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Higher harmonics and attosecond pulse generation by laserinduced Thomson Scattering in atomic clusters

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The generation of higher harmonics of intense lasers and associated attosecond pulses is a field of contemporary interest which promises a variety of applications ranging from the fundamental to applied sciences. In this work, we have probed the interaction of the intense ($\geq 10^{19}$ W/cm^2) 248 nm laser with Deuterium clusters using classical molecular dynamics simulation. The Thomson scattered radiation emitted by the electrons is considered by using standard Liénard-Wiechert potentials. We have studied the angular distribution of the radiation emitted by electrons and observed that the ponderomotive force exerted by these highly intense laser pulses leaves a very distinct signature of the radiated energy along a particular direction, which in principle has its own diagnostic potential to directly measure the intensities of incident laser pulses. Furthermore, the interaction of lasers with intensities ~10^{19}–10^{21} W/cm^2 with atomic clusters results in the attosecond burst of energy in form of electromagnetic radiations, which fall under the XUV to soft X-rays regime of electromagnetic radiation. The parameters of the atomic clusters, e.g. size (number of atoms), atomic species, etc. can be easily controlled experimentally and these in turn, change the number of electrons participating in the interaction process and hence, the properties of Thomson scattered radiation can be tuned accordingly.