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Calculation of X-ray emission produced by a quasi-monoenergetic electron distribution

M. Fanaei[1], L. Nikzad[2], R. Sadighi-Bonabi*[1]
[1] *Department of Physics, Sharif University of Technology, Tehran, Iran;*
[2] *School of Optics and Laser, Tehran, Iran;*
*corresponding author, R. Sadighi-Bonabi

By using an intense ultrafast laser interaction with plasma, generation of accelerated relativistic electrons with quasi monoenergetic spectrum has been possible. Analytic expressions for spectra and emission efficiencies of x-rays bremsstrahlung and characteristic line emission produced by a quasi-monoenergetic electron distribution from several targets are investigated. In this work, a Gaussian profile is assumed for the quasi-monoenergetic electron spectrum. The produced x-ray radiations are compared with the previous achieved results for a Maxwellian electron profile. These results and achievements are discussed in detail. Also, the outcomes can be evaluated with the experimental and simulated results.

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New laser-driven nuclear excitation studies: concepts and proposals

L. Drska, V. Hanus, M. Sinor
Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering, Brehova 7, 115 19 Prague 1, Czech Republic

There has been a great interest in the processes of nuclear excitation and triggering in high-parameter laser-produced plasmas in recent years. A series of papers devoted to the theory of this event has been published. Several experiments have already been attempted to study the excitation of the lowest nuclear levels of medium / high-Z nuclides (Ta 181, U 235 etc.), all the same unsuccessful or inconclusive [1], [2].
In the first part of this paper, the situation will be overviewed and analysis of the reasons of this unsatisfactory state of affairs will be accomplished. Prospects of the possible solving of the problem by using novel / projected laser facilities (esp. LIL / PETAL, XFEL, ELI-Phase1) will be outlined. Potential of the future ELI Beam Facility in the Czech Republic [3] in this area will be stressed. In the second part, some proposals for the excitation and triggering studies using combined high-power and high-intensity LIL / PETAL system (2012) with multi-kilojoule and multi-petawatt parameters [4] will be discussed. Results of preliminary simulations supporting the thinking about potential projects will be shown and conditions essential for meaningful effort in this area will be analyzed. Problems of realistic simulations of such experiments will be addressed.
Completely novel chances for the excitation / triggering studies would be started by constructed / projected facilities XFEL (coherent X-rays ~12 keV, 2014) [5] and ELI (multi-petawatt Phase 1, 2015). Application of intense / coherent high-energy X-rays and / or intense electron / ion beams allows new experimental schemes, extends the range of nuclides to be studied and (maybe) will enable to test some new triggering methods. In the last part of the presentation some possibilities in point (esp. for ELI Beamlines), will be drawn up.

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