

## **On the Stark broadening parameters of Fe XXV spectral lines for the investigation of neutron stars**

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Broadening of spectral lines by collisions with charged particles or Stark broadening is significant for many important astrophysical quantities as for example modelling of stellar plasma, analysis and synthesis of spectral lines, it enters in the calculations of absorption coefficient, opacity, radiative transfer, abundance determination, acceleration of gravity etc. Stark broadening is the most important pressure broadening mechanism of spectral lines in the conditions of neutron star atmospheres and their environment.

However, when Stark broadening parameters of Fe XXV lines are needed for neutron star investigations, they are calculated very approximately, and without taking into account the magnetic field (see e.g. Paerels 1997, Madej 1989, Majczyna et al. 2005, Suleimanov et al. 2014). Usually very simple formula of Cowley (1971) or approximate formula from Griem (1974) book (cf. Chap. IV 6) are used.

In this contribution we calculated widths and shifts of Fe XXV spectral lines broadened by collisions with important charged constituents of neutron star atmospheres, electrons, protons and Fe XXVII ions. Calculations have been performed for a grid of temperatures and electron densities for plasma conditions of interest for neutron star atmospheres and their environments. Since such results are also of interest for Virtual Observatories we will prepare them additionally for implementation in STARK-B database (Sahal-Brechet, et al. 2015), which is also a part of Virtual Atomic and Molecular Data Center - VAMDC (Dubernet et al. 2010).

## References

- Cowley, C. R., 1971, *Observatory*, 91, 139
- Dubernet M., Boudon, L. V., Culhane, J. L., Dimitrijević, M. S., et al., 2010, *J. Quant. Spectrosc. Radiat. Transfer*, 111, 2151
- Griem, H. R., 1974, *Spectral line broadening by plasmas*, Academic press
- Madej, J., 1989, *A&A*, 209, 226.
- Majczyna, A., Madej, J., Joss, P. C., Różanska, A., 2005, *A&A* 430, 643.
- Paerels, F., 1997, *ApJ*, 476, L47.
- Sahal-Bréchet S., Dimitrijević M. S., Moreau N., Ben Nessib N., 2015, *Phys. Scr.*, 50, 054008
- Suleimanov, V. F., Klochkov, D., Pavlov, G. G., Werner, K., 2014, *ApJS*, 210, 13