

STARK BROADENING PARAMETER TABLES FOR Ba I AND Ba II

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SUMMARY: Using a semiclassical approach, we have calculated electron–, proton–, and ionized helium–impact line widths and shifts for 14 Ba I and 66 Ba II multiplets as a function of temperature and perturber density.

1. INTRODUCTION

Like strontium lines analysed by authors recently (Dimitrijević and Sahal - Bréchet, 1996ab), barium lines are also of particular astrophysical interest since this element is among products of thermonuclear s - processes in stellar interiors. Barium lines are present in solar and stellar spectra (see e.g. Komarov and Basak, 1993), and its overabundance is observed in metal deficient barium stars (Šleivyte and Bartkevičius, 1995). In order to provide the Stark broadening data needed for various astrophysical problems and for investigation of laboratory plasmas, we have calculated within the semiclassical-perturbation formalism (Sahal–Bréchet, 1969ab) electron-, proton-, and ionized helium-impact line widths and shifts for 14 Ba I and 66 Ba II multiplets.

2. RESULTS AND DISCUSSION

The analysis of obtained results, details of calculations and the comparison with available experimental and theoretical data will be published elsewhere (Dimitrijević and Sahal–Bréchet, 1996c). Here, we present only tables of Stark broadening parameters for astrophysical and laboratory plasma diagnostic purposes. Our results for 14 Ba I and 66 Ba II multiplets are shown in Tables 1 and 2 respectively, for perturber densities $10^{15} - 10^{18} \text{ cm}^{-3}$ and temperatures $T = 2,500 - 50,000 \text{ K}$ for Ba I and $T = 5,000 - 100,000 \text{ K}$ for Ba II. We also specify a parameter c (Dimitrijević and Sahal–Bréchet 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 Tables 1 and

Table 1. This Table shows electron-, proton-, and He II- impact broadening parameters for Ba I, for perturber densities of $10^{15} - 10^{18} \text{ cm}^{-3}$ and temperatures from 2,500 up to 50,000 K. Transitions and averaged wavelengths for the multiplet (in Å) are also given. By dividing c by the corresponding full width at half maximum (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. Stark broadening parameters for densities lower than tabulated, are linear with perturber density.

PERTURBER DENSITY= 1.E+15cm-3							
PERTURBERS ARE:		ELECTRONS		PROTONS		IONIZED HELIUM	
TRANSITION	T(K)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
6S - 6P	2500.	0.231E-02	0.403E-03	0.115E-02	0.111E-03	0.115E-02	0.880E-04
5537.0 Å	5000.	0.228E-02	0.435E-03	0.115E-02	0.124E-03	0.115E-02	0.991E-04
C= 0.20E+19	10000.	0.246E-02	0.398E-03	0.115E-02	0.140E-03	0.115E-02	0.112E-03
	20000.	0.301E-02	0.204E-03	0.115E-02	0.157E-03	0.115E-02	0.125E-03
	30000.	0.353E-02	0.104E-03	0.115E-02	0.168E-03	0.115E-02	0.134E-03
	50000.	0.432E-02	0.300E-04	0.116E-02	0.183E-03	0.115E-02	0.146E-03
6S - 7P	2500.	0.516E-02	-0.247E-02	0.267E-02	-0.653E-03	0.264E-02	-0.515E-03
3072.5 Å	5000.	0.560E-02	-0.286E-02	0.269E-02	-0.746E-03	0.266E-02	-0.590E-03
C= 0.22E+18	10000.	0.607E-02	-0.316E-02	0.271E-02	-0.847E-03	0.267E-02	-0.672E-03
	20000.	0.658E-02	-0.319E-02	0.273E-02	-0.958E-03	0.269E-02	-0.762E-03
	30000.	0.688E-02	-0.306E-02	0.275E-02	-0.103E-02	0.270E-02	-0.817E-03
	50000.	0.725E-02	-0.276E-02	0.279E-02	-0.112E-02	0.272E-02	-0.892E-03
7S - 7P	2500.	0.375	-0.205	0.156	-0.552E-01	0.152	-0.434E-01
23164.3 Å	5000.	0.430	-0.238	0.158	-0.633E-01	0.154	-0.500E-01
C= 0.12E+20	10000.	0.497	-0.276	0.162	-0.720E-01	0.156	-0.571E-01
	20000.	0.560	-0.302	0.166	-0.816E-01	0.159	-0.648E-01
	30000.	0.593	-0.302	0.168	-0.876E-01	0.160	-0.697E-01
	50000.	0.627	-0.286	0.173	-0.956E-01	0.163	-0.761E-01
6P - 7S	2500.	0.318E-01	0.218E-01	0.729E-02	0.593E-02	0.614E-02	0.468E-02
9833.0 Å	5000.	0.366E-01	0.260E-01	0.802E-02	0.677E-02	0.669E-02	0.536E-02
C= 0.42E+19	10000.	0.412E-01	0.311E-01	0.885E-02	0.768E-02	0.732E-02	0.609E-02
	20000.	0.449E-01	0.313E-01	0.980E-02	0.868E-02	0.805E-02	0.691E-02
	30000.	0.480E-01	0.320E-01	0.104E-01	0.930E-02	0.852E-02	0.741E-02
	50000.	0.512E-01	0.276E-01	0.113E-01	0.101E-01	0.918E-02	0.808E-02
6P - 8S	2500.	0.109	0.768E-01	0.225E-01	0.182E-01	*0.179E-01	*0.139E-01
5268.5 Å	5000.	0.123	0.891E-01	0.252E-01	0.217E-01	*0.201E-01	*0.168E-01
C= 0.20E+18	10000.	0.134	0.907E-01	0.283E-01	0.253E-01	0.226E-01	0.198E-01
	20000.	0.149	0.817E-01	0.318E-01	0.290E-01	0.254E-01	0.229E-01
	30000.	0.164	0.695E-01	0.340E-01	0.313E-01	0.271E-01	0.248E-01
	50000.	0.184	0.576E-01	0.371E-01	0.344E-01	0.296E-01	0.273E-01
6P - 9S	2500.	0.166	-0.110	*0.321E-01	-0.247E-01	*0.256E-01	-0.186E-01
4948.7 Å	5000.	0.178	-0.126	*0.361E-01	-0.301E-01	*0.288E-01	-0.232E-01
C= 0.12E+18	10000.	0.185	-0.124	0.405E-01	-0.355E-01	*0.323E-01	-0.277E-01
	20000.	0.192	-0.105	0.454E-01	-0.410E-01	*0.362E-01	-0.323E-01
	30000.	0.205	-0.883E-01	0.486E-01	-0.444E-01	*0.388E-01	-0.351E-01
	50000.	0.219	-0.705E-01	0.530E-01	-0.489E-01	0.422E-01	-0.387E-01
7P - 8S	2500.	2.06	1.39	*0.426	*0.330	*0.347	*0.251
22252.3 Å	5000.	2.36	1.62	0.475	0.394	*0.386	*0.306
C= 0.36E+19	10000.	2.64	1.70	0.529	0.459	*0.429	*0.360
	20000.	2.98	1.57	0.591	0.527	0.477	0.416
	30000.	3.25	1.39	0.631	0.569	0.508	0.451
	50000.	3.60	1.17	0.685	0.625	0.551	0.496
7P - 9S	2500.	2.09	-1.37	*0.404	-0.306	*0.325	-0.230
17480.9 Å	5000.	2.23	-1.55	*0.452	-0.373	*0.363	-0.287
C= 0.15E+19	10000.	2.38	-1.56	0.506	-0.439	*0.406	-0.343
	20000.	2.50	-1.21	0.567	-0.507	*0.454	-0.399
	30000.	2.70	-1.02	0.606	-0.549	*0.485	-0.434
	50000.	2.90	-0.822	0.659	-0.604	0.527	-0.478

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
6P - 6D	2500.	0.261E-01	0.176E-01	0.903E-02	0.471E-02	0.855E-02	0.371E-02
8212.5 Å	5000.	0.304E-01	0.209E-01	0.938E-02	0.538E-02	0.878E-02	0.426E-02
C= 0.16E+19	10000.	0.343E-01	0.242E-01	0.981E-02	0.611E-02	0.905E-02	0.485E-02
	20000.	0.380E-01	0.242E-01	0.103E-01	0.691E-02	0.940E-02	0.550E-02
	30000.	0.405E-01	0.235E-01	0.107E-01	0.740E-02	0.964E-02	0.590E-02
	50000.	0.437E-01	0.198E-01	0.112E-01	0.808E-02	0.999E-02	0.644E-02
6P - 7D	2500.	0.178	-0.382E-01	*0.373E-01	-0.234E-01	*0.325E-01	-0.176E-01
5161.4 Å	5000.	0.216	-0.241E-01	*0.406E-01	-0.282E-01	*0.350E-01	-0.218E-01
C= 0.41E+17	10000.	0.244	-0.127E-01	0.443E-01	-0.331E-01	*0.376E-01	-0.259E-01
	20000.	0.267	-0.308E-02	0.489E-01	-0.382E-01	*0.406E-01	-0.301E-01
	30000.	0.275	0.245E-02	0.523E-01	-0.413E-01	*0.425E-01	-0.326E-01
	50000.	0.277	0.435E-02	0.575E-01	-0.454E-01	0.453E-01	-0.360E-01
7P - 7D	2500.	2.89	-0.571	*0.600	-0.363		
20458.8 Å	5000.	3.52	-0.348	*0.649	-0.439	*0.565	-0.339
C= 0.64E+18	10000.	3.99	-0.118	*0.705	-0.514	*0.604	-0.403
	20000.	4.37	0.526E-01	0.776	-0.593	*0.649	-0.467
	30000.	4.50	0.141	0.827	-0.641	*0.679	-0.507
	50000.	4.54	0.172	0.907	-0.705	0.720	-0.559
5D - 6P	2500.	0.187E-01	0.602E-02	0.854E-02	0.172E-02	0.851E-02	0.137E-02
15004.0 Å	5000.	0.198E-01	0.708E-02	0.857E-02	0.194E-02	0.853E-02	0.155E-02
C= 0.15E+20	10000.	0.222E-01	0.859E-02	0.860E-02	0.219E-02	0.854E-02	0.174E-02
	20000.	0.256E-01	0.982E-02	0.865E-02	0.246E-02	0.857E-02	0.196E-02
	30000.	0.279E-01	0.996E-02	0.869E-02	0.264E-02	0.859E-02	0.210E-02
	50000.	0.310E-01	0.953E-02	0.876E-02	0.287E-02	0.861E-02	0.229E-02
5D - 7P	2500.	0.122E-01	-0.576E-02	0.632E-02	-0.152E-02	0.626E-02	-0.120E-02
4727.8 Å	5000.	0.132E-01	-0.669E-02	0.636E-02	-0.174E-02	0.630E-02	-0.138E-02
C= 0.52E+18	10000.	0.144E-01	-0.738E-02	0.641E-02	-0.197E-02	0.633E-02	-0.157E-02
	20000.	0.155E-01	-0.731E-02	0.647E-02	-0.223E-02	0.637E-02	-0.178E-02
	30000.	0.162E-01	-0.690E-02	0.651E-02	-0.239E-02	0.639E-02	-0.191E-02
	50000.	0.169E-01	-0.606E-02	0.659E-02	-0.261E-02	0.643E-02	-0.208E-02
6D - 7P	2500.	1.40	-0.765	0.607	-0.205	0.595	-0.161
43285.2 Å	5000.	1.63	-0.891	0.616	-0.235	0.602	-0.186
C= 0.43E+20	10000.	1.88	-1.03	0.627	-0.268	0.609	-0.212
	20000.	2.10	-1.11	0.641	-0.303	0.617	-0.241
	30000.	2.22	-1.10	0.651	-0.326	0.623	-0.259
	50000.	2.34	-1.03	0.666	-0.356	0.632	-0.283
PERTURBER DENSITY= 1.E+16cm-3							
6S - 6P	2500.	0.231E-01	0.402E-02	0.115E-01	0.108E-02	0.114E-01	0.854E-03
5537.0 Å	5000.	0.228E-01	0.433E-02	0.115E-01	0.123E-02	0.115E-01	0.973E-03
C= 0.20E+20	10000.	0.246E-01	0.397E-02	0.115E-01	0.139E-02	0.115E-01	0.110E-02
	20000.	0.301E-01	0.204E-02	0.115E-01	0.157E-02	0.115E-01	0.125E-02
	30000.	0.353E-01	0.104E-02	0.115E-01	0.168E-02	0.115E-01	0.134E-02
	50000.	0.432E-01	0.300E-03	0.116E-01	0.183E-02	0.115E-01	0.146E-02
6S - 7P	2500.	0.516E-01	-0.240E-01	*0.259E-01	-0.586E-02	*0.249E-01	-0.448E-02
3072.5 Å	5000.	0.560E-01	-0.281E-01	*0.266E-01	-0.699E-02	*0.261E-01	-0.543E-02
C= 0.22E+19	10000.	0.607E-01	-0.313E-01	0.270E-01	-0.813E-02	*0.266E-01	-0.639E-02
	20000.	0.658E-01	-0.317E-01	0.273E-01	-0.933E-02	*0.268E-01	-0.737E-02
	30000.	0.688E-01	-0.305E-01	0.275E-01	-0.101E-01	0.270E-01	-0.797E-02
	50000.	0.725E-01	-0.276E-01	0.278E-01	-0.111E-01	0.271E-01	-0.877E-02
7S - 7P	2500.	3.74	-1.98	*1.51	-0.482		
23164.3 Å	5000.	4.30	-2.33	*1.57	-0.584	*1.51	-0.451
C= 0.12E+21	10000.	4.97	-2.72	1.61	-0.685	*1.55	-0.536
	20000.	5.60	-3.00	1.65	-0.790	*1.58	-0.623
	30000.	5.93	-3.01	1.68	-0.855	1.60	-0.676
	50000.	6.27	-2.86	1.73	-0.940	1.63	-0.745
6P - 7S	2500.	0.317	0.212	0.728E-01	0.536E-01	0.611E-01	0.411E-01
9833.0 Å	5000.	0.366	0.257	0.801E-01	0.637E-01	0.668E-01	0.496E-01
C= 0.42E+20	10000.	0.413	0.310	0.884E-01	0.739E-01	0.732E-01	0.581E-01
	20000.	0.449	0.312	0.979E-01	0.847E-01	0.805E-01	0.669E-01
	30000.	0.480	0.320	0.104	0.913E-01	0.852E-01	0.723E-01
	50000.	0.512	0.276	0.113	0.100	0.918E-01	0.795E-01

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
6P - 8S 5268.5 Å C= 0.20E+19	2500. 5000. 10000. 20000. 30000. 50000.	1.09 1.23 1.34 1.49 1.64 1.84	0.700 0.844 0.881 0.810 0.692 0.574				
				*0.283 *0.318 *0.340 *0.371	*0.219 *0.266 *0.294 *0.329	*0.295	*0.258
6P - 9S 4948.7 Å C= 0.12E+19	2500. 5000. 10000. 20000. 30000. 50000.	1.66 1.78 1.85 1.92 2.05 2.19	-0.974 -1.18 -1.18 -1.03 -0.872 -0.701				
				*0.530	-0.461		
7P - 8S 22252.3 Å C= 0.36E+20	2500. 5000. 10000. 20000. 30000. 50000.	20.6 23.6 26.4 29.8 32.5 36.0	12.6 15.3 16.4 15.5 13.8 11.6				
				*5.91 *6.31 *6.85	*4.83 *5.34 *5.97	*5.51	*4.68
7P - 9S 17480.9 Å C= 0.15E+20	2500. 5000. 10000. 20000. 30000. 50000.	20.9 22.3 23.8 25.0 27.0 29.0	-12.2 -14.5 -14.9 -11.8 -10.00 -8.18				
				*6.59	-5.70		
6P - 6D 8212.5 Å C= 0.16E+20	2500. 5000. 10000. 20000. 30000. 50000.	0.261 0.303 0.343 0.380 0.405 0.437	0.173 0.206 0.241 0.242 0.235 0.198	0.893E-01 0.935E-01 0.980E-01 0.103 0.107 0.112	0.423E-01 0.504E-01 0.586E-01 0.673E-01 0.726E-01 0.797E-01	*0.835E-01 *0.871E-01 0.903E-01 0.939E-01 0.964E-01 0.999E-01	*0.323E-01 *0.392E-01 0.460E-01 0.532E-01 0.575E-01 0.633E-01
6P - 7D 5161.4 Å C= 0.41E+18	2500. 5000. 10000. 20000. 30000. 50000.	1.76 2.15 2.43 2.67 2.74 2.77	-0.265 -0.161 -0.821E-01 -0.172E-01 0.245E-01 0.465E-01				
				*0.574	-0.430		
5D - 6P 15004.0 Å C= 0.15E+21	2500. 5000. 10000. 20000. 30000. 50000.	0.187 0.198 0.222 0.256 0.279 0.310	0.598E-01 0.704E-01 0.857E-01 0.981E-01 0.996E-01 0.953E-01	0.851E-01 0.855E-01 0.860E-01 0.865E-01 0.869E-01 0.876E-01	0.167E-01 0.190E-01 0.216E-01 0.245E-01 0.262E-01 0.286E-01	0.844E-01 0.850E-01 0.854E-01 0.857E-01 0.858E-01 0.861E-01	0.131E-01 0.151E-01 0.172E-01 0.194E-01 0.209E-01 0.228E-01
5D - 7P 4727.8 Å C= 0.52E+19	2500. 5000. 10000. 20000. 30000. 50000.	0.122 0.132 0.144 0.155 0.162 0.169	-0.560E-01 -0.658E-01 -0.731E-01 -0.728E-01 -0.688E-01 -0.605E-01	*0.613E-01 *0.630E-01 0.638E-01 0.646E-01 0.651E-01 0.658E-01	-0.137E-01 -0.163E-01 -0.190E-01 -0.217E-01 -0.235E-01 -0.258E-01	*0.590E-01 *0.617E-01 *0.629E-01 *0.635E-01 0.638E-01 0.642E-01	-0.105E-01 -0.127E-01 -0.149E-01 -0.172E-01 -0.186E-01 -0.204E-01
PERTURBER DENSITY= 1.E+17cm-3							
6S - 6P 5537.0 Å C= 0.20E+21	2500. 5000. 10000. 20000. 30000. 50000.	0.231 0.228 0.246 0.301 0.353 0.432	0.393E-01 0.426E-01 0.394E-01 0.202E-01 0.102E-01 0.293E-02	0.110 0.113 0.115 0.115 0.115 0.116	0.100E-01 0.117E-01 0.135E-01 0.154E-01 0.166E-01 0.182E-01	*0.105 *0.111 0.114 0.115 0.115 0.115	*0.777E-02 *0.919E-02 0.106E-01 0.122E-01 0.131E-01 0.144E-01
6S - 7P 3072.5 Å C= 0.22E+20	2500. 5000. 10000. 20000. 30000. 50000.	0.514 0.559 0.607 0.658 0.688 0.725	-0.219 -0.266 -0.302 -0.310 -0.300 -0.274				
				*0.270 *0.273 *0.278	-0.858E-01 -0.946E-01 -0.106		

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
6P - 7S 9833.0 Å C= 0.42E+21	2500.	3.17	1.94	*0.706	*0.357		
	5000.	3.66	2.46	*0.795	*0.510	*0.655	*0.369
	10000.	4.12	3.05	*0.882	*0.649	*0.728	*0.491
	20000.	4.49	3.09	0.979	0.783	*0.803	*0.606
	30000.	4.80	3.19	1.04	0.861	*0.851	*0.672
	50000.	5.12	2.75	1.13	0.962	*0.917	*0.755
6P - 8S 5268.5 Å C= 0.20E+20	2500.	*10.8	*4.78				
	5000.	*12.2	*6.87				
	10000.	*13.3	*7.71				
	20000.	*14.9	*7.45				
	30000.	*16.4	*6.59				
	50000.	18.4	5.55				
6P - 6D 8212.5 Å C= 0.16E+21	2500.	2.61	1.56				
	5000.	3.03	1.95	*0.898	*0.396		
	10000.	3.43	2.34	*0.967	*0.510		
	20000.	3.80	2.40	*1.03	*0.619	*0.930	*0.477
	30000.	4.05	2.34	*1.07	*0.682	*0.959	*0.531
	50000.	4.37	1.98	1.12	0.763	*0.996	*0.598
5D - 6P 15004.0 Å C= 0.15E+22	2500.	1.87	0.579	0.817	0.149	*0.778	*0.114
	5000.	1.98	0.691	0.844	0.178	*0.827	*0.138
	10000.	2.22	0.848	0.855	0.207	0.845	0.163
	20000.	2.56	0.976	0.863	0.238	0.854	0.188
	30000.	2.79	0.993	0.868	0.257	0.857	0.203
	50000.	3.10	0.951	0.876	0.282	0.860	0.224
5D - 7P 4727.8 Å C= 0.52E+20	2500.	1.21	-0.511				
	5000.	1.32	-0.624				
	10000.	1.44	-0.707				
	20000.	1.55	-0.714	*0.638	-0.200		
	30000.	1.62	-0.680	*0.646	-0.221		
	50000.	1.69	-0.601	*0.656	-0.247		
PERTURBER DENSITY= 1.E+18cm-3							
6S - 6P 5537.0 Å C= 0.20E+22	2500.	2.30	0.369	*0.701	*0.759E-01		
	5000.	2.28	0.411	*0.974	*0.100		
	10000.	2.46	0.382	*1.09	*0.123		
	20000.	3.01	0.193	*1.13	*0.145		
	30000.	3.53	0.965E-01	*1.14	*0.159	*1.13	*0.124
	50000.	4.32	0.258E-01	*1.15	*0.176	*1.14	*0.139
6S - 7P 3072.5 Å C= 0.22E+21	2500.	*4.84	-1.50				
	5000.	*5.51	-2.18				
	10000.	6.04	-2.68				
	20000.	6.57	-2.85				
	30000.	6.88	-2.80				
	50000.	7.25	-2.60				
5D - 7P 4727.8 Å C= 0.52E+21	2500.	*11.4	-3.53				
	5000.	*13.0	-5.12				
	10000.	14.3	-6.28				
	20000.	15.5	-6.67				
	30000.	16.1	-6.57				
	50000.	16.8	-5.83				

Table 2. This Table shows electron-, proton-, and He II- impact broadening parameters for Ba II, for perturber densities of $10^{15} - 10^{18} \text{ cm}^{-3}$ and temperatures from 5,000 up to 100,000 K. Transitions and averaged wavelengths for the multiplet (in Å) are also given. By dividing c by the corresponding full width at half maximum (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. Stark broadening parameters for densities lower than tabulated, are linear with perturber density.

PERTURBER DENSITY = 1.E+15cm-3							
PERTURBERS ARE:		ELECTRONS		PROTONS		IONIZED HELIUM	
TRANSITION	T(K)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 6S 6P 4675.3Å C= 0.35E+19	5000.	0.763E-02	-0.120E-01	*0.269E-03	-0.612E-04	0.350E-03	-0.578E-04
	10000.	0.567E-02	-0.899E-03	0.399E-03	-0.103E-03	0.474E-03	-0.894E-04
	20000.	0.431E-02	-0.687E-03	0.500E-03	-0.144E-03	0.539E-03	-0.123E-03
	30000.	0.383E-02	-0.601E-03	0.542E-03	-0.168E-03	0.577E-03	-0.137E-03
	50000.	0.347E-02	-0.536E-03	0.591E-03	-0.191E-03	0.619E-03	-0.157E-03
	100000.	0.319E-02	-0.428E-03	0.645E-03	-0.228E-03	0.649E-03	-0.187E-03
Ba II 6S 7P 2007.9Å C= 0.15E+18	5000.	0.325E-02	-0.415E-03	0.326E-03	-0.100E-03	0.362E-03	-0.872E-04
	10000.	0.259E-02	-0.318E-03	0.387E-03	-0.138E-03	0.412E-03	-0.112E-03
	20000.	0.226E-02	-0.334E-03	0.439E-03	-0.167E-03	0.457E-03	-0.135E-03
	30000.	0.218E-02	-0.282E-03	0.466E-03	-0.185E-03	0.471E-03	-0.151E-03
	50000.	0.215E-02	-0.254E-03	0.492E-03	-0.208E-03	0.483E-03	-0.168E-03
	100000.	0.214E-02	-0.227E-03	0.527E-03	-0.237E-03	0.514E-03	-0.190E-03
Ba II 6S 8P 1624.9Å C= 0.44E+17	5000.	0.473E-02	-0.152E-02	0.697E-03	-0.318E-03	0.732E-03	-0.257E-03
	10000.	0.413E-02	-0.114E-02	0.801E-03	-0.387E-03	0.816E-03	-0.316E-03
	20000.	0.387E-02	-0.933E-03	0.889E-03	-0.459E-03	0.870E-03	-0.373E-03
	30000.	0.386E-02	-0.801E-03	0.925E-03	-0.497E-03	0.902E-03	-0.405E-03
	50000.	0.396E-02	-0.691E-03	0.980E-03	-0.548E-03	0.911E-03	-0.436E-03
	100000.	0.403E-02	-0.534E-03	0.105E-02	-0.624E-03	0.988E-03	-0.515E-03
Ba II 6S 9P 1478.8Å C= 0.20E+17	5000.	0.829E-02	-0.355E-02	0.145E-02	-0.766E-03	*0.147E-02	-0.620E-03
	10000.	0.753E-02	-0.300E-02	0.165E-02	-0.939E-03	0.161E-02	-0.762E-03
	20000.	0.725E-02	-0.233E-02	0.179E-02	-0.108E-02	0.168E-02	-0.855E-03
	30000.	0.745E-02	-0.193E-02	0.191E-02	-0.118E-02	0.180E-02	-0.962E-03
	50000.	0.772E-02	-0.169E-02	0.201E-02	-0.128E-02	0.177E-02	-0.100E-02
	100000.	0.790E-02	-0.122E-02	0.227E-02	-0.149E-02	0.192E-02	-0.116E-02
Ba II 7S 7P 13424.7Å C= 0.67E+19	5000.	0.211	-0.780E-01	0.155E-01	-0.790E-02	0.167E-01	-0.676E-02
	10000.	0.160	-0.653E-01	0.188E-01	-0.102E-01	0.193E-01	-0.834E-02
	20000.	0.139	-0.532E-01	0.218E-01	-0.123E-01	0.217E-01	-0.100E-01
	30000.	0.133	-0.465E-01	0.234E-01	-0.136E-01	0.225E-01	-0.109E-01
	50000.	0.131	-0.395E-01	0.254E-01	-0.152E-01	0.237E-01	-0.122E-01
	100000.	0.132	-0.308E-01	0.270E-01	-0.172E-01	0.251E-01	-0.137E-01
Ba II 7S 8P 5212.1Å C= 0.46E+18	5000.	0.545E-01	-0.224E-01	0.729E-02	-0.356E-02	0.759E-02	-0.291E-02
	10000.	0.470E-01	-0.185E-01	0.840E-02	-0.436E-02	0.852E-02	-0.354E-02
	20000.	0.439E-01	-0.148E-01	0.946E-02	-0.521E-02	0.916E-02	-0.417E-02
	30000.	0.439E-01	-0.130E-01	0.100E-01	-0.563E-02	0.940E-02	-0.445E-02
	50000.	0.454E-01	-0.111E-01	0.105E-01	-0.623E-02	0.984E-02	-0.494E-02
	100000.	0.466E-01	-0.858E-02	0.113E-01	-0.707E-02	0.105E-01	-0.565E-02
Ba II 7S 9P 3957.3Å C= 0.14E+18	5000.	0.616E-01	-0.269E-01	0.104E-01	-0.558E-02	*0.105E-01	-0.450E-02
	10000.	0.557E-01	-0.224E-01	0.119E-01	-0.681E-02	0.115E-01	-0.555E-02
	20000.	0.539E-01	-0.187E-01	0.130E-01	-0.787E-02	0.122E-01	-0.629E-02
	30000.	0.555E-01	-0.163E-01	0.137E-01	-0.858E-02	0.129E-01	-0.702E-02
	50000.	0.578E-01	-0.139E-01	0.146E-01	-0.939E-02	0.130E-01	-0.751E-02
	100000.	0.595E-01	-0.103E-01	0.163E-01	-0.107E-01	0.139E-01	-0.847E-02
Ba II 8S 8P 28441.5Å C= 0.14E+20	5000.	2.21	-0.931	0.237	-0.144	0.238	-0.118
	10000.	1.88	-0.875	0.277	-0.177	0.270	-0.144
	20000.	1.75	-0.742	0.317	-0.208	0.296	-0.168
	30000.	1.75	-0.667	0.335	-0.225	0.306	-0.180
	50000.	1.80	-0.582	0.365	-0.247	0.316	-0.196
	100000.	1.85	-0.462	0.392	-0.286	0.326	-0.218

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 8S 9P 10417.2Å C= 0.10E+19	5000.	0.484	-0.242	0.744E-01	-0.422E-01	*0.746E-01	-0.343E-01
	10000.	0.435	-0.204	0.857E-01	-0.518E-01	0.813E-01	-0.413E-01
	20000.	0.427	-0.177	0.944E-01	-0.598E-01	0.867E-01	-0.481E-01
	30000.	0.440	-0.155	0.997E-01	-0.651E-01	0.898E-01	-0.505E-01
	50000.	0.458	-0.131	0.105	-0.707E-01	0.967E-01	-0.576E-01
	100000.	0.472	-0.991E-01	0.116	-0.801E-01	0.103	-0.649E-01
Ba II 9S 9P 51512.9Å C= 0.24E+20	5000.	15.3	-7.07	2.00	-1.31	*1.93	-1.06
	10000.	14.0	-7.04	2.35	-1.61	2.16	-1.28
	20000.	13.4	-5.95	2.63	-1.88	2.38	-1.50
	30000.	13.7	-5.29	2.71	-1.97	2.49	-1.61
	50000.	14.5	-4.73	3.03	-2.17	2.64	-1.71
	100000.	14.8	-3.64	3.21	-2.40	2.65	-1.90
Ba II 6P 7S 4769.5Å C= 0.17E+19	5000.	0.179E-01	0.670E-02	0.504E-03	0.614E-03	0.549E-03	0.537E-03
	10000.	0.125E-01	0.608E-02	0.840E-03	0.847E-03	0.779E-03	0.685E-03
	20000.	0.977E-02	0.491E-02	0.110E-02	0.102E-02	0.981E-03	0.830E-03
	30000.	0.892E-02	0.460E-02	0.124E-02	0.112E-02	0.109E-02	0.913E-03
	50000.	0.835E-02	0.392E-02	0.145E-02	0.126E-02	0.125E-02	0.101E-02
	100000.	0.795E-02	0.303E-02	0.171E-02	0.148E-02	0.146E-02	0.119E-02
Ba II 6P 8S 2729.5Å C= 0.26E+18	5000.	0.110E-01	0.547E-02	0.639E-03	0.756E-03	0.578E-03	0.610E-03
	10000.	0.823E-02	0.526E-02	0.891E-03	0.923E-03	0.756E-03	0.751E-03
	20000.	0.719E-02	0.447E-02	0.112E-02	0.110E-02	0.935E-03	0.896E-03
	30000.	0.697E-02	0.399E-02	0.129E-02	0.120E-02	0.105E-02	0.965E-03
	50000.	0.667E-02	0.356E-02	0.145E-02	0.134E-02	0.118E-02	0.108E-02
	100000.	0.679E-02	0.285E-02	0.175E-02	0.151E-02	0.138E-02	0.116E-02
Ba II 6P 9S 2257.6Å C= 0.99E+17	5000.	0.144E-01	0.801E-02	0.127E-02	0.132E-02	0.107E-02	0.107E-02
	10000.	0.122E-01	0.740E-02	0.163E-02	0.162E-02	0.135E-02	0.131E-02
	20000.	0.105E-01	0.674E-02	0.199E-02	0.187E-02	0.169E-02	0.151E-02
	30000.	0.103E-01	0.603E-02	0.227E-02	0.206E-02	0.188E-02	0.164E-02
	50000.	0.108E-01	0.521E-02	0.253E-02	0.219E-02	0.200E-02	0.180E-02
	100000.	0.108E-01	0.425E-02	0.286E-02	0.245E-02	0.241E-02	0.199E-02
Ba II 7P 8S 12163.9Å C= 0.52E+19	5000.	0.273	0.116	0.188E-01	0.166E-01	0.179E-01	0.134E-01
	10000.	0.216	0.115	0.236E-01	0.202E-01	0.216E-01	0.164E-01
	20000.	0.193	0.975E-01	0.287E-01	0.241E-01	0.257E-01	0.193E-01
	30000.	0.189	0.871E-01	0.320E-01	0.262E-01	0.274E-01	0.209E-01
	50000.	0.187	0.780E-01	0.362E-01	0.288E-01	0.304E-01	0.229E-01
	100000.	0.192	0.623E-01	0.400E-01	0.324E-01	0.327E-01	0.265E-01
Ba II 7P 9S 6297.5Å C= 0.77E+18	5000.	0.125	0.640E-01	0.107E-01	0.105E-01	0.930E-02	0.857E-02
	10000.	0.107	0.590E-01	0.137E-01	0.129E-01	0.115E-01	0.105E-01
	20000.	0.946E-01	0.550E-01	0.163E-01	0.151E-01	0.139E-01	0.119E-01
	30000.	0.937E-01	0.489E-01	0.188E-01	0.162E-01	0.156E-01	0.129E-01
	50000.	0.978E-01	0.422E-01	0.202E-01	0.176E-01	0.164E-01	0.145E-01
	100000.	0.993E-01	0.347E-01	0.231E-01	0.197E-01	0.194E-01	0.161E-01
Ba II 8P 9S 24141.5Å C= 0.98E+19	5000.	2.35	1.08	0.230	0.184	0.213	0.149
	10000.	2.06	0.996	0.281	0.226	0.251	0.181
	20000.	1.91	0.946	0.325	0.261	0.286	0.213
	30000.	1.91	0.845	0.348	0.283	0.292	0.224
	50000.	1.99	0.722	0.385	0.316	0.333	0.247
	100000.	2.05	0.598	0.407	0.367	0.350	0.279
Ba II 6P 6D 4051.2Å C= 0.38E+18	5000.	0.143E-01	0.756E-02	0.951E-03	0.832E-03	0.103E-02	0.710E-03
	10000.	0.115E-01	0.596E-02	0.130E-02	0.106E-02	0.125E-02	0.867E-03
	20000.	0.984E-02	0.478E-02	0.159E-02	0.127E-02	0.147E-02	0.104E-02
	30000.	0.936E-02	0.421E-02	0.177E-02	0.141E-02	0.163E-02	0.115E-02
	50000.	0.896E-02	0.358E-02	0.195E-02	0.157E-02	0.174E-02	0.124E-02
	100000.	0.859E-02	0.282E-02	0.230E-02	0.176E-02	0.188E-02	0.140E-02
Ba II 6P 7D 2599.5Å C= 0.11E+18	5000.	0.103E-01	0.473E-02	0.113E-02	0.604E-03	0.118E-02	0.490E-03
	10000.	0.880E-02	0.381E-02	0.132E-02	0.736E-03	0.134E-02	0.603E-03
	20000.	0.832E-02	0.311E-02	0.153E-02	0.883E-03	0.147E-02	0.715E-03
	30000.	0.828E-02	0.273E-02	0.160E-02	0.956E-03	0.152E-02	0.773E-03
	50000.	0.836E-02	0.232E-02	0.171E-02	0.106E-02	0.160E-02	0.861E-03
	100000.	0.846E-02	0.179E-02	0.184E-02	0.120E-02	0.173E-02	0.977E-03

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 6P 8D 2206.7Å C= 0.45E+17	5000.	0.152E-01	0.845E-02	0.228E-02	0.140E-02	0.227E-02	0.114E-02
	10000.	0.135E-01	0.707E-02	0.264E-02	0.172E-02	0.253E-02	0.139E-02
	20000.	0.130E-01	0.612E-02	0.302E-02	0.200E-02	0.269E-02	0.159E-02
	30000.	0.133E-01	0.540E-02	0.313E-02	0.214E-02	0.285E-02	0.171E-02
	50000.	0.137E-01	0.451E-02	0.331E-02	0.233E-02	0.303E-02	0.190E-02
	100000.	0.140E-01	0.349E-02	0.348E-02	0.260E-02	0.323E-02	0.211E-02
Ba II 6P 9D 2030.4Å C= 0.23E+17	5000.	0.246E-01	0.143E-01	0.434E-02	0.273E-02	*0.416E-02	*0.220E-02
	10000.	0.225E-01	0.124E-01	0.494E-02	0.333E-02	*0.455E-02	*0.266E-02
	20000.	0.225E-01	0.104E-01	0.547E-02	0.382E-02	0.491E-02	0.309E-02
	30000.	0.233E-01	0.937E-02	0.579E-02	0.408E-02	0.516E-02	0.330E-02
	50000.	0.241E-01	0.790E-02	0.641E-02	0.462E-02	0.554E-02	0.381E-02
	100000.	0.246E-01	0.596E-02	0.710E-02	0.516E-02	0.625E-02	0.421E-02
Ba II 7P 7D 9947.3Å C= 0.17E+19	5000.	0.188	0.700E-01	0.199E-01	0.995E-02	0.208E-01	0.804E-02
	10000.	0.161	0.612E-01	0.232E-01	0.121E-01	0.236E-01	0.989E-02
	20000.	0.152	0.531E-01	0.263E-01	0.144E-01	0.258E-01	0.117E-01
	30000.	0.152	0.459E-01	0.276E-01	0.158E-01	0.266E-01	0.127E-01
	50000.	0.154	0.390E-01	0.297E-01	0.177E-01	0.282E-01	0.142E-01
	100000.	0.157	0.302E-01	0.323E-01	0.200E-01	0.276E-01	0.154E-01
Ba II 7P 8D 5916.9Å C= 0.32E+18	5000.	0.121	0.601E-01	0.171E-01	0.103E-01	0.172E-01	0.837E-02
	10000.	0.108	0.534E-01	0.199E-01	0.127E-01	0.191E-01	0.103E-01
	20000.	0.104	0.449E-01	0.223E-01	0.147E-01	0.204E-01	0.117E-01
	30000.	0.106	0.411E-01	0.234E-01	0.158E-01	0.209E-01	0.126E-01
	50000.	0.109	0.343E-01	0.247E-01	0.174E-01	0.233E-01	0.142E-01
	100000.	0.112	0.265E-01	0.256E-01	0.193E-01	0.238E-01	0.154E-01
Ba II 7P 9D 4799.6Å C= 0.13E+18	5000.	0.144	0.819E-01	0.246E-01	0.154E-01	*0.236E-01	*0.124E-01
	10000.	0.133	0.709E-01	0.280E-01	0.187E-01	*0.259E-01	*0.150E-01
	20000.	0.132	0.594E-01	0.310E-01	0.215E-01	*0.282E-01	*0.174E-01
	30000.	0.137	0.540E-01	0.328E-01	0.230E-01	0.291E-01	0.184E-01
	50000.	0.142	0.453E-01	0.364E-01	0.260E-01	0.315E-01	0.214E-01
	100000.	0.145	0.342E-01	0.404E-01	0.290E-01	0.355E-01	0.236E-01
Ba II 8P 8D 19366.3Å C= 0.35E+19	5000.	1.63	0.734	0.223	0.129	0.223	0.104
	10000.	1.48	0.677	0.258	0.157	0.248	0.128
	20000.	1.43	0.571	0.287	0.184	0.261	0.146
	30000.	1.45	0.525	0.298	0.198	0.280	0.161
	50000.	1.51	0.440	0.320	0.215	0.271	0.166
	100000.	1.54	0.341	0.373	0.256	0.299	0.193
Ba II 8P 9D 10991.3Å C= 0.68E+18	5000.	0.856	0.425	0.138	0.847E-01	*0.134	*0.682E-01
	10000.	0.797	0.405	0.155	0.103	*0.146	*0.836E-01
	20000.	0.792	0.337	0.175	0.120	*0.160	*0.975E-01
	30000.	0.815	0.299	0.178	0.126	0.164	0.103
	50000.	0.850	0.261	0.200	0.141	0.181	0.117
	100000.	0.868	0.198	0.223	0.157	0.189	0.125
Ba II 9P 9D 33171.8Å C= 0.62E+19	5000.	9.71	4.53	*1.54	*0.922	*1.46	*0.734
	10000.	9.18	4.41	1.70	1.10	*1.61	*0.903
	20000.	9.12	3.70	1.94	1.29	*1.69	*1.01
	30000.	9.42	3.28	1.97	1.36	*1.68	*1.06
	50000.	9.86	2.89	2.15	1.46	1.94	1.22
	100000.	10.1	2.18	2.17	1.68	2.07	1.31
Ba II 5D 6P 6236.6Å C= 0.62E+19	5000.	0.119E-01	-0.138E-03	0.525E-03	-0.932E-05	0.677E-03	-0.929E-05
	10000.	0.894E-02	-0.456E-04	0.766E-03	-0.184E-04	0.903E-03	-0.178E-04
	20000.	0.685E-02	0.299E-04	0.941E-03	-0.325E-04	0.102E-02	-0.300E-04
	30000.	0.601E-02	-0.252E-04	0.101E-02	-0.425E-04	0.109E-02	-0.365E-04
	50000.	0.529E-02	0.699E-05	0.110E-02	-0.544E-04	0.117E-02	-0.467E-04
	100000.	0.471E-02	0.490E-06	0.118E-02	-0.691E-04	0.121E-02	-0.568E-04
Ba II 5D 7P 2249.7Å C= 0.19E+18	5000.	0.395E-02	-0.463E-03	0.414E-03	-0.118E-03	0.460E-03	-0.103E-03
	10000.	0.317E-02	-0.295E-03	0.490E-03	-0.165E-03	0.523E-03	-0.134E-03
	20000.	0.277E-02	-0.316E-03	0.554E-03	-0.198E-03	0.579E-03	-0.162E-03
	30000.	0.266E-02	-0.237E-03	0.591E-03	-0.219E-03	0.596E-03	-0.179E-03
	50000.	0.260E-02	-0.211E-03	0.619E-03	-0.249E-03	0.612E-03	-0.200E-03
	100000.	0.258E-02	-0.190E-03	0.648E-03	-0.283E-03	0.642E-03	-0.230E-03

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 5D 8P 1779.8Å C= 0.53E+17	5000.	0.557E-02	-0.178E-02	0.839E-03	-0.379E-03	0.880E-03	-0.307E-03
	10000.	0.488E-02	-0.132E-02	0.963E-03	-0.461E-03	0.982E-03	-0.378E-03
	20000.	0.459E-02	-0.104E-02	0.107E-02	-0.548E-03	0.104E-02	-0.444E-03
	30000.	0.458E-02	-0.913E-03	0.111E-02	-0.593E-03	0.109E-02	-0.481E-03
	50000.	0.468E-02	-0.745E-03	0.118E-02	-0.654E-03	0.109E-02	-0.522E-03
	100000.	0.477E-02	-0.578E-03	0.126E-02	-0.744E-03	0.118E-02	-0.616E-03
Ba II 5D 9P 1605.9Å C= 0.24E+17	5000.	0.969E-02	-0.419E-02	0.171E-02	-0.902E-03	*0.174E-02	-0.730E-03
	10000.	0.882E-02	-0.353E-02	0.195E-02	-0.111E-02	0.190E-02	-0.898E-03
	20000.	0.851E-02	-0.270E-02	0.212E-02	-0.128E-02	0.198E-02	-0.101E-02
	30000.	0.874E-02	-0.227E-02	0.226E-02	-0.139E-02	0.212E-02	-0.113E-02
	50000.	0.905E-02	-0.194E-02	0.236E-02	-0.151E-02	0.209E-02	-0.118E-02
	100000.	0.926E-02	-0.140E-02	0.268E-02	-0.176E-02	0.226E-02	-0.136E-02
Ba II 6D 7P 26799.4Å C= 0.17E+20	5000.	0.953	-0.398	0.803E-01	-0.467E-01	0.837E-01	-0.390E-01
	10000.	0.758	-0.312	0.958E-01	-0.584E-01	0.968E-01	-0.475E-01
	20000.	0.680	-0.257	0.112	-0.696E-01	0.109	-0.566E-01
	30000.	0.655	-0.225	0.121	-0.769E-01	0.115	-0.622E-01
	50000.	0.642	-0.189	0.130	-0.852E-01	0.122	-0.689E-01
	100000.	0.638	-0.150	0.143	-0.984E-01	0.130	-0.778E-01
Ba II 6D 8P 6464.8Å C= 0.70E+18	5000.	0.943E-01	-0.390E-01	0.120E-01	-0.602E-02	0.124E-01	-0.493E-02
	10000.	0.818E-01	-0.320E-01	0.138E-01	-0.740E-02	0.138E-01	-0.602E-02
	20000.	0.761E-01	-0.257E-01	0.156E-01	-0.878E-02	0.148E-01	-0.708E-02
	30000.	0.754E-01	-0.224E-01	0.162E-01	-0.948E-02	0.155E-01	-0.755E-02
	50000.	0.770E-01	-0.190E-01	0.174E-01	-0.106E-01	0.164E-01	-0.864E-02
	100000.	0.781E-01	-0.149E-01	0.192E-01	-0.120E-01	0.171E-01	-0.931E-02
Ba II 6D 9P 4640.0Å C= 0.20E+18	5000.	0.890E-01	-0.393E-01	0.147E-01	-0.785E-02	*0.148E-01	-0.636E-02
	10000.	0.808E-01	-0.329E-01	0.167E-01	-0.963E-02	0.160E-01	-0.779E-02
	20000.	0.784E-01	-0.272E-01	0.183E-01	-0.111E-01	0.171E-01	-0.884E-02
	30000.	0.804E-01	-0.237E-01	0.191E-01	-0.120E-01	0.180E-01	-0.973E-02
	50000.	0.832E-01	-0.204E-01	0.205E-01	-0.131E-01	0.184E-01	-0.107E-01
	100000.	0.850E-01	-0.150E-01	0.226E-01	-0.149E-01	0.197E-01	-0.119E-01
Ba II 7D 8P 59380.3Å C= 0.59E+20	5000.	9.83	-3.97	1.23	-0.596	1.27	-0.486
	10000.	8.69	-3.26	1.41	-0.732	1.41	-0.596
	20000.	8.36	-2.82	1.58	-0.875	1.51	-0.706
	30000.	8.42	-2.45	1.64	-0.947	1.53	-0.746
	50000.	8.71	-2.06	1.77	-1.05	1.59	-0.820
	100000.	8.92	-1.60	1.81	-1.17	1.60	-0.901
Ba II 7D 9P 12874.1Å C= 0.15E+19	5000.	0.756	-0.333	0.120	-0.634E-01	*0.122	-0.513E-01
	10000.	0.696	-0.282	0.138	-0.782E-01	0.131	-0.622E-01
	20000.	0.688	-0.238	0.148	-0.901E-01	0.140	-0.717E-01
	30000.	0.708	-0.207	0.155	-0.966E-01	0.144	-0.765E-01
	50000.	0.739	-0.178	0.163	-0.104	0.153	-0.867E-01
	100000.	0.759	-0.132	0.181	-0.120	0.161	-0.963E-01
Ba II 5D 5F 1916.7Å C= 0.86E+17	5000.	0.363E-02	0.204E-02	0.345E-03	0.231E-03	0.358E-03	0.194E-03
	10000.	0.286E-02	0.163E-02	0.424E-03	0.289E-03	0.421E-03	0.236E-03
	20000.	0.257E-02	0.132E-02	0.506E-03	0.347E-03	0.481E-03	0.282E-03
	30000.	0.247E-02	0.116E-02	0.553E-03	0.384E-03	0.504E-03	0.307E-03
	50000.	0.241E-02	0.966E-03	0.595E-03	0.421E-03	0.550E-03	0.344E-03
	100000.	0.238E-02	0.756E-03	0.655E-03	0.485E-03	0.584E-03	0.382E-03
Ba II 5D 6F 1686.4Å C= 0.46E+17	5000.	0.480E-02	0.168E-02	0.643E-03	0.197E-03	0.692E-03	0.163E-03
	10000.	0.408E-02	0.135E-02	0.733E-03	0.244E-03	0.770E-03	0.199E-03
	20000.	0.393E-02	0.117E-02	0.811E-03	0.292E-03	0.815E-03	0.240E-03
	30000.	0.397E-02	0.104E-02	0.830E-03	0.321E-03	0.835E-03	0.259E-03
	50000.	0.411E-02	0.859E-03	0.865E-03	0.357E-03	0.851E-03	0.280E-03
	100000.	0.430E-02	0.688E-03	0.914E-03	0.415E-03	0.872E-03	0.318E-03
Ba II 5D 7F 1565.3Å C= 0.20E+17	5000.	0.742E-02	0.420E-03	0.129E-02	-0.322E-03	0.138E-02	-0.263E-03
	10000.	0.719E-02	0.402E-03	0.144E-02	-0.394E-03	0.147E-02	-0.320E-03
	20000.	0.748E-02	0.394E-03	0.152E-02	-0.471E-03	0.153E-02	-0.377E-03
	30000.	0.781E-02	0.376E-03	0.155E-02	-0.509E-03	0.156E-02	-0.402E-03
	50000.	0.833E-02	0.340E-03	0.160E-02	-0.564E-03	0.158E-02	-0.446E-03
	100000.	0.876E-02	0.303E-03	0.169E-02	-0.637E-03	0.157E-02	-0.510E-03

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 5D 8F 1496.9Å C= 0.11E+17	5000.	0.129E-01	-0.263E-02	0.261E-02	-0.121E-02	*0.261E-02	-0.979E-03
	10000.	0.131E-01	-0.168E-02	0.289E-02	-0.149E-02	*0.280E-02	-0.118E-02
	20000.	0.142E-01	-0.133E-02	0.310E-02	-0.170E-02	*0.292E-02	-0.135E-02
	30000.	0.150E-01	-0.117E-02	0.323E-02	-0.187E-02	0.299E-02	-0.147E-02
	50000.	0.161E-01	-0.771E-03	0.323E-02	-0.196E-02	0.298E-02	-0.156E-02
	100000.	0.168E-01	-0.551E-03	0.354E-02	-0.223E-02	0.316E-02	-0.183E-02
Ba II 5D 9F 1454.6Å C= 0.65E+16	5000.	0.227E-01	-0.787E-02	*0.486E-02	-0.275E-02		
	10000.	0.231E-01	-0.570E-02	*0.547E-02	-0.336E-02	*0.500E-02	-0.268E-02
	20000.	0.255E-01	-0.450E-02	*0.587E-02	-0.382E-02	*0.535E-02	-0.310E-02
	30000.	0.271E-01	-0.382E-02	0.587E-02	-0.398E-02	*0.532E-02	-0.318E-02
	50000.	0.289E-01	-0.288E-02	0.664E-02	-0.450E-02	*0.596E-02	-0.367E-02
	100000.	0.298E-01	-0.211E-02	0.747E-02	-0.491E-02	0.546E-02	-0.396E-02
Ba II 6D 6F 5381.8Å C= 0.47E+18	5000.	0.500E-01	0.623E-02	0.679E-02	0.830E-03	0.735E-02	0.725E-03
	10000.	0.455E-01	0.362E-02	0.766E-02	0.114E-02	0.815E-02	0.923E-03
	20000.	0.462E-01	0.330E-02	0.834E-02	0.136E-02	0.857E-02	0.111E-02
	30000.	0.480E-01	0.286E-02	0.857E-02	0.152E-02	0.867E-02	0.123E-02
	50000.	0.508E-01	0.215E-02	0.882E-02	0.171E-02	0.881E-02	0.136E-02
	100000.	0.536E-01	0.195E-02	0.902E-02	0.195E-02	0.895E-02	0.155E-02
Ba II 6D 7F 4316.5Å C= 0.15E+18	5000.	0.593E-01	-0.273E-02	0.101E-01	-0.288E-02	0.107E-01	-0.236E-02
	10000.	0.581E-01	-0.194E-02	0.112E-01	-0.354E-02	0.115E-01	-0.290E-02
	20000.	0.614E-01	-0.185E-02	0.120E-01	-0.419E-02	0.118E-01	-0.333E-02
	30000.	0.646E-01	-0.213E-02	0.122E-01	-0.455E-02	0.120E-01	-0.371E-02
	50000.	0.692E-01	-0.147E-02	0.129E-01	-0.499E-02	0.122E-01	-0.399E-02
	100000.	0.729E-01	-0.905E-03	0.128E-01	-0.560E-02	0.122E-01	-0.440E-02
Ba II 6D 8F 3833.5Å C= 0.70E+17	5000.	0.879E-01	-0.186E-01	0.172E-01	-0.816E-02	*0.173E-01	-0.654E-02
	10000.	0.891E-01	-0.149E-01	0.192E-01	-0.100E-01	*0.186E-01	-0.802E-02
	20000.	0.970E-01	-0.118E-01	0.202E-01	-0.113E-01	*0.192E-01	-0.907E-02
	30000.	0.103	-0.104E-01	0.219E-01	-0.126E-01	0.197E-01	-0.973E-02
	50000.	0.110	-0.807E-02	0.212E-01	-0.130E-01	0.196E-01	-0.105E-01
	100000.	0.115	-0.609E-02	0.237E-01	-0.151E-01	0.213E-01	-0.124E-01
Ba II 6D 9F 3567.8Å C= 0.39E+17	5000.	0.140	-0.481E-01	*0.293E-01	-0.166E-01		
	10000.	0.142	-0.357E-01	*0.331E-01	-0.204E-01	*0.303E-01	-0.162E-01
	20000.	0.157	-0.306E-01	*0.354E-01	-0.232E-01	*0.321E-01	-0.187E-01
	30000.	0.167	-0.256E-01	0.351E-01	-0.240E-01	*0.325E-01	-0.194E-01
	50000.	0.178	-0.196E-01	0.404E-01	-0.274E-01	*0.359E-01	-0.222E-01
	100000.	0.184	-0.149E-01	0.457E-01	-0.298E-01	0.329E-01	-0.241E-01
Ba II 7D 7F 10658.2Å C= 0.92E+18	5000.	0.394	-0.386E-01	0.667E-01	-0.204E-01	*0.706E-01	-0.166E-01
	10000.	0.394	-0.284E-01	0.743E-01	-0.250E-01	0.753E-01	-0.203E-01
	20000.	0.424	-0.278E-01	0.785E-01	-0.294E-01	0.784E-01	-0.238E-01
	30000.	0.450	-0.265E-01	0.814E-01	-0.320E-01	0.797E-01	-0.254E-01
	50000.	0.486	-0.220E-01	0.824E-01	-0.350E-01	0.818E-01	-0.278E-01
	100000.	0.515	-0.155E-01	0.891E-01	-0.404E-01	0.853E-01	-0.311E-01
Ba II 7D 8F 8129.2Å C= 0.31E+18	5000.	0.415	-0.955E-01	*0.799E-01	-0.374E-01	*0.801E-01	-0.302E-01
	10000.	0.423	-0.778E-01	0.887E-01	-0.462E-01	*0.854E-01	-0.372E-01
	20000.	0.465	-0.617E-01	0.934E-01	-0.521E-01	*0.877E-01	-0.415E-01
	30000.	0.495	-0.555E-01	0.101	-0.584E-01	0.918E-01	-0.448E-01
	50000.	0.531	-0.436E-01	0.101	-0.622E-01	0.898E-01	-0.477E-01
	100000.	0.558	-0.332E-01	0.110	-0.702E-01	0.102	-0.581E-01
Ba II 7D 9F 7020.4Å C= 0.15E+18	5000.	0.555	-0.193	*0.115	-0.647E-01		
	10000.	0.569	-0.147	*0.129	-0.797E-01	*0.118	-0.634E-01
	20000.	0.630	-0.125	*0.138	-0.897E-01	*0.125	-0.724E-01
	30000.	0.671	-0.105	0.137	-0.940E-01	*0.126	-0.757E-01
	50000.	0.715	-0.808E-01	0.161	-0.108	*0.140	-0.858E-01
	100000.	0.742	-0.618E-01	0.177	-0.115	0.127	-0.935E-01
Ba II 8D 8F 18336.3Å C= 0.16E+19	5000.	2.49	-0.934	*0.455	-0.229	*0.449	-0.184
	10000.	2.51	-0.738	0.502	-0.280	*0.483	-0.224
	20000.	2.76	-0.599	0.540	-0.320	*0.518	-0.261
	30000.	2.94	-0.527	0.558	-0.341	*0.526	-0.274
	50000.	3.16	-0.427	0.617	-0.383	0.568	-0.317
	100000.	3.32	-0.323	0.669	-0.426	0.591	-0.347

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 8D 9F 13520.0Å C= 0.56E+18	5000.	2.24	-0.897	*0.451	-0.256		
	10000.	2.29	-0.722	*0.490	-0.305		
	20000.	2.55	-0.592	*0.523	-0.349	*0.495	-0.285
	30000.	2.71	-0.510	*0.555	-0.386	*0.476	-0.296
	50000.	2.89	-0.408	0.622	-0.415	*0.543	-0.332
	100000.	3.01	-0.313	0.678	-0.450	*0.522	-0.395
Ba II 9D 9F 28885.4Å C= 0.25E+19	5000.	12.3	-5.41	*2.31	-1.35		
	10000.	12.6	-4.74	*2.56	-1.66		
	20000.	13.8	-3.86	*2.83	-1.88	*2.39	-1.45
	30000.	14.6	-3.32	*3.00	-2.04	*2.69	-1.68
	50000.	15.5	-2.71	3.02	-2.14	*2.52	-1.68
	100000.	16.1	-2.04	3.35	-2.39	*3.09	-2.14
Ba II 4F 5D 2323.8Å C= 0.12E+18	5000.	0.353E-02	0.145E-03	0.151E-03	0.120E-03	0.180E-03	0.104E-03
	10000.	0.273E-02	0.174E-03	0.225E-03	0.167E-03	0.226E-03	0.137E-03
	20000.	0.219E-02	0.163E-03	0.276E-03	0.201E-03	0.266E-03	0.164E-03
	30000.	0.199E-02	0.145E-03	0.306E-03	0.223E-03	0.291E-03	0.182E-03
	50000.	0.178E-02	0.116E-03	0.347E-03	0.254E-03	0.315E-03	0.204E-03
	100000.	0.156E-02	0.103E-03	0.398E-03	0.287E-03	0.345E-03	0.232E-03
Ba II 4F 6D 43210.4Å C= 0.43E+20	5000.	2.12	0.935	0.135	0.120	0.139	0.100
	10000.	1.71	0.741	0.180	0.150	0.169	0.122
	20000.	1.49	0.596	0.221	0.180	0.200	0.146
	30000.	1.41	0.523	0.247	0.198	0.214	0.158
	50000.	1.34	0.442	0.271	0.218	0.242	0.177
	100000.	1.27	0.350	0.308	0.252	0.268	0.200
Ba II 4F 7D 8718.3Å C= 0.13E+19	5000.	0.138	0.552E-01	0.132E-01	0.759E-02	0.137E-01	0.613E-02
	10000.	0.117	0.466E-01	0.156E-01	0.925E-02	0.158E-01	0.755E-02
	20000.	0.109	0.382E-01	0.180E-01	0.110E-01	0.174E-01	0.893E-02
	30000.	0.107	0.330E-01	0.191E-01	0.120E-01	0.181E-01	0.966E-02
	50000.	0.107	0.278E-01	0.208E-01	0.135E-01	0.193E-01	0.108E-01
	100000.	0.107	0.216E-01	0.231E-01	0.152E-01	0.195E-01	0.118E-01
Ba II 4F 8D 5459.2Å C= 0.27E+18	5000.	0.102	0.533E-01	0.141E-01	0.876E-02	0.140E-01	0.712E-02
	10000.	0.901E-01	0.446E-01	0.165E-01	0.108E-01	0.157E-01	0.871E-02
	20000.	0.862E-01	0.387E-01	0.186E-01	0.125E-01	0.168E-01	0.998E-02
	30000.	0.872E-01	0.341E-01	0.196E-01	0.134E-01	0.173E-01	0.107E-01
	50000.	0.891E-01	0.284E-01	0.206E-01	0.148E-01	0.193E-01	0.120E-01
	100000.	0.901E-01	0.219E-01	0.216E-01	0.164E-01	0.198E-01	0.132E-01
Ba II 4F 9D 4493.9Å C= 0.11E+18	5000.	0.126	0.713E-01	0.213E-01	0.135E-01	*0.204E-01	*0.109E-01
	10000.	0.115	0.617E-01	0.243E-01	0.164E-01	*0.225E-01	*0.131E-01
	20000.	0.115	0.515E-01	0.270E-01	0.189E-01	*0.244E-01	*0.153E-01
	30000.	0.118	0.467E-01	0.285E-01	0.202E-01	0.253E-01	0.162E-01
	50000.	0.122	0.392E-01	0.316E-01	0.227E-01	0.273E-01	0.187E-01
	100000.	0.124	0.296E-01	0.352E-01	0.254E-01	0.309E-01	0.207E-01
Ba II 5F 6D 8729.2Å C= 0.18E+19	5000.	0.760E-01	-0.856E-02	0.749E-02	-0.157E-02	0.819E-02	-0.135E-02
	10000.	0.699E-01	-0.463E-02	0.867E-02	-0.218E-02	0.927E-02	-0.180E-02
	20000.	0.701E-01	-0.467E-02	0.974E-02	-0.264E-02	0.102E-01	-0.217E-02
	30000.	0.718E-01	-0.375E-02	0.103E-01	-0.294E-02	0.104E-01	-0.240E-02
	50000.	0.742E-01	-0.273E-02	0.107E-01	-0.333E-02	0.107E-01	-0.269E-02
	100000.	0.759E-01	-0.240E-02	0.111E-01	-0.386E-02	0.111E-01	-0.308E-02
Ba II 5F 7D 42943.7Å C= 0.31E+20	5000.	2.59	0.203	0.342	0.771E-01	0.370	0.662E-01
	10000.	2.54	0.173	0.389	0.996E-01	0.414	0.821E-01
	20000.	2.66	0.157	0.429	0.120	0.440	0.978E-01
	30000.	2.79	0.138	0.443	0.134	0.447	0.108
	50000.	2.96	0.131	0.457	0.150	0.454	0.119
	100000.	3.10	0.101	0.489	0.169	0.466	0.137
Ba II 5F 8D 10897.7Å C= 0.11E+19	5000.	0.350	0.172	0.560E-01	0.314E-01	0.566E-01	0.256E-01
	10000.	0.331	0.136	0.646E-01	0.384E-01	0.629E-01	0.313E-01
	20000.	0.338	0.109	0.718E-01	0.449E-01	0.667E-01	0.356E-01
	30000.	0.353	0.948E-01	0.770E-01	0.485E-01	0.697E-01	0.388E-01
	50000.	0.373	0.781E-01	0.800E-01	0.524E-01	0.742E-01	0.430E-01
	100000.	0.389	0.602E-01	0.867E-01	0.585E-01	0.801E-01	0.481E-01

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 5F 9D 7627.3Å C= 0.33E+18	5000.	0.342	0.187	0.613E-01	0.377E-01	*0.592E-01	*0.304E-01
	10000.	0.321	0.159	0.701E-01	0.462E-01	*0.646E-01	*0.368E-01
	20000.	0.330	0.134	0.778E-01	0.532E-01	0.692E-01	0.422E-01
	30000.	0.343	0.116	0.812E-01	0.564E-01	0.734E-01	0.461E-01
	50000.	0.360	0.965E-01	0.890E-01	0.636E-01	0.758E-01	0.518E-01
	100000.	0.371	0.723E-01	0.994E-01	0.708E-01	0.863E-01	0.583E-01
Ba II 6F 7D 20847.3Å C= 0.71E+19	5000.	0.876	0.124E-01	0.129	0.148E-01	0.138	0.128E-01
	10000.	0.847	0.168E-01	0.144	0.198E-01	0.152	0.162E-01
	20000.	0.896	0.178E-01	0.155	0.239E-01	0.159	0.194E-01
	30000.	0.947	0.136E-01	0.159	0.265E-01	0.162	0.213E-01
	50000.	1.02	0.144E-01	0.163	0.293E-01	0.164	0.236E-01
	100000.	1.09	0.919E-02	0.167	0.338E-01	0.166	0.267E-01
Ba II 6F 8D 48759.6Å C= 0.22E+20	5000.	7.96	3.18	1.27	0.622	1.31	0.505
	10000.	7.67	2.54	1.45	0.762	1.43	0.616
	20000.	8.01	2.01	1.58	0.884	1.50	0.708
	30000.	8.47	1.76	1.68	0.971	1.55	0.772
	50000.	9.09	1.46	1.74	1.04	1.63	0.842
	100000.	9.62	1.11	1.85	1.16	1.74	0.941
Ba II 6F 9D 16707.3Å C= 0.16E+19	5000.	1.75	0.875	0.305	0.180	*0.296	*0.146
	10000.	1.65	0.744	0.346	0.221	*0.322	*0.176
	20000.	1.72	0.623	0.383	0.255	*0.344	*0.202
	30000.	1.80	0.539	0.399	0.269	0.364	0.221
	50000.	1.91	0.452	0.437	0.305	0.374	0.247
	100000.	1.99	0.336	0.484	0.340	0.423	0.278
Ba II 7F 8D 39451.0Å C= 0.13E+20	5000.	7.39	2.66	1.20	0.547	*1.23	*0.442
	10000.	7.24	2.09	1.34	0.670	*1.32	*0.544
	20000.	7.71	1.66	1.45	0.770	1.39	0.610
	30000.	8.23	1.48	1.52	0.843	1.45	0.688
	50000.	8.85	1.22	1.60	0.918	1.47	0.719
	100000.	9.37	0.917	1.77	1.06	1.54	0.828
Ba II 7F 9D 71442.9Å C= 0.29E+20	5000.	38.7	17.5	*6.48	*3.61	*6.30	*2.90
	10000.	37.3	14.8	7.18	4.39	*6.78	*3.55
	20000.	39.3	12.5	7.95	5.10	*7.41	*4.17
	30000.	41.5	11.0	8.06	5.37	*7.72	*4.38
	50000.	44.1	9.11	8.98	6.01	8.18	4.97
	100000.	46.1	6.75	9.86	6.64	8.43	5.29
PERTURBER DENSITY = 1.E+16cm-3							
Ba II 6S 6P 4675.3Å C= 0.35E+20	5000.	0.763E-01	-0.120E-01	0.269E-02	-0.584E-03	0.349E-02	-0.550E-03
	10000.	0.567E-01	-0.894E-02	0.399E-02	-0.102E-02	0.473E-02	-0.882E-03
	20000.	0.432E-01	-0.690E-02	0.500E-02	-0.143E-02	0.539E-02	-0.123E-02
	30000.	0.383E-01	-0.598E-02	0.542E-02	-0.168E-02	0.577E-02	-0.136E-02
	50000.	0.347E-01	-0.536E-02	0.591E-02	-0.191E-02	0.619E-02	-0.157E-02
	100000.	0.319E-01	-0.428E-02	0.645E-02	-0.228E-02	0.649E-02	-0.187E-02
Ba II 6S 7P 2007.9Å C= 0.15E+19	5000.	0.325E-01	-0.402E-02	0.324E-02	-0.934E-03	0.359E-02	-0.806E-03
	10000.	0.259E-01	-0.316E-02	0.387E-02	-0.136E-02	0.411E-02	-0.110E-02
	20000.	0.226E-01	-0.331E-02	0.439E-02	-0.166E-02	0.456E-02	-0.135E-02
	30000.	0.218E-01	-0.282E-02	0.466E-02	-0.184E-02	0.471E-02	-0.151E-02
	50000.	0.215E-01	-0.254E-02	0.492E-02	-0.208E-02	0.483E-02	-0.168E-02
	100000.	0.214E-01	-0.227E-02	0.527E-02	-0.237E-02	0.514E-02	-0.190E-02
Ba II 6S 8P 1624.9Å C= 0.44E+18	5000.	0.473E-01	-0.148E-01	*0.689E-02	-0.284E-02	*0.713E-02	-0.223E-02
	10000.	0.413E-01	-0.112E-01	0.799E-02	-0.373E-02	*0.811E-02	-0.302E-02
	20000.	0.387E-01	-0.918E-02	0.889E-02	-0.456E-02	*0.870E-02	-0.370E-02
	30000.	0.386E-01	-0.793E-02	0.925E-02	-0.495E-02	*0.902E-02	-0.403E-02
	50000.	0.396E-01	-0.691E-02	0.980E-02	-0.548E-02	0.911E-02	-0.436E-02
	100000.	0.403E-01	-0.533E-02	0.105E-01	-0.624E-02	0.988E-02	-0.515E-02
Ba II 6S 9P 1478.8Å C= 0.20E+18	5000.	0.829E-01	-0.344E-01	*0.142E-01	-0.633E-02		
	10000.	0.753E-01	-0.291E-01	*0.165E-01	-0.884E-02		
	20000.	0.725E-01	-0.227E-01	*0.179E-01	-0.107E-01		
	30000.	0.745E-01	-0.190E-01	*0.191E-01	-0.117E-01	*0.180E-01	-0.953E-02
	50000.	0.772E-01	-0.168E-01	*0.201E-01	-0.128E-01	*0.177E-01	-0.100E-01
	100000.	0.790E-01	-0.122E-01	0.227E-01	-0.149E-01	*0.192E-01	-0.116E-01

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 7S 7P 13424.7Å C= 0.67E+20	5000.	2.11	-0.773	0.154	-0.730E-01	0.166	-0.617E-01
	10000.	1.60	-0.649	0.187	-0.990E-01	0.192	-0.809E-01
	20000.	1.39	-0.529	0.217	-0.122	0.217	-0.998E-01
	30000.	1.33	-0.462	0.234	-0.135	0.225	-0.109
	50000.	1.31	-0.394	0.254	-0.152	0.237	-0.122
	100000.	1.32	-0.308	0.270	-0.172	0.251	-0.137
Ba II 7S 8P 5212.1Å C= 0.46E+19	5000.	0.545	-0.220	*0.721E-01	-0.316E-01	*0.741E-01	-0.251E-01
	10000.	0.470	-0.183	0.838E-01	-0.419E-01	*0.848E-01	-0.337E-01
	20000.	0.439	-0.146	0.946E-01	-0.518E-01	*0.915E-01	-0.414E-01
	30000.	0.439	-0.128	0.999E-01	-0.561E-01	*0.940E-01	-0.442E-01
	50000.	0.454	-0.110	0.105	-0.623E-01	0.984E-01	-0.494E-01
	100000.	0.466	-0.857E-01	0.113	-0.707E-01	0.105	-0.565E-01
Ba II 7S 9P 3957.3Å C= 0.14E+19	5000.	0.616	-0.261	*0.102	-0.465E-01		
	10000.	0.557	-0.218	*0.119	-0.639E-01		
	20000.	0.539	-0.182	*0.130	-0.780E-01		
	30000.	0.555	-0.161	*0.137	-0.852E-01	*0.129	-0.696E-01
	50000.	0.578	-0.137	*0.146	-0.939E-01	*0.130	-0.751E-01
	100000.	0.595	-0.103	0.163	-0.107	*0.139	-0.847E-01
Ba II 8S 8P 28441.5Å C= 0.14E+21	5000.	22.1	-9.14	*2.35	-1.26	*2.31	-0.994
	10000.	18.8	-8.64	2.76	-1.69	*2.69	-1.37
	20000.	17.5	-7.32	3.17	-2.07	*2.96	-1.67
	30000.	17.5	-6.60	3.34	-2.24	*3.05	-1.78
	50000.	18.0	-5.78	3.65	-2.47	3.16	-1.96
	100000.	18.5	-4.61	3.92	-2.86	3.26	-2.18
Ba II 8S 9P 10417.2Å C= 0.10E+20	5000.	4.84	-2.35	*0.727	-0.346		
	10000.	4.35	-2.00	*0.852	-0.486		
	20000.	4.27	-1.73	*0.943	-0.592		
	30000.	4.40	-1.52	*0.997	-0.646	*0.897	-0.500
	50000.	4.58	-1.30	*1.05	-0.707	*0.967	-0.576
	100000.	4.72	-0.988	1.16	-0.801	*1.03	-0.649
Ba II 6P 7S 4769.5Å C= 0.17E+20	5000.	0.179	0.667E-01	0.502E-02	0.572E-02	0.546E-02	0.495E-02
	10000.	0.125	0.606E-01	0.840E-02	0.829E-02	0.779E-02	0.668E-02
	20000.	0.977E-01	0.489E-01	0.110E-01	0.101E-01	0.981E-02	0.826E-02
	30000.	0.891E-01	0.458E-01	0.124E-01	0.112E-01	0.109E-01	0.911E-02
	50000.	0.835E-01	0.391E-01	0.145E-01	0.126E-01	0.125E-01	0.101E-01
	100000.	0.795E-01	0.303E-01	0.171E-01	0.148E-01	0.146E-01	0.119E-01
Ba II 6P 8S 2729.5Å C= 0.26E+19	5000.	0.111	0.540E-01	0.642E-02	0.681E-02	0.577E-02	0.534E-02
	10000.	0.823E-01	0.521E-01	0.892E-02	0.891E-02	0.756E-02	0.720E-02
	20000.	0.719E-01	0.444E-01	0.112E-01	0.109E-01	0.935E-02	0.890E-02
	30000.	0.697E-01	0.396E-01	0.129E-01	0.120E-01	0.105E-01	0.960E-02
	50000.	0.667E-01	0.355E-01	0.145E-01	0.134E-01	0.118E-01	0.108E-01
	100000.	0.679E-01	0.285E-01	0.175E-01	0.151E-01	0.138E-01	0.116E-01
Ba II 6P 9S 2257.6Å C= 0.99E+18	5000.	0.144	0.784E-01	0.126E-01	0.112E-01	*0.107E-01	*0.873E-02
	10000.	0.122	0.728E-01	0.163E-01	0.154E-01	*0.134E-01	*0.123E-01
	20000.	0.105	0.663E-01	0.199E-01	0.185E-01	*0.169E-01	*0.150E-01
	30000.	0.103	0.596E-01	0.227E-01	0.205E-01	*0.188E-01	*0.163E-01
	50000.	0.108	0.517E-01	0.253E-01	0.219E-01	0.200E-01	0.180E-01
	100000.	0.108	0.425E-01	0.286E-01	0.245E-01	0.241E-01	0.199E-01
Ba II 7P 8S 12163.9Å C= 0.52E+20	5000.	2.74	1.14	0.187	0.149	0.178	0.117
	10000.	2.16	1.14	0.235	0.195	0.215	0.157
	20000.	1.93	0.966	0.287	0.240	0.257	0.191
	30000.	1.89	0.864	0.320	0.261	0.274	0.208
	50000.	1.87	0.777	0.362	0.288	0.304	0.229
	100000.	1.92	0.622	0.400	0.324	0.327	0.265
Ba II 7P 9S 6297.5Å C= 0.77E+19	5000.	1.25	0.626	*0.107	*0.896E-01	0.923E-01	0.696E-01
	10000.	1.07	0.580	0.137	0.122	*0.115	*0.984E-01
	20000.	0.946	0.541	0.163	0.150	*0.139	*0.118
	30000.	0.937	0.484	0.188	0.161	*0.156	*0.128
	50000.	0.978	0.419	0.202	0.176	*0.164	*0.145
	100000.	0.993	0.346	0.231	0.197	0.194	0.161

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 6P 6D 4051.2Å C= 0.38E+19	5000.	0.143	0.750E-01	0.946E-02	0.765E-02	0.103E-01	0.646E-02
	10000.	0.115	0.592E-01	0.130E-01	0.103E-01	0.125E-01	0.840E-02
	20000.	0.984E-01	0.474E-01	0.159E-01	0.127E-01	0.147E-01	0.103E-01
	30000.	0.936E-01	0.418E-01	0.177E-01	0.140E-01	0.163E-01	0.114E-01
	50000.	0.896E-01	0.357E-01	0.195E-01	0.157E-01	0.174E-01	0.124E-01
	100000.	0.859E-01	0.282E-01	0.230E-01	0.176E-01	0.188E-01	0.140E-01
Ba II 6P 7D 2599.5Å C= 0.11E+19	5000.	0.103	0.469E-01	0.111E-01	0.546E-02	*0.116E-01	*0.432E-02
	10000.	0.880E-01	0.378E-01	0.132E-01	0.712E-02	*0.134E-01	*0.580E-02
	20000.	0.832E-01	0.308E-01	0.153E-01	0.878E-02	0.147E-01	0.710E-02
	30000.	0.828E-01	0.271E-01	0.160E-01	0.952E-02	0.151E-01	0.769E-02
	50000.	0.836E-01	0.231E-01	0.171E-01	0.106E-01	0.160E-01	0.861E-02
	100000.	0.846E-01	0.179E-01	0.184E-01	0.120E-01	0.173E-01	0.977E-02
Ba II 6P 8D 2206.7Å C= 0.45E+18	5000.	0.152	0.826E-01	*0.224E-01	*0.118E-01		
	10000.	0.135	0.693E-01	*0.263E-01	*0.163E-01	*0.250E-01	*0.130E-01
	20000.	0.130	0.600E-01	*0.302E-01	*0.199E-01	*0.268E-01	*0.157E-01
	30000.	0.133	0.532E-01	*0.313E-01	*0.213E-01	*0.284E-01	*0.170E-01
	50000.	0.137	0.447E-01	0.331E-01	0.233E-01	*0.303E-01	*0.190E-01
	100000.	0.140	0.348E-01	0.348E-01	0.260E-01	*0.323E-01	*0.211E-01
Ba II 6P 9D 2030.4Å C= 0.23E+18	5000.	0.246	0.138				
	10000.	0.225	0.120				
	20000.	0.225	0.101	*0.547E-01	*0.377E-01		
	30000.	0.233	0.915E-01	*0.579E-01	*0.404E-01		
	50000.	0.241	0.778E-01	*0.641E-01	*0.462E-01		
	100000.	0.246	0.593E-01	*0.710E-01	*0.516E-01	*0.625E-01	*0.421E-01
Ba II 7P 7D 9947.3Å C= 0.17E+20	5000.	1.88	0.692	0.196	0.898E-01	*0.205	*0.703E-01
	10000.	1.61	0.606	0.232	0.117	*0.235	*0.948E-01
	20000.	1.52	0.526	0.263	0.144	*0.257	*0.117
	30000.	1.52	0.455	0.276	0.158	0.266	0.126
	50000.	1.54	0.388	0.297	0.177	0.282	0.142
	100000.	1.57	0.302	0.323	0.200	0.276	0.154
Ba II 7P 8D 5916.9Å C= 0.32E+19	5000.	1.21	0.587	*0.167	*0.868E-01		
	10000.	1.08	0.524	*0.200	*0.119		
	20000.	1.04	0.441	*0.223	*0.146	*0.204	*0.116
	30000.	1.06	0.405	*0.234	*0.157	*0.209	*0.124
	50000.	1.09	0.340	0.247	0.174	*0.233	*0.142
	100000.	1.12	0.264	0.256	0.193	*0.238	*0.154
Ba II 7P 9D 4799.6Å C= 0.13E+19	5000.	1.44	0.789				
	10000.	1.33	0.687				
	20000.	1.32	0.576	*0.310	*0.212		
	30000.	1.37	0.528	*0.328	*0.228		
	50000.	1.42	0.447	*0.364	*0.260		
	100000.	1.45	0.341	*0.404	*0.290	*0.355	*0.236
Ba II 8P 8D 19366.3Å C= 0.35E+20	5000.	16.3	7.15	*2.19	*1.06		
	10000.	14.8	6.64	*2.56	*1.49		
	20000.	14.3	5.60	*2.87	*1.82	*2.61	*1.44
	30000.	14.5	5.18	*2.98	*1.96	*2.80	*1.59
	50000.	15.1	4.36	*3.20	*2.15	*2.71	*1.66
	100000.	15.4	3.40	3.73	2.56	*2.99	*1.93
Ba II 8P 9D 10991.3Å C= 0.68E+19	5000.	8.55	4.08				
	10000.	7.97	3.93				
	20000.	7.92	3.27	*1.74	*1.18		
	30000.	8.15	2.93	*1.77	*1.24		
	50000.	8.50	2.57	*2.00	*1.41		
	100000.	8.68	1.98	*2.23	*1.57	*1.89	*1.25
Ba II 5D 6P 6236.6Å C= 0.62E+20	5000.	0.119	-0.108E-02	0.523E-02	-0.892E-04	0.674E-02	-0.890E-04
	10000.	0.894E-01	-0.472E-03	0.766E-02	-0.182E-03	0.903E-02	-0.177E-03
	20000.	0.685E-01	0.307E-03	0.941E-02	-0.325E-03	0.102E-01	-0.300E-03
	30000.	0.601E-01	-0.278E-03	0.101E-01	-0.425E-03	0.109E-01	-0.365E-03
	50000.	0.529E-01	0.700E-04	0.110E-01	-0.544E-03	0.117E-01	-0.467E-03
	100000.	0.471E-01	0.505E-05	0.118E-01	-0.691E-03	0.121E-01	-0.568E-03

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 5D 7P 2249.7Å C= 0.19E+19	5000.	0.395E-01	-0.460E-02	0.411E-02	-0.111E-02	0.455E-02	-0.954E-03
	10000.	0.317E-01	-0.288E-02	0.489E-02	-0.161E-02	0.521E-02	-0.131E-02
	20000.	0.277E-01	-0.312E-02	0.554E-02	-0.197E-02	0.579E-02	-0.161E-02
	30000.	0.266E-01	-0.236E-02	0.591E-02	-0.219E-02	0.596E-02	-0.178E-02
	50000.	0.260E-01	-0.211E-02	0.619E-02	-0.249E-02	0.612E-02	-0.200E-02
	100000.	0.258E-01	-0.190E-02	0.648E-02	-0.283E-02	0.642E-02	-0.230E-02
Ba II 5D 8P 1779.8Å C= 0.53E+18	5000.	0.557E-01	-0.174E-01	*0.828E-02	-0.339E-02	*0.857E-02	-0.266E-02
	10000.	0.488E-01	-0.129E-01	0.961E-02	-0.444E-02	*0.976E-02	-0.361E-02
	20000.	0.459E-01	-0.102E-01	0.107E-01	-0.544E-02	*0.104E-01	-0.441E-02
	30000.	0.458E-01	-0.904E-02	0.111E-01	-0.591E-02	*0.109E-01	-0.478E-02
	50000.	0.468E-01	-0.743E-02	0.118E-01	-0.654E-02	0.109E-01	-0.522E-02
	100000.	0.477E-01	-0.576E-02	0.126E-01	-0.744E-02	0.118E-01	-0.616E-02
Ba II 5D 9P 1605.9Å C= 0.24E+18	5000.	0.970E-01	-0.405E-01	*0.168E-01	-0.745E-02		
	10000.	0.882E-01	-0.343E-01	*0.195E-01	-0.104E-01		
	20000.	0.851E-01	-0.264E-01	*0.211E-01	-0.127E-01		
	30000.	0.874E-01	-0.224E-01	*0.225E-01	-0.138E-01	*0.212E-01	-0.112E-01
	50000.	0.905E-01	-0.194E-01	*0.236E-01	-0.151E-01	*0.209E-01	-0.118E-01
	100000.	0.926E-01	-0.139E-01	0.268E-01	-0.176E-01	*0.226E-01	-0.136E-01
Ba II 6D 7P 26799.4Å C= 0.17E+21	5000.	9.52	-3.95	0.797	-0.428	0.829	-0.350
	10000.	7.58	-3.09	0.957	-0.568	0.965	-0.458
	20000.	6.80	-2.55	1.12	-0.693	1.09	-0.562
	30000.	6.55	-2.24	1.21	-0.766	1.15	-0.619
	50000.	6.42	-1.88	1.30	-0.852	1.22	-0.689
	100000.	6.38	-1.50	1.43	-0.984	1.30	-0.778
Ba II 6D 8P 6464.8Å C= 0.70E+19	5000.	0.943	-0.384	*0.118	-0.531E-01	*0.121	-0.423E-01
	10000.	0.818	-0.315	0.138	-0.711E-01	*0.137	-0.573E-01
	20000.	0.761	-0.254	0.155	-0.872E-01	*0.148	-0.703E-01
	30000.	0.754	-0.221	0.162	-0.944E-01	*0.155	-0.750E-01
	50000.	0.770	-0.189	0.174	-0.106	0.164	-0.864E-01
	100000.	0.781	-0.149	0.192	-0.120	0.171	-0.931E-01
Ba II 6D 9P 4640.0Å C= 0.20E+19	5000.	0.890	-0.381	*0.143	-0.651E-01		
	10000.	0.808	-0.320	*0.166	-0.906E-01		
	20000.	0.784	-0.267	*0.183	-0.110		
	30000.	0.804	-0.232	*0.191	-0.119	*0.180	-0.963E-01
	50000.	0.832	-0.201	*0.205	-0.131	*0.184	-0.107
	100000.	0.850	-0.150	0.226	-0.149	*0.197	-0.119
Ba II 7D 9P 12874.1Å C= 0.15E+20	5000.	7.57	-3.23	*1.17	-0.521		
	10000.	6.96	-2.75	*1.37	-0.736		
	20000.	6.88	-2.32	*1.48	-0.892		
	30000.	7.08	-2.03	*1.55	-0.959	*1.44	-0.758
	50000.	7.39	-1.76	*1.63	-1.04	*1.53	-0.867
	100000.	7.59	-1.31	1.81	-1.20	*1.61	-0.963
Ba II 5D 5F 1916.7Å C= 0.86E+18	5000.	0.363E-01	0.202E-01	0.343E-02	0.212E-02	0.354E-02	0.174E-02
	10000.	0.286E-01	0.161E-01	0.423E-02	0.281E-02	0.420E-02	0.228E-02
	20000.	0.257E-01	0.131E-01	0.506E-02	0.346E-02	0.481E-02	0.281E-02
	30000.	0.247E-01	0.115E-01	0.553E-02	0.382E-02	0.504E-02	0.306E-02
	50000.	0.241E-01	0.962E-02	0.595E-02	0.421E-02	0.550E-02	0.344E-02
	100000.	0.238E-01	0.755E-02	0.655E-02	0.485E-02	0.584E-02	0.382E-02
Ba II 5D 6F 1686.4Å C= 0.46E+18	5000.	0.480E-01	0.166E-01	0.636E-02	0.179E-02	*0.676E-02	*0.147E-02
	10000.	0.408E-01	0.134E-01	0.731E-02	0.237E-02	*0.766E-02	*0.192E-02
	20000.	0.393E-01	0.116E-01	0.811E-02	0.291E-02	*0.814E-02	*0.238E-02
	30000.	0.397E-01	0.103E-01	0.830E-02	0.320E-02	0.834E-02	0.258E-02
	50000.	0.411E-01	0.856E-02	0.865E-02	0.357E-02	0.851E-02	0.280E-02
	100000.	0.430E-01	0.687E-02	0.914E-02	0.415E-02	0.872E-02	0.318E-02
Ba II 5D 7F 1565.3Å C= 0.20E+18	5000.	0.742E-01	0.451E-02	*0.126E-01	-0.286E-02		
	10000.	0.719E-01	0.423E-02	*0.143E-01	-0.379E-02		
	20000.	0.748E-01	0.412E-02	*0.152E-01	-0.468E-02	*0.153E-01	-0.374E-02
	30000.	0.781E-01	0.391E-02	*0.155E-01	-0.507E-02	*0.156E-01	-0.400E-02
	50000.	0.833E-01	0.347E-02	0.160E-01	-0.564E-02	*0.158E-01	-0.446E-02
	100000.	0.876E-01	0.304E-02	0.169E-01	-0.637E-02	*0.157E-01	-0.510E-02

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 5D 8F 1496.9Å C= 0.11E+18	5000.	0.129	-0.240E-01				
	10000.	0.131	-0.153E-01				
	20000.	0.142	-0.120E-01	*0.310E-01	-0.168E-01		
	30000.	0.150	-0.107E-01	*0.323E-01	-0.185E-01		
	50000.	0.161	-0.724E-02	*0.323E-01	-0.196E-01		
	100000.	0.168	-0.542E-02	*0.354E-01	-0.223E-01	*0.316E-01	-0.183E-01
Ba II 5D 9F 1454.6Å C= 0.65E+17	5000.	0.226	-0.710E-01				
	10000.	0.231	-0.516E-01				
	20000.	0.255	-0.406E-01				
	30000.	0.271	-0.346E-01				
	50000.	0.289	-0.271E-01				
	100000.	0.298	-0.208E-01				
Ba II 6D 6F 5381.8Å C= 0.47E+19	5000.	0.500	0.619E-01	0.670E-01	0.773E-02	*0.717E-01	0.668E-02
	10000.	0.455	0.360E-01	0.764E-01	0.111E-01	*0.811E-01	0.900E-02
	20000.	0.462	0.328E-01	0.834E-01	0.136E-01	*0.857E-01	0.111E-01
	30000.	0.480	0.285E-01	0.857E-01	0.151E-01	0.867E-01	0.123E-01
	50000.	0.508	0.215E-01	0.882E-01	0.171E-01	0.881E-01	0.136E-01
	100000.	0.536	0.195E-01	0.902E-01	0.195E-01	0.895E-01	0.155E-01
Ba II 6D 7F 4316.5Å C= 0.15E+19	5000.	0.593	-0.240E-01	*0.986E-01	-0.254E-01		
	10000.	0.581	-0.173E-01	*0.112	-0.339E-01		
	20000.	0.614	-0.170E-01	*0.120	-0.416E-01	*0.118	-0.330E-01
	30000.	0.646	-0.205E-01	*0.122	-0.452E-01	*0.120	-0.369E-01
	50000.	0.692	-0.146E-01	0.129	-0.499E-01	*0.122	-0.399E-01
	100000.	0.729	-0.893E-02	0.128	-0.560E-01	*0.122	-0.440E-01
Ba II 6D 8F 3833.5Å C= 0.70E+18	5000.	0.879	-0.169				
	10000.	0.891	-0.137				
	20000.	0.970	-0.110	*0.202	-0.112		
	30000.	1.03	-0.100	*0.218	-0.125		
	50000.	1.10	-0.801E-01	*0.212	-0.130		
	100000.	1.15	-0.603E-01	*0.237	-0.151	*0.213	-0.124
Ba II 6D 9F 3567.8Å C= 0.39E+18	5000.	*1.40	-0.434				
	10000.	1.42	-0.322				
	20000.	1.57	-0.279				
	30000.	1.67	-0.243				
	50000.	1.78	-0.194				
	100000.	1.84	-0.147				
Ba II 7D 7F 10658.2Å C= 0.92E+19	5000.	3.94	-0.366	*0.650	-0.179		
	10000.	3.94	-0.267	*0.739	-0.240		
	20000.	4.24	-0.266	*0.784	-0.292	*0.782	-0.236
	30000.	4.50	-0.259	*0.814	-0.318	*0.796	-0.253
	50000.	4.86	-0.219	0.824	-0.350	*0.818	-0.278
	100000.	5.15	-0.154	0.891	-0.404	*0.853	-0.311
Ba II 7D 8F 8129.2Å C= 0.31E+19	5000.	4.15	-0.883				
	10000.	4.23	-0.725				
	20000.	4.65	-0.576	*0.933	-0.515		
	30000.	4.95	-0.535	*1.01	-0.578		
	50000.	5.31	-0.433	*1.01	-0.622		
	100000.	5.58	-0.329	*1.10	-0.702	*1.02	-0.581
Ba II 7D 9F 7020.4Å C= 0.15E+19	5000.	*5.55	-1.75				
	10000.	5.68	-1.33				
	20000.	6.30	-1.14				
	30000.	6.71	-0.997				
	50000.	7.15	-0.801				
	100000.	7.42	-0.611				
Ba II 4F 5D 2323.8Å C= 0.12E+19	5000.	0.353E-01	0.134E-02	0.151E-02	0.112E-02	0.179E-02	0.966E-03
	10000.	0.273E-01	0.168E-02	0.225E-02	0.164E-02	0.226E-02	0.133E-02
	20000.	0.219E-01	0.160E-02	0.276E-02	0.200E-02	0.266E-02	0.164E-02
	30000.	0.199E-01	0.145E-02	0.306E-02	0.223E-02	0.291E-02	0.182E-02
	50000.	0.178E-01	0.116E-02	0.347E-02	0.254E-02	0.315E-02	0.204E-02
	100000.	0.156E-01	0.102E-02	0.398E-02	0.287E-02	0.345E-02	0.232E-02

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 4F 6D 43210.4Å C= 0.43E+21	5000.	21.2	9.25	1.35	1.10	1.38	0.899
	10000.	17.1	7.34	1.79	1.46	1.69	1.18
	20000.	14.9	5.91	2.21	1.79	2.00	1.45
	30000.	14.1	5.19	2.47	1.97	2.14	1.58
	50000.	13.4	4.40	2.71	2.18	2.42	1.77
	100000.	12.7	3.49	3.08	2.52	2.68	2.00
Ba II 4F 7D 8718.3Å C= 0.13E+20	5000.	1.38	0.545	0.131	0.686E-01	*0.135	*0.538E-01
	10000.	1.17	0.462	0.156	0.894E-01	*0.157	*0.724E-01
	20000.	1.09	0.378	0.180	0.109	0.174	0.887E-01
	30000.	1.07	0.327	0.191	0.120	0.181	0.961E-01
	50000.	1.07	0.277	0.208	0.135	0.193	0.108
	100000.	1.07	0.216	0.231	0.152	0.195	0.118
Ba II 4F 8D 5459.2Å C= 0.27E+19	5000.	1.02	0.521	*0.138	*0.738E-01		
	10000.	0.901	0.438	*0.165	*0.102	*0.155	*0.815E-01
	20000.	0.862	0.380	*0.186	*0.124	*0.168	*0.986E-01
	30000.	0.872	0.336	*0.196	*0.133	*0.173	*0.106
	50000.	0.891	0.281	0.206	0.148	*0.193	*0.120
	100000.	0.901	0.219	0.216	0.164	*0.198	*0.132
Ba II 4F 9D 4493.9Å C= 0.11E+19	5000.	1.26	0.686				
	10000.	1.15	0.597				
	20000.	1.15	0.500	*0.270	*0.186		
	30000.	1.18	0.456	*0.285	*0.200		
	50000.	1.22	0.386	*0.316	*0.227		
	100000.	1.24	0.295	*0.352	*0.254	*0.309	*0.207
Ba II 5F 6D 8729.2Å C= 0.18E+20	5000.	0.760	-0.847E-01	0.744E-01	-0.147E-01	0.809E-01	-0.126E-01
	10000.	0.699	-0.460E-01	0.866E-01	-0.214E-01	0.925E-01	-0.176E-01
	20000.	0.701	-0.462E-01	0.973E-01	-0.263E-01	0.102	-0.216E-01
	30000.	0.718	-0.372E-01	0.103	-0.294E-01	0.104	-0.239E-01
	50000.	0.742	-0.273E-01	0.107	-0.333E-01	0.107	-0.269E-01
	100000.	0.759	-0.239E-01	0.111	-0.386E-01	0.111	-0.308E-01
Ba II 5F 8D 10897.7Å C= 0.11E+20	5000.	3.50	1.68	*0.549	*0.267		
	10000.	3.31	1.33	*0.644	*0.365	*0.625	*0.293
	20000.	3.38	1.07	*0.717	*0.446	*0.666	*0.352
	30000.	3.53	0.936	*0.770	*0.481	*0.697	*0.385
	50000.	3.73	0.772	0.800	0.524	*0.742	*0.430
	100000.	3.89	0.600	0.867	0.585	*0.801	*0.481
Ba II 5F 9D 7627.3Å C= 0.33E+19	5000.	3.42	1.79				
	10000.	3.21	1.54				
	20000.	3.30	1.30	*0.777	*0.525		
	30000.	3.43	1.14	*0.811	*0.559		
	50000.	3.60	0.949	*0.890	*0.636		
	100000.	3.71	0.721	*0.994	*0.708	*0.863	*0.583
Ba II 6F 7D 20847.3Å C= 0.71E+20	5000.	8.76	0.120	*1.27	*0.137	*1.34	*0.117
	10000.	8.47	0.155	1.44	0.193	*1.51	*0.157
	20000.	8.96	0.173	1.55	0.238	*1.59	*0.193
	30000.	9.47	0.134	1.59	0.264	*1.61	*0.213
	50000.	10.2	0.143	1.63	0.293	1.64	0.236
	100000.	10.9	0.915E-01	1.67	0.338	1.66	0.267
Ba II 6F 9D 16707.3Å C= 0.16E+20	5000.	17.5	8.39				
	10000.	16.5	7.19				
	20000.	17.2	6.06	*3.83	*2.51		
	30000.	18.0	5.32	*3.99	*2.67		
	50000.	19.1	4.44	*4.37	*3.05		
	100000.	19.9	3.35	*4.84	*3.40	*4.23	*2.78
PERTURBER DENSITY = 1.E+17cm-3							
Ba II 6S 6P 4675.3Å C= 0.35E+21	5000.	0.763	-0.119	0.263E-01	-0.515E-02	0.338E-01	-0.480E-02
	10000.	0.567	-0.884E-01	0.397E-01	-0.952E-02	0.469E-01	-0.819E-02
	20000.	0.432	-0.685E-01	0.499E-01	-0.141E-01	0.538E-01	-0.120E-01
	30000.	0.383	-0.593E-01	0.541E-01	-0.166E-01	0.577E-01	-0.134E-01
	50000.	0.347	-0.533E-01	0.591E-01	-0.191E-01	0.618E-01	-0.157E-01
	100000.	0.319	-0.427E-01	0.645E-01	-0.228E-01	0.649E-01	-0.187E-01

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 6S 7P 2007.9Å C= 0.15E+20	5000.	0.325	-0.386E-01	*0.308E-01	-0.773E-02	*0.326E-01	-0.645E-02
	10000.	0.259	-0.302E-01	*0.379E-01	-0.121E-01	*0.398E-01	-0.951E-02
	20000.	0.226	-0.322E-01	0.438E-01	-0.160E-01	*0.453E-01	-0.129E-01
	30000.	0.218	-0.273E-01	0.464E-01	-0.179E-01	*0.467E-01	-0.145E-01
	50000.	0.215	-0.248E-01	0.492E-01	-0.207E-01	*0.483E-01	-0.167E-01
	100000.	0.214	-0.224E-01	0.527E-01	-0.237E-01	*0.514E-01	-0.190E-01
Ba II 6S 8P 1624.9Å C= 0.44E+19	5000.	0.473	-0.139				
	10000.	0.413	-0.105				
	20000.	0.387	-0.868E-01				
	30000.	0.386	-0.749E-01	*0.919E-01	-0.467E-01		
	50000.	0.396	-0.670E-01	*0.979E-01	-0.542E-01		
	100000.	0.403	-0.530E-01	*0.105	-0.624E-01		
Ba II 6S 9P 1478.8Å C= 0.20E+19	5000.	*0.828	-0.305				
	10000.	*0.752	-0.265				
	20000.	0.725	-0.207				
	30000.	0.745	-0.173				
	50000.	0.772	-0.161				
	100000.	0.790	-0.121				
Ba II 7S 7P 13424.7Å C= 0.67E+21	5000.	21.1	-7.56	*1.47	-0.583		
	10000.	16.0	-6.37	*1.84	-0.858	*1.86	-0.676
	20000.	13.9	-5.20	*2.17	-1.16	*2.15	-0.942
	30000.	13.3	-4.55	2.34	-1.31	*2.24	-1.04
	50000.	13.1	-3.88	2.53	-1.51	*2.37	-1.21
	100000.	13.2	-3.05	2.70	-1.72	*2.51	-1.37
Ba II 7S 8P 5212.1Å C= 0.46E+20	5000.	5.45	-2.09				
	10000.	4.70	-1.75				
	20000.	4.39	-1.41				
	30000.	4.39	-1.24	*0.997	-0.532		
	50000.	4.54	-1.07	*1.05	-0.617		
	100000.	4.66	-0.840	*1.13	-0.707		
Ba II 7S 9P 3957.3Å C= 0.14E+20	5000.	*6.15	-2.32				
	10000.	*5.57	-1.98				
	20000.	5.39	-1.68				
	30000.	5.55	-1.48				
	50000.	5.78	-1.28				
	100000.	5.95	-0.985				
Ba II 6P 7S 4769.5Å C= 0.17E+21	5000.	1.79	0.655	0.496E-01	0.471E-01	0.535E-01	0.394E-01
	10000.	1.25	0.598	0.837E-01	0.738E-01	0.775E-01	0.575E-01
	20000.	0.977	0.484	0.110	0.974E-01	0.980E-01	0.788E-01
	30000.	0.892	0.453	0.124	0.109	0.109	0.878E-01
	50000.	0.836	0.387	0.145	0.126	0.125	0.100
	100000.	0.795	0.301	0.171	0.148	0.146	0.119
Ba II 6P 8S 2729.5Å C= 0.26E+20	5000.	1.10	0.518	*0.632E-01	*0.497E-01	*0.567E-01	*0.351E-01
	10000.	0.823	0.507	*0.894E-01	*0.719E-01	*0.759E-01	*0.555E-01
	20000.	0.719	0.433	*0.112	*0.102	*0.941E-01	*0.820E-01
	30000.	0.697	0.387	*0.129	*0.114	*0.105	*0.901E-01
	50000.	0.667	0.349	*0.145	*0.133	*0.118	*0.107
	100000.	0.679	0.282	0.175	0.151	*0.138	*0.116
Ba II 6P 9S 2257.6Å C= 0.99E+19	5000.	*1.44	*0.726				
	10000.	1.22	0.689				
	20000.	1.05	0.636				
	30000.	1.03	0.574				
	50000.	1.08	0.500	*0.253	*0.216		
	100000.	1.08	0.416	*0.286	*0.245		
Ba II 7P 8S 12163.9Å C= 0.52E+21	5000.	27.3	10.9	*1.80	*1.07		
	10000.	21.6	11.0	*2.32	*1.55		
	20000.	19.3	9.42	*2.85	*2.24		
	30000.	18.9	8.44	*3.20	*2.49	*2.75	*1.96
	50000.	18.7	7.62	*3.62	*2.85	*3.04	*2.26
	100000.	19.2	6.15	*4.00	*3.24	*3.27	*2.65

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 7P 9S 6297.5Å C= 0.77E+20	5000.	*12.5	*5.79				
	10000.	10.7	5.49				
	20000.	9.46	5.19				
	30000.	9.37	4.65				
	50000.	9.78	4.06				
100000.	9.93	3.39	*2.31	*1.97			
Ba II 6P 6D 4051.2Å C= 0.38E+20	5000.	1.43	0.731	*0.921E-01	*0.604E-01	*0.971E-01	*0.483E-01
	10000.	1.15	0.579	*0.129	*0.885E-01	*0.123	*0.691E-01
	20000.	0.984	0.465	0.159	0.121	*0.147	*0.969E-01
	30000.	0.936	0.410	0.177	0.136	*0.163	*0.109
	50000.	0.896	0.351	0.195	0.156	*0.174	*0.123
100000.	0.859	0.279	0.230	0.176	0.188	0.140	
Ba II 6P 7D 2599.5Å C= 0.11E+20	5000.	1.03	0.452	*0.103	*0.408E-01		
	10000.	0.880	0.367	*0.128	*0.585E-01		
	20000.	0.832	0.300	*0.153	*0.827E-01		
	30000.	0.828	0.265	*0.158	*0.907E-01		
	50000.	0.836	0.226	*0.171	*0.105	*0.159	*0.852E-01
100000.	0.846	0.177	*0.184	*0.120	*0.173	*0.977E-01	
Ba II 6P 8D 2206.7Å C= 0.45E+19	5000.	*1.52	*0.760				
	10000.	1.35	0.649				
	20000.	1.30	0.569				
	30000.	1.33	0.507				
	50000.	1.37	0.428				
100000.	1.40	0.339	*0.348	*0.260			
Ba II 6P 9D 2030.4Å C= 0.23E+19	5000.	*2.45	*1.19				
	10000.	*2.25	*1.07				
	20000.	*2.25	*0.915				
	30000.	2.32	0.841				
	50000.	2.41	0.724				
100000.	2.46	0.567					
Ba II 7P 7D 9947.3Å C= 0.17E+21	5000.	18.8	6.63				
	10000.	16.1	5.87	*2.24	*0.949		
	20000.	15.2	5.12	*2.61	*1.34		
	30000.	15.2	4.44	*2.73	*1.50		
	50000.	15.4	3.80	*2.97	*1.76		
100000.	15.7	2.98	*3.23	*2.00	*2.76	*1.54	
Ba II 7P 8D 5916.9Å C= 0.32E+20	5000.	*12.1	*5.38				
	10000.	10.8	4.91				
	20000.	10.4	4.18				
	30000.	10.6	3.86				
	50000.	10.9	3.26				
100000.	11.2	2.57					
Ba II 7P 9D 4799.6Å C= 0.13E+20	5000.	*14.3	*6.82				
	10000.	*13.2	*6.14				
	20000.	*13.2	*5.25				
	30000.	*13.6	*4.86				
	50000.	14.2	4.16				
100000.	14.5	3.26					
Ba II 5D 6P 6236.6Å C= 0.62E+21	5000.	1.19	-0.105E-01	0.512E-01	-0.792E-03	0.652E-01	-0.790E-03
	10000.	0.894	-0.455E-02	0.761E-01	-0.173E-02	0.893E-01	-0.168E-02
	20000.	0.685	0.278E-02	0.940E-01	-0.321E-02	0.102	-0.296E-02
	30000.	0.601	-0.252E-02	0.101	-0.422E-02	0.109	-0.362E-02
	50000.	0.529	0.728E-03	0.110	-0.543E-02	0.117	-0.466E-02
100000.	0.471	0.537E-04	0.118	-0.691E-02	0.121	-0.568E-02	
Ba II 5D 7P 2249.7Å C= 0.19E+20	5000.	0.395	-0.436E-01	*0.391E-01	-0.920E-02		
	10000.	0.317	-0.274E-01	*0.481E-01	-0.145E-01	*0.504E-01	-0.114E-01
	20000.	0.277	-0.300E-01	0.552E-01	-0.190E-01	*0.575E-01	-0.154E-01
	30000.	0.266	-0.226E-01	0.589E-01	-0.213E-01	*0.593E-01	-0.172E-01
	50000.	0.260	-0.206E-01	0.619E-01	-0.248E-01	*0.612E-01	-0.198E-01
100000.	0.258	-0.189E-01	0.648E-01	-0.283E-01	*0.642E-01	-0.230E-01	

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS WIDTH(Å)	SHIFT(Å)	PROTONS WIDTH(Å)	SHIFT(Å)	IONIZED HELIUM WIDTH(Å) SHIFT(Å)	
Ba II 6D 7F 4316.5Å C= 0.15E+20	5000.	*5.92	-0.134				
	10000.	5.81	-0.995E-01				
	20000.	6.14	-0.116				
	30000.	6.46	-0.155				
	50000.	6.92	-0.110				
	100000.	7.29	-0.865E-01	*1.28	-0.560		
Ba II 6D 8F 3833.5Å C= 0.70E+19	5000.	*8.71	-1.15				
	10000.	*8.86	-1.01				
	20000.	*9.67	-0.825				
	30000.	*10.3	-0.761				
	50000.	*11.0	-0.618				
	100000.	11.5	-0.589				
Ba II 6D 9F 3567.8Å C= 0.39E+19	5000.						
	10000.						
	20000.	*15.5	-1.93				
	30000.	*16.5	-1.67				
	50000.	*17.6	-1.36				
	100000.	*18.3	-1.23				
Ba II 4F 5D 2323.8Å C= 0.12E+20	5000.	0.353	0.110E-01	0.147E-01	0.938E-02	*0.172E-01	*0.778E-02
	10000.	0.273	0.154E-01	0.224E-01	0.147E-01	*0.223E-01	*0.116E-01
	20000.	0.219	0.149E-01	0.276E-01	0.193E-01	0.265E-01	0.156E-01
	30000.	0.199	0.134E-01	0.306E-01	0.217E-01	0.290E-01	0.177E-01
	50000.	0.178	0.111E-01	0.347E-01	0.253E-01	0.315E-01	0.203E-01
	100000.	0.156	0.102E-01	0.398E-01	0.287E-01	0.345E-01	0.232E-01
Ba II 4F 7D 8718.3Å C= 0.13E+21	5000.	13.8	5.24	*1.21	*0.500		
	10000.	11.7	4.47	*1.51	*0.726		
	20000.	10.9	3.67	*1.80	*1.02		
	30000.	10.7	3.18	*1.92	*1.14		
	50000.	10.7	2.70	*2.08	*1.34	*1.93	*1.07
	100000.	10.7	2.13	*2.31	*1.52	*1.95	*1.18
Ba II 4F 8D 5459.2Å C= 0.27E+20	5000.	*10.2	*4.80				
	10000.	9.01	4.10				
	20000.	8.61	3.60				
	30000.	8.72	3.20				
	50000.	8.90	2.69				
	100000.	9.01	2.13				
Ba II 4F 9D 4493.9Å C= 0.11E+20	5000.	*12.6	*5.93				
	10000.	*11.5	*5.34				
	20000.	*11.5	*4.55				
	30000.	*11.8	*4.20				
	50000.	12.2	3.59				
	100000.	12.4	2.82				
Ba II 5F 6D 8729.2Å C= 0.18E+21	5000.	7.60	-0.819	*0.701	-0.123		
	10000.	6.99	-0.443	*0.848	-0.193		
	20000.	7.01	-0.448	*0.969	-0.254	*1.01	-0.207
	30000.	7.18	-0.360	1.02	-0.286	*1.04	-0.231
	50000.	7.42	-0.263	1.07	-0.331	*1.07	-0.267
	100000.	7.59	-0.235	1.11	-0.386	*1.11	-0.308
PERTURBER DENSITY = 1.E+18cm-3							
Ba II 6S 6P 4675.3Å C= 0.35E+22	5000.	7.63	-1.16	*0.205	-0.327E-01	*0.225	-0.293E-01
	10000.	5.67	-0.866	0.378	-0.799E-01	*0.432	-0.666E-01
	20000.	4.32	-0.673	0.490	-0.127	*0.521	-0.106
	30000.	3.83	-0.585	0.537	-0.156	*0.568	-0.125
	50000.	3.47	-0.525	0.589	-0.186	*0.616	-0.151
	100000.	3.19	-0.422	0.644	-0.227	*0.648	-0.186
Ba II 6S 7P 2007.9Å C= 0.15E+21	5000.	*3.24	-0.319				
	10000.	2.59	-0.258				
	20000.	2.26	-0.291				
	30000.	2.18	-0.249				
	50000.	2.15	-0.227				
	100000.	2.14	-0.211	*0.526	-0.234		

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 6S 8P 1624.9Å C= 0.44E+20	5000.						
	10000.	*4.10	-0.812				
	20000.	*3.86	-0.707				
	30000.	*3.85	-0.614				
	50000.	3.95	-0.551				
100000.	4.03	-0.450					
Ba II 6S 9P 1478.8Å C= 0.20E+20	5000.						
	10000.						
	20000.						
	30000.	*7.29	-1.20				
	50000.	*7.60	-1.13				
100000.	*7.82	-0.884					
Ba II 6P 7S 4769.5Å C= 0.17E+22	5000.	*17.9	*6.13	*0.406	*0.196		
	10000.	12.5	5.70	*0.811	*0.513		
	20000.	9.77	4.65	*1.08	*0.764		
	30000.	8.92	4.38	*1.25	*0.952		
	50000.	8.35	3.75	*1.45	*1.18	*1.23	*0.925
	100000.	7.95	2.93	*1.71	*1.47	*1.46	*1.17
Ba II 6P 8S 2729.5Å C= 0.26E+21	5000.						
	10000.	*8.23	*4.57				
	20000.	7.19	3.99				
	30000.	6.97	3.60				
	50000.	6.67	3.26				
100000.	6.79	2.67					
Ba II 6P 9S 2257.6Å C= 0.99E+20	5000.						
	10000.						
	20000.	*10.5	*5.45				
	30000.	*10.3	*4.98				
	50000.	*10.8	*4.41				
100000.	10.8	3.78					
Ba II 6P 6D 4051.2Å C= 0.38E+21	5000.	*14.3	*6.62				
	10000.	11.5	5.35				
	20000.	9.84	4.35				
	30000.	9.36	3.86				
	50000.	8.96	3.32				
100000.	8.59	2.67	2.30	1.74			
Ba II 6P 7D 2599.5Å C= 0.11E+21	5000.						
	10000.	*8.77	*3.28				
	20000.	*8.30	*2.73				
	30000.	8.27	2.42				
	50000.	8.35	2.09				
100000.	8.45	1.65					
Ba II 6P 8D 2206.7Å C= 0.45E+20	5000.						
	10000.						
	20000.	*12.8	*4.61				
	30000.	*13.1	*4.20				
	50000.	*13.5	*3.61				
100000.	*13.9	*2.93					
Ba II 5D 6P 6236.6Å C= 0.62E+22	5000.	11.9	-0.100	*0.394	-0.523E-02	*0.425	-0.520E-02
	10000.	8.94	-0.397E-01	*0.723	-0.151E-01	*0.818	-0.146E-01
	20000.	6.85	0.318E-01	0.923	-0.301E-01	*0.986	-0.276E-01
	30000.	6.01	-0.238E-01	1.01	-0.408E-01	*1.07	-0.348E-01
	50000.	5.29	0.821E-02	1.10	-0.536E-01	*1.16	-0.459E-01
	100000.	4.71	0.112E-02	1.18	-0.689E-01	*1.21	-0.566E-01
Ba II 5D 7P 2249.7Å C= 0.19E+21	5000.	*3.95	-0.357				
	10000.	3.17	-0.222				
	20000.	2.77	-0.265				
	30000.	2.66	-0.197				
	50000.	2.60	-0.180				
100000.	2.57	-0.171	*0.647	-0.280			

PERTURBERS ARE: TRANSITION	T(K)	ELECTRONS		PROTONS		IONIZED HELIUM	
		WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)	WIDTH(Å)	SHIFT(Å)
Ba II 5D 8P 1779.8Å C= 0.53E+20	5000.						
	10000.	*4.85	-0.930				
	20000.	*4.58	-0.769				
	30000.	*4.57	-0.690				
	50000.	4.68	-0.582				
100000.	4.76	-0.478					
Ba II 5D 9P 1605.9Å C= 0.24E+20	5000.						
	10000.						
	20000.						
	30000.	*8.55	-1.41				
	50000.	*8.90	-1.31				
100000.	*9.16	-1.00					
Ba II 5D 5F 1916.7Å C= 0.86E+20	5000.	*3.62	*1.76				
	10000.	*2.86	*1.45				
	20000.	2.57	1.19				
	30000.	2.47	1.06				
	50000.	2.40	0.890				
100000.	2.38	0.709					
Ba II 5D 6F 1686.4Å C= 0.46E+20	5000.						
	10000.	*4.06	*1.19				
	20000.	*3.92	*1.06				
	30000.	*3.97	*0.949				
	50000.	4.11	0.793				
100000.	4.30	0.647					
Ba II 5D 7F 1565.3Å C= 0.20E+20	5000.						
	10000.						
	20000.						
	30000.	*7.63	*0.581				
	50000.	*8.20	*0.497				
100000.	*8.67	*0.405					
Ba II 4F 5D 2323.8Å C= 0.12E+21	5000.	*3.53	*0.293E-01	*0.107	*0.432E-01		
	10000.	2.73	0.101	*0.211	*0.106		
	20000.	2.19	0.114	*0.269	*0.154		
	30000.	1.99	0.105	*0.302	*0.190		
	50000.	1.78	0.859E-01	*0.345	*0.238		
100000.	1.56	0.840E-01	*0.398	*0.285	*0.345	*0.229	

2, the collision volume (V) multiplied by the perturber density (N) is much less than one and the impact approximation is valid (Sahal-Bréchet, 1969ab). Values for $NV > 0.5$ are not given and values for $0.1 < NV \leq 0.5$ are denoted by an asterisk. Stark broadening parameters for densities lower than tabulated, are linear with perturber density. When the impact approximation is not valid, the ion broadening contribution may be estimated by using quasistatic approach (Sahal-Bréchet 1991 and Griem 1974). In the region between where neither of these two approximations is valid, a unified type theory should be used. For example in Barnard et al. (1974), a simple analytical formula for such a case is given. The accuracy of the results obtained decreases when broadening by ion interactions becomes important.

The analysis of present results and comparison with available experimental and theoretical data will be published elsewhere (Dimitrijević and Sahal-Bréchet, 1996c).

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ТАБЕЛЕ ПАРАМЕТАРА ШТАРКОВОГ ШИРЕЊА СПЕКТРАЛНИХ ЛИНИЈА Ва I И Ва II

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