

## **Annotation of the graduate work of 6th-year student I.V. Yakimchuk**

### **Study of the Whispering Gallery Effect at a Spherical Surface in Hard X-Ray Region**

Whispering gallery (WhG) effect consists in that an x-ray/soft x-ray beam falling tangentially onto a concave surface slides along it due to successive total external reflections.

In the present work the WhG effect is studied theoretically and experimentally in hard x-ray spectral range ( $\lambda \sim 0.15 - 0.3$  nm) with the use of concave spherical mirror of the 25 cm curvature radius and of the 6 cm diameter. Thereby, an angle of x-rays deflection observed in our experiments is about  $13.8^\circ$  that exceeds the critical angle of the total external reflection of fused quartz by a factor of 70 at  $\lambda = 0.165$  nm.

One of interesting results of the studying is that a spherical mirror itself detects and captures rays falling onto its surface in the WhG regime, i.e., alignment of a mirror in respect to x-ray beam does not need to be precise.

Ray-tracing computer code is used to analyze experimental data. Results of measurements and computer simulations are demonstrated to be in an excellent agreement. Computer modeling shows the number of x-rays reflections from a concave surface to be 50 – 70, on the average, in specific conditions of our experiments and, hence, the WhG effect is actually responsible for an intensity distribution observed with a 2D CCD detector.

Considering problem of the WhG effect at a concave spherical mirror only theoretically we have derived interesting formulas that completely explains observed intensity distribution in experiments and computer simulations.