Method of measuring the time of x-rays transfer in the closed cavities and in the mode of thermal breakdown

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Abstract. Method for the study of transfer processes of X-ray radiation (XR) in closed cavities and in thermal breakdown mode is developed and described. Experiments are carried out on "Iskra-5" facility using two RFR-4 streak cameras.

1. Introduction

The presented method is designed for the study of transfer processes of X-ray radiation (XR) in closed cavities and in thermal breakdown mode occurring during interaction of high-power laser radiation of the second harmonic of iodine laser "Iskra-5" with X-ray converter boxes.

The X-ray source is a cylindrical target-converter of "Porthole" type [1], irradiating or a hollow box with a slit on the side through which the rate of propagation along the box is measured, or a set of foils of different materials. The delay time of occurrence of radiation behind the foil and is the time of thermal breakdown.

2. Experimental setup

For measurements the two perfectly calibrated RFR-4 X-ray streak cameras and SKHR7 X-ray time frame magnifier are used. First RFR-4 observes the side wall of the target through the laser radiation input hole and is designed to define the parameters of XR, illuminating the investigated targets. Second RFR-4 [2] and SKHR7 both observe either the gap in the side surface of the additional target-channel or the studied foils, detectors are designed to measure the XR transfer time. To ensure the spatial resolution along the slit and behind different foil-filters the RIVS-4 spectrographs [3] are used. In the streak cameras the measurements are conducted in the spectral range from 0.2 keV to 1.1 keV in 5 narrow intervals with the width values hv/dhv~3-7, with spatial resolution ~150 microns and temporal resolution ~40 ps. The measurement margin of the absolute XR flows is ~20%. Frame magnifier registers 11 target images with a spatial resolution ~30 microns, 100 ps delay between frames and exposure time of each frame 100 ps [4].

In the experiments described, the Planck radiation temperature in the "Porthole" amounted to 110-150 eV, the rate of radiation propagation in the closed cavities was in the range 1-12 mm/ns, while the thermal breakdown of the foils of different materials was in the range of 50-550 ps.

References

[1] Lazarchuk V P, Muntyan A N, Murugov V M, Petrov S I and Senik A V 2008 *Instr. and Exp.*

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[2] Lazarchuk V P, Litvin D N, Murugov V M, Petrov S I, Pryanishnikov I G and Senik A V 2004 *Pribory I Tekhnika Eksperimenta* **2** 128-132
[3] Lazarchuk V P, Muntyan A N, Murugov V M, Petrov S I and Senik A V 2006 *Plasma Phys. Rep.* **32** 129-134
[4] Lazarchuk V P, Muntyan A N, Murugov V M, Petrov S I and Senik A V 2004 *Instr. and Exp. Techniques* **47** 255-259