Asymmetries in the angular distribution of photoelectrons produced by intense circularly polarized XUV radiation

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Two topics will be discussed from the theoretical viewpoint, which can be potentially studied at FERMI with the use of circularly polarized XUV radiation in the photon energy range 15–200 eV: (a) nonlinear non-dipole effects in the XUV regime and (b) coherent control of angular distributions of photoelectrons in bichromatic ($\omega + 2\omega$) ionization. These phenomena are better known in the case of linearly polarized radiation. For circularly polarized light, both phenomena can at present be studied experimentally only at FERMI, because they need high intensity of the radiation in case (a) and additionally longitudinal coherence in case (b).

For point (a), we concentrate on the sequential two-photon double ionization of the outer shells of noble gases. Theoretical predictions will be discussed for the non-dipole parameters in the angular distribution of electrons from the second ionization step for all three final double charged ionic states, $np^4\ ^3P$, ^1D, ^1S in neon, argon, krypton.

For point (b) we demonstrate controlling the interference between one-photon ionization by the second harmonic and two-photon ionization by the fundamental when the energy of the photon crosses an intermediate resonance. The illustrations will be given for the 2p ionization of neon for the fundamental frequency in the region of the $2p^5 3s\ ^1P$ state and supplemented by a hydrogen example.