

Experimental research of neutron and HXR emission from the dense plasma focus

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The dense plasma foci working on the z-pinch principle are the efficient sources of the intensive pulses of high-energy ions and electrons, and, at the presence of deuterium, neutrons from the deuterium-deuterium fusion reaction [1]. The acceleration mechanism of fast ions and electrons is under discussion to this time. Recently on the plasma focus PF-1000 device in the Institute of Plasma Physics and Laser Microfusion in Warsaw, the plasma was studied using the laser interferometry, x-ray, magnetic probe, deuteron and neutron diagnostics. Interferometry showed the existence of the dense ordered toroidal, helical, and spherical (plasmoidal) forms inside the plasma column, and XUV frames recorded their filamentary composition. On the base of these results, the scenario of the evolution of the dense internal structures in the pinched column is discussed. The hard X-rays (HXRs) and fusion DD neutrons are recorded at the time of formation and disintegration of these structures [2]. The acceleration of fast electron and ion beams we interpret by the reconnection and decay of magnetic lines similarly as in other Universe and fusion plasmas [3].

[1] Ryutov D D Derzon M S and Matzen M K 2000 Rev. Mod. Phys. 72 167

[2] Kubes P et al 2017 Phys. Plasmas 24 in print

[3] Yamada M Kulsrud R Ji H 2010 Rev. Modern Phys. 82 603