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Invited Lecture

STARK BROADENING IN PRE WHITE DWARFS, WHITE DWARFS AND NEUTRON STARS

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As the difference with plasmas in laboratory, plasma conditions in astronomy are more various, and Stark broadening may be of interest for incomparably wider interval of temperatures and electron densities. For example it may be important for interstellar molecular clouds, where typical electron temperatures are around 30 K or smaller, and typical electron densities 2-15 cm-3, or for neutron star atmospheres with temperatures of T=10^6 -10^7 K, and electron densities of 10^{22} - 10^{24} cm^{-3}.

Plasma conditions particularly favorable for Stark broadening are in white dwarf- and pre white dwarf - atmospheres, where this broadening mechanism is dominant. For example in hot hydrogen-deficient pre-white dwarf stars T_{eff} = 75 000 K - 180 000 K and log g = 5.5-8.0, Stark broadening is usually dominant line broadening mechanism in comparison with thermal Doppler broadening, as well as for DO white dwarfs, and for much cooler DA and DB, with typical effective temperatures of 10 000 K - 20 000 K. This is also the case for neutron star atmospheres.

In this review, we will consider Stark broadening of non hydrogenic spectral lines in the impact approximation in pre-white dwarf, white dwarf, and neutron star atmospheres and the corresponding results obtained by members of the Group for Astrophysical Spectroscopy on Belgrade Astronomical Observatory, and their partners from France, Tunisia, Bulgaria, Russia and Canada. Additionally, we will present new results fot the Stark widths and shifts for Xe VI spectral lines, of interest for such plasmas investigations, obtained within the semiclassdical perturbation approach. The obtained Stark broadening parameters, needed for analysis and modelling of the corresponding stellar atmospheres enter in the STARK-B database (http://stark-b.obspm.fr/), where our results of such calculations are included. The database STARK-B enters in the new search facility for such data, Virtual Atomic and Molecular Data Center (VAMDC - http://vamdc.org/) and also has a link in Serbian Virtual Observatory (SerVO - http://servo.aob.rs/).