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Program and Abstracts

Short talk

SEMI-CLASSICAL AND MODIFIED SEMI-EMPIRICAL IMPACT STARK BROADENING CALCULATIONS OF SINGLY-IONIZED CARBON AND OXYGEN SPECTRAL LINES

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Using the semi-classical impact perturbation theory including both dipole and quadrupole terms in the expression of electrostatic interaction between the optical electron and the perturber, we calculated widths and shifts of singly ionized carbon and oxygen spectral lines and compared with experimental results and those calculated by Griem. Energy levels and oscillator strengths have been taken from TOPbase. Mean radius and mean square radius have been calculated within hydrogenic approximation using the effective quantum numbers n_i^* obtained from TOPbase.

The impact approximation was checked for each case using the appropriate condition of validity (the collision volume must be very small compared to the inverse of the perturber density).

The species of ionic perturbers depends on the plasma composition in a particular experiment but since in stellar plasma the hydrogen is the most abundant element, we provided also the proton-impact Stark widths for possible astrophysical applications.

We also calculated modified semi-empirical widths using the formalism of Dimitrijević and Konjević, where the mean square radius is expressed in terms of the oscillator strengths for the contribution of the collisional transitions with $\Delta n = 0$ and hydrogenic approximation is used for $\Delta n \neq 0$.

Inside the same multiplet, widths and shifts of particular spectral lines in existing experimental data are determined by scaling multiplet values.

The agreement found between experimental and semi-classical values demonstrates that the method can be used for C II and O II Stark width calculations, especially when more sophisticated methods are not applicable in an adequate way.