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High-harmonic generation in lanthanides-containing plasmas

RASHID GANEEV, GANJABOY BOLTAEV, VYACHESLAV KIM, MAZHAR IQBAL, NAVEED ABBASI, ALI ALNASER, American University of Sharjah — High-order harmonic generation (HHG) in laser-produced plasmas (LPPs) from the very beginning provided a promising route for generating coherent extreme ultraviolet radiation using different targets. Among new potentially interesting elements of periodic table, the group of non-radioactive solid materials with large atomic mass, such as lanthanides, can be considered. This also allows studying the high-order nonlinear optical properties of those elements thorough HHG in LPPs. We have analyzed the high-order harmonic spectra produced during propagation of the femtosecond pulses through the lanthanide-contained LPPs. The species under investigation (praseodymium, terbium, lanthanum, and ytterbium) are among the heaviest non-radioactive solid elements of periodic table. We analyzed HHG in the plasmas produced on the surfaces of these lanthanides and their oxides (La, Yb, Pr_6O_{11} , Tb_4O_7) using different techniques (two-color pump, application of chirped pulses, variation of the parameters of heating and driving pulses, etc.). We have shown that Yb LPP is the efficient medium for the harmonic generation up to the 73rd order, which is one of the largest harmonic cutoffs generated in the laser-produced plasmas.

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