

Aluminum K-line radiation in experiments with explosive-magnetic generator

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The investigation results of Al K-line radiation at the implosion of a multi-wire array are provided in the paper. The array is powered from an explosive-magnetic generator (EMG) with a helix diameter of 200 mm equipped by an explosive opening switch. A cylindrical multi-wire array was used in the experiments. Its height was 14.5–14.7 mm, its diameter was 120 mm, and it consisted of 60–120 Al wires of 15.5–19 μm diameters. Spectral-time parameters of an soft x-ray (SXR) pulse generated by a Z-pinch were recorded by scintillation detectors and vacuum x-ray diodes with different filters. The time-integrated SXR energy in various spectral ranges was measured with bolometers. Streak cameras with pinholes and special x-ray methods were used to record space-time implosion characteristics of a plasma Z-pinch in optical and x-ray ranges of the spectrum. The current pulse in the load in the best experiment had the amplitude of 5 MA with the rise-time of 0.39 s. A full width at half maximum of the recorded SXR pulse was 13 ns in the spectrum range with quantum energy of more than 1 keV, and it was 21–25 ns in the spectrum range with quantum energy of less than 1 keV, and it was 19 ns according to the streak camera data. SXR pulse energy measured by a bolometric method was 71 kJ in the total range, and 232 kJ in the range of quantum energy of more than 1 keV. Radiative magnetohydrodynamic codes FLUX-3D and FLUX-rz were used for simulating the performed experiments.