Multiple Ionization under Strong Short Wavelength Radiation

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Strong, short wavelength radiation, of pulse duration in the range of few to tens of femtoseconds obtained in present day Free Electron Lasers (FEL) has ushered in a new era in laser- matter interactions. With photon energies ranging from the XUV to hard X-rays, various layers of new processes and phenomena are expected to emerge.

Although the hard X-ray machines have become operational only recently, in the XUV to soft X-ray range, a substantial body of experimental and theoretical work has already produced a variety of results, posing at the same time a number of questions for the future.

Owing to the high intensity, the common feature of those processes is the non-linear dependence on the intensity of the radiation and the production of multiply ionized species, occasionally of quite high ionization stage. After a broad overview of the landscape of existing data and general understanding, I outline the underlying mechanisms and their dependence on the photon energy range, the present theoretical framework, as well as an attempt to identify crucial areas of experimental and theoretical investigations necessary for further progress.