Invited Lecture

STARK BROADENING FROM IMPACT THEORY TO SIMULATIONS

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Stark profiles are used in astrophysics and other kinds of plasmas for obtaining information on the charged environment of the emitting particles. Using the light for conveying information on the plasma often requires a modeling of both the plasma and radiator. We will review different situations requiring different modeling approaches. The impact broadening approach considers the emitter plasma interaction as a sequence of brief separate collisions decorrelating the radiative dipole. Impact models are very effective in many types of plasmas, and can be applied to most kinds of emitters, hydrogen being an exception in many types of plasmas. We will identify situations for which other models are helpful, e.g. the far wing of a line or the case were the emitter-perturbers interactions can not be represented by a sequence of collisions. Such models use the statistical properties of the electric field created by the perturbing particles. In astrophysics, the model microfield methods provide an efficient alternative for the cases were neither the impact nor the static approximation are valid. For such conditions several models have been developed and interfaced with atomic data. Their accuracy can be tested by simulation techniques avoiding some approximations, but at the expenses of computer time. Such computer simulations can be used for analyzing the various physical processes involved in plasmas under arbitrary conditions. We will illustrate their use in the case of wave collapse and plasma rogue waves.