Generation of mid-infrared pulses during interaction of two-color laser field with atomic clusters

Romanov A A[1,2,@], **Silaev A A**[1,2] **and Vvedenskii N V**[1,2]

[1] Institute of Applied Physics of the Russian Academy of Sciences, Ulyanova 46, Nizhny Novgorod 603950, Russia

[2] Lobachevsky State University of Nizhni Novgorod, Gagarin Avenue 23, Nizhniy Novgorod 603950, Russia

[@] romanoval@ipfran.ru

One of the promising directions for generating short pulses in the mid-IR range uses nonlinear multiwave mixing of two-color laser pulses with a frequency ratio close to two in a gas. In this case, mid-IR radiation is generated at the detuning of the higher frequency from the doubled lower frequency of the laser field. In this work, we show that the use of an atomic cluster gas can lead to the significantly higher efficiency of radiation generation at the detuning frequency as compared to the usually considered atomic or molecular gases. To do this, we numerically investigate the generation of IR radiation during the interaction of a two-color laser pulse with C_{60} fullerene using supercomputer numerical simulation based on time-dependent density functional theory. Based on a comparison of the results obtained for the C_{60} with the results for the hydrogen atom, it is demonstrated that the generation of low-frequency radiation in C_{60} is more than an order of magnitude higher than for hydrogen atoms at intensities corresponding to the same final degree of target ionization. The work was partially supported by the Russian Foundation for Basic Research (Grant No. 20-32-70213).