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Ab initio **calculations of atomic coherence excited by optical pulses: CEP effects and generation of X-ray radiation** SUMAN DHAYAL, YURI ROSTOVTSEV, univ of North Texas — Recent progress in ultrashort, e.g. attosecond, laser technology allows to obtain ultra-strong fields which can be of the same order of magnitude as the electric field created by an atomic nucleus. Interaction of such strong and broadband field with atomic systems even under the action of a far-off resonance strong pulse of laser radiation should be revisited. As we have shown, such pulses can excite remarkable coherence on high frequency transitions. We have found and analyzed analitical solutions for various pulse shapes. We have developed new mechanisms of efficient atomic coherent excitation by using two-frequency laser pulses and via tunneling through electric fields. We have done *ab initio* calculations using TDDFT for several atoms and simple molecules interacting with strong optical fields. We compare efficiency generation with the efficiency of high harmonic generation approach, and discuss the CEP effects and possible applications of the results obtained to cooperative generation of XUV radiation. The efficiency of XUV generation is calculated for particular candidates for XUV radiation such as H (100 nm) and He (50 nm) atoms and H-like ions (Li^{2+} (30 nm), as well as Ar^{8+} and Xe^{8+} (30-50 nm).

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