Progress Report

COLLISONAL CONTRIBUTION TO THE SPECTRAL LINE SHAPE IN MAGNETIZED PLASMAS

L. Haouas, K. Touati and M. T. Meftah

LRPPS laboratory Ouargla University, 30000, Algeria
E-mail: mewalid@yahoo.com, meftah.tayeb@univ-ouargla.dz

The collisional contribution to the spectral line shape is modified by the presence of the magnetic field, in the case of electron perturbers, the resolution of the stochastic equation is based on the theory of impact of the interaction [1]. In the standard model, the emitter is subjected to a succession of independent collisions carried out by the electrons. The effect of the free electrons is presented by a phenomenological operator of electronic collisions [2], which can be calculated by the method of relaxation. This collision operator $\Phi(v, B)$ must take into account the influence of the magnetic field on the collision: the trajectory of the perturbers is modified in the presence of the magnetic field, as well as the velocity distribution function of the latter. In the standard models of the calculation of the Spectral line shape the influence of the magnetic field on the curvature of the trajectories of the charged particles is neglected, we made a detailed discussion by which we demonstrated, that we presence of magnetic field, this approximation is valid only when one is in the range where the radius of Larmor ω_L is greater than the length of Debye λ_{D} (laboratory plasmas), for the remaining of the cases, especially at densities Ne$<10^{14}$ cm^{-3} and for very strong fields B about 10^5 G (astrophysical plasmas) the influence of the curvature of the trajectories is not negligible and then you have to take it into account. We have therefore proposed a model of the collision operator in the presence of the magnetic field in order to give a more realistic image of the line profiles. Our collision operator model is proposed in the presence of the magnetic field and includes fine structure in the general case in the absence of any approximations. To validate and close this work, we present our computational results with and without the magnetic field. These calculations will provide a useful reference for testing the numerical development for arbitrary spectral line shape to enable the diagnosis of several plasma parameters, also this study makes it possible to specify the domains of validity of the different theories.

References

[1] Nguyen-Hoe, Drawin, H. W., Herman, L.: 1967, *JQSRT*, Vol. **7**, 429-474.
[2] Rosato, J., Marandet, Y., Peiffer, A., Capes, H., Godbert-Mouret, L., Koubiti, M., Stamm, R.: 2014, *Contrib. Plasma Phys.*, **54**, 565.