**Photonuclear reaction of laser-triggered gamma rays for radiography, nuclear medicine and waste transmutation.**

A. V. Brantov1,2, V. G. Lobok1,2, V. Yu. Bychenkov1,2

1Lebedev Physics Institute of the Russian Academy of Sciences, Moscow, Russia

2 Dukhov Research Institute of Automatics (VNIIA), Moscow, Russia

e-mail: brantovav@lebedev.ru

A self-trapping regime of laser pulse propagation in a near-critical density plasma was recently identified as one of the best way to obtain a large number of high-energy well directed electrons by using a laser pulse of the energy range from several joules to few tens joules [1,2] that is well suited for the gamma source [2,3]. The three-dimensional (3D) particle-in-cell (PIC) simulations have demonstrated how adjustment of the laser-plasma parameters to the matching condition [1,2], which warranties stable self-trapping propagation regime, allows to maximize the total charge of laser-accelerated hundred-MeV electron bunches up to several tens of nC. Here, we advance the study of the bremsstrahlung production of gamma rays with a maximum yield from a high-Z converter target placed immediately behind the near-critical density plasma target for electron acceleration with the aim of using the gamma beam for nuclear reaction to assess the possibility of medical isotope production and nuclear waste transmutation. isotope production and nuclear waste transmutation. It has been demonstrated that a 10Hz 30 fs 4J laser pulse is well suited for the production of therapeutic amounts of several standard medical radionuclides .The study of the transmutation of long-lived fusion products showed low efficiency and the need for preliminary isotopes separation. We also present examples of using the bremsstrahlung gamma-ray source for deep single shortshielded radiography of dense samples by end-to-end modeling from PIC to GEANT-4 (Monte-Carlo) simulation [3].

references:

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