

## STARK BROADENING OF Ar XV SPECTRAL LINES WITHIN X-WAVELENGTH RANGE

Milan S. Dimitrijević<sup>1</sup>, Andjelka Kovačević<sup>2</sup>,  
Zoran Simić<sup>1</sup>, Sylvie Sahal-Bréchet<sup>3</sup>

<sup>1</sup>*Astronomical Observatory, Belgrade, Serbia*

*E-mail: mdimitrijevic@aob.bg.ac.yu*

<sup>2</sup>*Faculty of Mathematics, Belgrade, Serbia*

<sup>3</sup>*Observatoire de Paris, Meudon, France*

With the development of satellite born spectroscopy, the spectral lines of trace elements become astrophysically significant and for example, far UV lines of Ar VII were discovered recently in the spectra of very hot central stars of planetary nebulae and white dwarfs (Werner et al. 2007). The interest for X-range of the wavelenghts for trace element spectra increases also with the space born instruments observing within this domain, like X-ray space observatory "Chandra". In order to provide Stark broadening data within the X-ray wavelength range, of interest for modelling and analysis of astrophysical plasmas in extreme conditions, we have performed semi-classical calculations of Stark broadened line widths and shifts for 8 Ar XV multiplets with wavelengths less than 100 Å. Stark broadening parameters for Ar XV lines are determined by using the semiclassical-perturbation formalism (Sahal-Bréchet, 1969ab). This formalism and the corresponding computer code have been updated and optimized several times (see e.g. Dimitrijević and Sahal-Bréchet, 1996). A brief review of the calculation procedure, with discussion of updatings and validity criteria is given by Dimitrijevic (1996).

Electron-impact (Stark) line width  $W$  (FWHM - Full Line Width at Half Maximum) and shift  $d$  for 8 fourteen times charged argon ion lines have been calculated within the semiclassical-perturbation approach. The atomic energy levels needed for the calculations were taken from Bhatia and Landi (2008) and the energy of ionization of Ar XV from NIST database. There are no other experimental or theoretical results for comparison.

The obtained Stark broadening parameters for prominent spectral lines of Ar XV within the X wavelength range, could be useful for analysis and modelling of X ray radiation from hot and dense astrophysical plasmas but also for inertial fusion research, where Ar and other trace elements could be added to modify characteristics of fusion plasma, and for laboratory plasma research in X-ray domain.

## References

- Bhatia, A. K., Landi, E.: 2008, *Atomic Data and Nuclear Data Tables*, **94**, 223.  
Dimitrijević, M. S.: 1996, *Zh. Prikl. Spektrosk.*, **63**, 810.  
Dimitrijević, M. S., Sahal-Bréchet, S.: 1996, *Physica Scripta*, **54**, 50.  
Sahal-Bréchet, S.: 1969a, *A&A*, **1**, 91.  
Sahal-Bréchet, S.: 1969b, *A&A*, **2**, 322.  
Werner, K., Rauch, T., Kruk, J. W.: 2007, *A&A*, **466**, 317.

Poster

## AB INITIO STARK BROADENING CALCULATIONS FOR Ca V SPECTRAL LINES

Rafik Hamdi<sup>1</sup>, Nebil Ben Nessib<sup>1</sup>, Milan S. Dimitrijević<sup>2</sup>  
and Sylvie Sahal-Bréchet<sup>3</sup>

<sup>1</sup>*Groupe de Recherche en Physique Atomique et Astrophysique,  
Institut National des Sciences Appliquées et de Technologie,  
Centre Urbain Nord B. P. No. 676, 1080 Tunis Cedex, Tunisia  
E-mail: hamdi.rafik@gmail.com, nebil.benessib@planet.tn*

<sup>2</sup>*Astronomical observatory, Volgina 7, 11060 Belgrade 38, Serbia  
E-mail: mdimitrijevic@aob.bg.ac.yu*

<sup>3</sup>*Laboratoire d'Etude du Rayonnement et de la Matière en Astrophysique,  
Observatoire de Paris, Section de Meudon, UMR CNRS 8112,  
Bâtiment 18, 5 Place Jules Janssen, F-92195 Meudon Cedex, France  
E-mail: Sylvie.Sahal-Brechot@obspm.fr*

Using semiclassical perturbation approach, we have obtained ab initio Stark broadening parameters for 7 Ca V multiplets. Energy levels and oscillator strengths are calculated using SUPERSTRUCTURE code.

Results are obtained as a function of temperature, for perturber density of  $10^{17}$   $\text{cm}^{-3}$ . In addition to electron-impact full halfwidths and shifts, Stark broadening parameters due to proton- and ionized helium-impacts have been calculated. Thus, we have provided Stark broadening data for all the important charged perturbers in stellar atmospheres.

This work is a reference for Ca V ion because there is no other previous data. New Stark parameters calculations and measurements for this ion will be interesting to check the validity of our calculations.