EXPERIMENTAL STUDY OF X-RAY FLUXES FORMED BY WAVEGUIDE-RESONATORS WITH NONPARALLEL REFLECTORS

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The model of planar X-ray waveguide-resonator (PXWR) formed by nonparallel reflectors disposition is described briefly. Analysis of the model showed that the unit must transport the quasi-monochromatic X-ray flux at any possible reflector nonparallelism if the distance between its through the waveguide-resonator length is smaller as the upper critical slit size [1]. The experimental study of this statement was the chief task of the work.

We studied peculiarities of $FeK_{\alpha\beta}$ radiation flux transportation by quartz PXWR at some nonparallelism reflectors angles. These are known that the upper critical distance for quartz reflectors allowed the flux propagation by a waveguide-resonance mechanism is near 200 nm. Because the length of PXWR was equal 100 nm, the reflectors nonparallelism angle can be varied from zero to $1.1\cdot10^{-4}$ degree. Experimental measurements showed that the permissible angular variation of a mutual reflection disposition does not provoke principle changes in space intensity distribution of the flux formed by such waveguide-resonance unit. Small parameter variations can be explained in frame of the statistical error. This result one allows to expect that the reflectors nonparallelism can be used for PXWR specific property improve. PXWR emergent beam is characterized by width, which is equal to it’s slit size. So, the waveguide-resonator, which has inlet width near the upper critical size and outlet width near the lower critical size, will form the emergent beam with smallest width and radiation density maximum without worsening of the flux space divergence and radiation gathering power. These expecting were confirmed by results of TXRF measurements with PXWR former characterized by reflectors nonparallelism.

[1] V.K. Egorov, E.V. Egorov. Planar waveguide-resonator: a new device for X-ray optics // X-ray spectrometry. v33. 2004. pp. 360-371.