SECTION 3 — PHENOMENA IN PLASMAS

3.1 Déplacement des raies de l'atome CsI dû à l'action simultanée d'un champ électrique et d'un champ magnétique constants

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3.2 A study of the Stark broadening of isolated ion lines in plasma

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The GBKO theory, based on the straight classical perturber path approximation, proved highly succesful in predicting widths and shifts of isolated lines of neutrals. However, the experimental half-widths for singly ionized atoms other than helium yielded values 2 to 10 times larger[1,2] than theoretically predicted[3]. In this paper, the advantages and limitations of Griem's semiempirical approach[4] for evaluation of half-widths of isolated ion lines, caused by electron impact, will be discussed.

Because of the lack of reliable excitation functions for electron-atom collisions, Griem was extensively making use of the semiempirical Gaunt factors (proposed by Van Regemorter and Seaton), extrapolating from below the excitation thresholds (elastic collisions).

Griem derived semiclassical analytic expresion for the half-width of an isolated ion line:

$$W_{se} \approx 8 \left(\frac{\pi}{3}\right)^{3/2} \frac{\hbar}{m a_0} N \left(\frac{E_H}{kT}\right)^{1/2} \cdot \sum \left[|\langle i'|r|i\rangle|^2 \bar{g}_{se}\left(\frac{\bar{E}}{|\Delta E_{i'i}|}\right) + |\langle f'|r|f\rangle|^2 \bar{g}_{se}\left(\frac{\bar{E}}{|\Delta E_{f'f}|}\right)\right], \tag{1}$$