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ON MODELING OF THE SPECTRAL LINE SHAPE OF HEAVY NEUTRAL, NON - HYDROGEN EMITTERS

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In accordance with plasma line broadening theory, the shapes of isolated spectral lines of the heavy neutral emitters, in plasmas of medium and high densities are predominately the result of collisions with the plasma electrons. These electron impacts cause a symmetric profile of Lorentzian shape. Griem et al. (1962) developed a semi-classical theory for the shapes of non-hydrogen lines emitted from plasmas and broadened by the local electric fields of both electrons as well as ions. This thery gives well known assymetrical $f_{A,R}(x)$ profile.

The effects on spectral line shape due to collisions of electrons with the radiating atoms were treated by an impact approximation, while influences of local electric fields generated by the plasma ions were assigned to asymmetries near the center of isolated spectral lines. Such asymmetries can be caused by the microfield-induced quadratic Stark shifts of the energy levels of the radiating atoms. Under usually encountered experimental conditions, where ion motion can be neglected for heavy element lines, local electric field due to plasma ions is treated by a quasi-static approximation. Appearance of asymmetry in spectral line profile provides the possibility for experimental separation of the quasi static ion broadening contribution from the electron impact broadening.

This paper deals with the convenience of using the nonlinear regression with the purpose to evaluate the Stark parameters directly from the experimental profiles of isolated or overlapped spectral lines of neutral atoms emitted from wall stabilized electric arc.