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On theoretical support of FAIR relevant experiments by JIHT of RAS

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Theoretical research in the Joint Institute for High Temperature of RAS on the intense laser and particle beams interaction with matter are discussed in view of current and future experiments, in particular with PHELIX at GSI-FAIR, Darmstadt.
A wide-range models elaborated in JIHT RAS are used for the description of material response on the intense laser action. The model is developed on the basis of two-temperature hydrodynamics with heat transport, ionization, plasma expansion, electron-ion collisions and two-temperature equation of state for an irradiated substance [1-6]. The effect of dynamical screening of Coulomb interactions as well as strong interactions in dense strongly coupled plasmas and their influence on the optical properties are studied in a wide frequency range [6]. Comparison of experimental findings with the results of simulation is used both for the numerical model verification and for estimations of the interaction parameters that cannot be measured directly in experiments [1,2, 4-6].
Secondary sources of high energy particles and hard X-ray radiation, produced by the action of in-tense short laser pulses on different targets, are widely used for creation and diagnostics of nonideal plasma (Warm Dense Matter, WDM). The different mechanisms of generation of the high energy electrons are investigated and discussed. Generation of energetic electron bunches in the laser interaction with low density targets, and also with preplasma created by laser prepulses at grazing incidence to solid targets are under discussion [8,9]. The features of bremsstrahlung and betatron X-ray radiation for radiographic applications will be considered. Analysis of the experimental data on characteristic X-ray generation at relativistic laser intensities is presented [7].
The theoretical support of laser-matter experiments and optimization of secondary sources of high energy particles and photons for warm dens matter diagnostics are considered.
References
[1] M.E. Veysman, M.B. Agranat, N.E. Andreev, S.I. Ashitkov, V.E. Fortov, K.V. Khishchenko, O.F. Kostenko, P.R. Levashov, A.V. Ovchinnikov and D.S. Sitnikov. J. Phys. B: At. Mol. Opt. Phys. 41, 125704 (2008).
[2] M.E. Povarnitsyn, N.E. Andreev, E.M. Apfelbaum, et al. App. Surf. Sci. 258, 9480 (2012).
[3] M.E. Povarnitsyn, N.E. Andreev, P.R. Levashov, K.V. Khishchenko, D.A. Kim, V.G. Novikov and O.N. Rosmej. Laser and Particle Beams V. 31 (4), pp 663-671 (2013).
[4] N.E. Andreev, M.E. Povarnitsyn, M.E. Veysman, et al. Laser and Particle Beams, 33, pp. 541-550 (2015).
[5] M E Veysman and N E Andreev. J. Phys. Conf. Ser., V 653, P 012004 (2015)
[6] M. Veysman, G. Röpke, M. Winkel, H. Reinholz. Phys. Rev. E. V. 94. P. 013203 (2016).
[7] O.F Kostenko, N.E Andreev, O.N Rosmej and A. Schoenlein. Journal of Physics: Conference Series 774 (2016) 012112
[8]N.E. Andreev, L.P. Pugachev, M.E. Povarnitsyn, and P.R. Levashov. Laser and Particle Beams, 34, pp. 115–122 (2016).
[9] L.P. Pugachev, N.E. Andreev, P.R. Levashov and O.N. Rosmej. Nuclear Instruments and Methods in Physics Research A 829 pp. 88–93 (2016).

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