V Serb. Conf. on Spectral Line Shapes in Astrophysics
Vršac, 6-10. June, 2005.
Program and Abstracts

Poster paper

COMPUTER-SIMULATED BALMER-ALPHA LINE PROFILE FOR CALCULATING THE ELECTRON NUMBER DENSITIES

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In general, the profile of the spectral lines observed in cold plasmas with a low density and at pressures of over 100 Torr, can be approximated well enough by means of Voigt type functions. This function is the result of the convolution of a gaussian function with a lorentzian function. In this way, by using a model permitting us to fit the Voigt function and intermediate theories, it is possible to obtain fundamental parameters characterizing the plasma (electron density and temperature, gas temperature, etc.)

In the present work, we have fitted the experimental profiles of the Hydrogen Balmer serie lines to a simulated profile obtained from the theoretical Stark profiles given by Gigosos *et al*[M.A. Gigosos, M.A. Gonzlez and V. Cardeoso: Spectrochim. Acta B **58** (2003) 1489.]. by means of the Model Microfield Method. For this treatment it is necessary to find out the most important effects causing the line broadening in our "low density plasmas": Van der Waals, Doppler, instrumental and Stark broadening.

This study was carried out for the first Hydrogen Balmer series line (H_α), this being the most problematic line because it depends heavily on the electron temperature and has a strong broadening by ion dynamics. This method permits the inclusion of ion dynamics effects and also to take into account the difference between T_e and T_g existing in the plasma, by means of the reduced mass, μ. (In our Ar-H plasma with $T_e = 6500$K y $T_g = 1400$K, μ is approximately 4). The best simulated profile corresponded to the convolution between a Van der Waals profile for a gas temperature of 1400 K (≈ 0.035), a Gaussian profile (Doppler+Instrumental) of approximately 0.02 nm and a Stark profile for a μ equal to 4 and an electron density of $\approx 4 - 5 \cdot 10^{14}$cm^{-3}, with a 95% approximation to the experimental profile.