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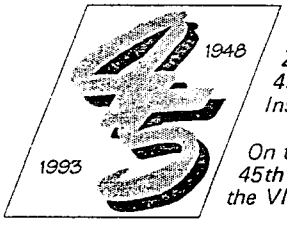

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STARK BROADENING OF FOURTHLY CHARGED NITROGEN SPECTRAL LINES

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1. INTRODUCTION

Stark broadening of multicharged ion spectral lines has a new interest in Astrophysics owing to the recent development of research on the physics of the stellar interiors [1]. Moreover, the knowledge of N V Stark broadening parameters is useful also for the spectroscopic diagnostic in atmospheres of hot stars and for the investigation of hot dense plasmas in laboratory [2-4] , due to its presence as an impurity in many laboratory plasma sources.

By using the semiclassical-perturbation formalism [5-6] we have calculated electron-, proton-, and ionized helium-impact line widths and shifts for 30 N V multiplets. A summary of the formalism is given in Ref. [7]. Our aim here is to discuss the results for N V, along with a comparison with experimental data [2-4] .

2. RESULTS AND DISCUSSION

Energy levels for N V lines have been taken from Ref. [8]. Oscillator strengths have been calculated by using the method of Bates and Damgaard [9 -10] . For higher levels, the method described by Van Regemorter et al. [11] has been used. In addition to the electron-impact full halfwidths and shifts, Stark broadening parameters due to proton-, and ionized

Table 1. Comparison between the experimental Stark full half width for $3s^2S_{1/2} - 3p^2P_{1/2}$ N V line (W_M-Böttcher et al, [2]), with different Stark width (W in Å) calculations at the electron density N = 1.8 x 10^{18} cm^{-3} and T=145.000 K.

W_{DSB} : present semiclassical calculations;
W_{DK} : modified semiempirical method [14], results from Ref. [2];
W_G :simplified semiclassical approach [13],results from Ref.[2];
W_{HB1} : quasiclassical Gaunt factor approach [15-16], results from Ref. [2];
W_{HB2} : quasiclassical Gaunt factor approach [17-18], results from Ref. [2]
W_B : simplified approach of Baranger [18], results from Ref. [2];
W_P : estimate based on regularities [4,20],results from Ref. [2];

N V $3s^2S_{1/2}-3p^2P_{1/2}$, λ=4603.7 Å, T=145,000 K, N=1.8 10^{18} cm^{-3}

W_M(Å)	W_{DSB}(Å)	W_{DK}(Å)	W_G(Å)	W_{HB1}(Å)	W_{HB2}(Å)	W_B(Å)	W_P(Å)
4.92	3.71	2.41	3.03	2.12	2.51	4.39	1.99

helium- impacts have been calculated. Thus we have provided Stark broadening data for all the important charged perturbers in stellar atmospheres. Our results are given for perturber densities 10^{15} - 10^{21} cm^{-3} and temperatures of T = 50,000 - 1,000,000 K, and will be published elsewhere [12]. In Table 1 our results for the 3s - 3p multiplet are compared with the experimental results and the calculations of Böttcher et al [2]. The latter were performed using the simplified semiclassical method [13], the modified semiempirical approach [14], the two variants of the quasiclassical Gaunt factor approximation of Hey and Breger [15-18], the approach of Baranger [19] and the simple estimates based on regularities and systematic trends [4,20].

Table 2. Comparison between the experimental Stark full halfwidths of N V lines (W_m) with our results (W_{DSB}), calculations (Bötcher et al, [2]) using simplified semiclassical method (Griem, 1974, [13]) (W_G) and estimates based on regularities (Puric et al, 1987, [4]) (W_P). Experimental data are obtained by: (a) Puric et al (1987) [4], (b) Bötcher et al (1987) [2].

Trans.	λ(Å)	$N(10^{17}cm^{-3})$	T(K)	W_M(Å)	W_{DSB}(Å)	W_P(Å)	W_G(Å)	Ref.
3s-3p	4603.8	1.78	50000	0.338	0.488	0.340		(a)
	4619.9	1.78	50000	0.338	0.488	0.340		(a)
3p-4d	713.8	7.7	124100	0.42	0.085		0.11	(b)
3d-4f	747.6	7.7	124100	0.30	0.050		0.071	(b)

In Table 2 we compare our results with the experimental data of Puric et al (1987) and Bötcher et al (1987) as well as with the calculations (Bötcher et al, 1987) obtained by using the simplified semiclassical method (Griem, 1974) and the simple estimates of Puric et al (1987). Our results are in reasonable agreement with experimental data for 3s - 3p multiplet but disagree considerably from experimental values for 3d - 4p and 3d - 4f lines.

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