LINE SHAPES AND INTENSITIES IN FLUCTUATING PLASMAS

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Line shapes and intensities of atoms and ions in a plasma may be affected by plasma fluctuations. We want to describe the effect on radiative properties of equilibrium and out of equilibrium plasma fluctuations with a unique formalism. For this purpose, we model the fluctuating variables by a stepwise constant stochastic process obeying to a prescribed probability density function (PDF). The time durations on each step are sampled along a waiting time distribution (WTD). For Stark line shapes in equilibrium plasmas, the Model Microfield Method (Frisch and Brissaud, JQSRT 11, 1753(1971)) provides a simple model using an exponential WTD. This model may be extended to other stochastic processes, as long as stationarity conditions are satisfied. We compare Lyman alpha profiles obtained with exponential, Gaussian and Weibull WTD for a wide range of plasma densities. Atomic populations may also be changed in presence of turbulent fluctuations of the plasma density or temperature. Gamma function PDF for the density or temperature are sometimes measured in a turbulent plasma. Assuming an exponential WTD we have studied the behaviour of the atomic population of simple systems as a function of the typical turbulent frequency.