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Excitation, ionization, and electron capture cross sections of atomic hydrogen in collisions with multiply charged ions

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Abstract

Excitation, ionization, and electron capture cross sections of atomic hydrogen in collisions with multiply charged ions are presented for various projectile charges (Z= 2–8) in the energy range from 0.25 to 800 keV/amu. All the cross sections are calculated consistently in a unified manner by the atomic-orbital close-coupling method based on a Gaussian-type orbitals expansion.

Key words;

H atom, excitation cross sections, electron capture cross sections, ionization cross sections, multiply-charged ion impact, close-coupling method

1 Introduction

The close-coupling method has been widely used in various fields of atomic collision physics with the recognition that it is one of the most reliable and powerful theoretical approaches. It is mostly applied to scattering processes in the intermediate or low energy region, where the multiple scattering effect is so significant that perturbative approaches are not applicable.

The expansion in terms of atomic orbitals centered around the target and projectile nuclei is a good representation of the scattering wave function in the energy range where the projectile velocity is comparable to or larger than that of the relevant bound electron. While the Slater-type orbitals have been mostly used for the construction of basis function of the expansion, the existence of the electron translation factor (ETF), which accounts for the different translational motion of the two nuclei, makes difficult the precise evaluation of the two-center matrix elements when the collision energy is high or when the states have many nodal structures. The expansion in terms of bound states only is not satisfactory for the account of transient molecular effects that become more and more important as the collision energy decreases. The explicit inclusion of abundant continuum states is, of course, inevitable for the calculation of ionization cross sections.

In this report we present excitation, ionization, and electron capture cross sections for the collisions of atomic hydrogen with multiply-charged naked ions for the nuclear charges $Z = 2 - 8$,

$$A^{Z+} + \mathrm{H}(1s) \rightarrow A^{Z+} + \mathrm{H}(n\ell m) \quad (1)$$

$$\rightarrow A^{Z+} + p + e \quad (2)$$

$$\rightarrow A^{(Z-1)+} + p \quad (3)$$

calculated by means of the Gaussian-basis close-coupling method, which was developed recently for the nonperturbative study of the Thomas mechanism [1] and extended later to the study of ionization processes [2, 3]. In this approach a large number of bound and continuum states are constructed by diagonalizing the atomic Hamiltonians of the target and the projectile in terms of the Gaussian-type basis functions as

$$\varphi_{nlm}(\mathbf{r}) = \sum_{\nu} c_{\nu}^{(n\ell)}\, e^{-\alpha_\nu r^2}\, r^{\ell} Y_{\ell m}(\hat{r}), \tag{4}$$

where the nonlinear parameters α_ν are generated as a modified geometrical progression.

The numbers of Gaussian-type orbitals used for the expansion of (3) are 20, 16, 13, 11, 10, 8, 7, and 6 for $\ell = 0$ to 7, respectively. These numbers and the ranges of the nonlinear parameters α_ν are determined and optimized so as to produce the wave functions of all the bound states sufficiently accurately; the matrix elements among bound states agree with those calculated in terms of exact hydrogenic wave functions within an accuracy of 1 %. The energy levels of the atomic orbitals used for the present calculations are listed in a previous publication [3]. For increasing the Gaussian orbitals still further, the eigenvalues of the pseudocontinuum states shift to lower energies as a whole and the spacings among them become smaller but the calculated ionization cross sections change little. The convergence of excitation and capture cross sections is achieved for smaller number of Gaussian orbitals.

The relative motion of the heavy particles is described classically by a rectilinear trajectory with a constant velocity v in the impact-parameter representation. The time-dependent two-center electronic wave function is expanded in a standard way as

$$\Psi(\mathbf{r}, t) = \sum_{i=1}^{N_T} a_i(t)\psi_i^T(\mathbf{r}_T, t) + \sum_{i=N_T+1}^{N} a_i(t)\psi_i^P(\mathbf{r}_P, t), \tag{5}$$

where $\psi_i^T(\mathbf{r}_T, t)$ and $\psi_i^P(\mathbf{r}_P, t)$ are the target and the projectile atomic orbital with ap-

propriate electron translation factors attached and $\mathbf{r}_T, \mathbf{r}_P$ are the electron coordinates measured from the target and projectile nucleus, respectively. Further details of the numerical procedures have already been shown in previous papers [1, 2, 3].

References

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2 Tables of cross sections

All the cross sections are given in the units of cm^2. The numbers in the brackets denote the powers of ten to be multiplied. The first column labeled by sum in each table gives the cross sections summed over the degenerate states belonging to the same principal quantum number n.

He2+ + H(1s) E= 1.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.89[-18]	5.10[-19]	2.38[-18]		
n=3	1.01[-19]	2.19[-20]	6.51[-20]	1.43[-20]	
n=4	1.37[-20]	1.87[-21]	3.81[-21]	4.46[-21]	3.53[-21]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.43[-23]	1.43[-23]				
n=2	2.45[-16]	6.26[-17]	1.82[-16]			
n=3	1.03[-17]	2.00[-19]	1.97[-18]	8.14[-18]		
n=4	5.82[-19]	2.21[-20]	2.35[-19]	1.06[-19]	2.19[-19]	
n=5	4.05[-20]	2.72[-21]	1.33[-20]	1.41[-20]	5.17[-21]	5.21[-21]

Ionization cross section 2.43[-20]

He2+ + H(1s) E= 2.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	9.15[-18]	1.86[-18]	7.28[-18]		
n=3	8.57[-19]	1.29[-20]	5.42[-19]	3.03[-19]	
n=4	1.81[-19]	2.65[-20]	2.33[-20]	6.19[-20]	6.93[-20]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	3.59[-21]	3.59[-21]				
n=2	6.04[-16]	1.32[-16]	4.72[-16]			
n=3	3.00[-17]	3.98[-18]	1.47[-17]	1.13[-17]		
n=4	2.70[-18]	3.09[-19]	2.91[-19]	7.97[-19]	1.30[-18]	
n=5	4.24[-19]	1.51[-20]	1.60[-19]	8.95[-20]	5.19[-20]	1.08[-19]

Ionization cross section 3.51[-19]

He2+ + H(1s) E= 3.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	8.01[-18]	3.87[-19]	7.62[-18]		
n=3	1.22[-18]	1.43[-19]	5.10[-19]	5.63[-19]	
n=4	4.12[-19]	3.27[-20]	1.35[-19]	1.49[-19]	9.50[-20]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.90[-20]	2.90[-20]				
n=2	8.21[-16]	1.63[-16]	6.58[-16]			
n=3	4.90[-17]	9.81[-18]	2.70[-17]	1.22[-17]		
n=4	2.51[-18]	1.34[-19]	4.18[-19]	9.90[-19]	9.64[-19]	
n=5	7.91[-19]	1.26[-19]	1.35[-19]	1.42[-19]	1.77[-19]	2.12[-19]

Ionization cross section 1.07[-18]

He2+ + H(1s) E= 4.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.40[-17]	1.40[-18]	1.26[-17]		
n=3	1.98[-18]	1.62[-19]	7.87[-19]	1.03[-18]	
n=4	8.18[-19]	6.06[-20]	1.77[-19]	2.16[-19]	3.65[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	9.44[-20]	9.44[-20]				
n=2	1.00[-15]	1.97[-16]	8.06[-16]			
n=3	5.77[-17]	1.14[-17]	3.10[-17]	1.53[-17]		
n=4	4.90[-18]	4.05[-19]	1.16[-18]	2.34[-18]	9.96[-19]	
n=5	1.26[-18]	8.53[-20]	2.51[-19]	3.85[-19]	3.57[-19]	1.85[-19]

Ionization cross section 2.40[-18]

He2+ + H(1s) E= 5.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.45[-17]	3.87[-18]	2.07[-17]		
n=3	3.52[-18]	1.55[-19]	1.95[-18]	1.42[-18]	
n=4	1.31[-18]	9.07[-20]	2.32[-19]	4.83[-19]	5.09[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.55[-19]	2.55[-19]				
n=2	1.11[-15]	2.13[-16]	9.00[-16]			
n=3	6.88[-17]	1.24[-17]	3.62[-17]	2.02[-17]		
n=4	8.21[-18]	4.76[-19]	2.74[-18]	3.78[-18]	1.21[-18]	
n=5	2.10[-18]	1.23[-19]	3.95[-19]	8.82[-19]	5.47[-19]	1.58[-19]

Ionization cross section 3.91[-18]

He2+ + H(1s) E= 7.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.73[-17]	4.42[-18]	3.29[-17]		
n=3	5.08[-18]	4.45[-19]	2.92[-18]	1.72[-18]	
n=4	2.55[-18]	1.79[-19]	1.01[-18]	1.05[-18]	3.03[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	5.00[-19]	5.00[-19]				
n=2	1.18[-15]	2.13[-16]	9.66[-16]			
n=3	8.29[-17]	1.21[-17]	3.73[-17]	3.35[-17]		
n=4	1.32[-17]	1.29[-18]	5.00[-18]	4.50[-18]	2.41[-18]	
n=5	4.07[-18]	2.32[-19]	1.03[-18]	1.57[-18]	7.59[-19]	4.83[-19]

Ionization cross section 8.02[-18]

He2+ + H(1s) E= 10.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.34[-17]	7.78[-18]	2.56[-17]		
n=3	5.89[-18]	7.65[-19]	2.24[-18]	2.89[-18]	
n=4	3.91[-18]	5.80[-19]	1.43[-18]	1.29[-18]	6.05[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.46[-18]	1.46[-18]				
n=2	1.22[-15]	2.27[-16]	9.89[-16]			
n=3	9.14[-17]	1.29[-17]	3.49[-17]	4.36[-17]		
n=4	1.63[-17]	2.56[-18]	6.07[-18]	3.60[-18]	4.08[-18]	
n=5	6.24[-18]	7.13[-19]	1.86[-18]	1.43[-18]	1.27[-18]	9.70[-19]

Ionization cross section 1.30[-17]

He2+ + H(1s) E= 15.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.27[-17]	1.25[-17]	2.03[-17]		
n=3	6.52[-18]	1.92[-18]	3.08[-18]	1.52[-18]	
n=4	6.14[-18]	1.68[-18]	2.48[-18]	1.57[-18]	4.04[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	6.41[-18]	6.41[-18]				
n=2	1.13[-15]	2.19[-16]	9.15[-16]			
n=3	1.15[-16]	2.25[-17]	5.40[-17]	3.88[-17]		
n=4	2.52[-17]	5.01[-18]	1.10[-17]	5.94[-18]	3.21[-18]	
n=5	1.03[-17]	2.03[-18]	3.86[-18]	2.35[-18]	1.54[-18]	5.66[-19]

Ionization cross section 2.78[-17]

He2+ + H(1s) E= 20.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.69[-17]	1.66[-17]	3.03[-17]		
n=3	1.15[-17]	3.54[-18]	5.70[-18]	2.29[-18]	
n=4	1.07[-17]	3.22[-18]	4.67[-18]	2.37[-18]	4.32[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.27[-17]	1.27[-17]				
n=2	9.37[-16]	1.82[-16]	7.55[-16]			
n=3	1.51[-16]	4.11[-17]	7.77[-17]	3.17[-17]		
n=4	4.03[-17]	1.18[-17]	1.93[-17]	7.16[-18]	2.02[-18]	
n=5	1.81[-17]	4.85[-18]	7.84[-18]	3.68[-18]	1.40[-18]	3.07[-19]

Ionization cross section 6.06[-17]

He2+ + H(1s) E= 25.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	7.06[-17]	2.29[-17]	4.77[-17]		
n=3	1.63[-17]	4.84[-18]	8.32[-18]	3.14[-18]	
n=4	1.50[-17]	4.46[-18]	6.86[-18]	3.21[-18]	5.24[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.79[-17]	1.79[-17]				
n=2	7.32[-16]	1.46[-16]	5.86[-16]			
n=3	1.68[-16]	5.01[-17]	9.05[-17]	2.75[-17]		
n=4	5.48[-17]	1.96[-17]	2.51[-17]	8.52[-18]	1.60[-18]	
n=5	2.49[-17]	8.84[-18]	1.08[-17]	4.14[-18]	9.48[-19]	2.38[-19]

Ionization cross section 1.19[-16]

He2+ + H(1s) E= 30.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	9.65[-17]	3.03[-17]	6.62[-17]		
n=3	2.33[-17]	6.28[-18]	1.23[-17]	4.76[-18]	
n=4	1.87[-17]	5.04[-18]	8.78[-18]	4.18[-18]	7.38[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.15[-17]	2.15[-17]				
n=2	5.59[-16]	1.16[-16]	4.43[-16]			
n=3	1.65[-16]	5.10[-17]	8.93[-17]	2.46[-17]		
n=4	5.88[-17]	2.23[-17]	2.71[-17]	8.38[-18]	1.04[-18]	
n=5	3.04[-17]	1.16[-17]	1.30[-17]	4.44[-18]	9.62[-19]	3.85[-19]

Ionization cross section 1.91[-16]

He2+ + H(1s) E= 35.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.19[-16]	3.68[-17]	8.20[-17]		
n=3	3.15[-17]	8.68[-18]	1.63[-17]	6.47[-18]	
n=4	2.21[-17]	5.65[-18]	1.03[-17]	5.15[-18]	9.67[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.35[-17]	2.35[-17]				
n=2	4.24[-16]	9.25[-17]	3.32[-16]			
n=3	1.47[-16]	4.69[-17]	7.89[-17]	2.09[-17]		
n=4	5.88[-17]	2.15[-17]	2.80[-17]	8.21[-18]	1.08[-18]	
n=5	2.96[-17]	1.18[-17]	1.29[-17]	3.98[-18]	6.53[-19]	2.59[-19]

Ionization cross section 2.65[-16]

He2+ + H(1s) E= 40.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.35[-16]	4.01[-17]	9.49[-17]		
n=3	3.68[-17]	1.01[-17]	1.88[-17]	7.93[-18]	
n=4	2.89[-17]	8.01[-18]	1.34[-17]	6.42[-18]	1.10[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.43[-17]	2.43[-17]				
n=2	3.24[-16]	7.44[-17]	2.49[-16]			
n=3	1.22[-16]	3.98[-17]	6.54[-17]	1.72[-17]		
n=4	5.64[-17]	2.05[-17]	2.69[-17]	7.66[-18]	1.23[-18]	
n=5	2.93[-17]	1.10[-17]	1.34[-17]	4.04[-18]	6.68[-19]	1.40[-19]

Ionization cross section 3.27[-16]

He2+ + H(1s) E= 45.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.47[-16]	3.97[-17]	1.07[-16]		
n=3	4.04[-17]	1.07[-17]	2.09[-17]	8.83[-18]	
n=4	3.17[-17]	9.16[-18]	1.47[-17]	6.77[-18]	1.06[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.42[-17]	2.42[-17]				
n=2	2.49[-16]	6.05[-17]	1.89[-16]			
n=3	9.94[-17]	3.26[-17]	5.30[-17]	1.38[-17]		
n=4	4.83[-17]	1.82[-17]	2.27[-17]	6.30[-18]	1.10[-18]	
n=5	3.01[-17]	1.11[-17]	1.36[-17]	4.25[-18]	9.68[-19]	9.24[-20]

Ionization cross section 3.81[-16]

He2+ + H(1s) E= 50.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.58[-16]	3.79[-17]	1.20[-16]		
n=3	4.16[-17]	1.05[-17]	2.23[-17]	8.76[-18]	
n=4	3.08[-17]	8.27[-18]	1.44[-17]	6.94[-18]	1.19[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.34[-17]	2.34[-17]				
n=2	1.93[-16]	4.97[-17]	1.44[-16]			
n=3	8.03[-17]	2.65[-17]	4.28[-17]	1.11[-17]		
n=4	3.88[-17]	1.48[-17]	1.81[-17]	5.04[-18]	8.83[-19]	
n=5	2.61[-17]	1.01[-17]	1.14[-17]	3.65[-18]	9.56[-19]	5.72[-20]

Ionization cross section 4.28[-16]

He2+ + H(1s) E= 55.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.69[-16]	3.63[-17]	1.33[-16]		
n=3	4.16[-17]	9.40[-18]	2.34[-17]	8.76[-18]	
n=4	3.11[-17]	7.90[-18]	1.48[-17]	7.10[-18]	1.27[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.22[-17]	2.22[-17]				
n=2	1.51[-16]	4.12[-17]	1.10[-16]			
n=3	6.50[-17]	2.16[-17]	3.46[-17]	8.86[-18]		
n=4	3.12[-17]	1.17[-17]	1.47[-17]	4.15[-18]	6.90[-19]	
n=5	2.02[-17]	8.02[-18]	8.61[-18]	2.84[-18]	7.22[-19]	4.13[-20]

Ionization cross section 4.60[-16]

He2+ + H(1s) E= 63.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.85[-16]	3.62[-17]	1.49[-16]		
n=3	4.39[-17]	8.91[-18]	2.59[-17]	9.17[-18]	
n=4	2.82[-17]	6.34[-18]	1.41[-17]	6.52[-18]	1.16[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.00[-17]	2.00[-17]				
n=2	1.04[-16]	3.09[-17]	7.33[-17]			
n=3	4.70[-17]	1.59[-17]	2.49[-17]	6.17[-18]		
n=4	2.31[-17]	8.66[-18]	1.10[-17]	3.02[-18]	4.40[-19]	
n=5	1.31[-17]	5.03[-18]	5.86[-18]	1.86[-18]	3.30[-19]	6.34[-20]

Ionization cross section 4.83[-16]

He2+ + H(1s) E= 75.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.09[-16]	4.07[-17]	1.69[-16]		
n=3	4.88[-17]	8.47[-18]	2.99[-17]	1.05[-17]	
n=4	2.87[-17]	5.83[-18]	1.49[-17]	6.71[-18]	1.19[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.65[-17]	1.65[-17]				
n=2	6.18[-17]	2.07[-17]	4.11[-17]			
n=3	2.98[-17]	1.08[-17]	1.54[-17]	3.57[-18]		
n=4	1.42[-17]	5.62[-18]	6.62[-18]	1.69[-18]	2.34[-19]	
n=5	8.75[-18]	3.36[-18]	4.04[-18]	1.06[-18]	1.71[-19]	1.17[-19]

Ionization cross section 4.83[-16]

He2+ + H(1s) E= 90.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.06[-16]	3.90[-17]	1.67[-16]		
n=3	5.48[-17]	9.13[-18]	3.39[-17]	1.18[-17]	
n=4	3.00[-17]	5.43[-18]	1.64[-17]	7.26[-18]	9.33[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.26[-17]	1.26[-17]				
n=2	3.40[-17]	1.28[-17]	2.12[-17]			
n=3	1.71[-17]	6.91[-18]	8.38[-18]	1.78[-18]		
n=4	8.54[-18]	3.43[-18]	3.92[-18]	1.04[-18]	1.52[-19]	
n=5	4.67[-18]	1.88[-18]	2.10[-18]	5.73[-19]	8.88[-20]	3.24[-20]

Ionization cross section 4.69[-16]

He2+ + H(1s) E=100.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.99[-16]	3.18[-17]	1.67[-16]		
n=3	5.29[-17]	9.81[-18]	3.27[-17]	1.04[-17]	
n=4	3.10[-17]	6.03[-18]	1.68[-17]	7.29[-18]	8.87[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.05[-17]	1.05[-17]				
n=2	2.36[-17]	9.50[-18]	1.41[-17]			
n=3	1.16[-17]	4.95[-18]	5.52[-18]	1.13[-18]		
n=4	6.34[-18]	2.67[-18]	2.82[-18]	7.41[-19]	1.04[-19]	
n=5	3.84[-18]	1.53[-18]	1.72[-18]	5.02[-19]	8.59[-20]	9.91[-21]

Ionization cross section 4.54[-16]

He2+ + H(1s) E=110.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.02[-16]	2.59[-17]	1.76[-16]		
n=3	4.66[-17]	8.31[-18]	3.02[-17]	8.07[-18]	
n=4	2.75[-17]	5.38[-18]	1.51[-17]	6.20[-18]	8.46[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	8.71[-18]	8.71[-18]				
n=2	1.67[-17]	7.16[-18]	9.57[-18]			
n=3	8.01[-18]	3.53[-18]	3.76[-18]	7.18[-19]		
n=4	4.46[-18]	1.98[-18]	1.93[-18]	4.83[-19]	6.60[-20]	
n=5	2.88[-18]	1.20[-18]	1.23[-18]	3.59[-19]	7.16[-20]	9.95[-21]

Ionization cross section 4.39[-16]

He2+ + H(1s) E=130.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.15[-16]	2.40[-17]	1.91[-16]		
n=3	4.29[-17]	4.70[-18]	3.16[-17]	6.63[-18]	
n=4	2.10[-17]	3.03[-18]	1.31[-17]	4.37[-18]	5.41[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	6.01[-18]	6.01[-18]				
n=2	8.83[-18]	4.17[-18]	4.66[-18]			
n=3	4.06[-18]	1.97[-18]	1.81[-18]	2.82[-19]		
n=4	2.11[-18]	9.81[-19]	8.97[-19]	1.94[-19]	3.41[-20]	
n=5	1.37[-18]	6.24[-19]	5.59[-19]	1.43[-19]	2.87[-20]	1.47[-20]

Ionization cross section 3.96[-16]

He2+ + H(1s) E=150.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.16[-16]	2.37[-17]	1.92[-16]		
n=3	4.62[-17]	5.80[-18]	3.37[-17]	6.73[-18]	
n=4	2.16[-17]	3.05[-18]	1.40[-17]	4.17[-18]	4.56[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	4.17[-18]	4.17[-18]				
n=2	5.00[-18]	2.51[-18]	2.49[-18]			
n=3	2.10[-18]	1.09[-18]	8.82[-19]	1.34[-19]		
n=4	1.15[-18]	5.87[-19]	4.63[-19]	8.21[-20]	2.25[-20]	
n=5	7.03[-19]	3.15[-19]	2.88[-19]	6.28[-20]	2.30[-20]	1.35[-20]

Ionization cross section 3.57[-16]

He2+ + H(1s) E=170.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.09[-16]	2.27[-17]	1.87[-16]		
n=3	4.28[-17]	4.79[-18]	3.22[-17]	5.83[-18]	
n=4	2.16[-17]	2.87[-18]	1.39[-17]	4.18[-18]	6.36[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.93[-18]	2.93[-18]				
n=2	3.02[-18]	1.59[-18]	1.43[-18]			
n=3	1.23[-18]	6.38[-19]	5.05[-19]	8.41[-20]		
n=4	5.79[-19]	3.10[-19]	2.18[-19]	4.22[-20]	8.62[-21]	
n=5	3.79[-19]	1.94[-19]	1.36[-19]	2.74[-20]	1.75[-20]	4.35[-21]

Ionization cross section 3.34[-16]

He2+ + H(1s) E=200.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.94[-16]	1.92[-17]	1.75[-16]		
n=3	4.13[-17]	4.77[-18]	3.14[-17]	5.20[-18]	
n=4	1.97[-17]	2.36[-18]	1.34[-17]	3.59[-18]	3.57[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.76[-18]	1.76[-18]				
n=2	1.51[-18]	8.45[-19]	6.67[-19]			
n=3	6.44[-19]	3.31[-19]	2.61[-19]	5.18[-20]		
n=4	3.04[-19]	1.56[-19]	1.17[-19]	2.75[-20]	3.89[-21]	
n=5	1.68[-19]	8.21[-20]	6.37[-20]	1.67[-20]	3.64[-21]	1.35[-21]

Ionization cross section 3.04[-16]

He2+ + H(1s) E=300.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.66[-16]	1.23[-17]	1.53[-16]		
n=3	3.23[-17]	2.92[-18]	2.62[-17]	3.14[-18]	
n=4	1.34[-17]	1.38[-18]	9.98[-18]	1.90[-18]	1.16[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	4.44[-19]	4.44[-19]				
n=2	2.11[-19]	1.38[-19]	7.35[-20]			
n=3	8.87[-20]	5.38[-20]	2.73[-20]	7.65[-21]		
n=4	4.96[-20]	2.38[-20]	1.36[-20]	4.24[-21]	7.94[-21]	
n=5	3.47[-20]	1.51[-20]	9.38[-21]	4.25[-21]	3.90[-21]	2.07[-21]

Ionization cross section 2.12[-16]

He2+ + H(1s) E=400.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.44[-16]	1.04[-17]	1.34[-16]		
n=3	2.82[-17]	2.12[-18]	2.38[-17]	2.29[-18]	
n=4	1.05[-17]	7.62[-19]	8.52[-18]	1.17[-18]	7.18[-20]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.56[-19]	1.56[-19]				
n=2	5.59[-20]	3.79[-20]	1.80[-20]			
n=3	2.32[-20]	1.43[-20]	7.27[-21]	1.64[-21]		
n=4	1.09[-20]	6.09[-21]	3.13[-21]	8.49[-22]	8.03[-22]	
n=5	5.91[-21]	2.80[-21]	1.50[-21]	6.72[-22]	8.38[-22]	9.48[-23]

Ionization cross section 1.64[-16]

Li3+ + H(1s) E= 1.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	8.61[-19]	3.28[-19]	5.33[-19]		
n=3	4.13[-20]	1.20[-20]	1.68[-20]	1.25[-20]	
n=4	2.15[-20]	3.96[-21]	1.69[-21]	1.29[-20]	2.95[-21]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	5.75[-24]	5.75[-24]				
n=2	5.81[-17]	2.73[-17]	3.08[-17]			
n=3	2.04[-16]	1.35[-17]	6.47[-17]	1.26[-16]		
n=4	4.19[-18]	6.38[-19]	7.09[-19]	8.57[-19]	1.99[-18]	
n=5	3.18[-19]	6.51[-20]	3.48[-20]	8.14[-20]	6.72[-20]	6.98[-20]

Ionization cross section 6.29[-20]

Li3+ + H(1s) E= 2.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.40[-18]	1.67[-18]	2.73[-18]		
n=3	5.62[-19]	1.58[-19]	2.16[-19]	1.88[-19]	
n=4	1.73[-19]	2.19[-20]	1.62[-20]	6.57[-20]	6.92[-20]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	4.04[-24]	4.04[-24]				
n=2	1.99[-16]	9.63[-17]	1.03[-16]			
n=3	2.91[-16]	6.46[-17]	1.35[-16]	9.24[-17]		
n=4	2.02[-17]	4.68[-18]	3.59[-18]	5.67[-18]	6.22[-18]	
n=5	2.22[-18]	1.66[-19]	4.89[-19]	4.46[-19]	5.81[-19]	5.41[-19]

Ionization cross section 7.18[-19]

Li3+ + H(1s) E= 3.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.18[-18]	1.66[-18]	3.52[-18]		
n=3	6.18[-19]	7.82[-20]	3.45[-19]	1.95[-19]	
n=4	3.94[-19]	7.09[-20]	9.68[-20]	9.06[-20]	1.36[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	6.99[-24]	6.99[-24]				
n=2	3.47[-16]	1.65[-16]	1.81[-16]			
n=3	3.45[-16]	4.89[-17]	1.53[-16]	1.43[-16]		
n=4	3.76[-17]	5.99[-18]	1.34[-17]	1.18[-17]	6.28[-18]	
n=5	2.45[-18]	2.66[-19]	4.43[-19]	5.99[-19]	6.52[-19]	4.89[-19]

Ionization cross section 1.32[-18]

Li3+ + H(1s) E= 5.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.12[-17]	3.87[-18]	7.29[-18]		
n=3	2.83[-18]	4.58[-19]	8.97[-19]	1.48[-18]	
n=4	1.53[-18]	2.90[-19]	3.83[-19]	3.10[-19]	5.49[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	6.17[-24]	6.17[-24]				
n=2	5.38[-16]	2.40[-16]	2.98[-16]			
n=3	5.85[-16]	1.27[-16]	1.95[-16]	2.63[-16]		
n=4	4.65[-17]	4.24[-18]	1.52[-17]	1.94[-17]	7.64[-18]	
n=5	5.97[-18]	1.00[-18]	1.49[-18]	1.65[-18]	1.16[-18]	6.62[-19]

Ionization cross section 6.12[-18]

Li3+ + H(1s) E= 6.25keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.08[-17]	7.43[-18]	1.34[-17]		
n=3	5.14[-18]	7.33[-19]	1.49[-18]	2.91[-18]	
n=4	3.11[-18]	2.35[-19]	6.94[-19]	9.80[-19]	1.20[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	8.01[-23]	8.01[-23]				
n=2	6.13[-16]	2.49[-16]	3.64[-16]			
n=3	7.36[-16]	1.44[-16]	2.34[-16]	3.58[-16]		
n=4	6.70[-17]	4.95[-18]	1.73[-17]	2.97[-17]	1.50[-17]	
n=5	9.92[-18]	1.01[-18]	2.36[-18]	3.50[-18]	2.16[-18]	8.86[-19]

Ionization cross section 9.59[-18]

Li3+ + H(1s) E= 10.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.91[-17]	6.31[-18]	2.28[-17]		
n=3	6.38[-18]	7.44[-19]	3.53[-18]	2.11[-18]	
n=4	5.15[-18]	7.77[-19]	1.79[-18]	1.54[-18]	1.05[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	9.25[-22]	9.25[-22]				
n=2	6.85[-16]	1.98[-16]	4.86[-16]			
n=3	1.03[-15]	9.16[-17]	3.02[-16]	6.35[-16]		
n=4	7.79[-17]	6.15[-18]	1.46[-17]	2.31[-17]	3.41[-17]	
n=5	1.66[-17]	1.12[-18]	3.45[-18]	6.13[-18]	2.70[-18]	3.24[-18]

Ionization cross section 1.69[-17]

Li3+ + H(1s) E= 15.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.78[-17]	1.06[-17]	1.71[-17]		
n=3	5.30[-18]	1.93[-18]	1.82[-18]	1.55[-18]	
n=4	8.32[-18]	2.23[-18]	3.50[-18]	1.92[-18]	6.59[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	8.15[-21]	8.15[-21]				
n=2	6.99[-16]	1.53[-16]	5.45[-16]			
n=3	1.10[-15]	5.54[-17]	2.99[-16]	7.47[-16]		
n=4	1.07[-16]	1.27[-17]	3.18[-17]	3.70[-17]	2.56[-17]	
n=5	2.63[-17]	2.65[-18]	6.40[-18]	7.78[-18]	5.50[-18]	3.91[-18]

Ionization cross section 2.63[-17]

Li3+ + H(1s) E= 25.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.89[-17]	2.27[-17]	3.62[-17]		
n=3	1.38[-17]	3.94[-18]	6.31[-18]	3.58[-18]	
n=4	2.54[-17]	7.47[-18]	1.08[-17]	5.83[-18]	1.29[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.19[-19]	1.19[-19]				
n=2	5.83[-16]	9.17[-17]	4.92[-16]			
n=3	7.98[-16]	3.75[-17]	2.23[-16]	5.38[-16]		
n=4	2.21[-16]	1.80[-17]	7.37[-17]	9.89[-17]	3.03[-17]	
n=5	7.64[-17]	9.42[-18]	2.68[-17]	2.86[-17]	9.76[-18]	1.83[-18]

Ionization cross section 1.12[-16]

Li3+ + H(1s) E= 35.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.06[-16]	3.60[-17]	7.04[-17]		
n=3	3.19[-17]	1.05[-17]	1.56[-17]	5.84[-18]	
n=4	5.11[-17]	1.49[-17]	2.30[-17]	1.17[-17]	1.43[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	3.78[-19]	3.78[-19]				
n=2	4.27[-16]	5.37[-17]	3.73[-16]			
n=3	5.18[-16]	2.94[-17]	1.73[-16]	3.15[-16]		
n=4	2.23[-16]	1.66[-17]	7.91[-17]	9.61[-17]	3.12[-17]	
n=5	1.08[-16]	1.10[-17]	4.27[-17]	3.83[-17]	1.35[-17]	2.18[-18]

Ionization cross section 3.10[-16]

Li3+ + H(1s) E= 50.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.94[-16]	6.29[-17]	1.31[-16]		
n=3	5.25[-17]	1.32[-17]	2.69[-17]	1.24[-17]	
n=4	6.30[-17]	1.76[-17]	2.84[-17]	1.47[-17]	2.30[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	8.60[-19]	8.60[-19]				
n=2	2.53[-16]	2.69[-17]	2.26[-16]			
n=3	2.73[-16]	1.94[-17]	1.11[-16]	1.43[-16]		
n=4	1.50[-16]	1.35[-17]	5.92[-17]	5.91[-17]	1.85[-17]	
n=5	8.99[-17]	9.90[-18]	3.47[-17]	3.17[-17]	1.19[-17]	1.70[-18]

Ionization cross section 5.95[-16]

Li3+ + H(1s) E= 75.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.46[-16]	5.15[-17]	1.94[-16]		
n=3	6.43[-17]	1.62[-17]	3.48[-17]	1.34[-17]	
n=4	7.91[-17]	2.38[-17]	3.64[-17]	1.62[-17]	2.75[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.44[-18]	1.44[-18]				
n=2	1.08[-16]	1.21[-17]	9.62[-17]			
n=3	1.04[-16]	1.02[-17]	4.96[-17]	4.38[-17]		
n=4	6.00[-17]	6.68[-18]	2.52[-17]	2.21[-17]	6.05[-18]	
n=5	3.95[-17]	5.20[-18]	1.63[-17]	1.28[-17]	4.46[-18]	7.32[-19]

Ionization cross section 8.13[-16]

Li3+ + H(1s) E=100.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.03[-16]	5.46[-17]	2.48[-16]		
n=3	7.73[-17]	1.30[-17]	4.75[-17]	1.67[-17]	
n=4	6.24[-17]	1.31[-17]	3.07[-17]	1.56[-17]	2.91[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.58[-18]	1.58[-18]				
n=2	5.04[-17]	6.76[-18]	4.37[-17]			
n=3	4.31[-17]	5.75[-18]	2.26[-17]	1.48[-17]		
n=4	2.76[-17]	3.83[-18]	1.32[-17]	8.61[-18]	1.97[-18]	
n=5	1.76[-17]	2.24[-18]	8.02[-18]	5.55[-18]	1.57[-18]	2.08[-19]

Ionization cross section 8.11[-16]

Li3+ + H(1s) E=150.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.16[-16]	4.91[-17]	2.67[-16]		
n=3	7.93[-17]	1.31[-17]	4.94[-17]	1.68[-17]	
n=4	5.29[-17]	1.00[-17]	2.79[-17]	1.31[-17]	1.93[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.29[-18]	1.29[-18]				
n=2	1.39[-17]	2.78[-18]	1.11[-17]			
n=3	9.52[-18]	1.89[-18]	5.26[-18]	2.37[-18]		
n=4	5.85[-18]	1.27[-18]	2.92[-18]	1.42[-18]	2.36[-19]	
n=5	4.08[-18]	8.35[-19]	1.97[-18]	1.00[-18]	2.33[-19]	4.36[-20]

Ionization cross section 7.17[-16]

Li3+ + H(1s) E=200.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.41[-16]	3.08[-17]	3.10[-16]		
n=3	7.00[-17]	6.73[-18]	5.18[-17]	1.15[-17]	
n=4	3.81[-17]	4.88[-18]	2.34[-17]	8.61[-18]	1.20[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	9.07[-19]	9.07[-19]				
n=2	4.81[-18]	1.33[-18]	3.48[-18]			
n=3	3.01[-18]	7.80[-19]	1.64[-18]	5.91[-19]		
n=4	1.64[-18]	4.38[-19]	8.29[-19]	3.22[-19]	5.13[-20]	
n=5	9.60[-19]	2.53[-19]	4.66[-19]	1.91[-19]	4.40[-20]	5.58[-21]

Ionization cross section 5.82[-16]

Li3+ + H(1s) E=400.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.73[-16]	2.04[-17]	2.53[-16]		
n=3	5.31[-17]	4.64[-18]	4.27[-17]	5.68[-18]	
n=4	2.37[-17]	2.22[-18]	1.70[-17]	3.82[-18]	6.70[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.63[-19]	1.63[-19]				
n=2	2.28[-19]	9.79[-20]	1.30[-19]			
n=3	1.08[-19]	4.26[-20]	5.22[-20]	1.32[-20]		
n=4	5.20[-20]	1.93[-20]	2.04[-20]	9.06[-21]	3.23[-21]	
n=5	3.05[-20]	9.71[-21]	1.04[-20]	6.93[-21]	2.44[-21]	1.04[-21]

Ionization cross section 3.58[-16]

Be4+ + H(1s) E= 0.25keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.16[-19]	6.89[-20]	4.70[-20]		
n=3	9.02[-21]	2.33[-21]	4.17[-21]	2.52[-21]	
n=4	3.08[-21]	2.16[-22]	4.02[-22]	1.87[-21]	5.90[-22]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	4.47[-25]	4.47[-25]				
n=2	3.42[-22]	1.31[-22]	2.11[-22]			
n=3	2.73[-15]	3.09[-16]	7.26[-16]	1.69[-15]		
n=4	3.16[-16]	4.27[-17]	6.85[-17]	8.61[-17]	1.18[-16]	
n=5	1.13[-18]	1.54[-19]	1.51[-19]	8.16[-20]	3.17[-19]	4.22[-19]

Ionization cross section 4.15[-21]

Be4+ + H(1s) E= 0.50keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	6.67[-19]	2.10[-19]	4.56[-19]		
n=3	3.31[-20]	3.71[-21]	6.66[-21]	2.28[-20]	
n=4	2.10[-20]	1.07[-21]	5.41[-21]	7.59[-21]	6.89[-21]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.29[-24]	1.29[-24]				
n=2	4.42[-22]	1.07[-22]	3.35[-22]			
n=3	2.84[-15]	3.03[-16]	6.41[-16]	1.90[-15]		
n=4	3.18[-16]	1.27[-17]	4.46[-17]	1.13[-16]	1.47[-16]	
n=5	2.46[-18]	3.67[-19]	4.39[-19]	4.32[-19]	4.71[-19]	7.49[-19]

Ionization cross section 4.85[-20]

Be4+ + H(1s) E= 1.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.58[-18]	6.77[-19]	9.02[-19]		
n=3	2.02[-19]	7.60[-20]	7.35[-20]	5.26[-20]	
n=4	2.90[-19]	1.98[-20]	1.13[-19]	5.28[-20]	1.05[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	5.83[-24]	5.83[-24]				
n=2	2.10[-20]	8.71[-21]	1.23[-20]			
n=3	3.42[-15]	3.00[-16]	1.07[-15]	2.05[-15]		
n=4	3.12[-16]	4.44[-17]	7.83[-17]	1.17[-16]	7.25[-17]	
n=5	6.42[-18]	8.05[-19]	4.76[-19]	1.82[-18]	1.75[-18]	1.57[-18]

Ionization cross section 3.96[-19]

Be4+ + H(1s) E= 2.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	6.58[-18]	2.35[-18]	4.23[-18]		
n=3	9.17[-19]	1.79[-19]	3.09[-19]	4.29[-19]	
n=4	4.51[-19]	5.15[-20]	1.26[-19]	1.76[-19]	9.67[-20]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.91[-24]	1.91[-24]				
n=2	4.84[-19]	2.05[-19]	2.79[-19]			
n=3	3.42[-15]	2.87[-16]	1.22[-15]	1.92[-15]		
n=4	3.13[-16]	5.91[-17]	1.06[-16]	1.04[-16]	4.44[-17]	
n=5	2.14[-17]	2.77[-18]	3.87[-18]	4.77[-18]	6.29[-18]	3.71[-18]

Ionization cross section 2.45[-18]

Be4+ + H(1s) E= 3.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	6.77[-18]	2.70[-18]	4.07[-18]		
n=3	1.05[-18]	2.01[-19]	4.72[-19]	3.77[-19]	
n=4	1.24[-18]	4.55[-20]	3.79[-19]	4.46[-19]	3.70[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	8.98[-23]	8.98[-23]				
n=2	2.32[-18]	6.99[-19]	1.62[-18]			
n=3	3.21[-15]	2.63[-16]	1.15[-15]	1.80[-15]		
n=4	3.41[-16]	4.30[-17]	9.93[-17]	1.29[-16]	6.88[-17]	
n=5	3.03[-17]	2.95[-18]	6.48[-18]	9.28[-18]	8.22[-18]	3.40[-18]

Ionization cross section 3.48[-18]

Be4+ + H(1s) E= 4.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.08[-18]	2.46[-18]	2.61[-18]		
n=3	1.25[-18]	3.71[-19]	4.37[-19]	4.38[-19]	
n=4	1.82[-18]	3.32[-19]	4.85[-19]	6.84[-19]	3.21[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.17[-23]	1.17[-23]				
n=2	6.29[-18]	1.82[-18]	4.47[-18]			
n=3	3.01[-15]	2.58[-16]	1.03[-15]	1.72[-15]		
n=4	3.54[-16]	2.95[-17]	9.36[-17]	1.41[-16]	9.05[-17]	
n=5	2.09[-17]	1.50[-18]	3.24[-18]	7.84[-18]	6.02[-18]	2.30[-18]

Ionization cross section 6.27[-18]

Be4+ + H(1s) E= 6.25keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.27[-17]	5.18[-18]	7.56[-18]		
n=3	4.54[-18]	6.09[-19]	1.33[-18]	2.60[-18]	
n=4	3.82[-18]	5.11[-19]	8.85[-19]	1.31[-18]	1.11[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.32[-24]	1.32[-24]				
n=2	1.84[-17]	9.17[-18]	9.25[-18]			
n=3	2.78[-15]	2.68[-16]	9.21[-16]	1.59[-15]		
n=4	4.36[-16]	2.68[-17]	9.26[-17]	1.55[-16]	1.62[-16]	
n=5	3.78[-17]	3.57[-18]	4.12[-18]	7.31[-18]	1.38[-17]	9.00[-18]

Ionization cross section 1.76[-17]

Be4+ + H(1s) E= 9.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.02[-17]	5.47[-18]	1.48[-17]		
n=3	6.42[-18]	4.94[-19]	2.18[-18]	3.74[-18]	
n=4	6.92[-18]	6.49[-19]	1.95[-18]	2.58[-18]	1.74[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	5.51[-25]	5.51[-25]				
n=2	3.67[-17]	1.85[-17]	1.81[-17]			
n=3	2.47[-15]	1.68[-16]	7.36[-16]	1.57[-15]		
n=4	5.55[-16]	2.11[-17]	6.99[-17]	1.81[-16]	2.82[-16]	
n=5	4.55[-17]	3.32[-18]	6.13[-18]	6.96[-18]	1.06[-17]	1.85[-17]

Ionization cross section 2.28[-17]

Be4+ + H(1s) E= 12.50keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.87[-17]	5.89[-18]	1.28[-17]		
n=3	5.06[-18]	7.83[-19]	2.05[-18]	2.22[-18]	
n=4	8.96[-18]	1.65[-18]	3.57[-18]	2.39[-18]	1.35[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	3.09[-24]	3.09[-24]				
n=2	5.82[-17]	2.49[-17]	3.32[-17]			
n=3	2.22[-15]	1.04[-16]	5.66[-16]	1.55[-15]		
n=4	6.38[-16]	1.74[-17]	5.59[-17]	1.99[-16]	3.65[-16]	
n=5	5.56[-17]	3.23[-18]	1.10[-17]	1.55[-17]	1.06[-17]	1.53[-17]

Ionization cross section 2.47[-17]

Be4+ + H(1s) E= 25.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.37[-17]	2.23[-17]	3.15[-17]		
n=3	1.29[-17]	3.28[-18]	4.42[-18]	5.21[-18]	
n=4	3.81[-17]	1.02[-17]	1.72[-17]	8.78[-18]	1.85[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	5.93[-22]	5.93[-22]				
n=2	1.13[-16]	3.41[-17]	7.86[-17]			
n=3	1.39[-15]	4.83[-17]	2.57[-16]	1.09[-15]		
n=4	6.62[-16]	1.82[-17]	8.59[-17]	2.25[-16]	3.32[-16]	
n=5	2.05[-16]	7.52[-18]	3.17[-17]	6.12[-17]	7.23[-17]	3.21[-17]

Ionization cross section 1.37[-16]

Be4+ + H(1s) E= 50.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.73[-16]	5.36[-17]	1.20[-16]		
n=3	4.76[-17]	1.65[-17]	2.17[-17]	9.41[-18]	
n=4	1.60[-16]	5.21[-17]	7.04[-17]	3.26[-17]	4.60[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.90[-20]	1.90[-20]				
n=2	1.05[-16]	2.09[-17]	8.45[-17]			
n=3	4.63[-16]	1.75[-17]	8.43[-17]	3.61[-16]		
n=4	3.52[-16]	1.08[-17]	5.59[-17]	1.55[-16]	1.30[-16]	
n=5	2.13[-16]	7.81[-18]	3.53[-17]	7.82[-17]	6.79[-17]	2.38[-17]

Ionization cross section 7.79[-16]

Be4+ + H(1s) E= 75.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.13[-16]	9.65[-17]	2.16[-16]		
n=3	8.11[-17]	2.12[-17]	4.13[-17]	1.87[-17]	
n=4	1.61[-16]	4.56[-17]	7.09[-17]	3.76[-17]	6.88[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	6.57[-20]	6.57[-20]				
n=2	6.74[-17]	9.19[-18]	5.82[-17]			
n=3	1.81[-16]	7.22[-18]	4.44[-17]	1.30[-16]		
n=4	1.43[-16]	4.82[-18]	2.92[-17]	6.49[-17]	4.41[-17]	
n=5	1.02[-16]	3.98[-18]	2.29[-17]	3.95[-17]	2.80[-17]	7.45[-18]

Ionization cross section 1.12[-15]

Be4+ + H(1s) E=100.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.37[-16]	7.44[-17]	2.63[-16]		
n=3	9.47[-17]	2.41[-17]	4.99[-17]	2.07[-17]	
n=4	1.42[-16]	4.33[-17]	6.28[-17]	3.00[-17]	5.44[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.22[-19]	1.22[-19]				
n=2	4.08[-17]	4.46[-18]	3.63[-17]			
n=3	8.04[-17]	3.82[-18]	2.52[-17]	5.15[-17]		
n=4	6.55[-17]	2.61[-18]	1.73[-17]	3.04[-17]	1.53[-17]	
n=5	4.61[-17]	1.88[-18]	1.05[-17]	1.94[-17]	1.19[-17]	2.45[-18]

Ionization cross section 1.22[-15]

Be4+ + H(1s) E=150.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.14[-16]	5.16[-17]	3.62[-16]		
n=3	9.84[-17]	1.43[-17]	6.22[-17]	2.20[-17]	
n=4	1.02[-16]	2.18[-17]	4.97[-17]	2.59[-17]	5.04[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.84[-19]	1.84[-19]				
n=2	1.59[-17]	1.58[-18]	1.43[-17]			
n=3	2.07[-17]	1.30[-18]	8.85[-18]	1.06[-17]		
n=4	1.54[-17]	1.12[-18]	5.80[-18]	6.41[-18]	2.09[-18]	
n=5	1.20[-17]	9.72[-19]	4.27[-18]	4.47[-18]	1.98[-18]	3.49[-19]

Ionization cross section 1.08[-15]

Be4+ + H(1s) E=200.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.60[-16]	6.03[-17]	3.99[-16]		
n=3	1.14[-16]	1.58[-17]	7.46[-17]	2.33[-17]	
n=4	8.53[-17]	1.49[-17]	4.49[-17]	2.15[-17]	3.92[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.94[-19]	1.94[-19]				
n=2	6.75[-18]	7.98[-19]	5.95[-18]			
n=3	7.09[-18]	6.92[-19]	3.56[-18]	2.83[-18]		
n=4	4.58[-18]	4.40[-19]	1.98[-18]	1.71[-18]	4.49[-19]	
n=5	3.04[-18]	3.00[-19]	1.28[-18]	1.04[-18]	3.60[-19]	6.84[-20]

Ionization cross section 9.33[-16]

Be4+ + H(1s) E=400.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.11[-16]	3.00[-17]	3.81[-16]		
n=3	8.69[-17]	7.85[-18]	6.56[-17]	1.34[-17]	
n=4	4.49[-17]	5.47[-18]	2.87[-17]	9.56[-18]	1.14[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	7.96[-20]	7.96[-20]				
n=2	4.92[-19]	1.20[-19]	3.72[-19]			
n=3	3.16[-19]	6.95[-20]	1.69[-19]	7.74[-20]		
n=4	1.72[-19]	3.76[-20]	7.46[-20]	4.88[-20]	1.05[-20]	
n=5	1.14[-19]	2.51[-20]	4.28[-20]	2.92[-20]	1.24[-20]	4.18[-21]

Ionization cross section 5.98[-16]

Be4+ + H(1s) E=600.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.80[-16]	2.31[-17]	3.57[-16]		
n=3	7.39[-17]	4.94[-18]	6.14[-17]	7.51[-18]	
n=4	3.15[-17]	2.59[-18]	2.35[-17]	5.03[-18]	4.11[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	4.44[-20]	4.44[-20]				
n=2	8.71[-20]	2.61[-20]	6.09[-20]			
n=3	4.70[-20]	1.35[-20]	2.57[-20]	7.79[-21]		
n=4	2.62[-20]	6.97[-21]	1.21[-20]	4.27[-21]	2.91[-21]	
n=5	1.55[-20]	3.95[-21]	5.82[-21]	2.01[-21]	1.13[-21]	2.60[-21]

Ionization cross section 4.16[-16]

Be4+ + H(1s) E=800.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.03[-16]	1.82[-17]	2.85[-16]		
n=3	5.98[-17]	3.92[-18]	5.06[-17]	5.27[-18]	
n=4	2.42[-17]	1.88[-18]	1.88[-17]	3.30[-18]	2.08[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.99[-20]	1.99[-20]				
n=2	2.32[-20]	9.05[-21]	1.42[-20]			
n=3	9.59[-21]	3.61[-21]	4.83[-21]	1.16[-21]		
n=4	4.66[-21]	1.88[-21]	2.18[-21]	5.31[-22]	8.01[-23]	
n=5	2.78[-21]	1.11[-21]	1.26[-21]	2.88[-22]	9.53[-23]	2.68[-23]

Ionization cross section 3.47[-16]

B5+ + H(1s) E= 0.25keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.35[-19]	2.85[-19]	1.50[-19]		
n=3	4.66[-20]	1.65[-20]	1.33[-20]	1.68[-20]	
n=4	2.19[-20]	1.83[-21]	4.53[-21]	7.97[-21]	7.53[-21]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	8.66[-27]	8.66[-27]				
n=2	4.03[-22]	2.01[-23]	3.83[-22]			
n=3	4.41[-18]	1.02[-18]	1.82[-18]	1.56[-18]		
n=4	1.60[-15]	1.42[-16]	4.34[-16]	5.67[-16]	4.53[-16]	
n=5	3.56[-17]	4.12[-18]	7.52[-18]	8.66[-18]	5.64[-18]	9.69[-18]

Ionization cross section 3.43[-20]

B5+ + H(1s) E= 0.50keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	7.98[-19]	4.03[-19]	3.95[-19]		
n=3	2.64[-19]	9.12[-20]	7.84[-20]	9.47[-20]	
n=4	1.51[-19]	3.29[-20]	2.34[-20]	4.37[-20]	5.06[-20]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	6.31[-26]	6.31[-26]				
n=2	2.12[-22]	4.59[-23]	1.66[-22]			
n=3	3.02[-17]	8.45[-18]	1.31[-17]	8.73[-18]		
n=4	1.61[-15]	9.18[-17]	2.89[-16]	5.76[-16]	6.54[-16]	
n=5	5.14[-17]	2.91[-18]	7.00[-18]	1.08[-17]	1.61[-17]	1.46[-17]

Ionization cross section 2.35[-19]

B5+ + H(1s) E= 1.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.57[-18]	6.51[-19]	9.18[-19]		
n=3	5.83[-19]	7.62[-20]	2.92[-19]	2.15[-19]	
n=4	5.41[-19]	5.48[-20]	1.88[-19]	1.76[-19]	1.23[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.20[-25]	2.20[-25]				
n=2	2.70[-22]	7.00[-23]	2.00[-22]			
n=3	1.56[-16]	4.18[-17]	7.82[-17]	3.61[-17]		
n=4	1.82[-15]	1.21[-16]	3.72[-16]	5.80[-16]	7.52[-16]	
n=5	7.86[-17]	1.49[-17]	1.71[-17]	2.08[-17]	1.75[-17]	8.17[-18]

Ionization cross section 1.01[-18]

B5+ + H(1s) E= 2.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.64[-18]	8.76[-19]	3.76[-18]		
n=3	2.19[-18]	2.68[-19]	5.48[-19]	1.37[-18]	
n=4	1.34[-18]	1.77[-19]	4.37[-19]	5.16[-19]	2.07[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	4.24[-26]	4.24[-26]				
n=2	9.31[-22]	2.40[-22]	6.91[-22]			
n=3	4.16[-16]	1.10[-16]	1.89[-16]	1.17[-16]		
n=4	2.11[-15]	1.33[-16]	3.97[-16]	6.57[-16]	9.21[-16]	
n=5	1.10[-16]	1.26[-17]	1.90[-17]	2.79[-17]	3.67[-17]	1.43[-17]

Ionization cross section 6.60[-18]

B5+ + H(1s) E= 3.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	7.90[-18]	2.08[-18]	5.81[-18]		
n=3	2.26[-18]	3.37[-19]	1.27[-18]	6.58[-19]	
n=4	3.02[-18]	2.03[-19]	7.49[-19]	1.16[-18]	9.04[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.71[-25]	2.71[-25]				
n=2	1.04[-20]	5.75[-21]	4.70[-21]			
n=3	6.28[-16]	1.59[-16]	2.89[-16]	1.80[-16]		
n=4	2.07[-15]	1.09[-16]	2.97[-16]	6.49[-16]	1.01[-15]	
n=5	1.93[-16]	1.19[-17]	3.25[-17]	5.04[-17]	6.81[-17]	3.00[-17]

Ionization cross section 8.59[-18]

B5+ + H(1s) E= 4.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.07[-18]	6.62[-19]	3.41[-18]		
n=3	2.44[-18]	2.80[-19]	9.27[-19]	1.24[-18]	
n=4	4.18[-18]	3.23[-19]	1.22[-18]	1.53[-18]	1.11[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.59[-24]	1.59[-24]				
n=2	5.81[-20]	1.68[-20]	4.13[-20]			
n=3	7.89[-16]	1.86[-16]	3.64[-16]	2.39[-16]		
n=4	2.13[-15]	1.02[-16]	3.01[-16]	6.53[-16]	1.08[-15]	
n=5	1.80[-16]	5.06[-18]	1.50[-17]	4.71[-17]	7.57[-17]	3.73[-17]

Ionization cross section 9.56[-18]

B5+ + H(1s) E= 6.25keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.05[-17]	3.00[-18]	7.52[-18]		
n=3	5.98[-18]	8.51[-19]	3.47[-18]	1.66[-18]	
n=4	8.43[-18]	9.21[-19]	1.95[-18]	3.74[-18]	1.82[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.81[-27]	1.81[-27]				
n=2	2.91[-19]	1.18[-19]	1.73[-19]			
n=3	9.51[-16]	1.59[-16]	4.43[-16]	3.48[-16]		
n=4	2.39[-15]	1.03[-16]	3.38[-16]	7.35[-16]	1.21[-15]	
n=5	2.11[-16]	6.15[-18]	1.40[-17]	3.28[-17]	8.27[-17]	7.50[-17]

Ionization cross section 2.45[-17]

B5+ + H(1s) E= 9.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.76[-17]	5.30[-18]	1.23[-17]		
n=3	7.99[-18]	9.54[-19]	2.20[-18]	4.83[-18]	
n=4	1.04[-17]	9.77[-19]	3.06[-18]	3.72[-18]	2.64[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	5.06[-26]	5.06[-26]				
n=2	1.23[-18]	4.70[-19]	7.56[-19]			
n=3	1.02[-15]	1.22[-16]	4.34[-16]	4.64[-16]		
n=4	2.41[-15]	6.65[-17]	2.31[-16]	6.90[-16]	1.42[-15]	
n=5	2.47[-16]	7.50[-18]	1.88[-17]	2.50[-17]	8.11[-17]	1.15[-16]

Ionization cross section 3.83[-17]

B5+ + H(1s) E= 12.50keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.69[-17]	6.14[-18]	1.08[-17]		
n=3	7.96[-18]	1.17[-18]	3.38[-18]	3.41[-18]	
n=4	1.52[-17]	2.25[-18]	5.21[-18]	5.51[-18]	2.22[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	8.07[-25]	8.07[-25]				
n=2	2.88[-18]	1.40[-18]	1.48[-18]			
n=3	1.05[-15]	9.97[-17]	3.88[-16]	5.65[-16]		
n=4	2.29[-15]	4.48[-17]	1.67[-16]	5.76[-16]	1.51[-15]	
n=5	2.75[-16]	6.37[-18]	2.21[-17]	3.62[-17]	8.12[-17]	1.29[-16]

Ionization cross section 4.18[-17]

B5+ + H(1s) E= 25.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	6.45[-17]	2.82[-17]	3.62[-17]		
n=3	1.80[-17]	3.12[-18]	6.32[-18]	8.56[-18]	
n=4	7.06[-17]	1.77[-17]	3.00[-17]	1.78[-17]	5.14[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	8.26[-25]	8.26[-25]				
n=2	1.23[-17]	4.69[-18]	7.60[-18]			
n=3	9.23[-16]	5.35[-17]	2.55[-16]	6.14[-16]		
n=4	1.46[-15]	2.53[-17]	1.08[-16]	3.27[-16]	1.00[-15]	
n=5	5.19[-16]	1.14[-17]	3.55[-17]	1.07[-16]	1.69[-16]	1.96[-16]

Ionization cross section 1.73[-16]

B5+ + H(1s) E= 35.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.33[-16]	5.86[-17]	7.44[-17]		
n=3	3.44[-17]	5.93[-18]	1.17[-17]	1.68[-17]	
n=4	1.33[-16]	3.47[-17]	6.16[-17]	2.89[-17]	7.55[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	3.95[-23]	3.95[-23]				
n=2	1.96[-17]	6.95[-18]	1.27[-17]			
n=3	6.95[-16]	3.23[-17]	1.64[-16]	4.99[-16]		
n=4	9.90[-16]	1.86[-17]	8.49[-17]	2.26[-16]	6.61[-16]	
n=5	5.41[-16]	9.91[-18]	4.42[-17]	9.62[-17]	1.98[-16]	1.93[-16]

Ionization cross section 4.97[-16]

B5+ + H(1s) E= 50.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.05[-16]	9.13[-17]	1.14[-16]		
n=3	4.94[-17]	1.91[-17]	1.78[-17]	1.25[-17]	
n=4	2.85[-16]	8.06[-17]	1.32[-16]	6.17[-17]	1.03[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	3.23[-22]	3.23[-22]				
n=2	2.50[-17]	7.62[-18]	1.73[-17]			
n=3	4.27[-16]	1.68[-17]	8.16[-17]	3.29[-16]		
n=4	5.69[-16]	1.22[-17]	4.98[-17]	1.58[-16]	3.49[-16]	
n=5	4.06[-16]	9.09[-18]	3.17[-17]	8.67[-17]	1.58[-16]	1.20[-16]

Ionization cross section 9.90[-16]

B5+ + H(1s) E= 75.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.72[-16]	6.63[-17]	2.06[-16]		
n=3	6.65[-17]	1.87[-17]	3.35[-17]	1.43[-17]	
n=4	2.72[-16]	9.18[-17]	1.18[-16]	5.29[-17]	8.84[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.31[-21]	2.31[-21]				
n=2	2.44[-17]	6.06[-18]	1.84[-17]			
n=3	1.96[-16]	7.77[-18]	3.20[-17]	1.56[-16]		
n=4	2.39[-16]	5.66[-18]	2.31[-17]	8.06[-17]	1.29[-16]	
n=5	1.92[-16]	4.40[-18]	1.86[-17]	5.38[-17]	7.14[-17]	4.40[-17]

Ionization cross section 1.52[-15]

B5+ + H(1s) E=100.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.07[-16]	1.15[-16]	2.92[-16]		
n=3	1.03[-16]	2.43[-17]	5.46[-17]	2.44[-17]	
n=4	2.44[-16]	7.15[-17]	1.09[-16]	5.51[-17]	9.22[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	6.27[-21]	6.27[-21]				
n=2	1.95[-17]	3.59[-18]	1.59[-17]			
n=3	9.71[-17]	3.50[-18]	1.74[-17]	7.62[-17]		
n=4	1.12[-16]	2.59[-18]	1.40[-17]	4.53[-17]	4.96[-17]	
n=5	9.14[-17]	1.96[-18]	8.83[-18]	2.92[-17]	3.64[-17]	1.50[-17]

Ionization cross section 1.61[-15]

B5+ + H(1s) E=150.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.70[-16]	7.13[-17]	3.99[-16]		
n=3	1.12[-16]	1.82[-17]	6.45[-17]	2.91[-17]	
n=4	1.57[-16]	4.27[-17]	6.98[-17]	3.64[-17]	8.15[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.90[-20]	1.90[-20]				
n=2	1.06[-17]	1.31[-18]	9.24[-18]			
n=3	2.92[-17]	1.10[-18]	7.04[-18]	2.11[-17]		
n=4	2.77[-17]	8.68[-19]	5.38[-18]	1.29[-17]	8.54[-18]	
n=5	2.42[-17]	8.42[-19]	4.63[-18]	9.49[-18]	7.36[-18]	1.88[-18]

Ionization cross section 1.55[-15]

B5+ + H(1s) E=200.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.31[-16]	7.15[-17]	4.60[-16]		
n=3	1.36[-16]	1.87[-17]	8.48[-17]	3.24[-17]	
n=4	1.36[-16]	2.67[-17]	6.58[-17]	3.65[-17]	7.39[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.67[-20]	2.67[-20]				
n=2	5.71[-18]	6.02[-19]	5.11[-18]			
n=3	1.11[-17]	5.32[-19]	3.57[-18]	6.99[-18]		
n=4	9.21[-18]	2.82[-19]	2.39[-18]	4.34[-18]	2.20[-18]	
n=5	6.72[-18]	2.58[-19]	1.53[-18]	2.70[-18]	1.78[-18]	4.51[-19]

Ionization cross section 1.30[-15]

B5+ + H(1s) E=400.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.51[-16]	5.17[-17]	4.99[-16]		
n=3	1.21[-16]	1.04[-17]	8.81[-17]	2.22[-17]	
n=4	6.96[-17]	8.65[-18]	4.14[-17]	1.65[-17]	3.06[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	2.77[-20]	2.77[-20]				
n=2	6.84[-19]	7.48[-20]	6.09[-19]			
n=3	6.48[-19]	5.82[-20]	3.31[-19]	2.58[-19]		
n=4	4.16[-19]	4.13[-20]	1.86[-19]	1.50[-19]	3.85[-20]	
n=5	3.02[-19]	3.85[-20]	1.24[-19]	9.29[-20]	3.93[-20]	7.20[-21]

Ionization cross section 8.88[-16]

B5+ + H(1s) E=800.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.46[-16]	2.66[-17]	4.20[-16]		
n=3	8.93[-17]	5.76[-18]	7.40[-17]	9.54[-18]	
n=4	3.90[-17]	3.20[-18]	2.87[-17]	6.50[-18]	5.93[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4
n=1	1.71[-21]	1.71[-21]				
n=2	2.66[-20]	1.84[-21]	2.48[-20]			
n=3	1.72[-20]	1.31[-21]	1.17[-20]	4.17[-21]		
n=4	9.79[-21]	9.47[-22]	6.07[-21]	2.47[-21]	3.04[-22]	
n=5	6.47[-21]	6.74[-22]	3.93[-21]	1.54[-21]	2.76[-22]	5.48[-23]

Ionization cross section 5.26[-16]

C6+ + H(1s) E= 0.25keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.20[-20]	1.43[-20]	7.65[-21]		
n=3	1.55[-20]	2.28[-21]	7.27[-21]	5.90[-21]	
n=4	1.42[-20]	1.56[-21]	5.40[-21]	3.30[-21]	3.94[-21]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	3.73[-27]	3.73[-27]					
n=2	2.09[-21]	1.11[-23]	2.08[-21]				
n=3	8.31[-20]	3.93[-21]	2.31[-20]	5.61[-20]			
n=4	1.71[-15]	7.25[-17]	3.09[-16]	3.98[-16]	9.28[-16]		
n=5	6.73[-16]	6.74[-18]	1.44[-16]	1.49[-16]	1.36[-16]	2.38[-16]	
n=6	1.38[-18]	2.20[-21]	1.56[-19]	6.68[-20]	4.30[-19]	4.23[-19]	3.06[-19]

Ionization cross section 3.95[-20]

C6+ + H(1s) E= 0.50keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.08[-19]	1.05[-19]	2.03[-19]		
n=3	5.53[-20]	1.42[-20]	2.52[-20]	1.59[-20]	
n=4	4.22[-20]	4.43[-21]	1.32[-20]	1.30[-20]	1.15[-20]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	7.41[-27]	7.41[-27]					
n=2	1.12[-21]	6.08[-22]	5.16[-22]				
n=3	4.56[-20]	8.70[-21]	2.16[-20]	1.53[-20]			
n=4	2.72[-15]	1.33[-16]	5.56[-16]	8.25[-16]	1.20[-15]		
n=5	6.80[-16]	4.17[-17]	8.44[-17]	1.55[-16]	2.45[-16]	1.55[-16]	
n=6	4.21[-18]	2.89[-19]	5.85[-19]	5.48[-19]	9.40[-19]	7.80[-19]	1.07[-18]

Ionization cross section 1.32[-19]

C6+ + H(1s) E= 1.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	6.53[-19]	3.10[-19]	3.43[-19]		
n=3	2.37[-19]	5.93[-20]	6.28[-20]	1.15[-19]	
n=4	2.52[-19]	1.63[-20]	3.78[-20]	9.72[-20]	1.00[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	1.68[-26]	1.68[-26]					
n=2	7.64[-22]	3.92[-22]	3.72[-22]				
n=3	8.55[-19]	1.10[-19]	4.55[-19]	2.89[-19]			
n=4	3.47[-15]	2.18[-16]	7.36[-16]	1.19[-15]	1.32[-15]		
n=5	6.50[-16]	9.30[-17]	1.78[-16]	1.74[-16]	1.41[-16]	6.38[-17]	
n=6	1.08[-17]	8.09[-19]	1.69[-18]	2.17[-18]	2.84[-18]	1.99[-18]	1.30[-18]

Ionization cross section 5.98[-19]

C6+ + H(1s) E= 2.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.07[-18]	7.52[-19]	1.32[-18]		
n=3	1.31[-18]	2.23[-19]	3.66[-19]	7.24[-19]	
n=4	9.01[-19]	3.78[-20]	2.52[-19]	2.26[-19]	3.85[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	5.08[-25]	5.08[-25]					
n=2	4.53[-23]	5.81[-24]	3.95[-23]				
n=3	1.20[-17]	2.04[-18]	6.34[-18]	3.62[-18]			
n=4	3.84[-15]	1.93[-16]	8.03[-16]	1.42[-15]	1.42[-15]		
n=5	7.16[-16]	4.45[-17]	1.19[-16]	1.79[-16]	2.25[-16]	1.48[-16]	
n=6	3.93[-17]	1.72[-18]	5.69[-18]	6.98[-18]	7.81[-18]	1.12[-17]	5.93[-18]

Ionization cross section 3.14[-18]

C6+ + H(1s) E= 3.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.97[-18]	1.29[-18]	3.68[-18]		
n=3	1.31[-18]	2.82[-19]	4.57[-19]	5.73[-19]	
n=4	1.35[-18]	6.10[-20]	3.05[-19]	4.35[-19]	5.45[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	2.04[-25]	2.04[-25]					
n=2	1.40[-22]	1.09[-22]	3.12[-23]				
n=3	3.79[-17]	9.27[-18]	1.74[-17]	1.13[-17]			
n=4	3.75[-15]	2.14[-16]	7.48[-16]	1.41[-15]	1.38[-15]		
n=5	7.67[-16]	3.14[-17]	8.65[-17]	1.44[-16]	2.64[-16]	2.41[-16]	
n=6	8.96[-17]	4.28[-18]	9.41[-18]	1.61[-17]	2.51[-17]	2.53[-17]	9.50[-18]

Ionization cross section 4.38[-18]

C6+ + H(1s) E= 4.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.94[-18]	5.15[-19]	2.43[-18]		
n=3	2.28[-18]	2.35[-19]	6.87[-19]	1.36[-18]	
n=4	2.24[-18]	1.83[-19]	5.15[-19]	7.23[-19]	8.15[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	4.21[-24]	4.21[-24]					
n=2	1.11[-21]	6.59[-22]	4.51[-22]				
n=3	6.88[-17]	2.13[-17]	2.98[-17]	1.76[-17]			
n=4	3.69[-15]	2.09[-16]	7.49[-16]	1.36[-15]	1.37[-15]		
n=5	8.74[-16]	1.65[-17]	6.03[-17]	1.56[-16]	3.05[-16]	3.37[-16]	
n=6	6.99[-17]	2.03[-18]	5.35[-18]	7.49[-18]	1.71[-17]	2.59[-17]	1.20[-17]

Ionization cross section 6.86[-18]

C6+ + H(1s) E= 6.25keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	7.84[-18]	1.95[-18]	5.89[-18]		
n=3	4.07[-18]	8.56[-19]	1.46[-18]	1.76[-18]	
n=4	5.02[-18]	9.27[-19]	9.48[-19]	1.96[-18]	1.19[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	1.32[-24]	1.32[-24]					
n=2	1.42[-20]	5.01[-21]	9.15[-21]				
n=3	1.29[-16]	3.28[-17]	6.08[-17]	3.49[-17]			
n=4	3.47[-15]	1.44[-16]	5.85[-16]	1.31[-15]	1.43[-15]		
n=5	1.12[-15]	1.90[-17]	6.80[-17]	1.34[-16]	3.62[-16]	5.39[-16]	
n=6	9.06[-17]	2.86[-18]	6.63[-18]	6.72[-18]	1.04[-17]	3.00[-17]	3.40[-17]

Ionization cross section 2.05[-17]

C6+ + H(1s) E= 9.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.08[-17]	3.30[-18]	7.45[-18]		
n=3	5.47[-18]	5.93[-19]	2.41[-18]	2.47[-18]	
n=4	7.99[-18]	1.13[-18]	2.23[-18]	3.08[-18]	1.55[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	8.38[-25]	8.38[-25]					
n=2	3.91[-20]	1.75[-20]	2.16[-20]				
n=3	1.82[-16]	3.67[-17]	8.49[-17]	6.02[-17]			
n=4	3.15[-15]	1.02[-16]	4.07[-16]	1.10[-15]	1.53[-15]		
n=5	1.32[-15]	1.74[-17]	6.64[-17]	1.26[-16]	3.78[-16]	7.27[-16]	
n=6	1.05[-16]	2.88[-18]	6.72[-18]	9.13[-18]	1.15[-17]	2.76[-17]	4.67[-17]

Ionization cross section 3.38[-17]

C6+ + H(1s) E= 12.50keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.04[-17]	4.32[-18]	6.12[-18]		
n=3	7.80[-18]	1.01[-18]	2.74[-18]	4.06[-18]	
n=4	1.05[-17]	1.57[-18]	3.71[-18]	3.22[-18]	2.03[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	3.32[-25]	3.32[-25]					
n=2	1.21[-19]	5.42[-20]	6.71[-20]				
n=3	2.37[-16]	3.82[-17]	1.03[-16]	9.57[-17]			
n=4	2.85[-15]	7.03[-17]	3.06[-16]	8.99[-16]	1.58[-15]		
n=5	1.37[-15]	1.41[-17]	5.94[-17]	1.36[-16]	3.61[-16]	7.97[-16]	
n=6	1.25[-16]	2.75[-18]	7.92[-18]	1.52[-17]	2.79[-17]	3.01[-17]	4.14[-17]

Ionization cross section 3.10[-17]

C6+ + H(1s) E= 25.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.30[-17]	2.32[-17]	2.98[-17]		
n=3	2.39[-17]	6.35[-18]	9.64[-18]	7.93[-18]	
n=4	7.12[-17]	1.70[-17]	2.89[-17]	2.00[-17]	5.30[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	8.44[-25]	8.44[-25]					
n=2	1.15[-18]	4.86[-19]	6.60[-19]				
n=3	3.34[-16]	3.75[-17]	1.21[-16]	1.75[-16]			
n=4	1.83[-15]	3.18[-17]	1.53[-16]	4.63[-16]	1.18[-15]		
n=5	1.18[-15]	1.34[-17]	5.81[-17]	1.47[-16]	3.15[-16]	6.46[-16]	
n=6	4.02[-16]	5.17[-18]	2.23[-17]	4.61[-17]	8.85[-17]	1.06[-16]	1.34[-16]

Ionization cross section 1.24[-16]

C6+ + H(1s) E= 50.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.93[-16]	7.93[-17]	1.13[-16]		
n=3	7.16[-17]	1.71[-17]	3.34[-17]	2.11[-17]	
n=4	2.94[-16]	8.04[-17]	1.32[-16]	6.29[-17]	1.82[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	8.40[-24]	8.40[-24]					
n=2	4.46[-18]	1.65[-18]	2.82[-18]				
n=3	2.51[-16]	1.54[-17]	7.14[-17]	1.64[-16]			
n=4	6.73[-16]	1.27[-17]	5.19[-17]	1.43[-16]	4.66[-16]		
n=5	6.24[-16]	9.17[-18]	3.28[-17]	8.45[-17]	1.85[-16]	3.12[-16]	
n=6	4.35[-16]	6.58[-18]	2.37[-17]	5.04[-17]	9.77[-17]	1.55[-16]	1.02[-16]

Ionization cross section 1.03[-15]

C6+ + H(1s) E= 75.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.08[-16]	1.06[-16]	2.03[-16]		
n=3	7.87[-17]	2.20[-17]	3.49[-17]	2.19[-17]	
n=4	3.41[-16]	1.11[-16]	1.52[-16]	6.58[-17]	1.28[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	4.62[-23]	4.62[-23]					
n=2	6.49[-18]	2.16[-18]	4.32[-18]				
n=3	1.45[-16]	6.56[-18]	3.13[-17]	1.07[-16]			
n=4	2.93[-16]	5.90[-18]	2.29[-17]	6.58[-17]	1.98[-16]		
n=5	2.82[-16]	4.71[-18]	1.58[-17]	4.38[-17]	1.02[-16]	1.16[-16]	
n=6	2.34[-16]	4.10[-18]	1.32[-17]	3.04[-17]	7.28[-17]	7.63[-17]	3.73[-17]

Ionization cross section 1.76[-15]

C6+ + H(1s) E=100.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.16[-16]	1.12[-16]	3.05[-16]		
n=3	1.05[-16]	2.34[-17]	5.36[-17]	2.77[-17]	
n=4	3.17[-16]	1.05[-16]	1.38[-16]	6.41[-17]	9.82[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	2.95[-22]	2.95[-22]					
n=2	6.85[-18]	2.03[-18]	4.83[-18]				
n=3	8.32[-17]	3.58[-18]	1.43[-17]	6.53[-17]			
n=4	1.42[-16]	3.36[-18]	1.06[-17]	4.03[-17]	8.79[-17]		
n=5	1.36[-16]	2.41[-18]	7.55[-18]	2.72[-17]	5.34[-17]	4.53[-17]	
n=6	1.13[-16]	2.23[-18]	5.73[-18]	2.13[-17]	3.43[-17]	3.57[-17]	1.37[-17]

Ionization cross section 1.96[-15]

C6+ + H(1s) E=150.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.13[-16]	1.10[-16]	4.03[-16]		
n=3	1.33[-16]	2.42[-17]	7.52[-17]	3.35[-17]	
n=4	2.37[-16]	7.11[-17]	1.05[-16]	5.09[-17]	1.02[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	1.26[-21]	1.26[-21]					
n=2	5.30[-18]	1.06[-18]	4.25[-18]				
n=3	3.09[-17]	1.13[-18]	5.18[-18]	2.46[-17]			
n=4	3.93[-17]	8.50[-19]	4.11[-18]	1.44[-17]	1.99[-17]		
n=5	3.68[-17]	7.70[-19]	3.62[-18]	1.09[-17]	1.46[-17]	6.94[-18]	
n=6	3.32[-17]	7.37[-19]	3.23[-18]	8.60[-18]	1.15[-17]	7.28[-18]	1.84[-18]

Ionization cross section 1.98[-15]

C6+ + H(1s) E=200.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.89[-16]	9.39[-17]	4.95[-16]		
n=3	1.39[-16]	2.29[-17]	8.30[-17]	3.33[-17]	
n=4	1.78[-16]	4.47[-17]	7.92[-17]	4.44[-17]	9.81[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	3.08[-21]	3.08[-21]					
n=2	3.53[-18]	4.89[-19]	3.04[-18]				
n=3	1.30[-17]	4.67[-19]	2.73[-18]	9.85[-18]			
n=4	1.41[-17]	3.13[-19]	1.99[-18]	6.16[-18]	5.67[-18]		
n=5	1.11[-17]	2.05[-19]	1.40[-18]	3.82[-18]	4.21[-18]	1.49[-18]	
n=6	9.51[-18]	2.49[-19]	1.38[-18]	2.98[-18]	3.06[-18]	1.51[-18]	3.38[-19]

Ionization cross section 1.77[-15]

C6+ + H(1s) E=400.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	6.76[-16]	6.29[-17]	6.13[-16]		
n=3	1.51[-16]	1.48[-17]	1.07[-16]	2.96[-17]	
n=4	1.06[-16]	1.58[-17]	5.81[-17]	2.67[-17]	5.70[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	6.32[-21]	6.32[-21]					
n=2	6.69[-19]	5.32[-20]	6.15[-19]				
n=3	9.96[-19]	4.73[-20]	3.98[-19]	5.52[-19]			
n=4	7.64[-19]	3.65[-20]	2.64[-19]	3.30[-19]	1.33[-19]		
n=5	5.66[-19]	3.10[-20]	1.88[-19]	2.10[-19]	1.11[-19]	2.67[-20]	
n=6	4.76[-19]	2.80[-20]	1.57[-19]	1.63[-19]	8.53[-20]	3.43[-20]	8.47[-21]

Ionization cross section 1.21[-15]

C6+ + H(1s) E=800.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	6.03[-16]	3.70[-17]	5.66[-16]		
n=3	1.22[-16]	8.07[-18]	9.84[-17]	1.52[-17]	
n=4	5.77[-17]	5.31[-18]	3.99[-17]	1.11[-17]	1.37[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5
n=1	5.91[-21]	5.91[-21]					
n=2	6.59[-20]	4.96[-21]	6.09[-20]				
n=3	4.64[-20]	3.84[-21]	3.00[-20]	1.26[-20]			
n=4	2.71[-20]	2.29[-21]	1.51[-20]	8.30[-21]	1.40[-21]		
n=5	1.64[-20]	1.59[-21]	8.41[-21]	4.96[-21]	1.20[-21]	2.33[-22]	
n=6	1.11[-20]	1.22[-21]	5.32[-21]	3.23[-21]	1.01[-21]	3.19[-22]	4.82[-23]

Ionization cross section 7.36[-16]

N7+ + H(1s) E= 0.50keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.78[-19]	1.83[-19]	3.94[-19]		
n=3	6.28[-20]	1.34[-20]	2.82[-20]	2.12[-20]	
n=4	5.48[-20]	1.15[-20]	1.32[-20]	2.03[-20]	9.77[-21]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	4.68[-27]	4.68[-27]						
n=2	6.49[-23]	1.05[-23]	5.43[-23]					
n=3	5.88[-22]	1.08[-22]	3.24[-22]	1.56[-22]				
n=4	1.24[-16]	1.55[-17]	4.58[-17]	4.68[-17]	1.63[-17]			
n=5	5.91[-15]	2.63[-16]	8.52[-16]	1.38[-15]	1.46[-15]	1.95[-15]		
n=6	3.24[-16]	2.68[-17]	4.05[-17]	5.75[-17]	7.35[-17]	8.43[-17]	4.11[-17]	
n=7	4.33[-18]	3.06[-19]	5.03[-19]	4.51[-19]	6.96[-19]	1.00[-18]	8.22[-19]	5.48[-19]

Ionization cross section 1.46[-19]

N7+ + H(1s) E= 1.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.60[-19]	2.57[-19]	3.03[-19]		
n=3	2.24[-19]	5.22[-20]	7.59[-20]	9.55[-20]	
n=4	1.07[-19]	1.51[-20]	2.71[-20]	4.10[-20]	2.40[-20]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	6.94[-27]	6.94[-27]						
n=2	1.97[-23]	1.56[-23]	4.05[-24]					
n=3	8.99[-21]	2.97[-21]	3.82[-21]	2.20[-21]				
n=4	4.46[-16]	7.68[-17]	1.59[-16]	1.47[-16]	6.40[-17]			
n=5	4.86[-15]	2.31[-16]	6.07[-16]	8.87[-16]	1.27[-15]	1.87[-15]		
n=6	3.07[-16]	2.55[-17]	5.93[-17]	7.35[-17]	7.60[-17]	5.14[-17]	2.12[-17]	
n=7	4.86[-18]	3.54[-19]	4.55[-19]	5.35[-19]	9.42[-19]	1.19[-18]	9.19[-19]	4.70[-19]

Ionization cross section 3.90[-19]

N7+ + H(1s) E= 2.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.65[-18]	5.84[-19]	1.07[-18]		
n=3	9.48[-19]	8.22[-20]	3.44[-19]	5.22[-19]	
n=4	7.77[-19]	1.28[-19]	9.99[-20]	2.03[-19]	3.45[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	1.22[-27]	1.22[-27]						
n=2	1.00[-23]	3.35[-24]	6.65[-24]					
n=3	1.95[-19]	4.72[-20]	8.19[-20]	6.59[-20]				
n=4	9.25[-16]	1.19[-16]	3.20[-16]	3.07[-16]	1.79[-16]			
n=5	4.34[-15]	1.25[-16]	4.13[-16]	7.82[-16]	1.38[-15]	1.64[-15]		
n=6	3.02[-16]	9.07[-18]	2.85[-17]	4.49[-17]	6.95[-17]	1.00[-16]	4.96[-17]	
n=7	1.99[-17]	1.46[-18]	2.36[-18]	3.28[-18]	3.56[-18]	3.37[-18]	3.86[-18]	2.06[-18]

Ionization cross section 2.58[-18]

N7+ + H(1s) E= 3.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.66[-18]	7.66[-19]	1.90[-18]		
n=3	9.48[-19]	2.11[-19]	3.30[-19]	4.07[-19]	
n=4	1.12[-18]	6.72[-20]	3.20[-19]	3.62[-19]	3.73[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	3.33[-26]	3.33[-26]						
n=2	9.09[-24]	3.24[-24]	5.85[-24]					
n=3	1.37[-18]	1.77[-19]	6.83[-19]	5.11[-19]				
n=4	1.24[-15]	1.59[-16]	4.19[-16]	3.99[-16]	2.65[-16]			
n=5	3.80[-15]	1.03[-16]	3.33[-16]	6.53[-16]	1.27[-15]	1.44[-15]		
n=6	4.09[-16]	1.20[-17]	3.06[-17]	5.25[-17]	9.36[-17]	1.33[-16]	8.73[-17]	
n=7	3.56[-17]	1.25[-18]	3.45[-18]	4.42[-18]	5.73[-18]	9.80[-18]	8.39[-18]	2.55[-18]

Ionization cross section 2.93[-18]

N7+ + H(1s) E= 4.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.85[-18]	3.56[-19]	1.49[-18]		
n=3	1.25[-18]	9.51[-20]	4.60[-19]	6.93[-19]	
n=4	9.81[-19]	1.10[-19]	2.82[-19]	3.49[-19]	2.40[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	9.19[-26]	9.19[-26]						
n=2	7.38[-24]	2.55[-24]	4.83[-24]					
n=3	3.90[-18]	8.53[-19]	1.71[-18]	1.33[-18]				
n=4	1.42[-15]	1.54[-16]	4.66[-16]	4.90[-16]	3.14[-16]			
n=5	3.70[-15]	9.06[-17]	2.86[-16]	6.36[-16]	1.25[-15]	1.44[-15]		
n=6	3.94[-16]	4.93[-18]	1.42[-17]	2.74[-17]	7.55[-17]	1.47[-16]	1.25[-16]	
n=7	2.89[-17]	7.43[-19]	2.26[-18]	3.40[-18]	5.61[-18]	6.31[-18]	6.31[-18]	4.30[-18]

Ionization cross section 4.64[-18]

N7+ + H(1s) E= 6.25keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.65[-18]	1.96[-18]	3.69[-18]		
n=3	2.89[-18]	7.21[-19]	8.47[-19]	1.33[-18]	
n=4	3.43[-18]	4.47[-19]	8.04[-19]	9.94[-19]	1.18[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	7.89[-25]	7.89[-25]						
n=2	4.97[-22]	1.25[-22]	3.72[-22]					
n=3	1.26[-17]	2.60[-18]	6.29[-18]	3.67[-18]				
n=4	1.58[-15]	1.02[-16]	3.88[-16]	6.21[-16]	4.68[-16]			
n=5	3.62[-15]	6.33[-17]	2.28[-16]	5.29[-16]	1.21[-15]	1.59[-15]		
n=6	4.64[-16]	4.90[-18]	1.71[-17]	3.42[-17]	4.91[-17]	1.44[-16]	2.15[-16]	
n=7	4.31[-17]	1.49[-18]	3.64[-18]	4.82[-18]	5.89[-18]	5.30[-18]	8.92[-18]	1.31[-17]

Ionization cross section 1.59[-17]

N7+ + H(1s) E= 9.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	7.49[-18]	2.00[-18]	5.49[-18]		
n=3	4.28[-18]	7.09[-19]	1.74[-18]	1.83[-18]	
n=4	6.22[-18]	1.07[-18]	1.47[-18]	2.38[-18]	1.30[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	1.07[-25]	1.07[-25]						
n=2	2.18[-21]	1.07[-21]	1.11[-21]					
n=3	2.29[-17]	5.54[-18]	1.03[-17]	7.00[-18]				
n=4	1.62[-15]	8.43[-17]	3.19[-16]	6.14[-16]	6.01[-16]			
n=5	3.39[-15]	4.34[-17]	1.68[-16]	4.15[-16]	1.06[-15]	1.70[-15]		
n=6	5.66[-16]	6.35[-18]	1.91[-17]	4.05[-17]	6.73[-17]	1.56[-16]	2.77[-16]	
n=7	5.02[-17]	1.13[-18]	3.18[-18]	4.91[-18]	5.81[-18]	7.09[-18]	9.61[-18]	1.85[-17]

Ionization cross section 2.82[-17]

N7+ + H(1s) E= 12.50keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	7.67[-18]	3.18[-18]	4.49[-18]		
n=3	6.51[-18]	1.10[-18]	2.34[-18]	3.07[-18]	
n=4	7.26[-18]	1.11[-18]	2.59[-18]	2.40[-18]	1.15[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	4.94[-26]	4.94[-26]						
n=2	5.34[-21]	2.17[-21]	3.18[-21]					
n=3	3.80[-17]	8.03[-18]	1.74[-17]	1.25[-17]				
n=4	1.63[-15]	7.01[-17]	2.78[-16]	5.78[-16]	7.08[-16]			
n=5	3.08[-15]	3.13[-17]	1.28[-16]	3.56[-16]	9.00[-16]	1.67[-15]		
n=6	6.26[-16]	5.71[-18]	1.96[-17]	4.78[-17]	9.67[-17]	1.69[-16]	2.88[-16]	
n=7	6.68[-17]	1.40[-18]	3.92[-18]	7.14[-18]	1.06[-17]	1.58[-17]	1.22[-17]	1.57[-17]

Ionization cross section 2.52[-17]

N7+ + H(1s) E= 25.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.39[-17]	1.98[-17]	2.40[-17]		
n=3	3.06[-17]	7.82[-18]	1.33[-17]	9.50[-18]	
n=4	5.23[-17]	1.24[-17]	2.00[-17]	1.51[-17]	4.78[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	1.67[-26]	1.67[-26]						
n=2	9.51[-20]	4.11[-20]	5.40[-20]					
n=3	8.82[-17]	1.38[-17]	3.62[-17]	3.81[-17]				
n=4	1.34[-15]	3.68[-17]	1.68[-16]	4.35[-16]	7.03[-16]			
n=5	1.93[-15]	1.88[-17]	7.51[-17]	2.25[-16]	5.01[-16]	1.11[-15]		
n=6	9.00[-16]	6.98[-18]	3.06[-17]	7.58[-17]	1.49[-16]	2.28[-16]	4.08[-16]	
n=7	3.02[-16]	2.87[-18]	1.25[-17]	2.56[-17]	4.85[-17]	5.93[-17]	7.02[-17]	8.31[-17]

Ionization cross section 1.06[-16]

N7+ + H(1s) E= 35.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.05[-16]	3.94[-17]	6.61[-17]		
n=3	7.67[-17]	1.81[-17]	3.32[-17]	2.53[-17]	
n=4	1.49[-16]	3.48[-17]	6.36[-17]	4.01[-17]	1.04[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	1.15[-23]	1.15[-23]						
n=2	2.90[-19]	1.17[-19]	1.73[-19]					
n=3	1.07[-16]	1.44[-17]	4.16[-17]	5.09[-17]				
n=4	9.94[-16]	2.26[-17]	1.01[-16]	2.97[-16]	5.73[-16]			
n=5	1.34[-15]	1.35[-17]	5.74[-17]	1.50[-16]	3.30[-16]	7.94[-16]		
n=6	8.68[-16]	7.17[-18]	3.04[-17]	7.18[-17]	1.42[-16]	2.13[-16]	4.03[-16]	
n=7	4.45[-16]	4.03[-18]	1.65[-17]	3.54[-17]	6.47[-17]	8.13[-17]	1.33[-16]	1.10[-16]

Ionization cross section 3.34[-16]

N7+ + H(1s) E= 50.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.08[-16]	8.70[-17]	1.21[-16]		
n=3	1.04[-16]	2.60[-17]	4.47[-17]	3.35[-17]	
n=4	2.56[-16]	6.36[-17]	1.16[-16]	6.24[-17]	1.46[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	1.43[-26]	1.43[-26]						
n=2	7.25[-19]	2.85[-19]	4.41[-19]					
n=3	1.07[-16]	1.10[-17]	3.92[-17]	5.71[-17]				
n=4	6.09[-16]	1.14[-17]	5.30[-17]	1.56[-16]	3.89[-16]			
n=5	8.05[-16]	8.31[-18]	3.72[-17]	9.03[-17]	1.83[-16]	4.86[-16]		
n=6	6.42[-16]	5.53[-18]	2.30[-17]	5.52[-17]	9.93[-17]	1.94[-16]	2.65[-16]	
n=7	4.44[-16]	4.53[-18]	1.57[-17]	3.80[-17]	5.82[-17]	1.00[-16]	1.45[-16]	8.28[-17]

Ionization cross section 1.04[-15]

N7+ + H(1s) E= 56.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.37[-16]	1.04[-16]	1.32[-16]		
n=3	1.13[-16]	3.07[-17]	4.85[-17]	3.36[-17]	
n=4	2.93[-16]	7.69[-17]	1.32[-16]	6.81[-17]	1.59[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	1.72[-23]	1.72[-23]						
n=2	9.13[-19]	3.49[-19]	5.64[-19]					
n=3	1.02[-16]	9.24[-18]	3.62[-17]	5.70[-17]				
n=4	5.04[-16]	9.56[-18]	4.17[-17]	1.22[-16]	3.31[-16]			
n=5	6.60[-16]	7.56[-18]	2.95[-17]	7.68[-17]	1.51[-16]	3.96[-16]		
n=6	5.51[-16]	5.44[-18]	1.87[-17]	5.01[-17]	8.53[-17]	1.80[-16]	2.11[-16]	
n=7	4.05[-16]	4.70[-18]	1.32[-17]	3.65[-17]	5.19[-17]	1.01[-16]	1.30[-16]	6.78[-17]

Ionization cross section 1.33[-15]

N7+ + H(1s) E= 75.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.91[-16]	1.18[-16]	1.73[-16]		
n=3	1.45[-16]	4.51[-17]	6.11[-17]	3.89[-17]	
n=4	3.99[-16]	1.18[-16]	1.80[-16]	8.24[-17]	1.83[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	1.38[-24]	1.38[-24]						
n=2	1.51[-18]	5.77[-19]	9.36[-19]					
n=3	8.15[-17]	5.67[-18]	2.49[-17]	5.10[-17]				
n=4	2.87[-16]	5.63[-18]	2.29[-17]	5.95[-17]	1.99[-16]			
n=5	3.61[-16]	4.25[-18]	1.78[-17]	3.93[-17]	9.71[-17]	2.03[-16]		
n=6	3.21[-16]	3.03[-18]	1.40[-17]	2.72[-17]	6.33[-17]	1.15[-16]	9.94[-17]	
n=7	2.67[-16]	2.41[-18]	1.13[-17]	2.08[-17]	4.27[-17]	8.28[-17]	7.49[-17]	3.21[-17]

Ionization cross section 1.94[-15]

N7+ + H(1s) E=100.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.05[-16]	1.11[-16]	2.94[-16]		
n=3	1.43[-16]	3.63[-17]	7.01[-17]	3.61[-17]	
n=4	3.71[-16]	1.29[-16]	1.59[-16]	7.12[-17]	1.31[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	5.15[-24]	5.15[-24]						
n=2	1.99[-18]	6.94[-19]	1.29[-18]					
n=3	5.53[-17]	2.80[-18]	1.39[-17]	3.86[-17]				
n=4	1.48[-16]	2.88[-18]	1.19[-17]	3.03[-17]	1.03[-16]			
n=5	1.76[-16]	2.43[-18]	8.72[-18]	2.20[-17]	5.61[-17]	8.73[-17]		
n=6	1.58[-16]	2.19[-18]	5.83[-18]	1.66[-17]	3.72[-17]	5.68[-17]	3.93[-17]	
n=7	1.35[-16]	1.94[-18]	5.10[-18]	1.25[-17]	3.02[-17]	3.90[-17]	3.42[-17]	1.20[-17]

Ionization cross section 2.31[-15]

N7+ + H(1s) E=150.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.57[-16]	1.31[-16]	4.26[-16]		
n=3	1.78[-16]	4.18[-17]	9.54[-17]	4.12[-17]	
n=4	3.06[-16]	9.88[-17]	1.33[-16]	6.29[-17]	1.12[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	6.79[-23]	6.79[-23]						
n=2	2.19[-18]	6.18[-19]	1.57[-18]					
n=3	2.58[-17]	1.12[-18]	4.58[-18]	2.01[-17]				
n=4	4.67[-17]	9.80[-19]	3.60[-18]	1.20[-17]	3.01[-17]			
n=5	4.94[-17]	8.23[-19]	2.95[-18]	9.27[-18]	1.99[-17]	1.65[-17]		
n=6	4.53[-17]	6.85[-19]	2.40[-18]	7.21[-18]	1.50[-17]	1.45[-17]	5.49[-18]	
n=7	4.09[-17]	6.25[-19]	1.90[-18]	5.68[-18]	1.22[-17]	1.26[-17]	6.43[-18]	1.47[-18]

Ionization cross section 2.37[-15]

N7+ + H(1s) E=200.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	6.76[-16]	1.13[-16]	5.63[-16]		
n=3	1.69[-16]	2.58[-17]	9.92[-17]	4.40[-17]	
n=4	2.34[-16]	6.44[-17]	1.02[-16]	5.47[-17]	1.28[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	2.42[-22]	2.42[-22]						
n=2	1.80[-18]	3.92[-19]	1.41[-18]					
n=3	1.25[-17]	5.23[-19]	2.13[-18]	9.89[-18]				
n=4	1.82[-17]	4.21[-19]	1.64[-18]	5.96[-18]	1.02[-17]			
n=5	1.66[-17]	2.73[-19]	1.16[-18]	3.96[-18]	7.08[-18]	4.08[-18]		
n=6	1.38[-17]	2.42[-19]	9.76[-19]	3.08[-18]	4.95[-18]	3.59[-18]	1.00[-18]	
n=7	1.23[-17]	2.93[-19]	9.94[-19]	2.69[-18]	3.97[-18]	3.00[-18]	1.11[-18]	2.40[-19]

Ionization cross section 2.15[-15]

N7+ + H(1s) E=400.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	7.80[-16]	9.15[-17]	6.88[-16]		
n=3	1.80[-16]	2.00[-17]	1.22[-16]	3.78[-17]	
n=4	1.44[-16]	2.48[-17]	7.34[-17]	3.64[-17]	9.20[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	1.19[-21]	1.19[-21]						
n=2	5.66[-19]	5.21[-20]	5.14[-19]					
n=3	1.27[-18]	4.10[-20]	3.76[-19]	8.58[-19]				
n=4	1.17[-18]	2.61[-20]	2.68[-19]	5.47[-19]	3.29[-19]			
n=5	8.97[-19]	2.37[-20]	1.71[-19]	3.61[-19]	2.68[-19]	7.38[-20]		
n=6	7.44[-19]	2.62[-20]	1.58[-19]	2.68[-19]	1.85[-19]	8.48[-20]	2.10[-20]	
n=7	7.14[-19]	3.09[-20]	1.65[-19]	2.41[-19]	1.62[-19]	8.04[-20]	2.52[-20]	1.02[-20]

Ionization cross section 1.59[-15]

N7+ + H(1s) E=600.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	7.86[-16]	5.79[-17]	7.28[-16]		
n=3	1.61[-16]	1.21[-17]	1.22[-16]	2.62[-17]	
n=4	9.42[-17]	1.16[-17]	5.64[-17]	2.19[-17]	4.28[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	3.65[-21]	3.65[-21]						
n=2	1.79[-19]	2.17[-20]	1.57[-19]					
n=3	2.48[-19]	1.77[-20]	1.02[-19]	1.27[-19]				
n=4	2.01[-19]	1.17[-20]	6.41[-20]	9.18[-20]	3.37[-20]			
n=5	1.37[-19]	7.44[-21]	3.86[-20]	5.22[-20]	2.97[-20]	9.05[-21]		
n=6	9.31[-20]	4.71[-21]	2.44[-20]	3.38[-20]	1.97[-20]	6.68[-21]	3.76[-21]	
n=7	7.13[-20]	4.83[-21]	1.68[-20]	2.35[-20]	1.61[-20]	4.43[-21]	2.73[-21]	2.88[-21]

Ionization cross section 1.16[-15]

N7+ + H(1s) E=800.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	7.56[-16]	4.54[-17]	7.10[-16]		
n=3	1.54[-16]	9.55[-18]	1.23[-16]	2.11[-17]	
n=4	7.97[-17]	7.76[-18]	5.25[-17]	1.67[-17]	2.64[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6
n=1	2.59[-21]	2.59[-21]						
n=2	6.65[-20]	9.69[-21]	5.68[-20]					
n=3	6.79[-20]	6.91[-21]	3.06[-20]	3.03[-20]				
n=4	4.78[-20]	4.96[-21]	1.73[-20]	1.97[-20]	5.72[-21]			
n=5	3.30[-20]	3.55[-21]	1.13[-20]	1.21[-20]	4.82[-21]	1.22[-21]		
n=6	2.45[-20]	2.49[-21]	8.00[-21]	8.54[-21]	3.94[-21]	1.33[-21]	2.29[-22]	
n=7	1.97[-20]	1.74[-21]	5.92[-21]	6.79[-21]	3.49[-21]	1.29[-21]	4.35[-22]	6.66[-23]

Ionization cross section 9.14[-16]

O8+ + H(1s) E= 0.50keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.64[-19]	4.45[-20]	1.19[-19]		
n=3	2.26[-20]	8.93[-21]	6.50[-21]	7.20[-21]	
n=4	2.46[-20]	7.33[-21]	6.77[-21]	5.16[-21]	5.37[-21]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	8.37[-27]	8.37[-27]							
n=2	1.78[-21]	1.40[-21]	3.86[-22]						
n=3	7.33[-19]	2.36[-19]	2.50[-19]	2.48[-19]					
n=4	2.03[-18]	3.94[-19]	4.71[-19]	7.46[-19]	4.14[-19]				
n=5	3.62[-15]	3.70[-17]	2.49[-16]	7.24[-16]	1.31[-15]	1.30[-15]			
n=6	1.29[-15]	5.16[-17]	2.01[-16]	2.20[-16]	3.76[-16]	2.12[-16]	2.30[-16]		
n=7	2.79[-17]	1.06[-18]	5.55[-18]	4.19[-18]	5.72[-18]	4.04[-18]	5.11[-18]	2.22[-18]	
n=8	8.30[-19]	1.34[-20]	8.27[-20]	9.87[-20]	1.03[-19]	1.03[-19]	1.89[-19]	1.52[-19]	8.79[-20]

Ionization cross section 7.02[-20]

O8+ + H(1s) E= 1.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	2.36[-19]	7.56[-20]	1.60[-19]		
n=3	1.19[-19]	2.57[-20]	6.45[-20]	2.90[-20]	
n=4	9.20[-20]	1.43[-20]	1.96[-20]	2.71[-20]	3.11[-20]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	9.76[-27]	9.76[-27]							
n=2	2.31[-22]	3.51[-23]	1.96[-22]						
n=3	5.98[-22]	1.72[-22]	1.96[-22]	2.31[-22]					
n=4	1.63[-17]	2.20[-18]	4.87[-18]	6.38[-18]	2.81[-18]				
n=5	4.63[-15]	9.94[-17]	6.32[-16]	1.16[-15]	1.42[-15]	1.32[-15]			
n=6	1.36[-15]	3.52[-17]	2.34[-16]	2.98[-16]	3.41[-16]	2.32[-16]	2.22[-16]		
n=7	4.93[-17]	5.94[-19]	4.85[-18]	8.47[-18]	1.11[-17]	1.20[-17]	8.20[-18]	4.12[-18]	
n=8	1.57[-18]	7.69[-20]	1.81[-19]	2.31[-19]	2.52[-19]	2.56[-19]	2.69[-19]	1.87[-19]	1.14[-19]

Ionization cross section 3.33[-19]

O8+ + H(1s) E= 2.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	9.19[-19]	3.24[-19]	5.95[-19]		
n=3	5.05[-19]	5.36[-20]	1.92[-19]	2.59[-19]	
n=4	3.39[-19]	2.72[-20]	8.00[-20]	7.45[-20]	1.58[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	2.78[-27]	2.78[-27]							
n=2	1.93[-23]	3.49[-24]	1.59[-23]						
n=3	3.99[-21]	6.96[-22]	1.88[-21]	1.42[-21]					
n=4	9.44[-17]	1.06[-17]	3.62[-17]	3.18[-17]	1.57[-17]				
n=5	4.73[-15]	9.14[-17]	5.45[-16]	1.22[-15]	1.52[-15]	1.36[-15]			
n=6	1.48[-15]	1.34[-17]	8.92[-17]	1.88[-16]	3.10[-16]	4.43[-16]	4.40[-16]		
n=7	8.89[-17]	1.67[-18]	5.69[-18]	9.68[-18]	1.29[-17]	1.78[-17]	2.57[-17]	1.55[-17]	
n=8	8.17[-18]	3.47[-19]	9.34[-19]	8.73[-19]	1.47[-18]	1.55[-18]	1.34[-18]	9.90[-19]	6.71[-19]

Ionization cross section 1.55[-18]

O8+ + H(1s) E= 3.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.61[-18]	5.49[-19]	1.06[-18]		
n=3	5.98[-19]	1.08[-19]	1.63[-19]	3.27[-19]	
n=4	6.31[-19]	3.15[-20]	8.92[-20]	2.64[-19]	2.46[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	5.93[-26]	5.93[-26]							
n=2	2.09[-21]	1.30[-21]	7.95[-22]						
n=3	4.55[-20]	1.13[-20]	1.34[-20]	2.08[-20]					
n=4	2.02[-16]	3.04[-17]	8.34[-17]	5.45[-17]	3.40[-17]				
n=5	4.59[-15]	1.05[-16]	5.58[-16]	1.16[-15]	1.51[-15]	1.26[-15]			
n=6	1.54[-15]	1.54[-17]	7.61[-17]	1.57[-16]	2.96[-16]	4.98[-16]	4.98[-16]		
n=7	1.80[-16]	2.73[-18]	1.08[-17]	1.50[-17]	2.48[-17]	5.13[-17]	4.87[-17]	2.64[-17]	
n=8	1.24[-17]	2.99[-19]	9.58[-19]	1.20[-18]	1.82[-18]	2.66[-18]	2.58[-18]	1.98[-18]	8.62[-19]

Ionization cross section 2.25[-18]

O8+ + H(1s) E= 4.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.22[-18]	2.52[-19]	9.69[-19]		
n=3	6.16[-19]	1.19[-19]	2.13[-19]	2.84[-19]	
n=4	7.41[-19]	9.78[-20]	1.33[-19]	3.29[-19]	1.80[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	6.24[-26]	6.24[-26]							
n=2	5.68[-23]	2.44[-23]	3.24[-23]						
n=3	2.12[-19]	3.97[-20]	7.93[-20]	9.34[-20]					
n=4	2.95[-16]	4.16[-17]	1.23[-16]	8.38[-17]	4.62[-17]				
n=5	4.47[-15]	1.07[-16]	4.99[-16]	1.10[-15]	1.52[-15]	1.25[-15]			
n=6	1.71[-15]	1.22[-17]	5.81[-17]	1.20[-16]	2.85[-16]	5.84[-16]	6.50[-16]		
n=7	1.41[-16]	1.08[-18]	4.24[-18]	7.48[-18]	1.29[-17]	2.68[-17]	4.59[-17]	4.30[-17]	
n=8	1.32[-17]	1.84[-19]	6.21[-19]	1.09[-18]	1.58[-18]	3.56[-18]	2.83[-18]	1.87[-18]	1.45[-18]

Ionization cross section 3.06[-18]

O8+ + H(1s) E= 6.25keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.27[-18]	1.18[-18]	2.09[-18]		
n=3	1.83[-18]	3.73[-19]	5.98[-19]	8.56[-19]	
n=4	2.02[-18]	2.42[-19]	5.03[-19]	5.63[-19]	7.11[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	1.89[-25]	1.89[-25]							
n=2	6.66[-23]	6.64[-24]	6.00[-23]						
n=3	1.23[-18]	2.70[-19]	4.95[-19]	4.61[-19]					
n=4	4.33[-16]	4.19[-17]	1.32[-16]	1.60[-16]	9.86[-17]				
n=5	4.21[-15]	7.66[-17]	3.49[-16]	8.47[-16]	1.47[-15]	1.47[-15]			
n=6	1.92[-15]	1.25[-17]	5.51[-17]	1.27[-16]	2.52[-16]	5.83[-16]	8.88[-16]		
n=7	1.78[-16]	1.35[-18]	5.21[-18]	1.00[-17]	1.70[-17]	2.02[-17]	4.53[-17]	7.92[-17]	
n=8	2.32[-17]	5.40[-19]	1.40[-18]	2.05[-18]	3.15[-18]	4.70[-18]	4.07[-18]	2.75[-18]	4.57[-18]

Ionization cross section 1.23[-17]

O8+ + H(1s) E= 9.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.94[-18]	1.59[-18]	3.35[-18]		
n=3	3.13[-18]	7.35[-19]	1.19[-18]	1.21[-18]	
n=4	4.55[-18]	8.16[-19]	8.90[-19]	1.74[-18]	1.10[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	6.13[-25]	6.13[-25]							
n=2	2.35[-21]	3.40[-22]	2.01[-21]						
n=3	2.55[-18]	5.55[-19]	1.18[-18]	8.11[-19]					
n=4	5.26[-16]	4.31[-17]	1.38[-16]	1.92[-16]	1.53[-16]				
n=5	3.81[-15]	6.49[-17]	2.61[-16]	6.64[-16]	1.26[-15]	1.56[-15]			
n=6	2.03[-15]	1.34[-17]	5.39[-17]	1.26[-16]	2.70[-16]	5.91[-16]	9.72[-16]		
n=7	2.15[-16]	1.61[-18]	6.30[-18]	1.20[-17]	2.13[-17]	3.51[-17]	5.22[-17]	8.65[-17]	
n=8	2.77[-17]	5.26[-19]	1.57[-18]	2.52[-18]	3.85[-18]	3.58[-18]	3.69[-18]	4.04[-18]	7.87[-18]

Ionization cross section 2.10[-17]

O8+ + H(1s) E= 12.50keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	5.58[-18]	2.41[-18]	3.17[-18]		
n=3	4.81[-18]	9.06[-19]	2.09[-18]	1.82[-18]	
n=4	5.23[-18]	7.48[-19]	2.02[-18]	1.50[-18]	9.64[-19]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	3.46[-26]	3.46[-26]							
n=2	3.09[-22]	1.63[-22]	1.46[-22]						
n=3	5.34[-18]	1.40[-18]	2.37[-18]	1.58[-18]					
n=4	6.18[-16]	4.56[-17]	1.42[-16]	2.21[-16]	2.09[-16]				
n=5	3.45[-15]	5.20[-17]	2.04[-16]	5.58[-16]	1.11[-15]	1.53[-15]			
n=6	1.98[-15]	1.19[-17]	4.75[-17]	1.20[-16]	2.81[-16]	5.68[-16]	9.51[-16]		
n=7	2.64[-16]	2.15[-18]	7.57[-18]	1.74[-17]	3.13[-17]	5.53[-17]	6.57[-17]	8.45[-17]	
n=8	3.75[-17]	5.42[-19]	1.94[-18]	3.43[-18]	5.15[-18]	6.91[-18]	6.60[-18]	4.77[-18]	8.11[-18]

Ionization cross section 2.03[-17]

O8+ + H(1s) E= 25.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.50[-17]	1.60[-17]	1.90[-17]		
n=3	3.36[-17]	7.79[-18]	1.54[-17]	1.05[-17]	
n=4	3.79[-17]	8.77[-18]	1.41[-17]	1.10[-17]	4.04[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	9.12[-26]	9.12[-26]							
n=2	7.70[-21]	3.80[-21]	3.90[-21]						
n=3	2.05[-17]	4.32[-18]	8.89[-18]	7.31[-18]					
n=4	6.97[-16]	3.60[-17]	1.26[-16]	2.45[-16]	2.90[-16]				
n=5	2.18[-15]	2.63[-17]	1.00[-16]	2.94[-16]	6.66[-16]	1.10[-15]			
n=6	1.61[-15]	1.13[-17]	4.29[-17]	1.10[-16]	2.32[-16]	4.10[-16]	8.06[-16]		
n=7	6.60[-16]	4.32[-18]	1.60[-17]	4.11[-17]	7.56[-17]	1.14[-16]	1.47[-16]	2.62[-16]	
n=8	2.26[-16]	1.87[-18]	6.42[-18]	1.65[-17]	2.50[-17]	3.78[-17]	3.82[-17]	5.14[-17]	4.91[-17]

Ionization cross section 9.43[-17]

O8+ + H(1s) E= 50.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	1.79[-16]	7.93[-17]	1.00[-16]		
n=3	1.34[-16]	3.91[-17]	5.83[-17]	3.69[-17]	
n=4	2.42[-16]	5.38[-17]	1.06[-16]	6.31[-17]	1.93[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	2.80[-26]	2.80[-26]							
n=2	1.20[-19]	5.27[-20]	6.69[-20]						
n=3	3.90[-17]	6.22[-18]	1.58[-17]	1.70[-17]					
n=4	4.31[-16]	1.27[-17]	5.07[-17]	1.38[-16]	2.30[-16]				
n=5	8.72[-16]	9.95[-18]	3.81[-17]	9.46[-17]	2.08[-16]	5.21[-16]			
n=6	8.55[-16]	6.83[-18]	2.52[-17]	6.01[-17]	1.14[-16]	1.97[-16]	4.52[-16]		
n=7	6.37[-16]	4.12[-18]	1.70[-17]	3.54[-17]	6.84[-17]	1.04[-16]	1.93[-16]	2.16[-16]	
n=8	4.39[-16]	3.00[-18]	1.23[-17]	2.33[-17]	4.41[-17]	6.10[-17]	9.96[-17]	1.30[-16]	6.58[-17]

Ionization cross section 1.06[-15]

O8+ + H(1s) E= 75.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	3.02[-16]	1.32[-16]	1.70[-16]		
n=3	1.97[-16]	6.12[-17]	8.29[-17]	5.28[-17]	
n=4	3.82[-16]	1.05[-16]	1.67[-16]	8.32[-17]	2.62[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	1.89[-26]	1.89[-26]							
n=2	3.19[-19]	1.34[-19]	1.85[-19]						
n=3	3.86[-17]	4.29[-18]	1.44[-17]	1.99[-17]					
n=4	2.34[-16]	5.42[-18]	2.16[-17]	6.06[-17]	1.47[-16]				
n=5	3.99[-16]	4.66[-18]	1.80[-17]	4.20[-17]	8.60[-17]	2.48[-16]			
n=6	4.12[-16]	3.58[-18]	1.30[-17]	3.08[-17]	5.54[-17]	1.23[-16]	1.85[-16]		
n=7	3.54[-16]	2.76[-18]	8.85[-18]	2.28[-17]	3.78[-17]	7.93[-17]	1.19[-16]	8.30[-17]	
n=8	2.94[-16]	2.94[-18]	6.77[-18]	2.04[-17]	2.72[-17]	5.40[-17]	8.44[-17]	7.11[-17]	2.70[-17]

Ionization cross section 2.07[-15]

O8+ + H(1s) E=100.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	4.19[-16]	1.45[-16]	2.74[-16]		
n=3	2.34[-16]	7.39[-17]	1.02[-16]	5.78[-17]	
n=4	4.01[-16]	1.25[-16]	1.70[-16]	8.56[-17]	2.09[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	2.09[-25]	2.09[-25]							
n=2	5.48[-19]	2.23[-19]	3.25[-19]						
n=3	3.14[-17]	2.49[-18]	1.05[-17]	1.84[-17]					
n=4	1.32[-16]	2.76[-18]	1.16[-17]	2.80[-17]	8.99[-17]				
n=5	2.01[-16]	2.47[-18]	9.51[-18]	2.07[-17]	4.83[-17]	1.20[-16]			
n=6	2.05[-16]	1.95[-18]	7.24[-18]	1.49[-17]	3.35[-17]	6.98[-17]	7.72[-17]		
n=7	1.80[-16]	1.37[-18]	6.02[-18]	1.08[-17]	2.49[-17]	4.88[-17]	5.75[-17]	3.11[-17]	
n=8	1.60[-16]	1.10[-18]	5.59[-18]	9.33[-18]	1.93[-17]	3.95[-17]	4.52[-17]	3.05[-17]	9.24[-18]

Ionization cross section 2.57[-15]

O8+ + H(1s) E=150.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	6.19[-16]	1.47[-16]	4.72[-16]		
n=3	2.14[-16]	4.89[-17]	1.12[-16]	5.36[-17]	
n=4	3.27[-16]	1.11[-16]	1.38[-16]	6.59[-17]	1.21[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	2.93[-24]	2.93[-24]							
n=2	8.28[-19]	3.27[-19]	5.01[-19]						
n=3	1.81[-17]	1.12[-18]	4.20[-18]	1.27[-17]					
n=4	4.82[-17]	1.21[-18]	3.50[-18]	9.71[-18]	3.38[-17]				
n=5	6.13[-17]	1.08[-18]	2.79[-18]	7.74[-18]	2.05[-17]	2.92[-17]			
n=6	6.04[-17]	8.74[-19]	2.24[-18]	6.02[-18]	1.54[-17]	2.22[-17]	1.37[-17]		
n=7	5.42[-17]	7.48[-19]	1.87[-18]	4.77[-18]	1.19[-17]	1.70[-17]	1.36[-17]	4.33[-18]	
n=8	4.87[-17]	6.34[-19]	1.71[-18]	3.62[-18]	9.45[-18]	1.44[-17]	1.22[-17]	5.59[-18]	1.06[-18]

Ionization cross section 2.74[-15]

O8+ + H(1s) E=200.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	7.44[-16]	1.34[-16]	6.10[-16]		
n=3	2.17[-16]	3.18[-17]	1.29[-16]	5.66[-17]	
n=4	2.95[-16]	8.51[-17]	1.30[-16]	6.58[-17]	1.40[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	1.73[-23]	1.73[-23]							
n=2	8.41[-19]	2.56[-19]	5.85[-19]						
n=3	1.04[-17]	5.05[-19]	1.99[-18]	7.92[-18]					
n=4	2.05[-17]	4.40[-19]	1.56[-18]	4.75[-18]	1.37[-17]				
n=5	2.22[-17]	3.51[-19]	1.16[-18]	3.62[-18]	8.80[-18]	8.26[-18]			
n=6	2.00[-17]	2.90[-19]	1.01[-18]	2.79[-18]	6.30[-18]	6.77[-18]	2.87[-18]		
n=7	1.78[-17]	3.07[-19]	8.18[-19]	2.51[-18]	5.05[-18]	5.27[-18]	3.06[-18]	7.45[-19]	
n=8	1.67[-17]	3.46[-19]	8.92[-19]	2.33[-18]	4.46[-18]	4.62[-18]	2.83[-18]	1.05[-18]	1.83[-19]

Ionization cross section 2.56[-15]

O8+ + H(1s) E=400.00keV/amu
Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	8.78[-16]	9.67[-17]	7.82[-16]		
n=3	1.99[-16]	1.94[-17]	1.34[-16]	4.60[-17]	
n=4	1.68[-16]	3.18[-17]	8.13[-17]	4.28[-17]	1.24[-17]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	1.70[-22]	1.70[-22]							
n=2	4.00[-19]	6.12[-20]	3.39[-19]						
n=3	1.38[-18]	5.16[-20]	2.89[-19]	1.04[-18]					
n=4	1.54[-18]	3.36[-20]	2.27[-19]	6.48[-19]	6.32[-19]				
n=5	1.31[-18]	2.50[-20]	1.72[-19]	4.44[-19]	4.85[-19]	1.84[-19]			
n=6	1.09[-18]	2.21[-20]	1.48[-19]	3.38[-19]	3.52[-19]	1.93[-19]	3.89[-20]		
n=7	9.25[-19]	2.16[-20]	1.28[-19]	2.71[-19]	2.74[-19]	1.65[-19]	5.41[-20]	1.18[-20]	
n=8	8.06[-19]	1.88[-20]	1.09[-19]	2.26[-19]	2.27[-19]	1.36[-19]	6.46[-20]	1.94[-20]	4.41[-21]

Ionization cross section 1.96[-15]

O8+ + H(1s) E=600.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	8.47[-16]	7.58[-17]	7.72[-16]		
n=3	1.82[-16]	1.45[-17]	1.33[-16]	3.41[-17]	
n=4	1.18[-16]	1.74[-17]	6.47[-17]	2.83[-17]	7.50[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	4.86[-22]	4.86[-22]							
n=2	1.53[-19]	8.88[-21]	1.44[-19]						
n=3	3.03[-19]	9.67[-21]	1.03[-19]	1.91[-19]					
n=4	2.82[-19]	7.16[-21]	1.04[-19]	9.89[-20]	7.25[-20]				
n=5	2.11[-19]	4.43[-21]	4.14[-20]	5.08[-20]	2.25[-20]	9.13[-20]			
n=6	1.51[-19]	2.41[-21]	6.83[-23]	1.90[-20]	6.95[-20]	3.39[-21]	5.65[-20]		
n=7	1.09[-19]	1.61[-25]	4.25[-24]	1.01[-20]	4.56[-20]	2.49[-21]	4.36[-20]	7.39[-21]	
n=8	8.79[-20]	1.64[-26]	2.24[-23]	2.35[-20]	1.23[-20]	2.40[-21]	3.14[-21]	3.43[-21]	4.31[-20]

Ionization cross section 1.52[-15]

O8+ + H(1s) E=800.00keV/amu

Excitation cross sections

	sum	l=0	l=1	l=2	l=3
n=2	8.77[-16]	6.05[-17]	8.16[-16]		
n=3	1.80[-16]	1.38[-17]	1.39[-16]	2.70[-17]	
n=4	1.01[-16]	1.26[-17]	6.25[-17]	2.21[-17]	4.15[-18]

Capture cross sections

	sum	l=0	l=1	l=2	l=3	l=4	l=5	l=6	l=7
n=1	1.48[-21]	1.48[-21]							
n=2	6.20[-20]	1.04[-20]	5.16[-20]						
n=3	8.50[-20]	7.74[-21]	3.13[-20]	4.60[-20]					
n=4	6.71[-20]	5.25[-21]	2.34[-20]	2.89[-20]	9.55[-21]				
n=5	4.99[-20]	3.68[-21]	1.28[-20]	7.35[-21]	3.26[-21]	2.27[-20]			
n=6	3.79[-20]	2.56[-21]	1.12[-23]	2.12[-21]	2.00[-20]	3.33[-22]	1.29[-20]		
n=7	2.99[-20]	1.85[-26]	1.27[-24]	2.45[-21]	1.55[-20]	1.98[-22]	9.20[-21]	2.56[-21]	
n=8	2.46[-20]	9.97[-28]	5.52[-25]	5.74[-21]	2.36[-21]	4.59[-23]	3.64[-22]	9.05[-22]	1.52[-20]

Ionization cross section 1.18[-15]

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