

Reconstruction of Z-pinch emission spectra in the wavelength range of less than 10 Å using a crystal X-ray spectrograph

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This work is devoted to the reconstruction of Z-pinch plasma emission spectra in the wavelength range of less than 10 Å recorded by using a crystal x-ray spectrograph at the Angara 5-1 mega-ampere facility. The spectrograph JA-1 used in experiments has a cylindrical mica crystal with dimensions of $50 \times 40 \text{ mm}^2$ and radius of curvature of 100 mm. Registration of spectra is performed on the photographic film UF-4 with dimensions of $30 \times 10 \text{ mm}^2$. To reconstruct the spectra, the previously developed method based on iterative approximation of a true spectrum shape while minimizing a residual between experimental and calculated spectrograms is used [1] [2]. The calculated spectrogram was obtained taking into account the instrumental function of the spectrograph. To define the instrumental function a virtual Monte-Carlo model in the Geant4 toolkit has been developed [3]. This model takes into account the interaction of radiation with the mica crystal using dynamical theory of diffraction. A true spectrum of Z-pinch plasma radiation is reconstructed for a load made of Al wire liners.

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