

**INFLUENCE OF IMPACTS WITH CHARGED PARTICLES ON Cd I
AND F III SPECTRAL LINES IN STELLAR PLASMA (MSc Thesis)**

ZORAN SIMIĆ

*Astronomical Observatory, Volgina 7, 11160 Belgrade, Serbia
E-mail: zsimic@aob.bg.ac.yu*

Data on the Stark broadening of neutral cadmium and doubly ionized fluorine are of interest not only for laboratory but also for astrophysical plasma research as e.g. for stellar spectra analysis and synthesis, for cadmium and fluorine abundance determination and opacity calculations. Abundance analysis for A type stars showed the presence of neutral cadmium in stellar spectra of e.g. 68 Tauri, χ Lupi and V816 Centauri, in distinction from fluorine which cosmic abundance is smaller.

We have calculated within the semiclassical perturbation approach the Stark broadening parameters of 11 Cd I singlets and 13 triplets in ultra-violet and visible, and 24 Cd I triplets in infra red spectral ranges, for temperatures between 2500 K and 50000 K, and for perturber density of 10^{16} cm^{-3} . Also, we have calculated within the same approach such parameters for F III $2p^3 \ ^4S^o - 3s \ ^4P$ resonant line. Moreover, for 10 F III multiplets, line widths have been obtained within the modified semiempirical approach, for temperatures between 10000 K and 300000 K, and for perturber density of 10^{17} cm^{-3} .

We compared our results for Cd I $5p \ ^3P^o - 6s \ ^3S^o$ multiplet with existing experimental data. Also, for the same multiplet there are theoretical results obtained within GBKO approach.

In the case when there are no reliable data for Stark broadening, investigation of regularities and systematic trends can provide fast estimate of missing values, especially if it is not necessary to have the high accuracy for each particular line, and a good average accuracy for large number of lines is sufficient. We investigated here the regularity within a spectral series of Cd I $5s^2 \ ^1S - np \ ^1P^o$ and we confirmed such behavior.

We have analyzed the influence of Stark broadening mechanism of neutral cadmium and doubly ionized fluorine in comparison to the Doppler one for A type star atmosphere ($T_{eff}=10000 \text{ K}$, $\log g=4$), close to the conditions for 68 Tauri ($T_{eff}=9025 \text{ K}$, $\log g=3.95$). Our results show that Stark broadening data for neutral cadmium and doubly ionized fluorine lines are needed for an adequate description of stellar spectra and plasma modelisation.