The principles of non-Maxwellian and non-stationary atomic kinetics driven by suprathermal electrons and intense photon sources

F.B. Rosmej

Sorbonne Université, Faculté des Sciences, UMR 7605, 4 Place Jussieu, 75252 Paris, France
Laboratoire d'Utilisation des Lasers Intenses, Ecole Polytechnique, CRNS, UPS, CEA, Palaiseau, France

The present overview talk provides an introduction to the general principles of atomic population kinetics that is at the very heard of all radiative properties of matter and emission spectroscopic diagnostics. Particular attention is paid to the phenomena of suprathermal electrons and intense photon sources that are discussed along with relevant atomic physics processes in plasmas [1]. While standard methods [2] fail, it is demonstrated that even in non-Maxwellian and non-stationarity plasmas general characteristics can be derived. These characteristics concern the so-called "Atomic Physics Confinement Parameter", the distortions of the charge state distributions, the impact of the multi-channel dielectronic recombination [3] and the ionization potential depression in plasmas that modifies effectively the number of atomic bound levels [4].

Theory is discussed along with numerous examples and proof of principle experiments. Finally we mention very recent developments concerning generalized atomic physics processes [5], schocked atomic systems [6] and ultra-short photon bursts that invalidate the standard Fermi's Golden rule to determine quantum mechanical cross sections [7].

References:

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