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Preliminary report

STARK BROADENING PARAMETER TABLES FOR Li II

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SUMMARY: Using a semiclassical approach, we have calculated electron–, proton–, and ionised helium–impact line widths and shifts for 37 Li II multiplets as a function of temperature and perturber density.

1. INTRODUCTION

Since the He-like Li II spectrum is particularly suitable for theoretical research, the corresponding Stark broadening parameters are of importance for the consideration of Stark broadening theory as well as for the examination of regularities and systematic trends within the astrophysically important helium isoelectronic sequence. In order to provide to astrophysicists the needed Stark broadening data, we have calculated within the semiclassical-perturbation formalism (Sahal–Bréchot, 1969ab) electron-, proton-, and ionized helium-impact line widths and shifts for 37 Li II multiplets.

2. RESULTS AND DISCUSSION

Analysis of obtained results and all details of calculations as well as the comparison with availlable experimental data will be published elsewhere (Dimitrijević and Sahal–Bréchot, 1995). Here, we present only tables of Stark broadening parameters for astrophysical and laboratory plasma diagnostic purposes. Our results for 37 Li II multiplets are shown in Table 1, for perturber densities 10^{11} (of interest for infrared spectroscopy) and 10^{15}– 10^{20} cm^{-3} (the data for 10^{17} cm^{-3} will be published in Dimitrijević and Sahal–Bréchot, 1995) and temperatures T = 5,000 – 40,000 K. We also specify a parameter c (Dimitri-

Table 1. This table shows electron-, proton-, and He II- impact broadening parameters for Li II, for perturber densities of 10^{11} (of interest for infrared spectroscopy) and $10^{15} - 10^{20}$ cm^{-3} and temperatures from 5,000 up to 40,000 K. Transitions and averaged wavelengths for the multiplet (in Å) are also given. By using c [see Eq. (5) in Dimitrijević et *al.*, 1991], we obtain an estimate for the maximum perturber density for which the line may be treated as isolated and tabulated data may be used. The asterisk identifies cases for which the collision volume multiplied by the perturber density (the condition for validity of the impact approximation) lies between 0.1 and 0.5.

PERTURBER DENSITY = 0.1E+12cm-3

		ELECTRONS		PROTONS		IONIZED HELIUM	
TRANSITION	T(K)	WIDTH(A)	SHIFT(A)	WIDTH(A)	SHIFT(A)	WIDTH(A)	SHIFT(A)
Li II 3D- 3P	5000.	0.550E-02	-0.108E-02	0.471E-03	-0.527E-03	0.947E-03	-0.110E-02
	10000.	0.446E-02	-0.902E-03	0.632E-03	-0.630E-03	0.131E-02	-0.132E-02
C= 0.21E+17	20000.	0.373E-02	-0.783E-03	0.801E-03	-0.751E-03	0.164E-02	-0.157E-02
	40000.	0.319E-02	-0.640E-03	0.100E-02	-0.865E-03	0.200E-02	-0.182E-02
Li II 4S- 6P	5000.	0.276E-04	0.578E-05	0.443E-05	0.383E-05	0.907E-05	0.804E-05
5655.7 A	10000.	0.279E-04	0.447E-05	0.523E-05	0.443E-05	0.110E-04	0.934E-05
C= 0.68E+13	20000.	0.283E-04	0.348E-05	0.590E-05	0.510E-05	0.125E-04	0.105E-04
	40000.	0.279E-04	0.245E-05	0.739E-05	0.582E-05	0.144E-04	0.123E-04
Li II 4P- 4D	5000.	0.829E-02	-0.188E-03	0.194E-02	0.181E-02	0.379E-02	0.378E-02
	10000.	0.727E-02	-0.176E-03	0.250E-02	0.208E-02	0.482E-02	0.443E-02
C= 0.56E+15	20000.	0.643E-02	-0.148E-03	0.334E-02	0.239E-02	0.561E-02	0.502E-02
	40000.	0.572E-02	-0.188E-03	0.397E-02	0.272E-02	0.683E-02	0.563E-02

PERTURBER DENSITY = 0.1E+16cm-3

Li II 1S- 3P	5000.	0.282E-04	-0.408E-05	0.230E-05	-0.272E-05	0.460E-05	-0.544E-05
178.0 A	10000.	0.228E-04	-0.315E-05	0.333E-05	-0.334E-05	0.689E-05	-0.690E-05
C= 0.15E+15	20000.	0.190E-04	-0.287E-05	0.424E-05	-0.399E-05	0.867E-05	-0.836E-05
	40000.	0.161E-04	-0.227E-05	0.531E-05	-0.471E-05	0.109E-04	-0.970E-05
Li II 1S- 4P	5000.	0.841E-04	-0.223E-04	0.132E-04	-0.128E-04*	0.273E-04	-0.247E-04
171.6 A	10000.	0.730E-04	-0.183E-04	0.167E-04	-0.156E-04*	0.345E-04	-0.319E-04
C= 0.59E+14	20000.	0.643E-04	-0.146E-04	0.209E-04	-0.183E-04	0.417E-04	-0.378E-04
	40000.	0.568E-04	-0.114E-04	0.245E-04	-0.204E-04	0.511E-04	-0.434E-04
Li II 1S- 5P	5000.	0.191E-03	-0.671E-04*	0.387E-04	-0.351E-04		
168.7 A	10000.	0.174E-03	-0.546E-04	0.485E-04	-0.421E-04		
C= 0.34E+14	20000.	0.159E-03	-0.425E-04	0.585E-04	-0.496E-04*	0.112E-03	-0.101E-03
	40000.	0.144E-03	-0.329E-04	0.682E-04	-0.542E-04*	0.136E-03	-0.117E-03
Li II 2S- 2P	5000.	0.237E-01	-0.154E-02	0.170E-03	-0.319E-03	0.306E-03	-0.632E-03
9584.1 A	10000.	0.169E-01	-0.137E-02	0.405E-03	-0.525E-03	0.773E-03	-0.107E-02
C= 0.96E+19	20000.	0.125E-01	-0.114E-02	0.679E-03	-0.731E-03	0.134E-02	-0.151E-02
	40000.	0.974E-02	-0.123E-02	0.974E-03	-0.909E-03	0.198E-02	-0.190E-02
Li II 2S- 3P	5000.	0.197E-02	-0.330E-03	0.148E-03	-0.176E-03	0.297E-03	-0.351E-03
1420.9 A	10000.	0.158E-02	-0.254E-03	0.214E-03	-0.215E-03	0.445E-03	-0.445E-03
C= 0.97E+16	20000.	0.131E-02	-0.215E-03	0.273E-03	-0.257E-03	0.558E-03	-0.539E-03
	40000.	0.112E-02	-0.185E-03	0.348E-03	-0.303E-03	0.699E-03	-0.625E-03

PERTURBER DENSITY = 0.1E+16cm-3

		ELECTRONS		PROTONS		IONIZED HELIUM	
TRANSITION	T(K)	WIDTH(A)	SHIFT(A)	WIDTH(A)	SHIFT(A)	WIDTH(A)	SHIFT(A)
Li II 2S- 4P	5000.	0.352E-02	-0.903E-03	0.536E-03	-0.520E-03*	0.111E-02	-0.100E-02
1093.4 A	10000.	0.304E-02	-0.733E-03	0.677E-03	-0.633E-03*	0.140E-02	-0.130E-02
C= 0.24E+16	20000.	0.267E-02	-0.626E-03	0.853E-03	-0.742E-03	0.170E-02	-0.154E-02
	40000.	0.236E-02	-0.474E-03	0.995E-03	-0.831E-03	0.208E-02	-0.177E-02
Li II 2S- 5P	5000.	0.663E-02	-0.227E-02	0.133E-02	-0.120E-02		
987.6 A	10000.	0.603E-02	-0.183E-02	0.166E-02	-0.144E-02		
C= 0.12E+16	20000.	0.550E-02	-0.148E-02	0.201E-02	-0.170E-02*	0.382E-02	-0.347E-02
	40000.	0.496E-02	-0.112E-02	0.234E-02	-0.186E-02*	0.464E-02	-0.401E-02
Li II 3S- 3P	5000.	1.48	-0.507	0.106	-0.121	0.213	-0.242
33614.6 A	10000.	1.20	-0.390	0.146	-0.148	0.300	-0.303
C= 0.54E+19	20000.	1.04	-0.317	0.185	-0.176	0.378	-0.370
	40000.	0.915	-0.250	0.231	-0.205	0.476	-0.425
Li II 3S- 4P	5000.	0.544E-01	-0.178E-01	0.791E-02	-0.771E-02*	0.164E-01	-0.149E-01
4157.6 A	10000.	0.477E-01	-0.145E-01	0.999E-02	-0.940E-02*	0.207E-01	-0.192E-01
C= 0.34E+17	20000.	0.427E-01	-0.117E-01	0.127E-01	-0.109E-01	0.252E-01	-0.229E-01
	40000.	0.383E-01	-0.915E-02	0.147E-01	-0.122E-01	0.307E-01	-0.257E-01
Li II 3S- 5P	5000.	0.607E-01	-0.221E-01*	0.120E-01	-0.108E-01		
2953.6 A	10000.	0.556E-01	-0.182E-01	0.148E-01	-0.130E-01		
C= 0.11E+17	20000.	0.510E-01	-0.143E-01	0.181E-01	-0.152E-01*	0.343E-01	-0.313E-01
	40000.	0.464E-01	-0.112E-01	0.210E-01	-0.166E-01*	0.416E-01	-0.362E-01
Li II 2P- 3S	5000.	0.188E-02	0.841E-03	0.749E-04	0.118E-03	0.152E-03	0.236E-03
1755.3 A	10000.	0.147E-02	0.655E-03	0.138E-03	0.157E-03	0.281E-03	0.326E-03
C= 0.92E+17	20000.	0.127E-02	0.536E-03	0.185E-03	0.189E-03	0.381E-03	0.394E-03
	40000.	0.114E-02	0.424E-03	0.233E-03	0.225E-03	0.488E-03	0.470E-03
Li II 2P- 3D	5000.	0.171E-02	0.412E-03	0.118E-03	0.156E-03	0.235E-03	0.313E-03
1681.7 A	10000.	0.133E-02	0.334E-03	0.187E-03	0.198E-03	0.387E-03	0.409E-03
C= 0.14E+17	20000.	0.107E-02	0.271E-03	0.248E-03	0.239E-03	0.507E-03	0.500E-03
	40000.	0.877E-03	0.214E-03	0.320E-03	0.278E-03	0.628E-03	0.596E-03
Li II 3D- 4P	5000.	0.699E-01	-0.180E-01	0.101E-01	-0.975E-02*	0.208E-01	-0.188E-01
4639.0 A	10000.	0.601E-01	-0.146E-01	0.126E-01	-0.119E-01*	0.264E-01	-0.243E-01
C= 0.43E+17	20000.	0.526E-01	-0.124E-01	0.159E-01	-0.136E-01	0.318E-01	-0.288E-01
	40000.	0.463E-01	-0.954E-02	0.185E-01	-0.153E-01	0.381E-01	-0.322E-01
Li II 3D- 5P	5000.	0.722E-01	-0.250E-01*	0.140E-01	-0.126E-01		
3188.6 A	10000.	0.654E-01	-0.204E-01	0.172E-01	-0.152E-01		
C= 0.12E+17	20000.	0.594E-01	-0.160E-01	0.212E-01	-0.177E-01*	0.402E-01	-0.367E-01
	40000.	0.535E-01	-0.125E-01	0.245E-01	-0.195E-01*	0.489E-01	-0.425E-01
Li II 2S- 3P	5000.	0.780E-03	0.282E-04	0.363E-04	0.341E-04	0.709E-04	0.689E-04
1198.1 A	10000.	0.667E-03	0.489E-04	0.563E-04	0.474E-04	0.111E-03	0.974E-04
C= 0.25E+17	20000.	0.590E-03	0.407E-04	0.709E-04	0.570E-04	0.143E-03	0.120E-03
	40000.	0.533E-03	0.378E-04	0.860E-04	0.679E-04	0.177E-03	0.144E-03

PERTURBER DENSITY = 0.1E+16cm-3

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
Li II 2s- 4P	5000.	0.134E-02	0.257E-03	0.146E-03	0.129E-03	0.296E-03	0.258E-03
944.7 A	10000.	0.127E-02	0.215E-03	0.183E-03	0.157E-03	0.375E-03	0.323E-03
C= 0.65E+16	20000.	0.121E-02	0.185E-03	0.226E-03	0.187E-03	0.459E-03	0.390E-03
	40000.	0.116E-02	0.163E-03	0.261E-03	0.212E-03	0.551E-03	0.457E-03
Li II 2s- 5P	5000.	0.273E-02	0.669E-03	0.408E-03	0.347E-03*0.839E-03*0.668E-03		
861.3 A	10000.	0.269E-02	0.560E-03	0.501E-03	0.427E-03*0.103E-02*0.854E-03		
C= 0.27E+16	20000.	0.268E-02	0.504E-03	0.586E-03	0.486E-03*0.121E-02*0.103E-02		
	40000.	0.262E-02	0.391E-03	0.657E-03	0.551E-03	0.138E-02	0.116E-02
Li II 2s- 6P	5000.	0.534E-02	0.151E-02*0.953E-03*0.786E-03				
822.2 A	10000.	0.541E-02	0.120E-02	0.113E-02	0.957E-03		
C= 0.14E+16	20000.	0.550E-02	0.104E-02	0.130E-02	0.112E-02*0.270E-02*0.228E-02		
	40000.	0.539E-02	0.781E-03	0.159E-02	0.124E-02*0.319E-02*0.267E-02		
Li II 3s- 3P	5000.	0.354	-0.723E-01	0.867E-02	0.502E-03	0.162E-01	0.987E-03
21066.8 A	10000.	0.290	-0.479E-01	0.123E-01	0.912E-03	0.234E-01	0.185E-02
C= 0.77E+19	20000.	0.264	-0.381E-01	0.146E-01	0.139E-02	0.285E-01	0.289E-02
	40000.	0.245	-0.298E-01	0.166E-01	0.191E-02	0.322E-01	0.398E-02
Li II 3s- 4P	5000.	0.240E-01	0.223E-02	0.212E-02	0.184E-02	0.430E-02	0.368E-02
3685.8 A	10000.	0.219E-01	0.184E-02	0.266E-02	0.225E-02	0.543E-02	0.461E-02
C= 0.99E+17	20000.	0.209E-01	0.149E-02	0.322E-02	0.267E-02	0.670E-02	0.565E-02
	40000.	0.201E-01	0.136E-02	0.383E-02	0.303E-02	0.777E-02	0.647E-02
Li II 3s- 5P	5000.	0.279E-01	0.475E-02	0.389E-02	0.331E-02*0.803E-02*0.641E-02		
2675.3 A	10000.	0.272E-01	0.420E-02	0.477E-02	0.407E-02*0.991E-02*0.818E-02		
C= 0.26E+17	20000.	0.270E-01	0.391E-02	0.559E-02	0.462E-02*0.115E-01*0.978E-02		
	40000.	0.265E-01	0.301E-02	0.629E-02	0.526E-02	0.133E-01	0.110E-01
Li II 3s- 6P	5000.	0.439E-01	0.114E-01*0.765E-02*0.630E-02				
2330.6 A	10000.	0.443E-01	0.878E-02	0.905E-02	0.767E-02		
C= 0.12E+17	20000.	0.450E-01	0.789E-02	0.104E-01	0.895E-02*0.215E-01*0.182E-01		
	40000.	0.442E-01	0.576E-02	0.127E-01	0.991E-02*0.254E-01*0.214E-01		
Li II 4s- 4P	5000.	6.43	-1.16	0.287	0.124	0.554	0.247
52504.5 A	10000.	6.09	-0.950	0.339	0.160	0.672	0.332
C= 0.20E+20	20000.	5.85	-0.838	0.392	0.193	0.776	0.404
	40000.	5.70	-0.634	0.438	0.228	0.865	0.481
Li II 4s- 5P	5000.	0.305	0.226E-01	0.341E-01	0.283E-01*0.698E-01*0.547E-01		
8228.6 A	10000.	0.297	0.162E-01	0.420E-01	0.347E-01*0.854E-01*0.706E-01		
C= 0.25E+18	20000.	0.295	0.122E-01	0.487E-01	0.403E-01*0.102	*0.833E-01	
	40000.	0.291	0.830E-02	0.560E-01	0.451E-01	0.120	0.980E-01
Li II 4s- 6P	5000.	0.276	0.538E-01*0.444E-01*0.363E-01				
5655.7 A	10000.	0.279	0.423E-01	0.522E-01	0.439E-01		
C= 0.68E+17	20000.	0.283	0.337E-01	0.590E-01	0.510E-01*0.125	*0.104	
	40000.	0.279	0.244E-01	0.739E-01	0.582E-01*0.144	*0.123	

PERTURBER DENSITY = 0.1E+16cm-3

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
Li II 2P- 3S	5000.	0.137E-02	0.640E-03	0.396E-04	0.657E-04	0.786E-04	0.133E-03
1653.1 A	10000.	0.101E-02	0.483E-03	0.710E-04	0.913E-04	0.143E-03	0.188E-03
C= 0.13E+18	20000.	0.844E-03	0.396E-03	0.104E-03	0.110E-03	0.217E-03	0.231E-03
	40000.	0.749E-03	0.312E-03	0.132E-03	0.131E-03	0.279E-03	0.276E-03
Li II 2P- 4S	5000.	0.168E-02	0.113E-02	0.144E-03	0.168E-03	0.292E-03	0.337E-03
1166.6 A	10000.	0.143E-02	0.931E-03	0.197E-03	0.205E-03	0.410E-03	0.421E-03
C= 0.26E+17	20000.	0.129E-02	0.749E-03	0.253E-03	0.245E-03	0.516E-03	0.512E-03
	40000.	0.122E-02	0.597E-03	0.303E-03	0.281E-03	0.649E-03	0.595E-03
Li II 3P- 4S	5000.	0.341E-01	0.184E-01	0.235E-02	0.269E-02	0.471E-02	0.538E-02
4882.8 A	10000.	0.304E-01	0.150E-01	0.323E-02	0.327E-02	0.667E-02	0.674E-02
C= 0.42E+18	20000.	0.286E-01	0.120E-01	0.408E-02	0.391E-02	0.855E-02	0.819E-02
	40000.	0.275E-01	0.944E-02	0.500E-02	0.447E-02	0.103E-01	0.947E-02
Li II 2P- 3D	5000.	0.123E-02	0.775E-04	0.357E-04	-0.392E-04	0.683E-04	-0.786E-04
1493.0 A	10000.	0.926E-03	0.422E-04	0.577E-04	-0.550E-04	0.112E-03	-0.112E-03
C= 0.39E+17	20000.	0.709E-03	0.227E-04	0.783E-04	-0.678E-04	0.158E-03	-0.142E-03
	40000.	0.565E-03	0.106E-04	0.976E-04	-0.809E-04	0.197E-03	-0.169E-03
Li II 2P- 4D	5000.	0.415E-02	0.147E-03	0.136E-02	0.121E-02*0.267E-02*0.226E-02		
1131.9 A	10000.	0.345E-02	0.156E-03	0.176E-02	0.149E-02*0.343E-02*0.292E-02		
C= 0.38E+15	20000.	0.288E-02	0.157E-03	0.230E-02	0.167E-02*0.402E-02*0.362E-02		
	40000.	0.242E-02	0.123E-03	0.281E-02	0.195E-02*0.475E-02*0.391E-02		
Li II 3P- 3D	5000.	2.74	-0.164	0.123	-0.120	0.239	-0.239
57388.8 A	10000.	2.26	-0.183	0.186	-0.160	0.376	-0.333
C= 0.57E+20	20000.	1.95	-0.153	0.232	-0.193	0.473	-0.404
	40000.	1.72	-0.136	0.282	-0.229	0.581	-0.485
Li II 3P- 4D	5000.	0.656E-01	0.568E-03	0.198E-01	0.176E-01*0.390E-01*0.328E-01		
4326.7 A	10000.	0.554E-01	0.702E-03	0.255E-01	0.217E-01*0.501E-01*0.425E-01		
C= 0.55E+16	20000.	0.470E-01	0.131E-02	0.336E-01	0.244E-01*0.584E-01*0.526E-01		
	40000.	0.401E-01	0.887E-03	0.409E-01	0.283E-01*0.695E-01*0.573E-01		
Li II 3D- 4P	5000.	0.407E-01	0.715E-02	0.401E-02	0.353E-02	0.819E-02	0.707E-02
4844.4 A	10000.	0.376E-01	0.618E-02	0.503E-02	0.433E-02	0.104E-01	0.893E-02
C= 0.17E+18	20000.	0.356E-01	0.511E-02	0.617E-02	0.515E-02	0.126E-01	0.108E-01
	40000.	0.338E-01	0.457E-02	0.702E-02	0.586E-02	0.150E-01	0.123E-01
Li II 3D- 5P	5000.	0.407E-01	0.998E-02	0.582E-02	0.493E-02*0.119E-01*0.947E-02		
3237.3 A	10000.	0.397E-01	0.825E-02	0.716E-02	0.607E-02*0.147E-01*0.122E-01		
C= 0.39E+17	20000.	0.394E-01	0.728E-02	0.839E-02	0.693E-02*0.173E-01*0.147E-01		
	40000.	0.384E-01	0.565E-02	0.934E-02	0.787E-02	0.196E-01	0.166E-01
Li II 3D- 6P	5000.	0.611E-01	0.163E-01*0.107E-01*0.878E-02				
2745.8 A	10000.	0.616E-01	0.138E-01	0.127E-01	0.107E-01		
C= 0.16E+17	20000.	0.624E-01	0.118E-01	0.145E-01	0.125E-01*0.303E-01*0.254E-01		
	40000.	0.611E-01	0.885E-02	0.178E-01	0.138E-01*0.356E-01*0.298E-01		

PERTURBER DENSITY = 0.1E+17cm-3

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
Li II 1s- 3P	5000.	0.282E-03	-0.386E-04	0.229E-04	-0.247E-04	0.460E-04	-0.457E-04
178.0 A	10000.	0.228E-03	-0.299E-04	0.333E-04	-0.323E-04	0.693E-04	-0.632E-04
C= 0.15E+16	20000.	0.190E-03	-0.275E-04	0.424E-04	-0.397E-04	0.868E-04	-0.808E-04
	40000.	0.161E-03	-0.221E-04	0.531E-04	-0.469E-04	0.109E-03	-0.964E-04
Li II 1s- 4P	5000.	0.841E-03	-0.202E-03*	0.132E-03	-0.105E-03		
171.6 A	10000.	0.730E-03	-0.167E-03*	0.166E-03	-0.146E-03		
C= 0.59E+15	20000.	0.643E-03	-0.136E-03*	0.209E-03	-0.181E-03		
	40000.	0.568E-03	-0.109E-03*	0.245E-03	-0.203E-03		
Li II 1s- 5P	5000.	0.190E-02	-0.570E-03				
168.7 A	10000.	0.173E-02	-0.474E-03				
C= 0.34E+15	20000.	0.158E-02	-0.378E-03				
	40000.	0.143E-02	-0.307E-03				
Li II 2s- 2P	5000.	0.237	-0.145E-01	0.170E-02	-0.305E-02	0.304E-02	-0.579E-02
9584.1 A	10000.	0.169	-0.139E-01	0.405E-02	-0.519E-02	0.772E-02	-0.104E-01
C= 0.96E+20	20000.	0.125	-0.114E-01	0.679E-02	-0.730E-02	0.134E-01	-0.149E-01
	40000.	0.974E-01	-0.123E-01	0.974E-02	-0.908E-02	0.198E-01	-0.189E-01
Li II 2s- 3P	5000.	0.197E-01	-0.315E-02	0.148E-02	-0.160E-02	0.297E-02	-0.294E-02
1420.9 A	10000.	0.158E-01	-0.243E-02	0.214E-02	-0.208E-02	0.447E-02	-0.406E-02
C= 0.97E+17	20000.	0.131E-01	-0.207E-02	0.273E-02	-0.256E-02	0.560E-02	-0.521E-02
	40000.	0.112E-01	-0.181E-02	0.348E-02	-0.302E-02	0.699E-02	-0.621E-02
Li II 2s- 4P	5000.	0.352E-01	-0.814E-02*	0.537E-02	-0.425E-02		
1093.4 A	10000.	0.304E-01	-0.668E-02*	0.674E-02	-0.594E-02		
C= 0.24E+17	20000.	0.267E-01	-0.577E-02*	0.853E-02	-0.735E-02		
	40000.	0.236E-01	-0.454E-02*	0.997E-02	-0.826E-02		
Li II 2s- 5P	5000.	0.659E-01	-0.192E-01				
987.6 A	10000.	0.600E-01	-0.158E-01				
C= 0.12E+17	20000.	0.547E-01	-0.129E-01				
	40000.	0.495E-01	-0.105E-01				
Li II 3s- 3P	5000.	14.8	-4.96	1.06	-1.09	* 2.11	-2.00
33614.6 A	10000.	12.0	-3.82	1.46	-1.43	* 2.99	-2.75
C= 0.54E+20	20000.	10.4	-3.12	1.85	-1.75	* 3.80	-3.56
	40000.	9.15	-2.47	2.31	-2.04	4.76	-4.22
Li II 3s- 4P	5000.	0.544	-0.165	*0.791E-01	-0.628E-01		
4157.6 A	10000.	0.477	-0.136	*0.999E-01	-0.884E-01		
C= 0.34E+18	20000.	0.426	-0.111	*0.127	-0.107		
	40000.	0.383	-0.885E-01	*0.147	-0.121		
Li II 3s- 5P	5000.	0.603	-0.190				
2953.6 A	10000.	0.553	-0.160				
C= 0.11E+18	20000.	0.508	-0.129				
	40000.	0.463	-0.105				

PERTURBER DENSITY = 0.1E+17cm-3

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
Li II 2P- 3S	5000.	0.188E-01	0.835E-02	0.750E-03	0.110E-02	0.153E-02	0.205E-02
1755.3 A	10000.	0.147E-01	0.651E-02	0.138E-02	0.153E-02	0.281E-02	0.305E-02
C= 0.92E+18	20000.	0.127E-01	0.533E-02	0.185E-02	0.188E-02	0.381E-02	0.384E-02
	40000.	0.114E-01	0.422E-02	0.233E-02	0.224E-02	0.488E-02	0.468E-02
Li II 2P- 3D	5000.	0.171E-01	0.399E-02	0.117E-02	0.143E-02	0.235E-02	0.269E-02
1681.7 A	10000.	0.133E-01	0.326E-02	0.187E-02	0.193E-02	0.388E-02	0.379E-02
C= 0.14E+18	20000.	0.107E-01	0.265E-02	0.248E-02	0.238E-02	0.506E-02	0.486E-02
	40000.	0.877E-02	0.211E-02	0.320E-02	0.278E-02	0.628E-02	0.594E-02
Li II 3D- 4P	5000.	0.699	-0.164	*0.100	-0.793E-01		
4639.0 A	10000.	0.601	-0.134	*0.127	-0.112		
C= 0.43E+18	20000.	0.526	-0.116	*0.159	-0.134		
	40000.	0.463	-0.915E-01	*0.185	-0.152		
Li II 3D- 5P	5000.	0.718	-0.213				
3188.6 A	10000.	0.651	-0.178				
C= 0.12E+18	20000.	0.592	-0.140				
	40000.	0.534	-0.117				
Li II 2S- 3P	5000.	0.780E-02	0.285E-03	0.362E-03	0.319E-03	0.705E-03	0.613E-03
1198.1 A	10000.	0.666E-02	0.480E-03	0.563E-03	0.465E-03	0.111E-02	0.923E-03
C= 0.25E+18	20000.	0.590E-02	0.395E-03	0.709E-03	0.569E-03	0.143E-02	0.117E-02
	40000.	0.533E-02	0.373E-03	0.860E-03	0.678E-03	0.177E-02	0.143E-02
Li II 2S- 4P	5000.	0.134E-01	0.244E-02	0.145E-02	0.114E-02*0.291E-02*0.206E-02		
944.7 A	10000.	0.127E-01	0.205E-02	0.182E-02	0.151E-02*0.375E-02*0.288E-02		
C= 0.65E+17	20000.	0.121E-01	0.179E-02	0.226E-02	0.186E-02*0.457E-02*0.371E-02		
	40000.	0.116E-01	0.160E-02	0.261E-02	0.211E-02*0.551E-02*0.454E-02		
Li II 2S- 5P	5000.	0.273E-01	0.610E-02*0.403E-02*0.282E-02				
861.3 A	10000.	0.269E-01	0.518E-02*0.500E-02*0.398E-02				
C= 0.27E+17	20000.	0.268E-01	0.476E-02*0.586E-02*0.480E-02				
	40000.	0.262E-01	0.377E-02*0.657E-02*0.548E-02				
Li II 2S- 6P	5000.	0.533E-01	0.131E-01				
822.2 A	10000.	0.541E-01	0.105E-01				
C= 0.14E+17	20000.	0.549E-01	0.943E-02				
	40000.	0.539E-01	0.732E-02				
Li II 3S- 3P	5000.	3.54	-0.722	0.864E-01	0.480E-02	0.160	0.908E-02
21066.8 A	10000.	2.90	-0.481	0.123	0.903E-02	0.234	0.179E-01
C= 0.77E+20	20000.	2.63	-0.382	0.146	0.139E-01	0.285	0.287E-01
	40000.	2.45	-0.297	0.166	0.191E-01	0.322	0.398E-01
Li II 3S- 4P	5000.	0.240	0.205E-01	0.210E-01	0.163E-01*0.423E-01*0.297E-01		
3685.8 A	10000.	0.219	0.171E-01	0.266E-01	0.217E-01*0.538E-01*0.413E-01		
C= 0.99E+18	20000.	0.209	0.138E-01	0.322E-01	0.266E-01*0.672E-01*0.543E-01		
	40000.	0.201	0.132E-01	0.383E-01	0.302E-01*0.777E-01*0.643E-01		

PERTURBER DENSITY = 0.1E+17cm-3

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
LI II 3S- 5P	5000.	0.279	0.417E-01*0.383E-01*0.269E-01				
2675.3 A	10000.	0.272	0.375E-01*0.477E-01*0.381E-01				
C= 0.26E+18	20000.	0.270	0.359E-01*0.559E-01*0.457E-01				
	40000.	0.265	0.287E-01*0.629E-01*0.522E-01				
LI II 3S- 6P	5000.	0.438	0.974E-01				
2330.6 A	10000.	0.443	0.755E-01				
C= 0.12E+18	20000.	0.450	0.695E-01				
	40000.	0.442	0.536E-01				
LI II 4S- 5P	5000.	3.05	0.179	*0.336	*0.232		
8228.6 A	10000.	2.97	0.129	*0.418	*0.325		
C= 0.25E+19	20000.	2.95	0.100	*0.487	*0.399		
	40000.	2.91	0.726E-01	*0.560	*0.448		
LI II 4S- 6P	5000.	2.75	0.441				
5655.7 A	10000.	2.78	0.353				
C= 0.68E+18	20000.	2.83	0.293				
	40000.	2.79	0.222				
LI II 2P- 3S	5000.	0.137E-01	0.636E-02	0.396E-03	0.614E-03	0.786E-03	0.118E-02
1653.1 A	10000.	0.101E-01	0.480E-02	0.711E-03	0.896E-03	0.143E-02	0.178E-02
C= 0.13E+19	20000.	0.844E-02	0.394E-02	0.104E-02	0.109E-02	0.217E-02	0.225E-02
	40000.	0.749E-02	0.311E-02	0.132E-02	0.130E-02	0.279E-02	0.275E-02
LI II 2P- 4S	5000.	0.168E-01	0.112E-01	0.144E-02	0.150E-02*0.292E-02*0.275E-02		
1166.6 A	10000.	0.143E-01	0.922E-02	0.197E-02	0.197E-02*0.412E-02*0.381E-02		
C= 0.26E+18	20000.	0.129E-01	0.740E-02	0.253E-02	0.244E-02*0.520E-02*0.491E-02		
	40000.	0.122E-01	0.594E-02	0.304E-02	0.280E-02*0.649E-02*0.591E-02		
LI II 3P- 4S	5000.	0.341	0.181	0.235E-01	0.241E-01*0.472E-01*0.442E-01		
4882.8 A	10000.	0.304	0.148	0.323E-01	0.316E-01*0.671E-01*0.607E-01		
C= 0.42E+19	20000.	0.286	0.119	0.408E-01	0.389E-01*0.853E-01*0.784E-01		
	40000.	0.275	0.939E-01	0.501E-01	0.445E-01	0.103	0.941E-01
LI II 2P- 3D	5000.	0.124E-01	0.799E-03	0.357E-03	-0.369E-03	0.679E-03	-0.706E-03
1493.0 A	10000.	0.926E-02	0.429E-03	0.577E-03	-0.540E-03	0.112E-02	-0.107E-02
C= 0.39E+18	20000.	0.709E-02	0.237E-03	0.783E-03	-0.677E-03	0.159E-02	-0.139E-02
	40000.	0.565E-02	0.112E-03	0.976E-03	-0.808E-03	0.197E-02	-0.169E-02
LI II 2P- 4D	5000.	0.383E-01	-0.660E-03				
1131.9 A	10000.	0.323E-01	-0.608E-04				
C= 0.38E+16	20000.	0.273E-01	0.374E-03				
	40000.	0.231E-01	0.561E-03*0.281E-01*0.193E-01				
LI II 3P- 4D	5000.	0.610	-0.257E-01				
4326.7 A	10000.	0.521	-0.164E-01				
C= 0.55E+17	20000.	0.447	-0.807E-02				
	40000.	0.385	-0.877E-03*0.410		*0.281		

PERTURBER DENSITY = 0.1E+17cm-3

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
Li II 3D- 4P	5000.	0.407	0.676E-01	0.398E-01	0.311E-01*0.806E-01		*0.563E-01
4844.4 A	10000.	0.376	0.591E-01	0.503E-01	0.416E-01*0.103		*0.793E-01
C= 0.17E+19	20000.	0.356	0.492E-01	0.617E-01	0.512E-01*0.126		*0.103
	40000.	0.338	0.448E-01	0.702E-01	0.584E-01*0.150		*0.122
Li II 3D- 5P	5000.	0.407	0.913E-01*0.579E-01*0.403E-01				
3237.3 A	10000.	0.397	0.763E-01*0.712E-01*0.566E-01				
C= 0.39E+18	20000.	0.394	0.687E-01*0.839E-01*0.685E-01				
	40000.	0.384	0.545E-01*0.935E-01*0.783E-01				
Li II 3D- 6P	5000.	0.610	0.140				
2745.8 A	10000.	0.616	0.121				
C= 0.16E+18	20000.	0.624	0.107				
	40000.	0.611	0.829E-01				
Li II 4D- 5P	5000.	6.79	1.05				
10503.5 A	10000.	6.37	0.844				
C= 0.33E+18	20000.	6.04	0.695	* 1.60	-1.07		
	40000.	5.66	0.537	* 2.08	-1.22		
Li II 4D- 6P	5000.	4.53	0.867				
6644.8 A	10000.	4.45	0.724	*0.469	*0.236		
C= 0.13E+18	20000.	4.40	0.625	*0.586	*0.284		
	40000.	4.22	0.473	*0.739	*0.324		

PERTURBER DENSITY = 0.1E+19cm-3

Li II 1S- 2P	5000.	0.557E-02	0.407E-03	0.434E-04	-0.141E-04	0.586E-04	-0.162E-04
199.3 A	10000.	0.395E-02	0.407E-03	0.104E-03	-0.390E-04	0.180E-03	-0.633E-04
C= 0.41E+19	20000.	0.286E-02	0.279E-03	0.171E-03	-0.718E-04	0.322E-03	-0.135E-03
	40000.	0.211E-02	0.178E-03	0.237E-03	-0.107E-03	0.463E-03	-0.210E-03
Li II 1S- 3P	5000.	*0.259E-01	-0.622E-03				
178.0 A	10000.	0.215E-01	-0.853E-03				
C= 0.15E+18	20000.	0.181E-01	-0.127E-02				
	40000.	0.155E-01	-0.115E-02				
Li II 1S- 4P	5000.						
171.6 A	10000.	*0.536E-01	-0.311E-02				
C= 0.59E+17	20000.	*0.515E-01	-0.381E-02				
	40000.	*0.480E-01	-0.372E-02				
Li II 2S- 2P	5000.	23.7	-1.26	0.152	-0.169	*0.224	-0.183
9584.1 A	10000.	16.9	-1.25	0.399	-0.406	*0.731	-0.632
C= 0.96E+22	20000.	12.5	-1.04	0.678	-0.642	* 1.32	-1.16
	40000.	9.74	-1.16	0.973	-0.875	* 1.97	-1.68
Li II 2S- 3P	5000.	*1.82	-0.105				
1420.9 A	10000.	*1.50	-0.105				
C= 0.97E+19	20000.	1.26	-0.111				
	40000.	1.08	-0.113				

PERTURBER DENSITY = 0.1E+19cm-3

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
Li II 2S- 4P	5000.						
1093.4 A	10000.*	2.25	-0.114				
C= 0.24E+19	20000.*	2.15	-0.180				
	40000.*	2.00	-0.161				
Li II 2P- 3S	5000.	*1.88	*0.720	*0.652E-01	*0.322E-01		
1755.3 A	10000.	1.47	0.575	*0.136	*0.878E-01		
C= 0.92E+20	20000.	1.27	0.481	*0.184	*0.138		
	40000.	1.14	0.385	*0.234	*0.206		
Li II 2P- 3D	5000.*	1.60	0.237				
1681.7 A	10000.	1.27	0.219				
C= 0.14E+20	20000.	1.02	0.191				
	40000.	0.846	0.158				
Li II 2S- 2P	5000.	6.23	-0.431	0.288E-01	-0.269E-01	0.407E-01	-0.304E-01
5486.1 A	10000.	4.41	-0.255	0.754E-01	-0.682E-01	0.134	-0.109
C= 0.55E+22	20000.	3.19	-0.220	0.134	-0.113	0.257	-0.209
	40000.	2.40	-0.239	0.202	-0.164	0.407	-0.323
Li II 2S- 3P	5000.*	0.779	-0.124E-02*	0.272E-01*	0.122E-01		
1198.1 A	10000.	0.666	0.285E-01*	0.535E-01*	0.300E-01		
C= 0.25E+20	20000.	0.590	0.261E-01*	0.693E-01*	0.438E-01		
	40000.	0.532	0.277E-01*	0.858E-01*	0.631E-01		
Li II 2S- 4P	5000.*	1.26	*0.369E-01				
944.7 A	10000.*	1.21	*0.711E-01				
C= 0.65E+19	20000.*	1.17	*0.847E-01				
	40000.	1.14	0.933E-01				
Li II 2P- 3S	5000.	1.37	0.580	*0.368E-01	*0.234E-01		
1653.1 A	10000.	1.01	0.444	*0.706E-01	*0.576E-01		
C= 0.13E+21	20000.	0.844	0.369	*0.103	*0.846E-01		
	40000.	0.749	0.294	*0.132	*0.121		
Li II 2P- 4S	5000.*	1.67	*0.875				
1166.6 A	10000.*	1.43	*0.764				
C= 0.26E+20	20000.	1.29	0.633				
	40000.	1.21	0.516				
Li II 2P- 3D	5000.*	1.23	*0.112	*0.292E-01	-0.161E-01		
1493.0 A	10000.	0.925	0.633E-01*	0.556E-01	-0.366E-01		
C= 0.39E+20	20000.	0.708	0.378E-01*	0.776E-01	-0.541E-01		
	40000.	0.564	0.213E-01*	0.974E-01	-0.758E-01		
Li II 2P- 4D	5000.						
1131.9 A	10000.*	1.97	-0.362E-01				
C= 0.38E+18	20000.*	1.83	-0.240E-01				
	40000.	1.67	-0.257E-01				

PERTURBER DENSITY = 0.1E+20cm-3

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
Li II 1S- 2P	5000.	0.556E-01	0.438E-02	0.179E-03	-0.382E-04*	0.469E-04	-0.100E-04
199.3 A	10000.	0.395E-01	0.433E-02	0.807E-03	-0.233E-03*	0.913E-03	-0.222E-03
C= 0.41E+20	20000.	0.286E-01	0.296E-02	0.163E-02	-0.587E-03*	0.270E-02	-0.875E-03
	40000.	0.211E-01	0.189E-02	0.233E-02	-0.943E-03*	0.442E-02	-0.168E-02
Li II 2P- 3D	5000.						
1681.7 A	10000.						
C= 0.14E+21	20000.*	8.33	* 1.18				
	40000.	7.19	1.05				
Li II 2S- 3P	5000.						
1198.1 A	10000.*	6.27	-0.219				
C= 0.25E+21	20000.*	5.59	-0.670E-01				
	40000.*	5.12	0.577E-01				
Li II 2P- 3S	5000.						
1653.1 A	10000.*	9.99	* 3.40				
C= 0.13E+22	20000.*	8.39	* 3.03				
	40000.	7.46	2.49				
Li II 2P- 3D	5000.						
1493.0 A	10000.*	8.66	* 1.18				
C= 0.39E+21	20000.*	6.77	*0.730				
	40000.	5.45	0.448				

PERTURBER DENSITY = 0.1E+21cm-3

Li II 1S- 2P	5000.		
199.3 A	10000.*	0.382	*0.558E-01
C= 0.41E+21	20000.*	0.282	*0.364E-01
	40000.	0.209	0.232E-01

jević and Sahal–Bréchot 1984), which gives an estimate for the maximum perturber density for which the line may be treated as isolated when it is divided by the corresponding full width at half maximum. For each value given in Table 1, the collision volume (V) multiplied by the perturber density (N) is much less than one and the impact approximation is valid (Sahal–Bréchot, 1969ab). Values for NV > 0.5 are not given and values for $0.1 < NV \leq 0.5$ are denoted by an asterisk. When the impact approximation is not valid, the ion broadening contribution may be estimated by using quasistatic approach (Sahal–Bréchot 1991 and Griem 1974). The accuracy of the results obtained decreases when broadening by ion interactions becomes important.

The analysis of present results and comparison with available theoretical data will be published elsewhere (Dimitrijević and Sahal–Bréchot, 1995).

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REFERENCES

Dimitrijević, M. S., and Sahal–Bréchot, S.: 1984, *JQSRT*, **31**, 301.

Dimitrijević, M. S., and Sahal–Bréchot, S.: 1995, *Physica Scripta*, submitted.

Griem, H. R.: 1974, *Spectral Line Broadening by Plasmas*, Academic Press, New York.

Sahal–Bréchot, S.: 1969a, *Astron. Astrophys.* **1**, 91.

Sahal–Bréchot, S.: 1969b, *Astron. Astrophys.* **2**, 322.

Sahal–Bréchot, S.: 1991, *Astron. Astrophys.* **245**, 322.

ТАБЕЛЕ ПАРАМЕТАРА ШТАРКОВОГ ШИРЕЊА Li II

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Претходно саопштење

Користећи семикласичан прилаз, израчунате су ширине и помераји спектралних линија, проузроковани сударима са електронима, протонима и јонизованим хелијумом, за 37 мултиплета Li II. Резултати су дати у функцији температуре и концентрације пертурбера.