10)		-	He	

Table B List of Measurements

Authors	Year	Projectile	Target	Energy(keV)	Method	Reference
Keene	1949	$H^+$ , $H_2^+$ , $He^+$	$H_2$ , He	3 - 35	$C\sigma_-$	16
Fogel et al.	1955	$H^+$	$H_2$	12 - 37	$C\sigma_-$	7
Fedorenko et al.	1956	$He^+$ , $Ne^+$ , $Ar^+$	He, Ne, Ar, Kr	20 - 180	$C\sigma_-$	5
Gilbody-Hasted	1957	$H^+$ , $H_2^+$ , $He^+$ , $Ne^+$ , $Ar^+$ , $Kr^+$	$H_2$ , He, Ne, Ar, Kr	0.1 - 40	$C\sigma_-$	8
Afrosimov et al.	1958	$H^+$ , $H_2^+$ , $H_3^+$	$H_2$	5 - 180	$C\sigma_-$	1
Fite et al.	1960	$H^+$	H	0.4 - 40	$C\sigma_-$	6
Schwirzke	1960	$H^+$ , H	$H_2$	9 - 60	$C\sigma_-$	32
Hooper et al.	1961	$H^+$	$H_2$	150 - 1100	$C\sigma_-$	14
McDaniel et al.	1961	$H^+$	He, Ne, Ar, $H_2$ , $N_2$ , CO, $O_2$	150 - 1100	$C\sigma_-$	19
Solov'ev et al.	1962	$H^+$ , H	$H_2$ , $N_2$ , He, Ne, Ar, Kr	10 - 180	$C\sigma_-$	33
Gilbody et al.	1963	$He^+$ , $Ne^+$ , $Ar^+$ , $Kr^+$	$H_2$ , He, Ne, Ar, Kr	60 - 450	$C\sigma_-$	9
Gilbody-Lee	1963	$H^+$	$H_2$ , He, Ne, Ar, Kr	100 - 450	$C\sigma_-$	10
Kuyatt-Jorgensen	1963	$H^+$	$H_2$	50 - 100	DDCS	15

Table B List of Measurements

Authors	Year	Projectile	Target	Energy(keV)	Method	Reference
Rudd-Jorgensen	1963	H <sup>+</sup>	H <sub>2</sub> , He	50 - 150	DDCS	26
Gilbody-Ireland	1964	H <sup>+</sup>	H	60 - 400	C $\alpha$ <sub>-</sub>	11
Gordeev-Panov	1964	H <sup>+</sup> , H <sub>2</sub> <sup>+</sup> , H <sub>3</sub> <sup>+</sup>	H <sub>2</sub> , N <sub>2</sub> , Ar	1 - 40	C $\alpha$ <sub>-</sub>	12
Langley et al.	1964	He <sup>+</sup>	He, Ne, Ar, H <sub>2</sub> , N <sub>2</sub> , O <sub>2</sub> , CO	133 - 1000	C $\alpha$ <sub>-</sub>	17
Solov'ev et al.	1964	He <sup>+</sup> , He	He, Ar, H <sub>2</sub> , N <sub>2</sub>	150 - 180	C $\alpha$ <sub>-</sub>	34
Hollricher	1965	H <sup>+</sup> , H <sub>2</sub> <sup>+</sup> , D <sup>+</sup> , D <sub>2</sub> <sup>+</sup>	H <sub>2</sub> , D <sub>2</sub>	1.5 - 30	C $\alpha$ <sub>-</sub>	13
de Heer et al.	1966	H <sup>+</sup>	He, Ne, Ar, Kr, H <sub>2</sub> , N <sub>2</sub> , O <sub>2</sub>	10 - 140	C $\alpha$ <sub>-</sub>	3
de Heer et al.	1966	He <sup>+</sup>	He, Ne, Ar, Kr, H <sub>2</sub> , N <sub>2</sub> , O <sub>2</sub>	10 - 140	C $\alpha$ <sub>-</sub>	4
Rudd et al.	1966	H <sup>+</sup>	H <sub>2</sub> , He	100 - 300	DDCS	27
Rudolph-Melton	1966	He <sup>++</sup>	He, Ne, Ar, Kr, H <sub>2</sub> , D <sub>2</sub> , O <sub>2</sub> , CH <sub>4</sub> , H <sub>2</sub> O, C <sub>2</sub> H <sub>2</sub> , C <sub>2</sub> H <sub>4</sub> , C <sub>2</sub> H <sub>6</sub> , N <sub>2</sub>	2200	C $\alpha$ <sub>+</sub>	31
Pivovarov-Levchenko	1967	H <sup>+</sup>	H <sub>2</sub> , N <sub>2</sub> , He, Ne, Ar, Kr	1000 - 3000	C $\alpha$ <sub>-</sub>	23
Pivovarov et al.	1968	He <sup>+</sup>	H <sub>2</sub> , N <sub>2</sub> , He	200 - 1800	C $\alpha$ <sub>-</sub>	24

Table B List of Measurements

Authors	Year	Projectile	Target	Energy(keV)	Method	Reference
Afroshimov et al.	1969	H <sup>+</sup>	H <sub>2</sub>	5 - 50	CD	2
Park-Schowengerdt	1969	H <sup>+</sup>	He	25 - 125	EL	21
Puckett et al.	1969	He <sup>++</sup> , He, H	He, Ar, H <sub>2</sub> , N <sub>2</sub>	200 - 1000	Cσ <sub>-</sub>	25
Latykov et al.	1970	He <sup>++</sup> , He	He	0.4 - 8	Cσ <sub>-</sub>	18
Stolterfoht	1971	H <sup>+</sup>	He	200 - 500	DDCS	35
Toburen-Wilson	1972	H <sup>+</sup>	H <sub>2</sub>	300 - 1500	DDCS	36
Manson et al.	1975	H <sup>+</sup>	He	100 - 5000	DDCS	20
Rudd-Madison	1976	H <sup>+</sup>	He	5 - 100	DDCS	28
Rudd et al.	1976	H <sup>+</sup>	He	5 - 5000	DDCS	29
Park et al.	1977	H <sup>+</sup>	H	25 - 200	EL	22
Rudd	1979	H <sup>+</sup>	H <sub>2</sub> , N <sub>2</sub>	5 - 100	DDCS	30



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Graphs and Tables of Ionization Cross Sections

Fig. 1  $H^+ + H$

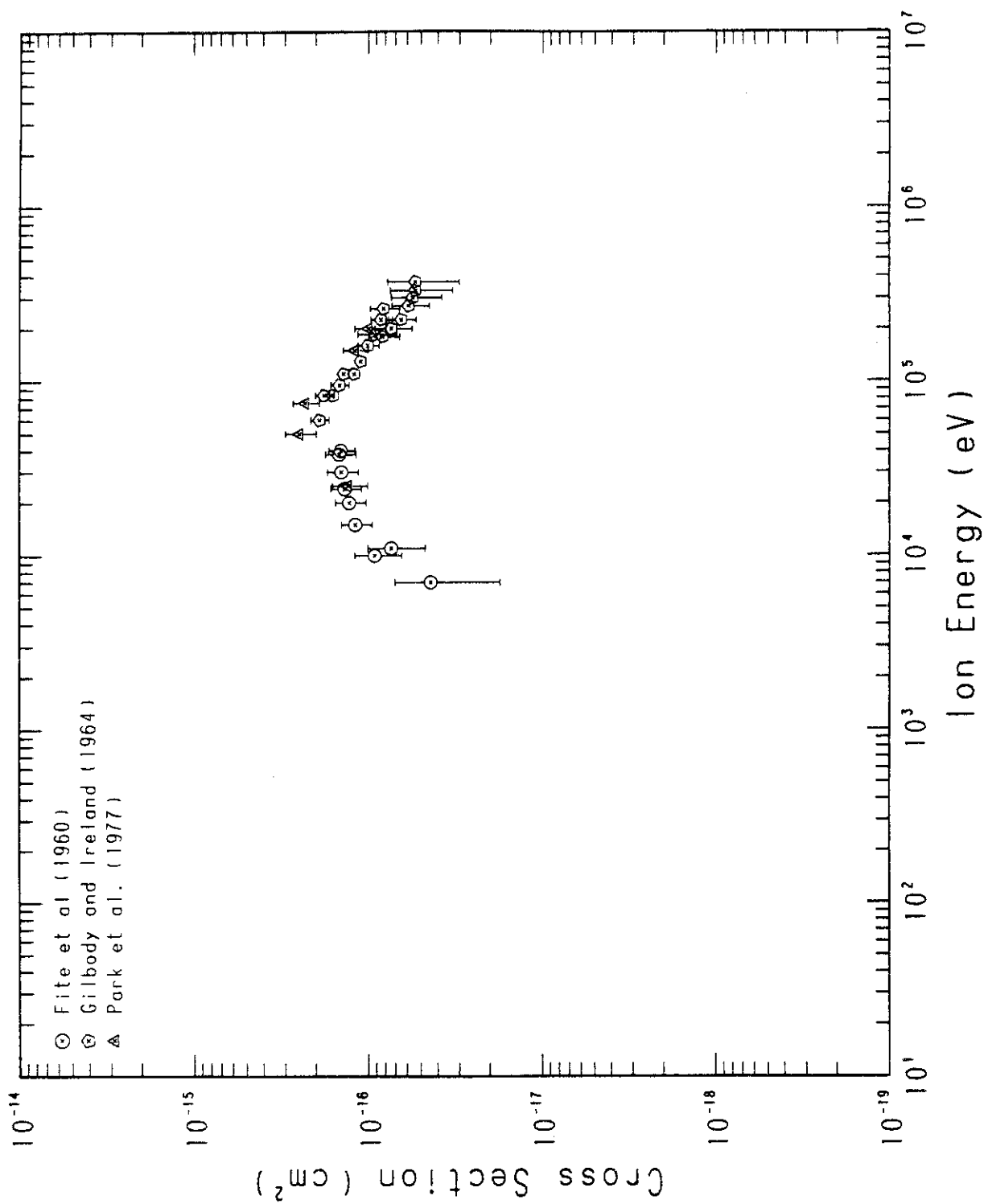


TABLE 1

PROCESS : H+ - H IONIZATION  
 FITE ET AL., PHYS. REV. 119 663 (1960)

DATA FROM FIGURES

E(KEV) -----	E(AU)	V(10(8)*CM/SEC)	SIGMA(CM(2)) -----	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
7.00E+00	2.57E+02	1.16E+00	4.40E-17	1.57E+00	5.00E-01	60.0
1.00E+01	3.67E+02	1.39E+00	9.20E-17	3.29E+00	1.05E+00	30.0
1.10E+01	4.04E+02	1.46E+00	7.40E-17	2.64E+00	8.41E-01	36.0
1.50E+01	5.51E+02	1.70E+00	1.19E-16	4.25E+00	1.35E+00	20.0
2.00E+01	7.35E+02	1.96E+00	1.29E-16	4.61E+00	1.47E+00	20.0
2.40E+01	8.82E+02	2.15E+00	1.37E-16	4.89E+00	1.56E+00	20.0
3.00E+01	1.10E+03	2.41E+00	1.43E-16	5.11E+00	1.63E+00	20.0
3.80E+01	1.40E+03	2.71E+00	1.47E-16	5.25E+00	1.67E+00	20.0
4.00E+01	1.47E+03	2.78E+00	1.44E-16	5.14E+00	1.64E+00	17.0

TABLE 1 - CONTINUED

PROCESS : H+ - H IONIZATION  
 GILBODY AND IRELAND, PROC. ROY. SOC. (LONDON) 277A 137 (1964)

DATA FROM FIGURES

E(KEV) -----	E(AU)	V(10(8)*CH/SEC)	SIGMA(CH(2)) -----	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
6.00E+01	2.20E+03	3.40E+00	1.91E-16	6.82E+00	2.17E+00	12.0
8.30E+01	3.05E+03	4.00E+00	1.80E-16	6.43E+00	2.05E+00	12.0
8.30E+01	3.05E+03	4.00E+00	1.60E-16	5.71E+00	1.82E+00	8.0
9.50E+01	3.49E+03	4.28E+00	1.47E-16	5.25E+00	1.67E+00	12.0
1.10E+02	4.04E+03	4.61E+00	1.39E-16	4.96E+00	1.58E+00	7.4
1.10E+02	4.04E+03	4.61E+00	1.21E-16	4.32E+00	1.38E+00	7.4
1.30E+02	4.78E+03	5.01E+00	1.11E-16	3.96E+00	1.26E+00	7.3
1.60E+02	5.88E+03	5.56E+00	1.01E-16	3.61E+00	1.15E+00	14.0
1.80E+02	6.61E+03	5.89E+00	8.30E-17	2.96E+00	9.43E-01	20.0
1.85E+02	6.80E+03	5.97E+00	9.20E-17	3.29E+00	1.05E+00	25.0
2.00E+02	7.35E+03	6.21E+00	7.40E-17	2.64E+00	8.41E-01	24.0
2.25E+02	8.27E+03	6.59E+00	8.50E-17	3.04E+00	9.66E-01	14.0
2.25E+02	8.27E+03	6.59E+00	6.50E-17	2.32E+00	7.39E-01	18.0
2.60E+02	9.55E+03	7.08E+00	8.20E-17	2.93E+00	9.32E-01	19.0
2.70E+02	9.92E+03	7.22E+00	5.90E-17	2.11E+00	6.71E-01	24.0
3.00E+02	1.10E+04	7.61E+00	5.60E-17	2.00E+00	6.37E-01	32.0
3.30E+02	1.21E+04	7.98E+00	5.40E-17	1.93E+00	6.14E-01	39.0
3.70E+02	1.36E+04	8.45E+00	5.40E-17	1.93E+00	6.14E-01	44.0



TABLE 1 - CONTINUED

PROCESS : H+ - H IONIZATION  
 PARK ET AL., PHYS. REV. A15 508 (1977)

DATA FROM FIGURES

E(KEV) -----	E(AU)	V(10(8)*CM/SEC)	SIGMA(CM(2)) -----	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
2.50E+01	9.19E+02	2.20E+00	1.31E-16	4.68E+00	1.49E+00	23.0
5.00E+01	1.84E+03	3.11E+00	2.49E-16	8.89E+00	2.83E+00	20.0
7.50E+01	2.76E+03	3.80E+00	2.31E-16	8.25E+00	2.63E+00	17.0
1.50E+02	5.51E+03	5.38E+00	1.20E-16	4.29E+00	1.36E+00	16.0
2.00E+02	7.35E+03	6.21E+00	1.00E-16	3.57E+00	1.14E+00	20.0

Fig. 2  $H^+ - H_2$

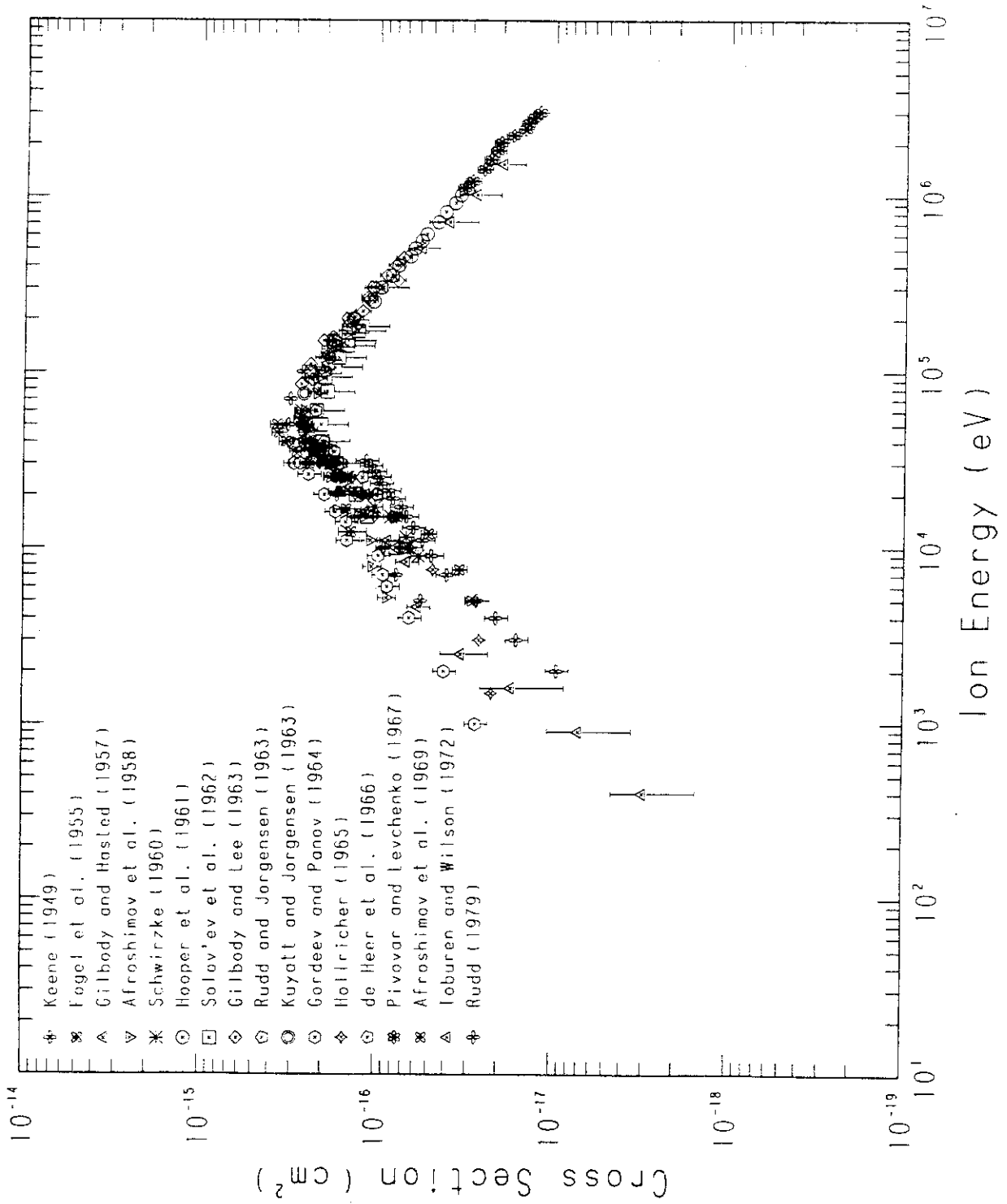


TABLE 2

PROCESS : H+-H2 IONIZATION  
 KEENE, PHIL. MAG. 40 369 (1949)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
2.00E+00	7.35E+01	6.21E-01	9.40E-18	3.36E-01	1.07E-01	15.0
3.00E+00	1.10E+02	7.61E-01	1.60E-17	5.71E-01	1.82E-01	15.0
4.00E+00	1.47E+02	8.79E-01	2.10E-17	7.50E-01	2.39E-01	15.0
5.00E+00	1.84E+02	9.82E-01	2.70E-17	9.64E-01	3.07E-01	15.0
7.00E+00	2.57E+02	1.16E+00	4.00E-17	1.43E+00	4.55E-01	15.0
9.00E+00	3.31E+02	1.32E+00	4.90E-17	1.75E+00	5.57E-01	15.0
1.10E+01	4.04E+02	1.46E+00	5.50E-17	1.96E+00	6.25E-01	15.0
1.30E+01	4.78E+02	1.58E+00	6.20E-17	2.21E+00	7.05E-01	15.0
1.50E+01	5.51E+02	1.70E+00	6.80E-17	2.43E+00	7.73E-01	15.0
1.70E+01	6.25E+02	1.81E+00	7.30E-17	2.61E+00	8.30E-01	15.0
1.90E+01	6.98E+02	1.91E+00	7.30E-17	2.61E+00	8.30E-01	15.0
2.10E+01	7.72E+02	2.01E+00	8.10E-17	2.89E+00	9.21E-01	15.0
2.30E+01	8.45E+02	2.11E+00	8.60E-17	3.07E+00	9.78E-01	15.0
2.50E+01	9.19E+02	2.20E+00	9.50E-17	3.39E+00	1.08E+00	15.0
2.70E+01	9.92E+02	2.28E+00	9.80E-17	3.50E+00	1.11E+00	15.0
2.90E+01	1.07E+03	2.37E+00	1.04E-16	3.71E+00	1.18E+00	15.0
3.10E+01	1.14E+03	2.45E+00	1.09E-16	3.89E+00	1.24E+00	15.0
			1.15E-16	4.11E+00	1.31E+00	15.0

PROCESS : H+-H2 IONIZATION  
 FOGEL ET AL., SOV. PHYS. JETP 1 415 (1955)

DATA FROM TABLES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.23E+01	4.52E+02	1.54E+00	1.40E-16	5.00E+00	1.59E+00	18.0
1.66E+01	6.10E+02	1.79E+00	1.50E-16	5.36E+00	1.71E+00	18.0
2.08E+01	7.64E+02	2.00E+00	1.60E-16	5.71E+00	1.82E+00	18.0
2.54E+01	9.33E+02	2.21E+00	1.70E-16	6.07E+00	1.93E+00	18.0
2.97E+01	1.09E+03	2.39E+00	1.80E-16	6.43E+00	2.05E+00	18.0
3.30E+01	1.21E+03	2.52E+00	2.00E-16	7.14E+00	2.27E+00	18.0
3.67E+01	1.35E+03	2.66E+00	2.20E-16	7.86E+00	2.50E+00	18.0

TABLE 2 - CONTINUED

PROCESS : H+-H2 IONIZATION  
GILKROY AND HASTED, PROC. ROY. SOC. (LONDON) 240A 382 (1957)

DATA FROM TABLES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
4.00E-01	1.47E+01	2.78E-01	3.00E-18	1.07E-01	3.41E-02	50.0
9.00E-01	3.31E+01	4.17E-01	7.00E-18	2.50E-01	7.96E-02	50.0
1.60E+00	5.88E+01	5.56E-01	1.70E-17	6.07E-01	1.93E-01	50.0
2.50E+00	9.19E+01	6.95E-01	3.30E-17	1.18E+00	3.75E-01	30.0
4.60E+00	1.69E+02	9.42E-01	5.81E-17	2.07E+00	6.60E-01	15.0
8.30E+00	3.05E+02	1.27E+00	6.77E-17	2.42E+00	7.70E-01	15.0
1.00E+01	3.67E+02	1.39E+00	7.78E-17	2.78E+00	8.84E-01	15.0
1.10E+01	4.04E+02	1.46E+00	8.65E-17	3.09E+00	9.83E-01	15.0
1.60E+01	5.88E+02	1.76E+00	1.16E-16	4.14E+00	1.32E+00	15.0
2.00E+01	7.35E+02	1.96E+00	1.25E-16	4.46E+00	1.42E+00	15.0
2.20E+01	8.08E+02	2.06E+00	1.42E-16	5.07E+00	1.61E+00	15.0
3.00E+01	1.10E+03	2.41E+00	1.77E-16	6.32E+00	2.01E+00	15.0
3.30E+01	1.21E+03	2.52E+00	2.12E-16	7.57E+00	2.41E+00	15.0
3.60E+01	1.32E+03	2.64E+00	2.36E-16	8.43E+00	2.68E+00	15.0
4.10E+01	1.51E+03	2.81E+00	2.64E-16	9.43E+00	3.00E+00	15.0

PROCESS : H+-H2 IONIZATION  
AFROSIMOV ET AL., SOV. PHYS. JETP 7 968 (1958)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
5.20E+00	1.91E+02	1.00E+00	8.80E-17	3.14E+00	1.00E+00	12.0
7.80E+00	2.87E+02	1.23E+00	1.07E-16	3.82E+00	1.22E+00	12.0
1.10E+01	4.04E+02	1.46E+00	1.09E-16	3.89E+00	1.24E+00	12.0
1.50E+01	5.51E+02	1.70E+00	1.19E-16	4.25E+00	1.35E+00	12.0
2.50E+01	9.19E+02	2.20E+00	1.52E-16	5.43E+00	1.73E+00	12.0
3.00E+01	1.10E+03	2.41E+00	1.88E-16	6.71E+00	2.14E+00	12.0
3.80E+01	1.40E+03	2.71E+00	1.94E-16	6.93E+00	2.21E+00	12.0
4.70E+01	1.73E+03	3.01E+00	2.49E-16	8.89E+00	2.83E+00	12.0
5.40E+01	1.98E+03	3.23E+00	2.66E-16	9.50E+00	3.02E+00	12.0
6.00E+01	2.20E+03	3.40E+00	2.60E-16	9.28E+00	2.96E+00	12.0
7.50E+01	2.76E+03	3.80E+00	2.21E-16	7.89E+00	2.51E+00	12.0
9.10E+01	3.34E+03	4.19E+00	2.21E-16	7.89E+00	2.51E+00	12.0
1.03E+02	3.79E+03	4.46E+00	2.01E-16	7.18E+00	2.28E+00	12.0
1.20E+02	4.41E+03	4.81E+00	2.02E-16	7.21E+00	2.30E+00	12.0
1.34E+02	4.92E+03	5.08E+00	1.88E-16	6.71E+00	2.14E+00	12.0
1.46E+02	5.37E+03	5.31E+00	1.76E-16	6.29E+00	2.00E+00	12.0
1.62E+02	5.95E+03	5.59E+00	1.55E-16	5.54E+00	1.76E+00	12.0
1.79E+02	6.58E+03	5.88E+00	1.35E-16	4.82E+00	1.53E+00	12.0

TABLE 2 - CONTINUED

PROCESS : H<sup>+</sup>-H<sub>2</sub> IONIZATION  
 SCHWIRZKE, Z. PHYS. 157 510 (1960)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
9.00E+00	3.31E+02	1.32E+00	5.81E-17	2.07E+00	6.60E-01	10.0
1.00E+01	3.67E+02	1.39E+00	6.66E-17	2.38E+00	7.57E-01	10.0
1.15E+01	4.23E+02	1.49E+00	6.80E-17	2.43E+00	7.73E-01	10.0
1.50E+01	5.51E+02	1.70E+00	8.32E-17	2.97E+00	9.46E-01	10.0
1.70E+01	6.25E+02	1.81E+00	1.03E-16	3.68E+00	1.17E+00	10.0
2.00E+01	7.35E+02	1.96E+00	1.11E-16	3.96E+00	1.26E+00	10.0
2.50E+01	9.19E+02	2.20E+00	1.47E-16	5.25E+00	1.67E+00	10.0
2.50E+01	9.19E+02	2.20E+00	1.51E-16	5.39E+00	1.72E+00	10.0
3.00E+01	1.10E+03	2.41E+00	1.80E-16	6.43E+00	2.05E+00	10.0
3.00E+01	1.10E+03	2.41E+00	1.84E-16	6.57E+00	2.09E+00	10.0
3.50E+01	1.29E+03	2.60E+00	2.18E-16	7.78E+00	2.48E+00	10.0
3.50E+01	1.29E+03	2.60E+00	2.23E-16	7.96E+00	2.53E+00	10.0
4.00E+01	1.47E+03	2.78E+00	2.44E-16	8.71E+00	2.77E+00	10.0
4.00E+01	1.47E+03	2.78E+00	2.53E-16	9.03E+00	2.88E+00	10.0
4.50E+01	1.65E+03	2.95E+00	2.54E-16	9.07E+00	2.89E+00	10.0
5.00E+01	1.84E+03	3.11E+00	2.59E-16	9.25E+00	2.94E+00	10.0
5.00E+01	1.84E+03	3.11E+00	2.63E-16	9.39E+00	2.99E+00	10.0
5.50E+01	2.02E+03	3.26E+00	2.68E-16	9.57E+00	3.05E+00	10.0
6.00E+01	2.20E+03	3.40E+00	2.70E-16	9.64E+00	3.07E+00	10.0

TABLE 2 - CONTINUED

PROCESS : H+-H2 IONIZATION  
 HOOPER ET AL., PHYS. REV. 121 1123 (1961)

DATA FROM FIGURES

E (KEV)	E(AU)	V(10(8)*CM/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.50E+02	5.51E+03	5.38E+00	1.77E-16	6.32E+00	2.01E+00	6.0
2.00E+02	7.35E+03	6.21E+00	1.39E-16	4.96E+00	1.58E+00	6.0
2.50E+02	9.19E+03	6.95E+00	1.06E-16	3.79E+00	1.20E+00	6.0
3.00E+02	1.10E+04	7.61E+00	9.62E-17	3.44E+00	1.09E+00	6.0
3.50E+02	1.29E+04	8.22E+00	8.40E-17	3.00E+00	9.55E-01	6.0
4.00E+02	1.47E+04	8.79E+00	7.70E-17	2.75E+00	8.75E-01	6.0
4.50E+02	1.65E+04	9.32E+00	6.63E-17	2.37E+00	7.54E-01	6.0
5.00E+02	1.84E+04	9.82E+00	6.26E-17	2.24E+00	7.12E-01	6.0
5.50E+02	2.02E+04	1.03E+01	5.74E-17	2.05E+00	6.52E-01	6.0
6.00E+02	2.20E+04	1.08E+01	5.38E-17	1.92E+00	6.12E-01	6.0
7.00E+02	2.57E+04	1.16E+01	4.63E-17	1.65E+00	5.26E-01	6.0
8.00E+02	2.94E+04	1.24E+01	4.21E-17	1.50E+00	4.79E-01	6.0
9.00E+02	3.31E+04	1.32E+01	3.73E-17	1.33E+00	4.24E-01	6.0
1.00E+03	3.67E+04	1.39E+01	3.47E-17	1.24E+00	3.94E-01	6.0
1.10E+03	4.04E+04	1.46E+01	3.14E-17	1.12E+00	3.57E-01	6.0

PROCESS : H+-H2 IONIZATION  
 SOLOV'EV ET AL., SOV. PHYS. JETP 15 459 (1962)

DATA FROM FIGURES

E (KEV)	E(AU)	V(10(8)*CH/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.00E+01	3.67E+02	1.39E+00	7.80E-17	2.79E+00	8.87E-01	30.0
1.50E+01	5.51E+02	1.70E+00	1.14E-16	4.07E+00	1.30E+00	30.0
2.00E+01	7.35E+02	1.96E+00	1.32E-16	4.71E+00	1.50E+00	30.0
3.00E+01	1.10E+03	2.41E+00	1.70E-16	6.07E+00	1.93E+00	30.0
4.00E+01	1.47E+03	2.78E+00	2.05E-16	7.32E+00	2.33E+00	30.0
5.00E+01	1.84E+03	3.11E+00	2.09E-16	7.46E+00	2.38E+00	30.0
6.00E+01	2.20E+03	3.40E+00	2.22E-16	7.93E+00	2.52E+00	30.0
7.00E+01	2.83E+03	3.85E+00	1.93E-16	6.89E+00	2.19E+00	30.0
9.30E+01	3.42E+03	4.24E+00	2.00E-16	7.14E+00	2.27E+00	30.0
1.06E+02	3.90E+03	4.52E+00	1.76E-16	6.29E+00	2.00E+00	30.0
1.20E+02	4.41E+03	4.81E+00	1.67E-16	5.96E+00	1.90E+00	30.0
1.40E+02	5.14E+03	5.20E+00	1.50E-16	5.36E+00	1.71E+00	30.0
1.50E+02	5.51E+03	5.38E+00	1.43E-16	5.29E+00	1.68E+00	30.0
1.70E+02	6.25E+03	5.73E+00	1.30E-16	4.64E+00	1.46E+00	30.0
1.30E+02	6.61E+03	5.89E+00	1.24E-16	4.43E+00	1.41E+00	30.0

TABLE 2 - CONTINUED

PROCESS : H+-H2 IONIZATION  
 GILBODY AND LEE, PROC. ROY. SOC. (LONDON) 274A 365 (1963)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
8.50E+01	3.12E+03	4.05E+00	2.71E-16	9.68E+00	3.08E+00	
9.00E+01	3.31E+03	4.17E+00	2.36E-16	8.43E+00	2.68E+00	
1.10E+02	4.04E+03	4.61E+00	2.41E-16	8.61E+00	2.74E+00	
1.25E+02	4.59E+03	4.91E+00	1.91E-16	6.82E+00	2.17E+00	
1.50E+02	5.51E+03	5.38E+00	2.03E-16	7.25E+00	2.31E+00	
1.57E+02	5.77E+03	5.50E+00	1.81E-16	6.46E+00	2.06E+00	
1.90E+02	6.98E+03	6.05E+00	1.44E-16	5.14E+00	1.64E+00	10.0
2.04E+02	7.50E+03	6.27E+00	1.36E-16	4.86E+00	1.55E+00	10.0
2.20E+02	8.08E+03	6.52E+00	1.23E-16	4.39E+00	1.40E+00	10.0
2.55E+02	9.37E+03	7.01E+00	1.13E-16	4.04E+00	1.28E+00	10.0
2.65E+02	9.74E+03	7.15E+00	1.14E-16	4.07E+00	1.30E+00	10.0
3.00E+02	1.10E+04	7.61E+00	1.04E-16	3.71E+00	1.18E+00	10.0
3.28E+02	1.21E+04	7.96E+00	7.82E-17	2.79E+00	8.89E-01	10.0
3.50E+02	1.29E+04	8.22E+00	8.97E-17	3.20E+00	1.02E+00	10.0
4.00E+02	1.47E+04	8.79E+00	8.02E-17	2.86E+00	9.12E-01	10.0
4.40E+02	1.62E+04	9.21E+00	7.28E-17	2.60E+00	8.28E-01	10.0

PROCESS : H+-H2 IONIZATION  
 KUYATT AND JORGENSEN, PHYS. REV. 130 1444 (1963)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
5.00E+01	1.84E+03	3.11E+00	2.59E-16	9.25E+00	2.94E+00	
7.50E+01	2.76E+03	3.80E+00	2.62E-16	9.36E+00	2.98E+00	
1.00E+02	3.67E+03	4.39E+00	2.41E-16	8.61E+00	2.74E+00	

TABLE 2 - CONTINUED

PROCESS : H+-H2 IONIZATION  
 RUDD AND JORGENSEN, PHYS. REV. 131 666 (1963)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(Z)
1.50E+02	5.51E+03	5.38E+00	1.81E-16	6.46E+00	2.06E+00	
2.00E+02	7.35E+03	6.21E+00	1.49E-16	5.32E+00	1.69E+00	
3.00E+02	1.10E+04	7.61E+00	1.08E-16	3.86E+00	1.23E+00	

PROCESS : H+-H2 IONIZATION  
 GORDEEV AND PANOV, SOV. PHYS. TECH. PHYS. 9 656 (1964)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(Z)
1.00E+00	3.67E+01	4.39E-01	2.70E-17	9.64E-01	3.07E-01	15.0
2.00E+00	7.35E+01	6.21E-01	4.10E-17	1.46E+00	4.66E-01	15.0
4.00E+00	1.47E+02	8.79E-01	6.50E-17	2.32E+00	7.39E-01	15.0
6.00E+00	2.20E+02	1.08E+00	8.70E-17	3.11E+00	9.89E-01	15.0
7.00E+00	2.57E+02	1.16E+00	9.20E-17	3.29E+00	1.05E+00	15.0
9.00E+00	3.31E+02	1.32E+00	9.80E-17	3.50E+00	1.11E+00	15.0
1.10E+01	4.04E+02	1.46E+00	1.48E-16	5.29E+00	1.68E+00	15.0
1.40E+01	5.14E+02	1.64E+00	1.50E-16	5.36E+00	1.71E+00	15.0
1.60E+01	5.88E+02	1.76E+00	1.72E-16	6.14E+00	1.96E+00	15.0
2.00E+01	7.35E+02	1.96E+00	1.99E-16	7.11E+00	2.26E+00	15.0
2.60E+01	9.55E+02	2.24E+00	2.45E-16	8.75E+00	2.78E+00	15.0
3.00E+01	1.10E+03	2.41E+00	2.73E-16	9.75E+00	3.10E+00	15.0
3.00E+01	1.10E+03	2.41E+00	2.95E-16	1.05E+01	3.35E+00	15.0
3.90E+01	1.43E+03	2.74E+00	2.40E-16	8.57E+00	2.73E+00	15.0
3.90E+01	1.43E+03	2.74E+00	3.01E-16	1.07E+01	3.42E+00	15.0



TABLE 2 - CONTINUED

PROCESS : H+-H2 IONIZATION  
 HOLLRICH, Z. PHYS. 187 41 (1965)

DATA FROM FIGURES

E(KEV)	E(AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.50E+00	5.51E+01	5.38E-01	2.20E-17	7.86E-01	2.50E-01	
3.00E+00	1.10E+02	7.61E-01	2.60E-17	9.28E-01	2.96E-01	
7.50E+00	2.76E+02	1.20E+00	4.80E-17	1.71E+00	5.46E-01	
1.00E+01	3.67E+02	1.39E+00	6.50E-17	2.32E+00	7.39E-01	
1.50E+01	5.51E+02	1.70E+00	1.03E-16	3.68E+00	1.17E+00	
2.00E+01	7.35E+02	1.96E+00	1.33E-16	4.75E+00	1.51E+00	
2.50E+01	9.19E+02	2.20E+00	1.71E-16	6.11E+00	1.94E+00	
3.00E+01	1.10E+03	2.41E+00	2.12E-16	7.57E+00	2.41E+00	

PROCESS : H+-H2 IONIZATION  
 DE HEER ET AL., PHYSICA 32 1766 (1966)

DATA FROM TABLES

E(KEV)	E(AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.00E+01	3.67E+02	1.39E+00	7.00E-17	2.50E+00	7.96E-01	8.0
1.50E+01	5.51E+02	1.70E+00	8.06E-17	2.88E+00	9.16E-01	8.0
2.00E+01	7.35E+02	1.96E+00	1.00E-16	3.57E+00	1.14E+00	8.0
2.50E+01	9.19E+02	2.20E+00	1.21E-16	4.32E+00	1.38E+00	8.0
3.00E+01	1.10E+03	2.41E+00	1.61E-16	5.75E+00	1.83E+00	8.0
3.50E+01	1.29E+03	2.60E+00	1.75E-16	6.25E+00	1.99E+00	8.0
4.00E+01	1.47E+03	2.78E+00	2.00E-16	7.14E+00	2.27E+00	8.0
6.00E+01	2.20E+03	3.40E+00	2.24E-16	8.00E+00	2.55E+00	8.0
8.00E+01	2.94E+03	3.93E+00	2.16E-16	7.71E+00	2.46E+00	8.0
1.00E+02	3.67E+03	4.39E+00	2.00E-16	7.14E+00	2.27E+00	8.0
1.20E+02	4.41E+03	4.81E+00	1.88E-16	6.71E+00	2.14E+00	8.0
1.40E+02	5.14E+03	5.20E+00	1.71E-16	6.11E+00	1.94E+00	8.0

TABLE 2 - CONTINUED

PROCESS : H+-H2 IONIZATION  
 PIVOVAR AND LEVCHENKO, SOV. PHYS. JETP 25 27 (1967)

DATA FROM FIGURES

E (KEV)	E(AU)	V(10(8)*CM/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.10E+03	4.04E+04	1.46E+01	3.29E-17	1.17E+00	3.74E-01	10.0
1.20E+03	4.41E+04	1.52E+01	2.98E-17	1.06E+00	3.39E-01	10.0
1.40E+03	5.14E+04	1.64E+01	2.56E-17	9.14E-01	2.91E-01	10.0
1.60E+03	5.88E+04	1.76E+01	2.35E-17	8.39E-01	2.67E-01	10.0
1.80E+03	6.61E+04	1.86E+01	2.16E-17	7.71E-01	2.46E-01	10.0
2.00E+03	7.35E+04	1.96E+01	2.06E-17	7.36E-01	2.34E-01	10.0
2.20E+03	8.08E+04	2.06E+01	1.76E-17	6.29E-01	2.00E-01	10.0
2.40E+03	8.82E+04	2.15E+01	1.50E-17	5.36E-01	1.71E-01	10.0
2.60E+03	9.55E+04	2.24E+01	1.44E-17	5.14E-01	1.64E-01	10.0
2.80E+03	1.03E+05	2.32E+01	1.35E-17	4.82E-01	1.53E-01	10.0
3.00E+03	1.10E+05	2.41E+01	1.24E-17	4.43E-01	1.41E-01	10.0

PROCESS : H+-H2 IONIZATION  
 AFROSHIMOV ET AL., SOV. PHYS. JETP 29 648 (1969)

DATA FROM FIGURES

E (KEV)	E(AU)	V(10(8)*CM/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
5.00E+00	1.84E+02	9.82E-01	2.86E-17	1.02E+00	3.25E-01	10.0
7.50E+00	2.76E+02	1.20E+00	3.39E-17	1.21E+00	3.85E-01	10.0
1.20E+01	4.41E+02	1.52E+00	5.08E-17	1.81E+00	5.77E-01	10.0
1.50E+01	5.51E+02	1.70E+00	7.62E-17	2.72E+00	8.66E-01	10.0
2.00E+01	7.35E+02	1.96E+00	1.17E-16	4.18E+00	1.33E+00	10.0
2.50E+01	9.19E+02	2.20E+00	1.82E-16	6.50E+00	2.07E+00	10.0
3.00E+01	1.10E+03	2.41E+00	2.41E-16	8.61E+00	2.74E+00	10.0
3.50E+01	1.29E+03	2.60E+00	2.86E-16	1.02E+01	3.25E+00	10.0
4.00E+01	1.47E+03	2.78E+00	3.29E-16	1.17E+01	3.74E+00	10.0
4.50E+01	1.65E+03	2.95E+00	3.60E-16	1.29E+01	4.09E+00	10.0
5.00E+01	1.84E+03	3.11E+00	3.68E-16	1.31E+01	4.18E+00	10.0

TABLE 2 - CONTINUED

PROCESS : H+-H2 IONIZATION  
TOBUREN AND WILSON, PHYS. REV. A5 247 (1972)

DATA FROM FIGURES

E (KEV) -----	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2)) -----	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
3.00E+02	1.10E+04	7.61E+00	9.40E-17	3.36E+00	1.07E+00	28.0
5.00E+02	1.84E+04	9.82E+00	5.70E-17	2.04E+00	6.48E-01	20.0
7.00E+02	2.57E+04	1.16E+01	4.00E-17	1.43E+00	4.55E-01	31.0
1.00E+03	3.67E+04	1.39E+01	2.80E-17	1.00E+00	3.18E-01	27.0
1.50E+03	5.51E+04	1.70E+01	2.00E-17	7.14E-01	2.27E-01	25.0

PROCESS : H+-H2 IONIZATION  
RUDD, PHYS. REV. A20 787 (1979)

DATA FROM TABLES

E (KEV) -----	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2)) -----	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
5.00E+00	1.84E+02	9.82E-01	5.62E-17	2.01E+00	6.39E-01	
7.00E+00	2.57E+02	1.16E+00	7.75E-17	2.77E+00	8.81E-01	
1.00E+01	3.67E+02	1.39E+00	9.16E-17	3.27E+00	1.04E+00	
1.50E+01	5.51E+02	1.70E+00	1.31E-16	4.68E+00	1.49E+00	
2.00E+01	7.35E+02	1.96E+00	1.69E-16	6.04E+00	1.92E+00	
3.00E+01	1.10E+03	2.41E+00	2.49E-16	8.89E+00	2.83E+00	
5.00E+01	1.84E+03	3.11E+00	3.20E-16	1.14E+01	3.64E+00	
7.00E+01	2.57E+03	3.68E+00	3.12E-16	1.11E+01	3.55E+00	
1.00E+02	3.67E+03	4.39E+00	2.65E-16	9.46E+00	3.01E+00	

Fig. 3  $H^+ + He$

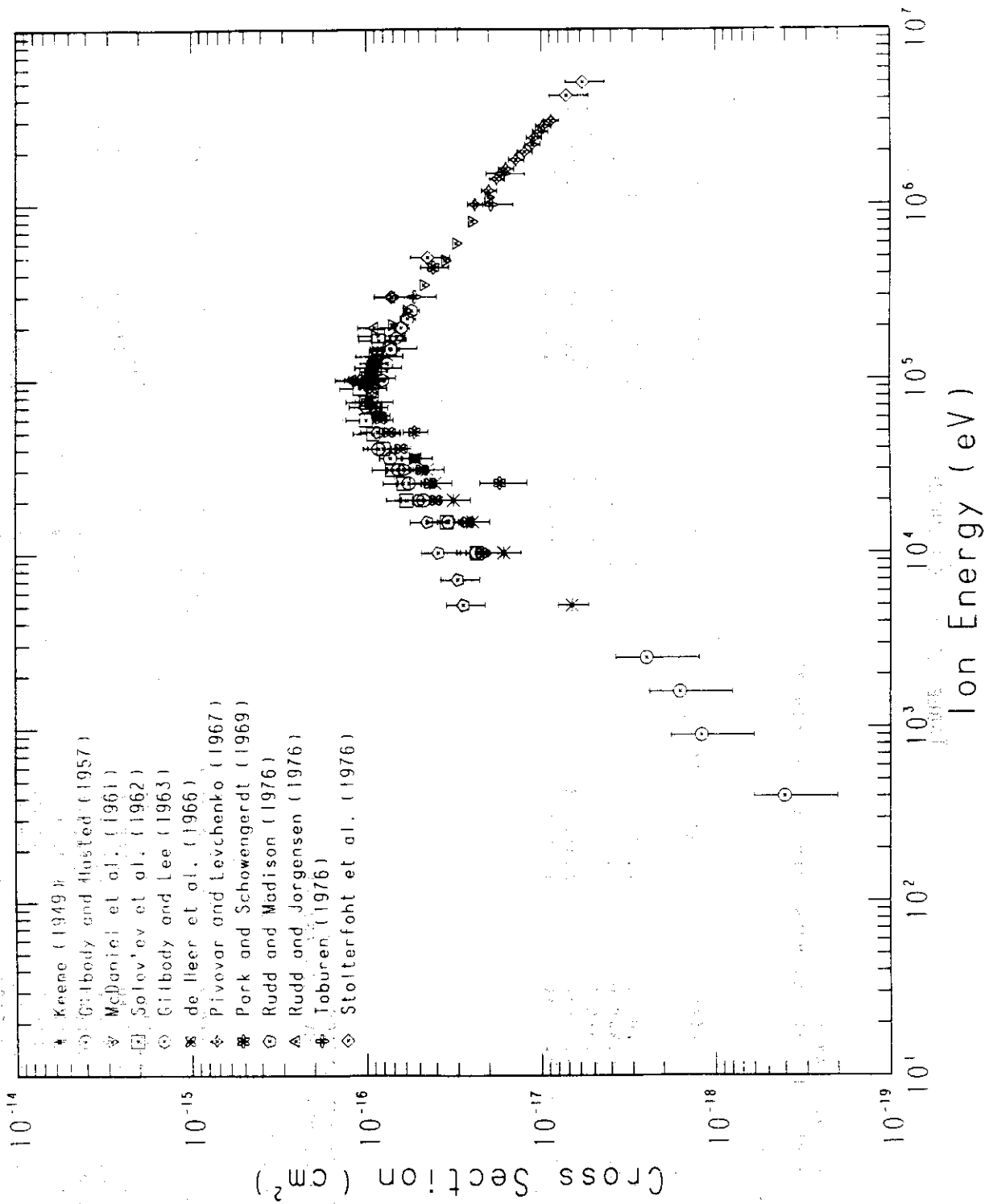


TABLE 3

PROCESS : H+ - HE IONIZATION  
 KEENE, PHIL. MAG. 40 369 (1949)

DATA FROM FIGURES

E(KEY) -----	E(AU)	V(10(8)*CH/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*A0(2)) -----	ERROR(%)
5.00E+00	1.84E+02	9.82E-01	6.70E-18	2.39E-01	7.62E-02	20.0
1.00E+01	3.67E+02	1.39E+00	1.64E-17	5.86E-01	1.86E-01	20.0
1.50E+01	5.51E+02	1.70E+00	2.47E-17	8.82E-01	2.81E-01	20.0
2.00E+01	7.35E+02	1.96E+00	3.17E-17	1.13E+00	3.60E-01	20.0
2.50E+01	9.19E+02	2.20E+00	4.04E-17	1.44E+00	4.59E-01	20.0
3.00E+01	1.10E+03	2.41E+00	4.48E-17	1.60E+00	5.09E-01	20.0
3.50E+01	1.29E+03	2.60E+00	5.24E-17	1.87E+00	5.96E-01	20.0

PROCESS : H+ - HE IONIZATION  
 GILBODY AND HASTED, PROC. ROY. SOC. (LONDON) 240A 382 (1957)

DATA FROM TABLES

E(KEY) -----	E(AU)	V(10(8)*CH/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*A0(2)) -----	ERROR(%)
4.00E-01	1.47E+01	2.78E-01	4.00E-19	1.43E-02	4.55E-03	50.0
9.00E-01	3.31E+01	4.17E-01	1.20E-18	4.29E-02	1.36E-02	50.0
1.60E+00	5.88E+01	5.56E-01	1.60E-18	5.71E-02	1.82E-02	50.0
2.50E+00	9.19E+01	6.95E-01	2.50E-18	8.93E-02	2.84E-02	50.0
1.00E+01	3.67E+02	1.39E+00	2.35E-17	8.39E-01	2.67E-01	15.0
1.50E+01	5.51E+02	1.70E+00	3.40E-17	1.21E+00	3.86E-01	15.0
2.00E+01	7.35E+02	1.96E+00	4.70E-17	1.68E+00	5.34E-01	15.0
2.50E+01	9.19E+02	2.20E+00	5.70E-17	2.04E+00	6.48E-01	15.0
3.00E+01	1.10E+03	2.41E+00	6.55E-17	2.34E+00	7.45E-01	15.0
3.50E+01	1.29E+03	2.60E+00	7.28E-17	2.60E+00	8.28E-01	15.0
4.00E+01	1.47E+03	2.78E+00	8.48E-17	3.03E+00	9.64E-01	15.0

TABLE 3 - CONTINUED

PROCESS : H+ - HE IONIZATION  
 MC DANIEL ET AL.. PROC.5TH INT.CONF.IONIZATION PHENOMENA GASES 1 60 (1961)

DATA FROM TABLES

E (KEV)	E(AU)	V(10(8)*CH/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
2.08E+02	7.64E+03	6.34E+00	7.13E-17	2.55E+00	8.10E-01	6.0
2.50E+02	9.19E+03	6.95E+00	5.89E-17	2.10E+00	6.70E-01	6.0
3.50E+02	1.29E+04	8.22E+00	4.70E-17	1.68E+00	5.34E-01	6.0
4.80E+02	1.76E+04	9.62E+00	3.54E-17	1.26E+00	4.02E-01	6.0
6.00E+02	2.20E+04	1.08E+01	3.07E-17	1.10E+00	3.49E-01	6.0
8.00E+02	2.94E+04	1.24E+01	2.49E-17	8.89E-01	2.83E-01	6.0
1.10E+03	4.04E+04	1.46E+01	2.01E-17	7.18E-01	2.28E-01	6.0

PROCESS : H+ - HE IONIZATION  
 SOLOV'EV ET AL.. SOV. PHYS. JETP 15 459 (1962)

DATA FROM FIGURES

E (KEV)	E(AU)	V(10(8)*CH/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.00E+01	3.67E+02	1.39E+00	2.34E-17	8.36E-01	2.66E-01	30.0
1.50E+01	5.51E+02	1.70E+00	3.47E-17	1.24E+00	3.94E-01	30.0
2.00E+01	7.35E+02	1.96E+00	5.88E-17	2.10E+00	6.68E-01	30.0
2.50E+01	9.19E+02	2.20E+00	6.13E-17	2.19E+00	6.97E-01	30.0
3.00E+01	1.10E+03	2.41E+00	7.09E-17	2.53E+00	8.06E-01	30.0
4.00E+01	1.47E+03	2.78E+00	7.95E-17	2.84E+00	9.04E-01	30.0
4.90E+01	1.80E+03	3.07E+00	9.10E-17	3.25E+00	1.03E+00	30.0
5.90E+01	2.17E+03	3.37E+00	1.00E-16	3.57E+00	1.14E+00	30.0
7.50E+01	2.76E+03	3.80E+00	1.00E-16	3.57E+00	1.14E+00	30.0
9.00E+01	3.31E+03	4.17E+00	1.09E-16	3.89E+00	1.24E+00	30.0
1.03E+02	3.79E+03	4.46E+00	9.69E-17	3.46E+00	1.10E+00	30.0
1.18E+02	4.34E+03	4.77E+00	8.92E-17	3.19E+00	1.01E+00	30.0
1.37E+02	5.03E+03	5.14E+00	8.82E-17	3.15E+00	1.00E+00	30.0
1.52E+02	5.59E+03	5.42E+00	7.32E-17	2.61E+00	8.32E-01	30.0
1.69E+02	6.21E+03	5.71E+00	8.46E-17	3.02E+00	9.62E-01	30.0
1.80E+02	6.61E+03	5.89E+00	8.55E-17	3.05E+00	9.72E-01	30.0

TABLE 3 - CONTINUED

PROCESS : H+ - HE IONIZATION  
 GILBODY AND LEE, PROC. ROY. SOC. (LONDON) 274A 365 (1963)

DATA FROM FIGURES

E(KEV)	E(AU)	V(10(8)*CN/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
-----			-----			
1.00E+02	3.67E+03	4.39E+00	8.05E-17	2.87E+00	9.15E-01	5.0
1.25E+02	4.59E+03	4.91E+00	7.60E-17	2.71E+00	8.64E-01	
1.50E+02	5.51E+03	5.38E+00	7.18E-17	2.56E+00	8.16E-01	10.0
1.75E+02	6.43E+03	5.81E+00	6.70E-17	2.39E+00	7.62E-01	10.0
2.00E+02	7.35E+03	6.21E+00	6.30E-17	2.25E+00	7.16E-01	10.0
2.25E+02	8.27E+03	6.59E+00	5.80E-17	2.07E+00	6.59E-01	10.0
2.50E+02	9.19E+03	6.95E+00	5.50E-17	1.96E+00	6.25E-01	10.0

PROCESS : H+ - HE IONIZATION  
 DE HEER ET AL., PHYSICA 32 1766 (1966)

DATA FROM TABLES

E(KEV)	E(AU)	V(10(8)*CN/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
-----			-----			
1.00E+01	3.67E+02	1.39E+00	2.20E-17	7.86E-01	2.50E-01	8.0
1.50E+01	5.51E+02	1.70E+00	2.65E-17	9.46E-01	3.01E-01	8.0
2.00E+01	7.35E+02	1.96E+00	4.00E-17	1.43E+00	4.55E-01	8.0
2.50E+01	9.19E+02	2.20E+00	4.33E-17	1.55E+00	4.92E-01	8.0
3.00E+01	1.10E+03	2.41E+00	4.80E-17	1.71E+00	5.46E-01	8.0
3.50E+01	1.29E+03	2.60E+00	5.24E-17	1.87E+00	5.96E-01	8.0
4.00E+01	1.47E+03	2.78E+00	6.33E-17	2.26E+00	7.20E-01	8.0
5.00E+01	1.84E+03	3.11E+00	7.42E-17	2.65E+00	8.43E-01	8.0
6.00E+01	2.20E+03	3.40E+00	8.27E-17	2.95E+00	9.40E-01	8.0
7.00E+01	2.57E+03	3.68E+00	8.78E-17	3.14E+00	9.98E-01	8.0
8.00E+01	2.94E+03	3.93E+00	9.25E-17	3.30E+00	1.05E+00	8.0
9.00E+01	3.31E+03	4.17E+00	9.24E-17	3.30E+00	1.05E+00	8.0
1.00E+02	3.67E+03	4.39E+00	9.74E-17	3.48E+00	1.11E+00	8.0
1.10E+02	4.04E+03	4.61E+00	9.39E-17	3.35E+00	1.07E+00	8.0
1.20E+02	4.41E+03	4.81E+00	9.21E-17	3.29E+00	1.05E+00	8.0
1.25E+02	4.59E+03	4.91E+00	9.00E-17	3.21E+00	1.02E+00	8.0
1.30E+02	4.78E+03	5.01E+00	8.80E-17	3.14E+00	1.00E+00	8.0
1.40E+02	5.14E+03	5.20E+00	8.64E-17	3.09E+00	9.82E-01	8.0

TABLE 3 - CONTINUED

PROCESS : H+ - HE IONIZATION  
 PIVOVAR AND LEVCHENKO, SOV. PHYS. JETP 25 27 (1967)

DATA FROM FIGURES

E(KEV)	E(AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(Z)
1.00E+03	3.67E+04	1.39E+01	2.40E-17	8.57E-01	2.73E-01	10.0
1.20E+03	4.41E+04	1.52E+01	2.00E-17	7.14E-01	2.27E-01	10.0
1.40E+03	5.14E+04	1.64E+01	1.80E-17	6.43E-01	2.05E-01	10.0
1.60E+03	5.88E+04	1.76E+01	1.60E-17	5.71E-01	1.82E-01	10.0
1.80E+03	6.61E+04	1.86E+01	1.40E-17	5.00E-01	1.59E-01	10.0
2.00E+03	7.35E+04	1.96E+01	1.25E-17	4.46E-01	1.42E-01	10.0
2.20E+03	8.08E+04	2.06E+01	1.13E-17	4.04E-01	1.28E-01	10.0
2.40E+03	8.82E+04	2.15E+01	1.11E-17	3.96E-01	1.26E-01	10.0
2.60E+03	9.55E+04	2.24E+01	1.02E-17	3.64E-01	1.16E-01	10.0
2.80E+03	1.03E+05	2.32E+01	9.80E-18	3.50E-01	1.11E-01	10.0
3.00E+03	1.10E+05	2.41E+01	8.80E-18	3.14E-01	1.00E-01	10.0

PROCESS : H+ - HE IONIZATION  
 PARK AND SCHOWENGERDT, PHYS. REV. 185 152 (1969)

DATA FROM FIGURES

E(KEV)	E(AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(Z)
2.50E+01	9.19E+02	2.20E+00	1.73E-17	6.18E-01	1.97E-01	30.0
4.40E+02	1.62E+04	9.21E+00	4.13E-17	1.47E+00	4.69E-01	18.0
5.00E+01	1.84E+03	3.11E+00	5.29E-17	1.89E+00	6.01E-01	16.0
6.25E+01	2.30E+03	3.47E+00	8.29E-17	2.96E+00	9.42E-01	12.0
7.50E+01	2.76E+03	3.80E+00	9.85E-17	3.52E+00	1.12E+00	17.0
9.50E+01	3.49E+03	4.28E+00	1.01E-16	3.61E+00	1.15E+00	17.0
1.00E+02	3.67E+03	4.39E+00	9.22E-17	3.29E+00	1.05E+00	16.0
1.13E+02	4.13E+03	4.66E+00	9.22E-17	3.29E+00	1.05E+00	18.0
1.25E+02	4.59E+03	4.91E+00	9.16E-17	3.27E+00	1.04E+00	18.0



TABLE 3 - CONTINUED

PROCESS : H+ - HE IONIZATION  
 RUDD AND MADISON, AT. DATA NUCL. DATA TABLES 18 413 (1976)

DATA FROM TABLES

E(KEV)	E(AU)	V(10(8)*CM/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
-----			-----			
5.00E+00	1.84E+02	9.82E-01	2.80E-17	1.00E+00	3.18E-01	25.0
7.00E+00	2.57E+02	1.16E+00	3.01E-17	1.07E+00	3.42E-01	25.0
1.00E+01	3.67E+02	1.39E+00	3.88E-17	1.39E+00	4.41E-01	25.0
1.50E+01	5.51E+02	1.70E+00	4.49E-17	1.60E+00	5.10E-01	25.0
2.00E+01	7.35E+02	1.96E+00	5.03E-17	1.80E+00	5.72E-01	25.0
3.00E+01	1.10E+03	2.41E+00	6.08E-17	2.17E+00	6.91E-01	25.0
5.00E+01	1.84E+03	3.11E+00	8.58E-17	3.06E+00	9.75E-01	25.0
7.00E+01	2.57E+03	3.68E+00	1.00E-16	3.57E+00	1.14E+00	25.0
1.00E+02	3.67E+03	4.39E+00	1.06E-16	3.79E+00	1.20E+00	25.0

PROCESS : H+ - HE IONIZATION  
 RUDD AND JORGENSEN, AT. DATA NUCL. DATA TABLES 18 413 (1976)

DATA FROM TABLES

E(KEV)	E(AU)	V(10(8)*CM/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
-----			-----			
1.00E+02	3.67E+03	4.39E+00	1.20E-16	4.29E+00	1.36E+00	25.0
2.00E+02	7.35E+03	6.21E+00	8.95E-17	3.20E+00	1.02E+00	25.0
3.00E+02	1.10E+04	7.61E+00	7.14E-17	2.55E+00	8.12E-01	25.0

TABLE 3 - CONTINUED

PROCESS : H+ - HE IONIZATION  
 TOBUREN, AT. DATA NUCL. DATA TABLES 18 413 (1976)

DATA FROM TABLES

E (KEV) -----	E (AU)	V(10(E))*CM/SEC	SIGMA(CH(2)) -----	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
3.00E+02	1.10E+04	7.61E+00	5.29E-17	1.89E+00	6.01E-01	25.0
1.00E+03	3.67E+04	1.39E+01	1.94E-17	6.93E-01	2.21E-01	25.0
1.50E+03	5.51E+04	1.70E+01	1.66E-17	5.93E-01	1.89E-01	25.0

TABLE 3 - CONTINUED

PROCESS : H+ - HE IONIZATION  
 STOLTERFOHT ET AL., AT. DATA NUCL. DATA TABLES 18 413 (1976)

DATA FROM TABLES

E(KEV) -----	E(AU)	V(10(S))*CN/SEC	SIGMA(CN(2)) -----	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
3.00E+02	1.10E+04	7.61E+00	7.16E-17	2.56E+00	8.14E-01	25.0
5.00E+02	1.84E+04	9.82E+00	4.46E-17	1.59E+00	5.07E-01	25.0
4.20E+03	1.54E+05	2.85E+01	7.21E-18	2.57E-01	8.20E-02	25.0
5.00E+03	1.84E+05	3.11E+01	5.81E-18	2.07E-01	6.60E-02	25.0

Fig. 4  $H_2^+ + H_2$

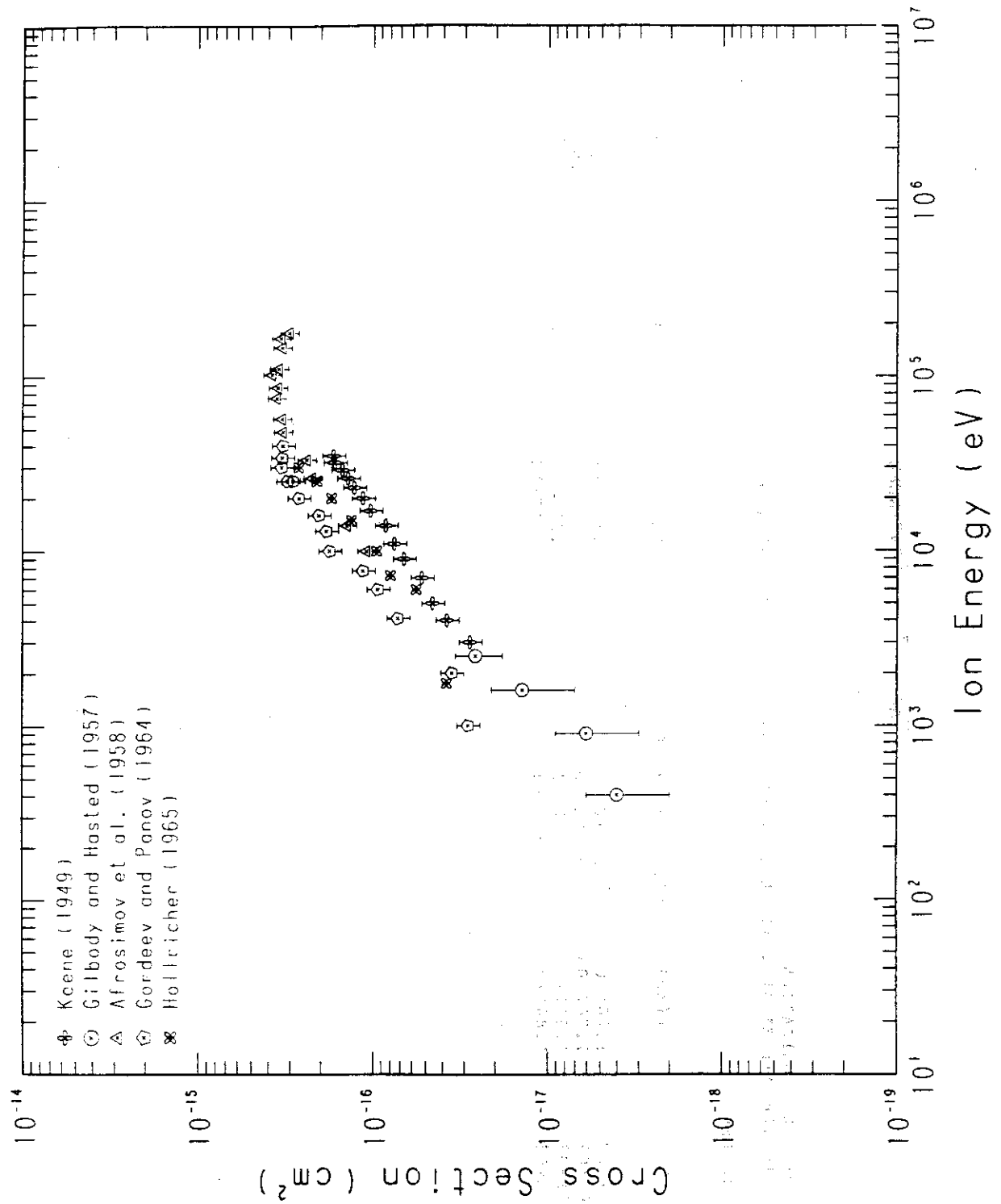


TABLE 4

PROCESS : H2+ - H2 IONIZATION  
 KEENE, PHIL. MAG. 40 369 (1949)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
3.00E+00	1.10E+02	5.38E-01	2.80E-17	1.00E+00	3.18E-01	15.0
4.00E+00	1.47E+02	6.21E-01	3.80E-17	1.36E+00	4.32E-01	15.0
5.00E+00	1.84E+02	6.95E-01	4.60E-17	1.64E+00	5.23E-01	15.0
7.00E+00	2.57E+02	8.22E-01	5.30E-17	1.89E+00	6.02E-01	15.0
9.00E+00	3.31E+02	9.32E-01	6.70E-17	2.39E+00	7.62E-01	15.0
1.10E+01	4.04E+02	1.03E+00	7.60E-17	2.71E+00	8.64E-01	15.0
1.40E+01	5.14E+02	1.16E+00	8.50E-17	3.04E+00	9.66E-01	15.0
1.70E+01	6.25E+02	1.28E+00	1.04E-16	3.71E+00	1.18E+00	15.0
2.00E+01	7.35E+02	1.39E+00	1.15E-16	4.11E+00	1.31E+00	15.0
2.30E+01	8.45E+02	1.49E+00	1.29E-16	4.61E+00	1.47E+00	15.0
2.60E+01	9.55E+02	1.58E+00	1.40E-16	5.00E+00	1.59E+00	15.0
2.90E+01	1.07E+03	1.67E+00	1.51E-16	5.39E+00	1.72E+00	15.0
3.20E+01	1.18E+03	1.76E+00	1.67E-16	5.96E+00	1.90E+00	15.0
3.50E+01	1.29E+03	1.84E+00	1.70E-16	6.07E+00	1.93E+00	15.0

PROCESS : H2+ - H2 IONIZATION  
 GILBODY AND HASTED, PROC. ROY. SOC. (LONDON) 240A 382 (1957)

DATA FROM TABLES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
4.00E-01	1.47E+01	1.96E-01	4.00E-18	1.43E-01	4.55E-02	50.0
9.00E-01	3.31E+01	2.95E-01	6.00E-18	2.14E-01	6.82E-02	50.0
1.60E+00	5.88E+01	3.93E-01	1.40E-17	5.00E-01	1.59E-01	50.0
2.50E+00	9.19E+01	4.91E-01	2.60E-17	9.28E-01	2.96E-01	30.0

TABLE 4 - CONTINUED

PROCESS : H2+ - H2 IONIZATION  
 AFROSIMOV ET AL., SOV. PHYS. JETP 7 968 (1958)  
 DATA FROM FIGURES

E(KEV)	E(AU)	V(10(8)*CH/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
1.00E+01	3.67E+02	9.82E-01	1.10E-16	3.93E+00	1.25E+00	12.0
1.40E+01	5.14E+02	1.16E+00	1.42E-16	5.07E+00	1.61E+00	12.0
2.60E+01	9.55E+02	1.58E+00	2.24E-16	8.00E+00	2.55E+00	12.0
3.30E+01	1.21E+03	1.78E+00	2.41E-16	8.61E+00	2.74E+00	12.0
4.80E+01	1.76E+03	2.15E+00	3.30E-16	1.18E+01	3.75E+00	12.0
5.70E+01	2.09E+03	2.35E+00	3.34E-16	1.19E+01	3.80E+00	12.0
7.50E+01	2.76E+03	2.69E+00	3.58E-16	1.28E+01	4.07E+00	12.0
8.60E+01	3.16E+03	2.88E+00	3.53E-16	1.26E+01	4.01E+00	12.0
1.02E+02	3.75E+03	3.14E+00	3.80E-16	1.36E+01	4.32E+00	12.0
1.10E+02	4.04E+03	3.26E+00	3.49E-16	1.25E+01	3.97E+00	12.0
1.45E+02	5.33E+03	3.74E+00	3.33E-16	1.19E+01	3.79E+00	12.0
1.64E+02	6.03E+03	3.98E+00	3.39E-16	1.21E+01	3.85E+00	12.0
1.76E+02	6.47E+03	4.12E+00	3.04E-16	1.09E+01	3.46E+00	12.0

PROCESS : H2+ - H2 IONIZATION  
 GORDEEV AND PANOV, SOV. PHYS. TECH. PHYS. 9 656 (1964)

DATA FROM FIGURES

E(KEV)	E(AU)	V(10(8)*CH/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
1.00E+00	3.67E+01	3.11E-01	2.86E-17	1.02E+00	3.25E-01	15.0
2.00E+00	7.35E+01	4.39E-01	3.55E-17	1.27E+00	4.04E-01	15.0
4.10E+00	1.51E+02	6.29E-01	7.27E-17	2.60E+00	8.26E-01	15.0
6.00E+00	2.20E+02	7.61E-01	9.47E-17	3.36E+00	1.08E+00	15.0
7.70E+00	2.83E+02	8.62E-01	1.15E-16	4.11E+00	1.31E+00	15.0
1.00E+01	3.67E+02	9.82E-01	1.79E-16	6.39E+00	2.03E+00	15.0
1.30E+01	4.78E+02	1.12E+00	1.87E-16	6.68E+00	2.13E+00	15.0
1.60E+01	5.88E+02	1.24E+00	2.06E-16	7.36E+00	2.34E+00	15.0
2.00E+01	7.35E+02	1.39E+00	2.68E-16	9.57E+00	3.05E+00	15.0
2.50E+01	9.19E+02	1.55E+00	2.90E-16	1.04E+01	3.30E+00	15.0
2.50E+01	9.19E+02	1.55E+00	3.11E-16	1.11E+01	3.54E+00	15.0
3.00E+01	1.10E+03	1.70E+00	3.36E-16	1.20E+01	3.82E+00	15.0
3.40E+01	1.25E+03	1.81E+00	3.33E-16	1.19E+01	3.79E+00	15.0
4.00E+01	1.47E+03	1.96E+00	3.30E-16	1.18E+01	3.75E+00	15.0
4.00E+01	1.47E+03	1.96E+00	3.50E-16	1.25E+01	3.98E+00	15.0

TABLE 4 - CONTINUED

PROCESS : H2+ - H2 IONIZATION  
 HOLLRICH, Z. PHYS. 187 41 (1965)

DATA FROM FIGURES

E(KEV)	E(AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.75E+00	6.43E+01	4.11E-01	3.80E-17	1.36E+00	4.32E-01	
6.00E+00	2.20E+02	7.61E-01	5.70E-17	2.04E+00	6.48E-01	
7.25E+00	2.66E+02	8.36E-01	8.00E-17	2.86E+00	9.09E-01	
1.00E+01	3.67E+02	9.82E-01	9.60E-17	3.43E+00	1.09E+00	
1.50E+01	5.51E+02	1.20E+00	1.34E-16	4.79E+00	1.52E+00	
2.00E+01	7.35E+02	1.39E+00	1.74E-16	6.21E+00	1.98E+00	
2.50E+01	9.19E+02	1.55E+00	2.11E-16	7.53E+00	2.40E+00	
3.00E+01	1.10E+03	1.70E+00	2.68E-16	9.57E+00	3.05E+00	

Fig. 5 H<sub>2</sub><sup>+</sup> + He

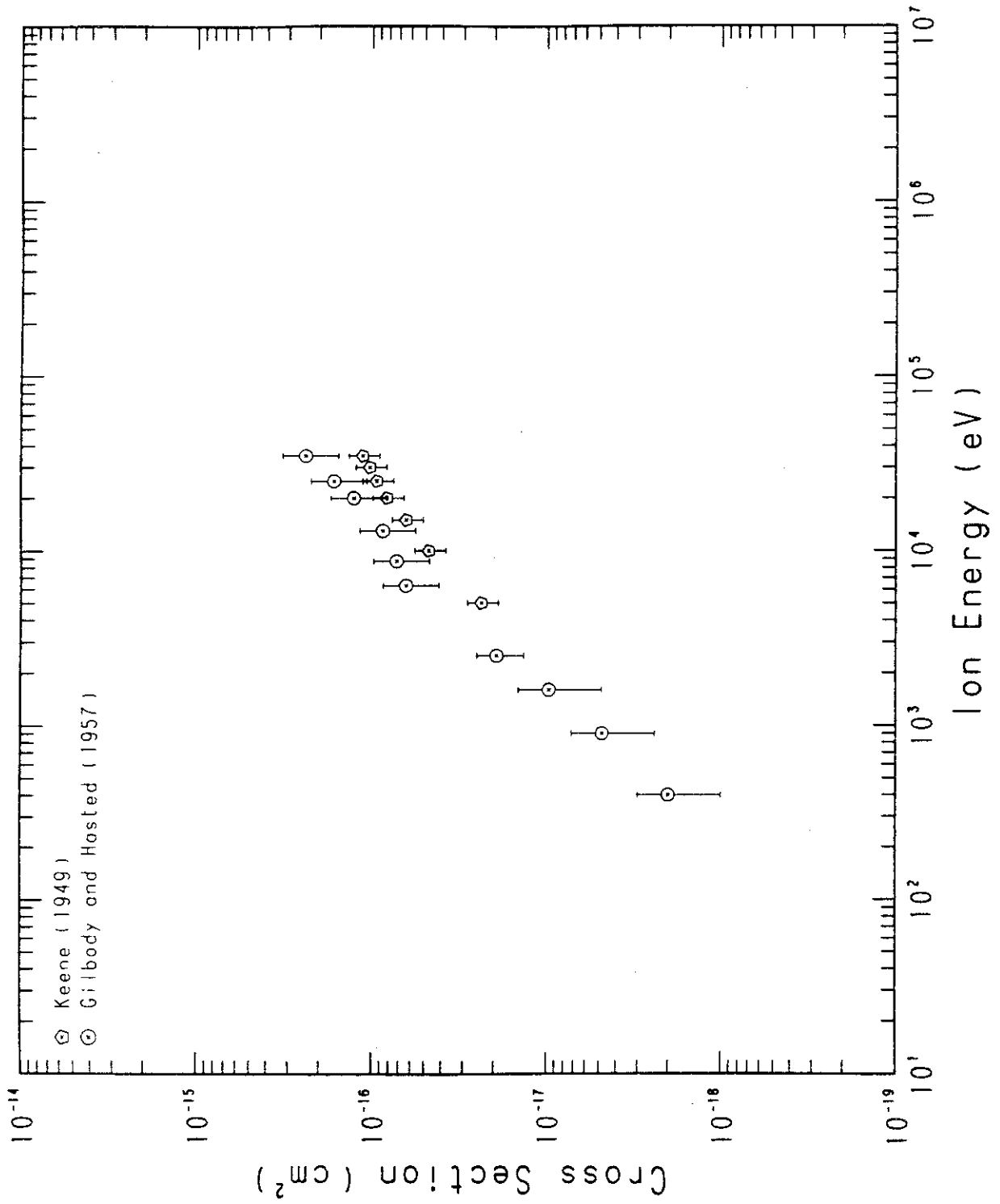




TABLE 5

PROCESS : H2+ - HE IONIZATION  
 KEENE, PHIL. MAG. 40 369 (1949)

DATA FROM FIGURES

E (KEV) -----	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2)) -----	ERROR(%)
5.00E+00	1.84E+02	6.95E-01	2.37E-17	8.46E-01	2.69E-01	20.0
1.00E+01	3.67E+02	9.82E-01	4.74E-17	1.69E+00	5.39E-01	20.0
1.50E+01	5.51E+02	1.20E+00	6.38E-17	2.28E+00	7.25E-01	20.0
2.00E+01	7.35E+02	1.39E+00	8.22E-17	2.94E+00	9.34E-01	20.0
2.50E+01	9.19E+02	1.55E+00	9.42E-17	3.36E+00	1.07E+00	20.0
3.00E+01	1.10E+03	1.70E+00	1.03E-16	3.68E+00	1.17E+00	20.0
3.50E+01	1.29E+03	1.84E+00	1.13E-16	4.04E+00	1.28E+00	20.0

PROCESS : H2+ - HE IONIZATION  
 GILBODY AND HASTED, PROC. ROY. SOC. (LONDON) 240A 382 (1957)

DATA FROM TABLES

E (KEV) -----	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2)) -----	ERROR(%)
4.00E-01	1.47E+01	1.96E-01	2.00E-18	7.14E-02	2.27E-02	50.0
9.00E-01	3.31E+01	2.95E-01	4.80E-18	1.71E-01	5.46E-02	50.0
1.60E+00	5.88E+01	3.93E-01	9.67E-18	3.45E-01	1.10E-01	50.0
2.50E+00	9.19E+01	4.91E-01	1.93E-17	6.89E-01	2.19E-01	30.0
6.30E+00	2.32E+02	7.80E-01	6.38E-17	2.28E+00	7.25E-01	35.0
8.70E+00	3.20E+02	9.16E-01	7.23E-17	2.58E+00	8.22E-01	35.0
1.30E+01	4.78E+02	1.12E+00	8.67E-17	3.10E+00	9.86E-01	35.0
2.00E+01	7.35E+02	1.39E+00	1.27E-16	4.54E+00	1.44E+00	35.0
2.50E+01	9.19E+02	1.55E+00	1.65E-16	5.89E+00	1.88E+00	35.0
3.50E+01	1.29E+03	1.84E+00	2.39E-16	8.53E+00	2.72E+00	35.0

Fig. 6  $H_3^+ - H_2$

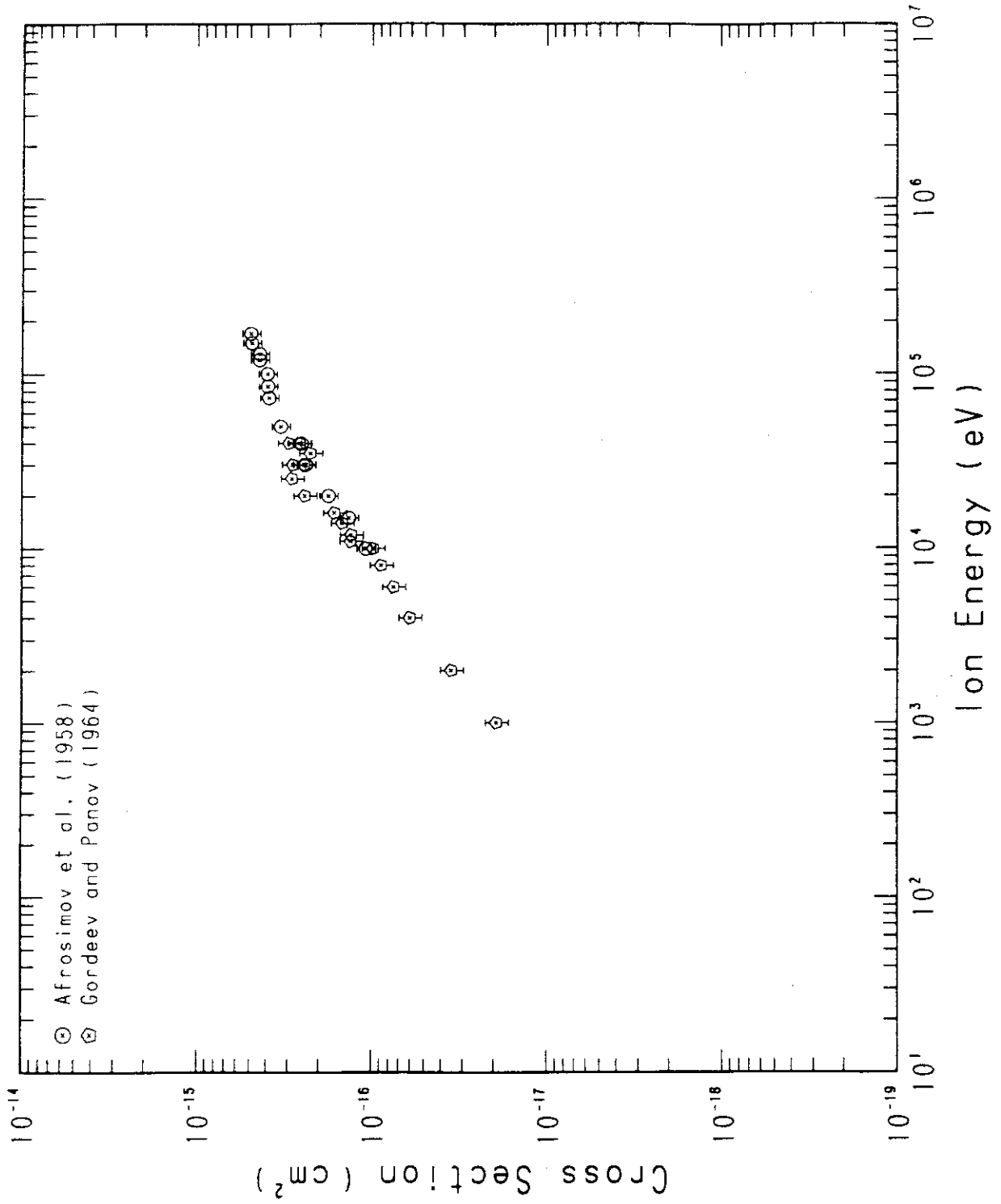


TABLE 6

PROCESS : H3+ - H2 IONIZATION  
AFROSIMOV ET AL., SOV. PHYS. JETP 7 968 (1958)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.00E+01	3.67E+02	8.02E-01	1.09E-16	3.89E+00	1.24E+00	12.0
1.50E+01	5.51E+02	9.82E-01	1.36E-16	4.86E+00	1.55E+00	12.0
2.00E+01	7.35E+02	1.13E+00	1.78E-16	6.36E+00	2.02E+00	12.0
3.00E+01	1.10E+03	1.39E+00	2.40E-16	8.57E+00	2.73E+00	12.0
4.00E+01	1.47E+03	1.60E+00	2.54E-16	9.07E+00	2.89E+00	12.0
5.00E+01	1.84E+03	1.79E+00	3.34E-16	1.19E+01	3.80E+00	12.0
7.30E+01	2.68E+03	2.17E+00	3.90E-16	1.39E+01	4.43E+00	12.0
8.50E+01	3.12E+03	2.34E+00	3.97E-16	1.42E+01	4.51E+00	12.0
1.00E+02	3.67E+03	2.54E+00	3.99E-16	1.42E+01	4.54E+00	12.0
1.20E+02	4.41E+03	2.78E+00	4.43E-16	1.58E+01	5.04E+00	12.0
1.30E+02	4.78E+03	2.89E+00	4.42E-16	1.58E+01	5.02E+00	12.0
1.50E+02	5.51E+03	3.11E+00	4.91E-16	1.75E+01	5.58E+00	12.0
1.70E+02	6.25E+03	3.31E+00	4.97E-16	1.77E+01	5.65E+00	12.0

PROCESS : H3+ - H2 IONIZATION  
GORDEEV AND PANOV, SOV. PHYS. TECH. PHYS. 9 656 (1964)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.00E+00	3.67E+01	2.54E-01	1.93E-17	6.89E-01	2.19E-01	15.0
2.00E+00	7.35E+01	3.59E-01	3.50E-17	1.25E+00	3.98E-01	15.0
4.00E+00	1.47E+02	5.07E-01	6.07E-17	2.17E+00	6.90E-01	15.0
6.00E+00	2.20E+02	6.21E-01	7.53E-17	2.69E+00	8.56E-01	15.0
8.00E+00	2.94E+02	7.17E-01	8.89E-17	3.17E+00	1.01E+00	15.0
1.00E+01	3.67E+02	8.02E-01	9.90E-17	3.54E+00	1.13E+00	15.0
1.10E+01	4.04E+02	8.41E-01	1.33E-16	4.75E+00	1.51E+00	15.0
1.20E+01	4.41E+02	8.79E-01	1.32E-16	4.71E+00	1.50E+00	15.0
1.40E+01	5.14E+02	9.49E-01	1.49E-16	5.32E+00	1.69E+00	15.0
1.60E+01	5.88E+02	1.01E+00	1.65E-16	5.89E+00	1.88E+00	15.0
2.00E+01	7.35E+02	1.13E+00	2.44E-16	8.71E+00	2.77E+00	15.0
2.50E+01	9.19E+02	1.27E+00	2.88E-16	1.03E+01	3.27E+00	15.0
3.00E+01	1.10E+03	1.39E+00	2.46E-16	8.78E+00	2.80E+00	15.0
3.00E+01	1.10E+03	1.39E+00	2.85E-16	1.02E+01	3.24E+00	15.0
3.50E+01	1.29E+03	1.50E+00	2.26E-16	8.07E+00	2.57E+00	15.0
4.00E+01	1.47E+03	1.60E+00	2.61E-16	9.32E+00	2.97E+00	15.0
4.00E+01	1.47E+03	1.60E+00	3.00E-16	1.07E+01	3.41E+00	15.0

Fig. 7  $\text{He}^+ + \text{H}_2$

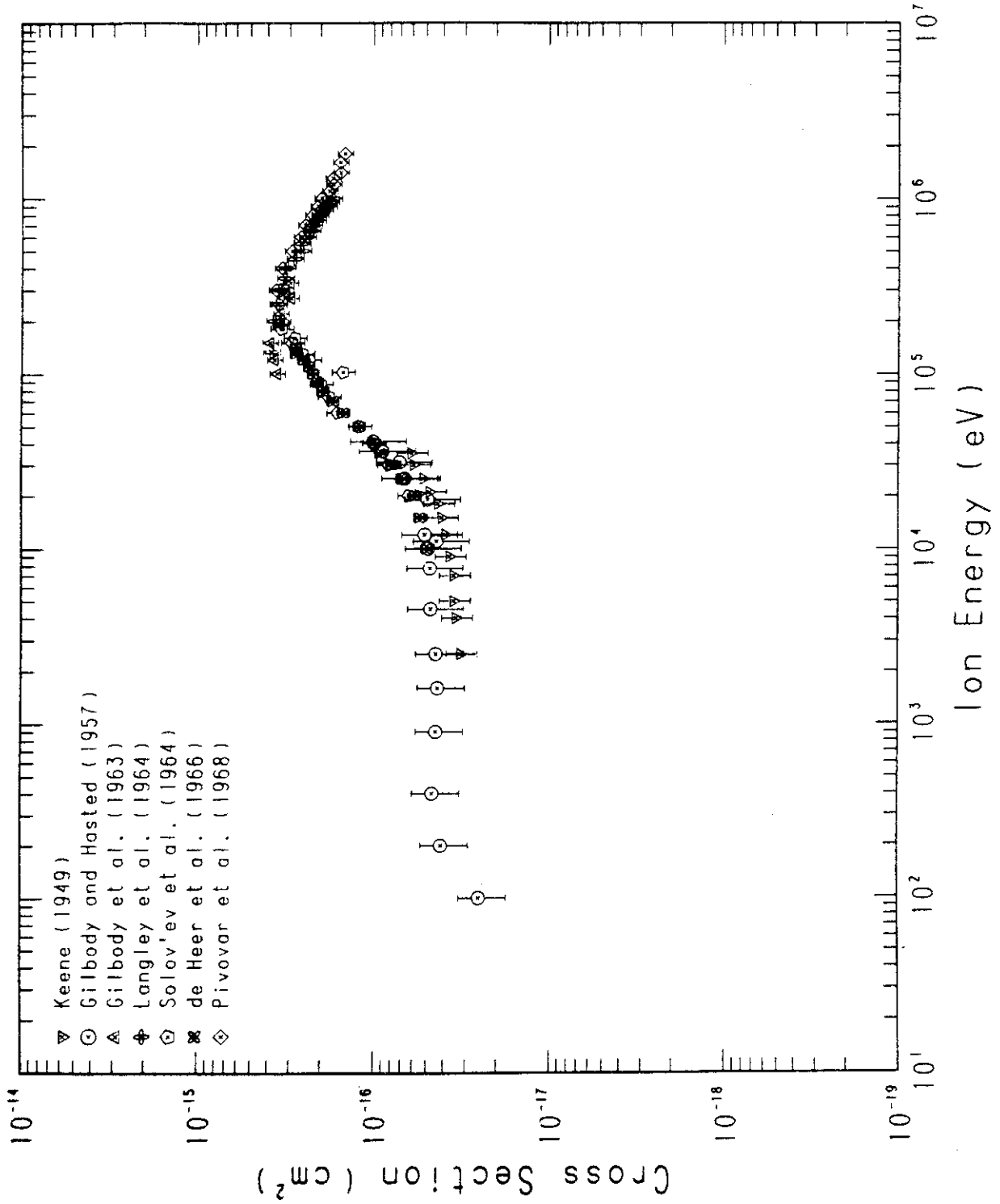


TABLE 7

PROCESS : HE+ - H2 IONIZATION  
 KEENE, PHIL. MAG. 40 369 (1949)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CH/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
2.50E+00	9.19E+01	3.47E-01	3.20E-17	1.14E+00	3.64E-01	20.0
4.00E+00	1.47E+02	4.39E-01	3.40E-17	1.21E+00	3.86E-01	20.0
5.00E+00	1.84E+02	4.91E-01	3.50E-17	1.25E+00	3.98E-01	20.0
7.00E+00	2.57E+02	5.81E-01	3.50E-17	1.25E+00	3.98E-01	20.0
9.00E+00	3.31E+02	6.59E-01	3.70E-17	1.32E+00	4.21E-01	20.0
1.20E+01	4.41E+02	7.61E-01	3.90E-17	1.39E+00	4.43E-01	20.0
1.50E+01	5.51E+02	8.51E-01	4.10E-17	1.46E+00	4.66E-01	20.0
1.80E+01	6.61E+02	9.32E-01	4.30E-17	1.54E+00	4.89E-01	20.0
2.10E+01	7.72E+02	1.01E+00	4.80E-17	1.71E+00	5.46E-01	20.0
2.50E+01	9.19E+02	1.10E+00	5.20E-17	1.86E+00	5.91E-01	20.0
3.00E+01	1.10E+03	1.20E+00	5.90E-17	2.11E+00	6.71E-01	20.0
3.50E+01	1.29E+03	1.30E+00	6.10E-17	2.18E+00	6.93E-01	20.0

PROCESS : HE+ - H2 IONIZATION  
 GLEEDY AND WASTED, PROC. ROY. SOC. (LONDON) 240A 382 (1957)

DATA FROM TABLES

E (KEV)	E (AU)	V(10(8)*CH/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.00E-01	3.67E+00	6.95E-02	2.50E-17	8.93E-01	2.84E-01	30.0
2.00E-01	7.35E+00	9.82E-02	4.10E-17	1.46E+00	4.66E-01	30.0
4.00E-01	1.47E+01	1.39E-01	4.60E-17	1.64E+00	5.23E-01	30.0
9.00E-01	3.31E+01	2.08E-01	4.40E-17	1.57E+00	5.00E-01	30.0
1.60E+00	5.88E+01	2.78E-01	4.30E-17	1.54E+00	4.89E-01	30.0
2.50E+00	9.19E+01	3.47E-01	4.40E-17	1.57E+00	5.00E-01	30.0
4.50E+00	1.65E+02	4.66E-01	4.72E-17	1.69E+00	5.37E-01	35.0
7.70E+00	2.83E+02	6.09E-01	4.76E-17	1.70E+00	5.41E-01	35.0
1.00E+01	3.67E+02	6.95E-01	4.86E-17	1.74E+00	5.52E-01	35.0
1.10E+01	4.04E+02	7.28E-01	4.38E-17	1.56E+00	4.98E-01	35.0
1.20E+01	4.41E+02	7.61E-01	5.10E-17	1.82E+00	5.80E-01	35.0
1.90E+01	6.98E+02	9.57E-01	4.91E-17	1.75E+00	5.58E-01	35.0
2.50E+01	9.19E+02	1.10E+00	6.62E-17	2.36E+00	7.52E-01	35.0
3.10E+01	1.14E+03	1.22E+00	7.10E-17	2.54E+00	8.07E-01	35.0
3.60E+01	1.32E+03	1.32E+00	8.86E-17	3.16E+00	1.01E+00	35.0
4.10E+01	1.51E+03	1.41E+00	1.00E-16	3.57E+00	1.14E+00	35.0

TABLE 7 - CONTINUED

PROCESS : HE+ - H2 IONIZATION  
 GILBODY ET AL., PROC. ROY. SOC. (LONDON) 274A 40 (1963)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CH/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
1.00E+02	3.67E+03	2.20E+00	3.54E-16	1.26E+01	4.02E+00	10.0
1.20E+02	4.41E+03	2.41E+00	3.66E-16	1.31E+01	4.16E+00	10.0
1.50E+02	5.51E+03	2.69E+00	3.89E-16	1.39E+01	4.42E+00	10.0
1.90E+02	6.98E+03	3.03E+00	3.38E-16	1.21E+01	3.84E+00	10.0
2.20E+02	8.08E+03	3.26E+00	3.38E-16	1.21E+01	3.84E+00	10.0
2.70E+02	9.92E+03	3.61E+00	2.96E-16	1.06E+01	3.36E+00	10.0
2.90E+02	1.07E+04	3.74E+00	3.17E-16	1.13E+01	3.60E+00	10.0
3.30E+02	1.21E+04	3.99E+00	2.98E-16	1.06E+01	3.39E+00	10.0

PROCESS : HE+ - H2 IONIZATION  
 LANGLEY ET AL., PHYS. REV. 136 A379 (1964)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CH/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
1.33E+02	4.89E+03	2.53E+00	3.82E-16	1.36E+01	4.34E+00	11.0
2.00E+02	7.35E+03	3.11E+00	3.68E-16	1.31E+01	4.18E+00	11.0
2.50E+02	9.19E+03	3.47E+00	3.52E-16	1.26E+01	4.00E+00	11.0
3.00E+02	1.10E+04	3.80E+00	3.40E-16	1.21E+01	3.86E+00	11.0
3.50E+02	1.29E+04	4.11E+00	3.19E-16	1.14E+01	3.63E+00	11.0
4.00E+02	1.47E+04	4.39E+00	3.12E-16	1.11E+01	3.55E+00	11.0
4.50E+02	1.65E+04	4.66E+00	2.81E-16	1.00E+01	3.19E+00	11.0
5.00E+02	1.84E+04	4.91E+00	2.55E-16	9.11E+00	2.90E+00	11.0
5.50E+02	2.02E+04	5.15E+00	2.57E-16	9.18E+00	2.92E+00	11.0
6.00E+02	2.20E+04	5.38E+00	2.39E-16	8.53E+00	2.72E+00	11.0
6.50E+02	2.39E+04	5.60E+00	2.26E-16	8.07E+00	2.57E+00	11.0
7.00E+02	2.57E+04	5.81E+00	2.20E-16	7.86E+00	2.50E+00	11.0
7.50E+02	2.76E+04	6.01E+00	2.10E-16	7.50E+00	2.39E+00	11.0
8.00E+02	2.94E+04	6.21E+00	2.03E-16	7.25E+00	2.31E+00	11.0
8.50E+02	3.12E+04	6.40E+00	1.92E-16	6.86E+00	2.18E+00	11.0
9.00E+02	3.31E+04	6.59E+00	1.82E-16	6.50E+00	2.07E+00	11.0
9.50E+02	3.49E+04	6.77E+00	1.77E-16	6.32E+00	2.01E+00	11.0
1.00E+03	3.67E+04	6.95E+00	1.70E-16	6.07E+00	1.93E+00	11.0

TABLE 7 - CONTINUED

PROCESS : HE+ - H2 IONIZATION  
 SOLOV'EV ET AL.. SOV. PHYS. JETP 18 342 (1964)

DATA FROM FIGURES

E(KEV) -----	E(AU)	V(I0(8)*CM/SEC)	SIGMA(CN(2)) -----	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
2.00E+01	7.35E+02	9.82E-01	6.30E-17	2.25E+00	7.16E-01	15.0
3.00E+01	1.10E+03	1.20E+00	8.20E-17	2.93E+00	9.32E-01	15.0
4.00E+01	1.47E+03	1.39E+00	1.00E-16	3.57E+00	1.14E+00	15.0
5.00E+01	1.84E+03	1.55E+00	1.20E-16	4.29E+00	1.36E+00	15.0
6.00E+01	2.20E+03	1.70E+00	1.60E-16	5.71E+00	1.82E+00	15.0
7.40E+01	2.72E+03	1.89E+00	1.80E-16	6.43E+00	2.05E+00	15.0
8.70E+01	3.20E+03	2.05E+00	2.00E-16	7.14E+00	2.27E+00	15.0
1.02E+02	3.75E+03	2.22E+00	1.50E-16	5.36E+00	1.71E+00	15.0
1.20E+02	4.41E+03	2.41E+00	2.33E-16	8.32E+00	2.65E+00	15.0
1.30E+02	4.78E+03	2.50E+00	2.55E-16	9.11E+00	2.90E+00	15.0
1.50E+02	5.51E+03	2.69E+00	2.92E-16	1.04E+01	3.32E+00	15.0
1.60E+02	5.88E+03	2.78E+00	2.82E-16	1.01E+01	3.21E+00	15.0
1.80E+02	6.61E+03	2.95E+00	3.35E-16	1.20E+01	3.81E+00	15.0

TABLE 7 - CONTINUED

PROCESS : HE+ - H2 IONIZATION  
 DE HEER ET AL., PHYSICA 32 1793 (1966)

DATA FROM TABLES

E (KEV) -----	E (AU)	V(10(8)*CM/SEC)	SIGMA(CN(2)) -----	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
1.00E+01	3.67E+02	6.95E-01	4.98E-17	1.78E+00	5.66E-01	7.8
1.50E+01	5.51E+02	8.51E-01	5.45E-17	1.95E+00	6.20E-01	7.8
2.00E+01	7.35E+02	9.82E-01	5.83E-17	2.08E+00	6.63E-01	7.8
2.50E+01	9.19E+02	1.10E+00	6.90E-17	2.46E+00	7.84E-01	7.8
3.00E+01	1.10E+03	1.20E+00	7.87E-17	2.81E+00	8.95E-01	7.8
3.50E+01	1.29E+03	1.30E+00	9.10E-17	3.25E+00	1.03E+00	7.8
4.00E+01	1.47E+03	1.39E+00	9.85E-17	3.52E+00	1.12E+00	7.8
5.00E+01	1.84E+03	1.55E+00	1.21E-16	4.32E+00	1.38E+00	7.8
6.00E+01	2.20E+03	1.70E+00	1.49E-16	5.32E+00	1.69E+00	7.8
7.00E+01	2.57E+03	1.84E+00	1.71E-16	6.11E+00	1.94E+00	7.8
8.00E+01	2.94E+03	1.96E+00	1.95E-16	6.96E+00	2.22E+00	7.8
9.00E+01	3.31E+03	2.08E+00	2.10E-16	7.50E+00	2.39E+00	7.8
1.00E+02	3.67E+03	2.20E+00	2.22E-16	7.93E+00	2.52E+00	7.8
1.10E+02	4.04E+03	2.30E+00	2.34E-16	8.36E+00	2.66E+00	7.8
1.20E+02	4.41E+03	2.41E+00	2.52E-16	9.00E+00	2.86E+00	7.8
1.30E+02	4.78E+03	2.50E+00	2.78E-16	9.93E+00	3.16E+00	7.8
1.40E+02	5.14E+03	2.60E+00	2.79E-16	9.96E+00	3.17E+00	7.8



TABLE 7 - CONTINUED

PROCESS : HE+ - H2 IONIZATION  
 PIVOVAR ET AL., SOV. PHYS. JETP 27 699 (1968)

DATA FROM FIGURES

E(KEV) -----	E(AU)	V(10(8)*CM/SEC)	SIGMA(CM(2)) -----	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
2.60E+02	7.35E+03	3.11E+00	3.31E-16	1.18E+01	3.76E+00	10.0
2.50E+02	9.19E+03	3.47E+00	3.46E-16	1.24E+01	3.93E+00	10.0
3.00E+02	1.10E+04	3.80E+00	3.59E-16	1.28E+01	4.08E+00	10.0
4.00E+02	1.47E+04	4.39E+00	3.31E-16	1.18E+01	3.76E+00	10.0
5.00E+02	1.84E+04	4.91E+00	2.91E-16	1.04E+01	3.31E+00	10.0
6.00E+02	2.20E+04	5.38E+00	2.59E-16	9.25E+00	2.94E+00	10.0
7.00E+02	2.57E+04	5.81E+00	2.45E-16	8.75E+00	2.78E+00	10.0
8.00E+02	2.94E+04	6.21E+00	2.23E-16	7.96E+00	2.53E+00	10.0
9.00E+02	3.31E+04	6.59E+00	2.08E-16	7.43E+00	2.36E+00	10.0
1.00E+03	3.67E+04	6.95E+00	1.98E-16	7.07E+00	2.25E+00	10.0
1.10E+03	4.04E+04	7.28E+00	1.79E-16	6.39E+00	2.03E+00	10.0
1.20E+03	4.41E+04	7.61E+00	1.69E-16	6.04E+00	1.92E+00	10.0
1.30E+03	4.78E+04	7.92E+00	1.71E-16	6.11E+00	1.94E+00	10.0
1.40E+03	5.14E+04	8.22E+00	1.54E-16	5.50E+00	1.75E+00	10.0
1.60E+03	5.88E+04	8.79E+00	1.55E-16	5.54E+00	1.76E+00	10.0
1.80E+03	6.61E+04	9.32E+00	1.46E-16	5.21E+00	1.66E+00	10.0

Fig. 8 He<sup>+</sup> + He

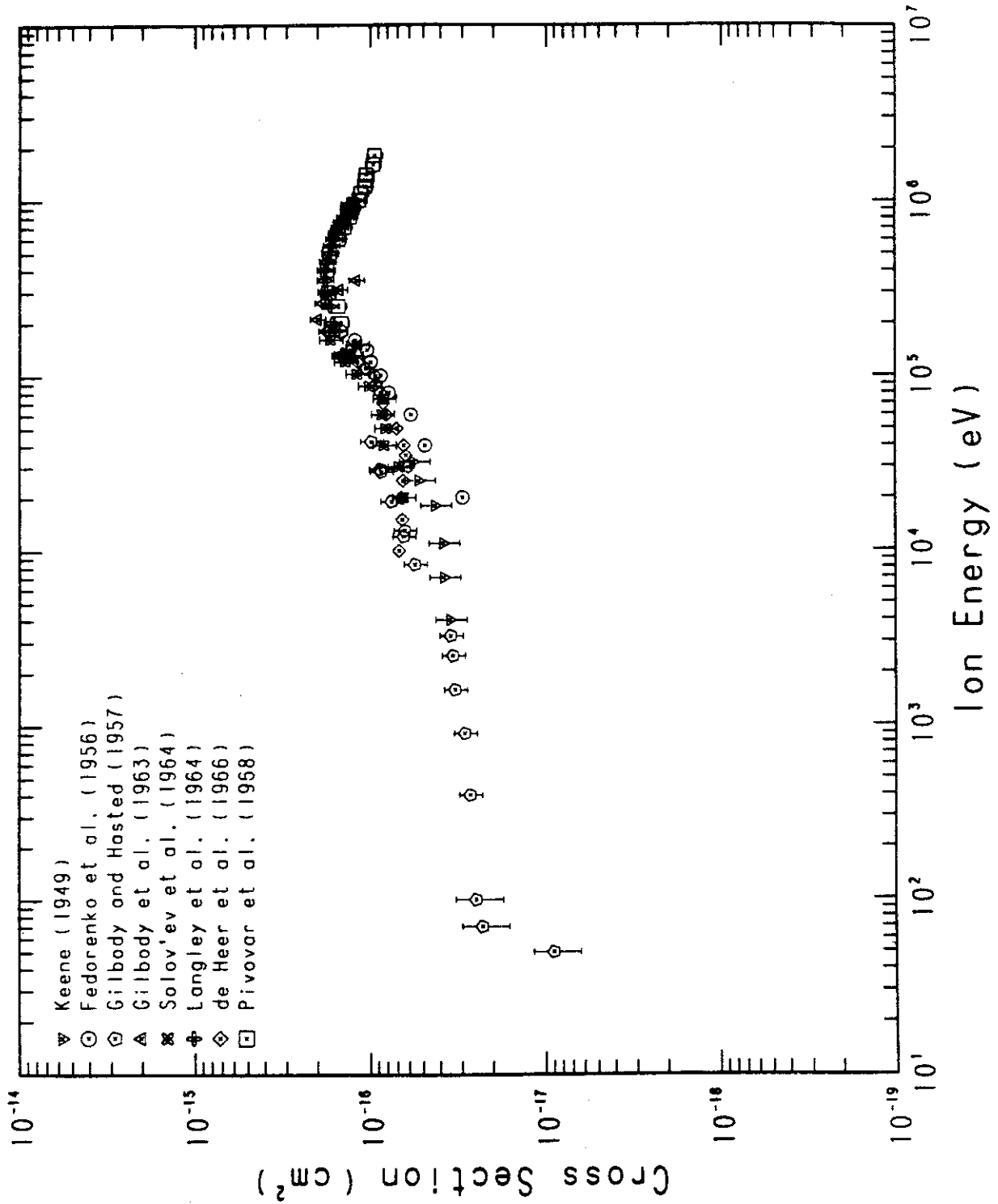


TABLE 8

PROCESS : HE+ - HE IONIZATION  
 KEENE, PHIL. MAG. 40 369 (1949)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
4.00E+00	1.47E+02	4.39E-01	3.54E-17	1.26E+00	4.02E-01	20.0
7.00E+00	2.57E+02	5.81E-01	3.84E-17	1.37E+00	4.36E-01	20.0
1.10E+01	4.04E+02	7.28E-01	3.88E-17	1.39E+00	4.41E-01	20.0
1.80E+01	6.61E+02	9.32E-01	4.31E-17	1.54E+00	4.90E-01	20.0
2.50E+01	9.19E+02	1.10E+00	5.34E-17	1.91E+00	6.07E-01	20.0
3.20E+01	1.18E+03	1.24E+00	5.71E-17	2.04E+00	6.49E-01	20.0

PROCESS : HE+ - HE IONIZATION  
 FEDORENKO ET AL., SOV. PHYS. TECH. PHYS. 1 1861 (1956)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
2.00E+01	7.35E+02	9.82E-01	3.00E-17	1.07E+00	3.41E-01	
4.00E+01	1.47E+03	1.39E+00	4.90E-17	1.75E+00	5.57E-01	
6.00E+01	2.20E+03	1.70E+00	5.90E-17	2.11E+00	6.71E-01	
8.00E+01	2.94E+03	1.96E+00	7.90E-17	2.82E+00	8.98E-01	
1.00E+02	3.67E+03	2.20E+00	8.80E-17	3.14E+00	1.00E+00	
1.20E+02	4.41E+03	2.41E+00	1.00E-16	3.57E+00	1.14E+00	
1.40E+02	5.14E+03	2.60E+00	1.05E-16	3.75E+00	1.19E+00	
1.60E+02	5.88E+03	2.78E+00	1.23E-16	4.39E+00	1.40E+00	
1.80E+02	6.61E+03	2.95E+00	1.48E-16	5.29E+00	1.68E+00	

TABLE 8 - CONTINUED

PROCESS : HE+ - HE IONIZATION  
GILBODY AND HASTED, PROC. ROY. SOC. (LONDON) 240A 382 (1957)

DATA FROM TABLES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
5.00E-02	1.84E+00	4.91E-02	9.00E-18	3.21E-01	1.02E-01	30.0
7.00E-02	2.57E+00	5.81E-02	2.30E-17	8.21E-01	2.61E-01	30.0
1.00E-01	3.67E+00	6.95E-02	2.50E-17	8.93E-01	2.84E-01	30.0
4.00E-01	1.47E+01	1.39E-01	2.70E-17	9.64E-01	3.07E-01	15.0
9.00E-01	3.31E+01	2.08E-01	2.90E-17	1.04E+00	3.30E-01	15.0
1.60E+00	5.88E+01	2.78E-01	3.30E-17	1.18E+00	3.75E-01	15.0
2.50E+00	9.19E+01	3.47E-01	3.40E-17	1.21E+00	3.86E-01	15.0
3.25E+00	1.19E+02	3.96E-01	3.50E-17	1.25E+00	3.98E-01	15.0
8.30E+00	3.05E+02	6.33E-01	5.60E-17	2.00E+00	6.37E-01	15.0
1.20E+01	4.41E+02	7.61E-01	6.50E-17	2.32E+00	7.39E-01	15.0
1.30E+01	4.78E+02	7.92E-01	6.40E-17	2.29E+00	7.27E-01	15.0
1.90E+01	6.98E+02	9.57E-01	7.60E-17	2.71E+00	8.64E-01	15.0
2.80E+01	1.03E+03	1.16E+00	8.70E-17	3.11E+00	9.89E-01	15.0
2.90E+01	1.07E+03	1.18E+00	8.80E-17	3.14E+00	1.00E+00	15.0
4.20E+01	1.54E+03	1.42E+00	9.90E-17	3.54E+00	1.13E+00	15.0

PROCESS : HE+ - HE IONIZATION  
GILBODY ET AL., PROC. ROY. SOC. (LONDON) 274A 40 (1963)

DATA FROM FIGURES

E (KEV)	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.30E+02	4.78E+03	2.50E+00	1.51E-16	5.39E+00	1.72E+00	10.0
1.80E+02	6.61E+03	2.95E+00	1.80E-16	6.43E+00	2.05E+00	10.0
2.10E+02	7.72E+03	3.18E+00	2.01E-16	7.18E+00	2.28E+00	10.0
2.60E+02	9.55E+03	3.54E+00	1.89E-16	6.75E+00	2.15E+00	10.0
2.90E+02	1.07E+04	3.74E+00	1.75E-16	6.25E+00	1.99E+00	10.0
3.10E+02	1.14E+04	3.87E+00	1.51E-16	5.39E+00	1.72E+00	10.0
3.50E+02	1.29E+04	4.11E+00	1.21E-16	4.32E+00	1.38E+00	10.0

TABLE 8 - CONTINUED

PROCESS : HE+ - HE IONIZATION  
 LANGLEY ET AL., PHYS. REV. 136 A379 (1964)

DATA FROM FIGURES

E(KEV)	E(AU)	V(10(8)*CM/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.33E+02	4.89E+03	2.53E+00	1.45E-16	5.18E+00	1.65E+00	11.0
2.00E+02	7.35E+03	3.11E+00	1.66E-16	5.93E+00	1.89E+00	11.0
2.50E+02	9.19E+03	3.47E+00	1.71E-16	6.11E+00	1.94E+00	11.0
3.00E+02	1.10E+04	3.80E+00	1.80E-16	6.43E+00	2.05E+00	11.0
3.50E+02	1.29E+04	4.11E+00	1.82E-16	6.50E+00	2.07E+00	11.0
4.00E+02	1.47E+04	4.39E+00	1.82E-16	6.50E+00	2.07E+00	11.0
4.50E+02	1.65E+04	4.66E+00	1.77E-16	6.32E+00	2.01E+00	11.0
5.00E+02	1.84E+04	4.91E+00	1.71E-16	6.11E+00	1.94E+00	11.0
5.50E+02	2.02E+04	5.15E+00	1.68E-16	6.00E+00	1.91E+00	11.0
6.00E+02	2.20E+04	5.38E+00	1.63E-16	5.82E+00	1.85E+00	11.0
6.50E+02	2.39E+04	5.60E+00	1.57E-16	5.61E+00	1.78E+00	11.0
7.00E+02	2.57E+04	5.81E+00	1.52E-16	5.43E+00	1.73E+00	11.0
7.50E+02	2.76E+04	6.01E+00	1.47E-16	5.25E+00	1.67E+00	11.0
8.00E+02	2.94E+04	6.21E+00	1.41E-16	5.04E+00	1.60E+00	11.0
8.50E+02	3.12E+04	6.40E+00	1.34E-16	4.79E+00	1.52E+00	11.0
9.00E+02	3.31E+04	6.59E+00	1.34E-16	4.79E+00	1.52E+00	11.0
9.50E+02	3.49E+04	6.77E+00	1.33E-16	4.75E+00	1.51E+00	11.0
1.00E+03	3.67E+04	6.95E+00	1.23E-16	4.39E+00	1.40E+00	11.0

PROCESS : HE+ - HE IONIZATION  
 SOLOV'EV ET AL., SOV. PHYS. JETP 18 342 (1964)

DATA FROM FIGURES

E(KEV)	E(AU)	V(10(8)*CM/SEC)	SIGMA(CN(2))	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
2.00E+01	7.35E+02	9.82E-01	6.50E-17	2.32E+00	7.39E-01	15.0
3.00E+01	1.10E+03	1.20E+00	6.90E-17	2.46E+00	7.84E-01	15.0
4.00E+01	1.47E+03	1.39E+00	8.40E-17	3.00E+00	9.55E-01	15.0
5.00E+01	1.84E+03	1.55E+00	8.20E-17	2.93E+00	9.32E-01	15.0
6.00E+01	2.20E+03	1.70E+00	8.60E-17	3.07E+00	9.78E-01	15.0
7.40E+01	2.72E+03	1.89E+00	8.40E-17	3.00E+00	9.55E-01	15.0
8.70E+01	3.20E+03	2.05E+00	1.02E-16	3.64E+00	1.16E+00	15.0
1.02E+02	3.75E+03	2.22E+00	1.20E-16	4.29E+00	1.36E+00	15.0
1.20E+02	4.41E+03	2.41E+00	1.40E-16	5.00E+00	1.59E+00	15.0
1.30E+02	4.78E+03	2.50E+00	1.30E-16	4.64E+00	1.48E+00	15.0
1.50E+02	5.51E+03	2.69E+00	1.20E-16	4.29E+00	1.36E+00	15.0
1.60E+02	5.88E+03	2.78E+00	1.70E-16	6.07E+00	1.93E+00	15.0
1.80E+02	6.61E+03	2.95E+00	1.60E-16	5.71E+00	1.82E+00	15.0

TABLE 8 - CONTINUED

PROCESS : HE+ - HE IONIZATION  
 DE HEER ET AL., PHYSICA 32 1793 (1966)

DATA FROM TABLES

E (KEY) -----	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2)) -----	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.00E+01	3.67E+02	6.95E-01	6.88E-17	2.46E+00	7.82E-01	7.8
1.50E+01	5.51E+02	8.51E-01	6.60E-17	2.36E+00	7.50E-01	7.8
2.00E+01	7.35E+02	9.82E-01	6.67E-17	2.38E+00	7.58E-01	7.8
2.50E+01	9.19E+02	1.10E+00	6.54E-17	2.34E+00	7.43E-01	7.8
3.00E+01	1.10E+03	1.20E+00	6.10E-17	2.18E+00	6.93E-01	7.8
3.50E+01	1.29E+03	1.30E+00	6.31E-17	2.25E+00	7.17E-01	7.8
4.00E+01	1.47E+03	1.39E+00	6.47E-17	2.31E+00	7.35E-01	7.8
5.00E+01	1.84E+03	1.55E+00	7.11E-17	2.54E+00	8.08E-01	7.8
6.00E+01	2.20E+03	1.70E+00	8.14E-17	2.91E+00	9.25E-01	7.8
7.00E+01	2.57E+03	1.84E+00	8.50E-17	3.04E+00	9.66E-01	7.8
8.00E+01	2.94E+03	1.96E+00	8.80E-17	3.14E+00	1.00E+00	7.8
9.00E+01	3.31E+03	2.08E+00	9.30E-17	3.32E+00	1.06E+00	7.8
1.00E+02	3.67E+03	2.20E+00	9.42E-17	3.36E+00	1.07E+00	7.8
1.10E+02	4.04E+03	2.30E+00	1.07E-16	3.82E+00	1.22E+00	7.8
1.20E+02	4.41E+03	2.41E+00	1.19E-16	4.25E+00	1.35E+00	7.8
1.30E+02	4.78E+03	2.50E+00	1.32E-16	4.71E+00	1.50E+00	7.8
1.40E+02	5.14E+03	2.60E+00	1.31E-16	4.68E+00	1.49E+00	7.8

TABLE 8 - CONTINUED

PROCESS : HE+ - HE IONIZATION  
 PIVOVAR ET AL., SOV. PHYS. JETP 27 699 (1968)

DATA FROM FIGURES

E (KEV) -----	E (AU)	V(10(8)*CM/SEC)	SIGMA(CM(2)) -----	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
2.00E+02	7.35E+03	3.11E+00	1.47E-16	5.25E+00	1.67E+00	10.0
2.50E+02	9.19E+03	3.47E+00	1.53E-16	5.46E+00	1.74E+00	10.0
3.00E+02	1.10E+04	3.80E+00	1.75E-16	6.25E+00	1.99E+00	10.0
4.00E+02	1.47E+04	4.39E+00	1.77E-16	6.32E+00	2.01E+00	10.0
5.00E+02	1.84E+04	4.91E+00	1.72E-16	6.14E+00	1.96E+00	10.0
6.00E+02	2.20E+04	5.38E+00	1.53E-16	5.46E+00	1.74E+00	10.0
7.00E+02	2.57E+04	5.81E+00	1.42E-16	5.07E+00	1.61E+00	10.0
8.00E+02	2.94E+04	6.21E+00	1.32E-16	4.71E+00	1.50E+00	10.0
9.00E+02	3.31E+04	6.59E+00	1.27E-16	4.54E+00	1.44E+00	10.0
1.00E+03	3.67E+04	6.95E+00	1.27E-16	4.18E+00	1.33E+00	10.0
1.10E+03	4.04E+04	7.28E+00	1.17E-16	4.18E+00	1.33E+00	10.0
1.20E+03	4.41E+04	7.61E+00	1.14E-16	4.07E+00	1.30E+00	10.0
1.30E+03	4.78E+04	7.92E+00	1.08E-16	3.86E+00	1.23E+00	10.0
1.40E+03	5.14E+04	8.22E+00	1.07E-16	3.82E+00	1.22E+00	10.0
1.60E+03	5.88E+04	8.79E+00	1.06E-16	3.79E+00	1.20E+00	10.0
1.80E+03	6.61E+04	9.32E+00	9.70E-17	3.46E+00	1.10E+00	10.0
			9.50E-17	3.39E+00	1.08E+00	10.0

Fig. 9 He<sup>++</sup> + H<sub>2</sub>

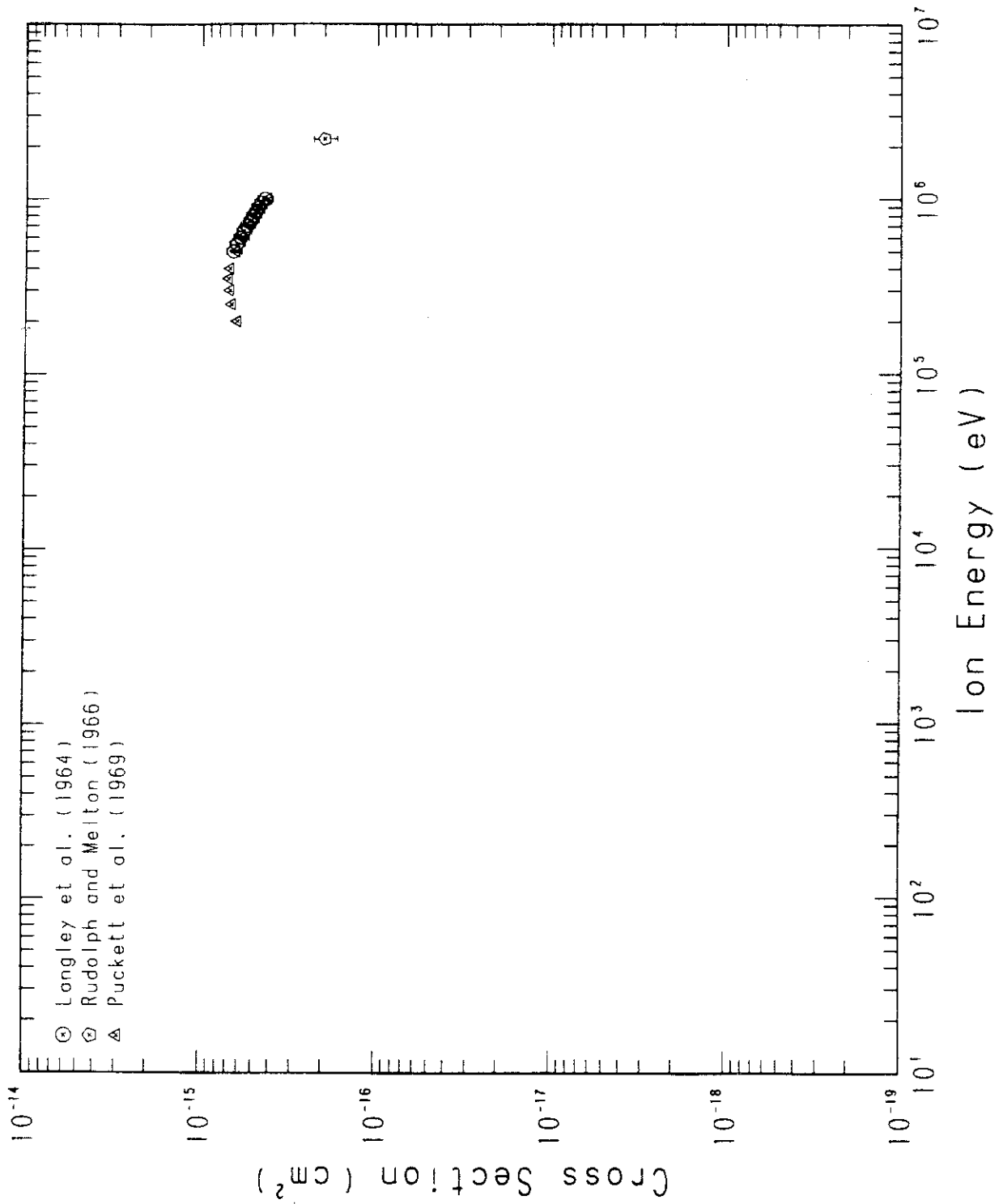




TABLE 9

PROCESS : HE++ - H2 IONIZATION  
 LANGLEY ET AL., PHYS. REV. 136 A379 (1964)

DATA FROM FIGURES

E (KEV)	E(AU)	V(10(8)*CH/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
5.00E+02	1.84E+04	4.91E+00	6.56E-16	2.34E+01	7.46E+00	10.0
5.50E+02	2.02E+04	5.15E+00	6.28E-16	2.24E+01	7.14E+00	10.0
6.00E+02	2.20E+04	5.38E+00	5.96E-16	2.13E+01	6.77E+00	10.0
6.50E+02	2.39E+04	5.60E+00	5.75E-16	2.05E+01	6.54E+00	10.0
7.00E+02	2.57E+04	5.81E+00	5.47E-16	1.95E+01	6.22E+00	10.0
7.50E+02	2.76E+04	6.01E+00	5.20E-16	1.86E+01	5.91E+00	10.0
8.00E+02	2.94E+04	6.21E+00	5.05E-16	1.80E+01	5.74E+00	10.0
8.50E+02	3.12E+04	6.40E+00	4.85E-16	1.73E+01	5.51E+00	10.0
9.00E+02	3.31E+04	6.59E+00	4.71E-16	1.68E+01	5.35E+00	10.0
9.50E+02	3.49E+04	6.77E+00	4.55E-16	1.62E+01	5.17E+00	10.0
1.00E+03	3.67E+04	6.95E+00	4.35E-16	1.55E+01	4.94E+00	10.0

PROCESS : HE++ - H2 IONIZATION  
 RUDOLPH AND MELTON, J. CHEM. PHYS. 45 2227 (1966)

DATA FROM TABLES

E (KEV)	E(AU)	V(10(8)*CH/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
2.20E+03	2.20E+06	1.03E+01	2.00E-16	2.00E-16	2.27E+00	15.0

PROCESS : HE++ - H2 IONIZATION  
 PUCKETT ET AL., PHYS. REV. 178 271 (1969)

DATA FROM TABLES

E (KEV)	E(AU)	V(10(8)*CH/SEC)	SIGMA(CH(2))	SIGMA(AU)	SIGMA(PI*A0(2))	ERROR(%)
2.00E+02	7.35E+03	3.11E+00	6.20E-16	2.21E+01	7.05E+00	5.4
2.50E+02	9.19E+03	3.47E+00	6.70E-16	2.39E+01	7.62E+00	5.4
3.00E+02	1.10E+04	3.80E+00	6.85E-16	2.45E+01	7.79E+00	5.4
3.50E+02	1.29E+04	4.11E+00	6.97E-16	2.49E+01	7.92E+00	5.4
4.00E+02	1.47E+04	4.39E+00	6.85E-16	2.45E+01	7.79E+00	5.4
5.00E+02	1.84E+04	4.91E+00	6.34E-16	2.26E+01	7.21E+00	5.4
6.00E+02	2.20E+04	5.38E+00	5.90E-16	2.11E+01	6.71E+00	5.4
7.00E+02	2.57E+04	5.81E+00	5.37E-16	1.92E+01	6.10E+00	5.4
8.00E+02	2.94E+04	6.21E+00	4.91E-16	1.75E+01	5.58E+00	5.4
9.00E+02	3.31E+04	6.59E+00	4.59E-16	1.64E+01	5.22E+00	5.4
1.00E+03	3.67E+04	6.95E+00	4.17E-16	1.49E+01	4.74E+00	5.4

Fig. 10 He<sup>++</sup> + He

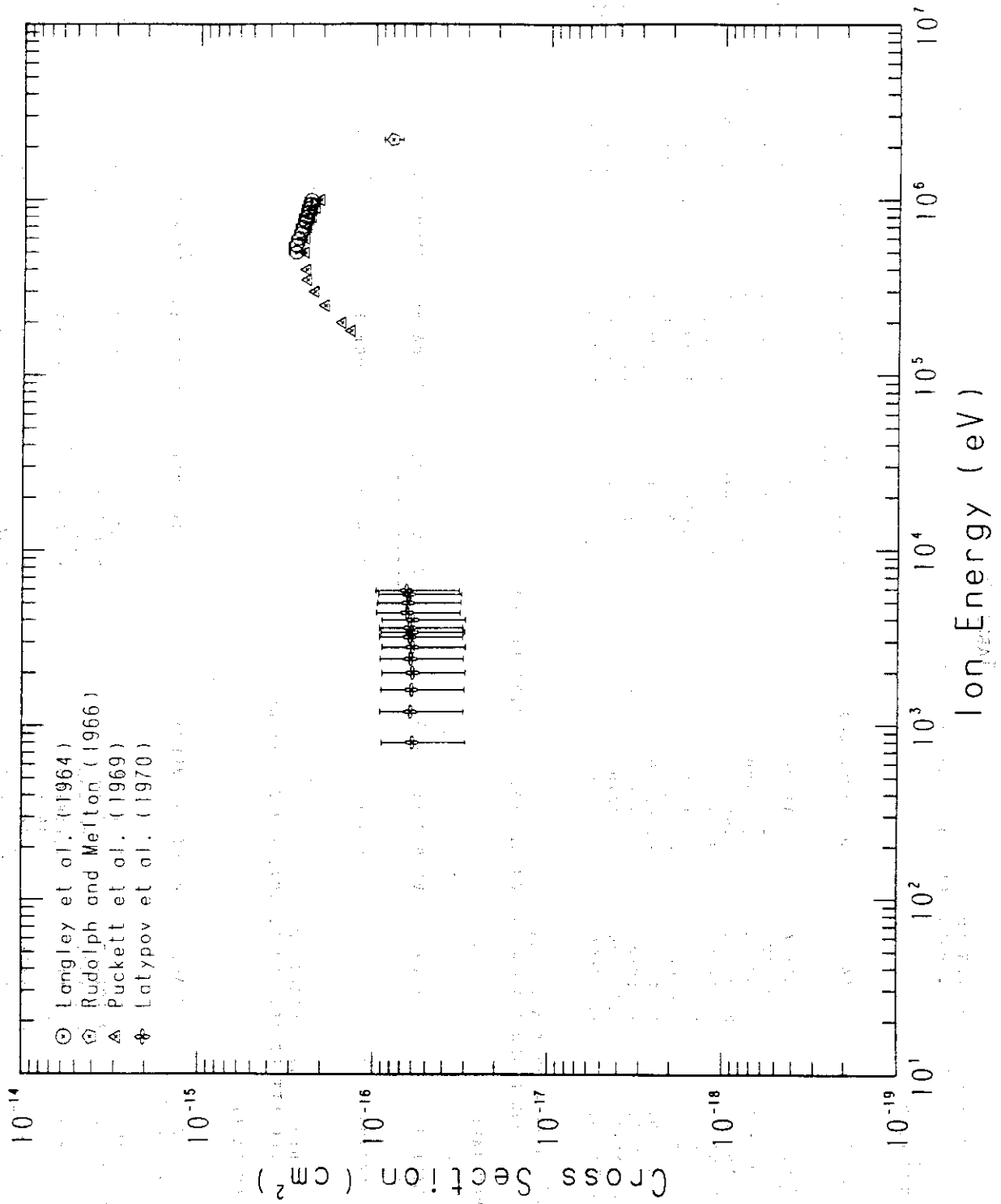


TABLE 10

PROCESS : HE++ - HE IONIZATION  
LAUGLEY ET AL., PHYS. REV. 136 A379 (1964)

DATA FROM FIGURES

E (KEV) -----	E (AU)	V(10(8)*CH/SEC)	SIGMA(CM(2)) -----	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
5.00E+02	1.84E+04	4.91E+00	2.84E-16	1.01E+01	3.23E+00	10.0
5.50E+02	2.02E+04	5.15E+00	2.85E-16	1.02E+01	3.24E+00	10.0
6.00E+02	2.20E+04	5.38E+00	2.76E-16	9.86E+00	3.14E+00	10.0
6.50E+02	2.39E+04	5.60E+00	2.66E-16	9.50E+00	3.02E+00	10.0
7.00E+02	2.57E+04	5.81E+00	2.61E-16	9.32E+00	2.97E+00	10.0
7.50E+02	2.76E+04	6.01E+00	2.53E-16	9.03E+00	2.88E+00	10.0
8.00E+02	2.94E+04	6.21E+00	2.51E-16	8.96E+00	2.85E+00	10.0
8.50E+02	3.12E+04	6.40E+00	2.43E-16	8.68E+00	2.76E+00	10.0
9.00E+02	3.31E+04	6.59E+00	2.42E-16	8.64E+00	2.75E+00	10.0
9.50E+02	3.49E+04	6.77E+00	2.35E-16	8.39E+00	2.67E+00	10.0
1.00E+03	3.67E+04	6.95E+00	2.33E-16	8.32E+00	2.65E+00	10.0

PROCESS : HE++ - HE IONIZATION  
RUDOLPH AND NELTON, J. CHEM. PHYS. 45 2227 (1966)

DATA FROM TABLES

E (KEV) -----	E (AU)	V(10(8)*CH/SEC)	SIGMA(CM(2)) -----	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
2.20E+03	2.20E+06	1.03E+01	8.00E-17	8.00E-17	9.09E-01	12.5

PROCESS : HE++ - HE IONIZATION  
PUCKETT ET AL., PHYS. REV. 178 271 (1966)

DATA FROM FIGURES

E (KEV) -----	E (AU)	V(10(8)*CH/SEC)	SIGMA(CM(2)) -----	SIGMA(AU)	SIGMA(PI*AO(2))	ERROR(%)
1.80E+02	6.61E+03	2.95E+00	1.37E-16	4.89E+00	1.56E+00	5.8
2.00E+02	7.35E+03	3.11E+00	1.55E-16	5.54E+00	1.76E+00	5.8
2.50E+02	9.19E+03	3.47E+00	1.93E-16	6.89E+00	2.19E+00	5.8
3.00E+02	1.10E+04	3.80E+00	2.21E-16	7.89E+00	2.51E+00	5.8
3.50E+02	1.29E+04	4.11E+00	2.44E-16	8.71E+00	2.77E+00	5.8
4.00E+02	1.47E+04	4.39E+00	2.47E-16	8.82E+00	2.81E+00	5.8
5.00E+02	1.84E+04	4.91E+00	2.51E-16	8.96E+00	2.85E+00	5.8
6.00E+02	2.20E+04	5.38E+00	2.50E-16	8.93E+00	2.84E+00	5.8
7.00E+02	2.57E+04	5.81E+00	2.43E-16	8.68E+00	2.76E+00	5.8
8.00E+02	2.94E+04	6.21E+00	2.30E-16	8.21E+00	2.61E+00	5.8
9.00E+02	3.31E+04	6.59E+00	2.19E-16	7.82E+00	2.49E+00	5.8
1.00E+03	3.67E+04	6.95E+00	2.06E-16	7.36E+00	2.34E+00	5.8