

Whispering Gallery Effect in X-Ray Optics

Vladimir I.Ostashev, Oleg N.Gilev, and Nikolai A.Havronin

Russian Federal Nuclear Center - VNIITF, Snezhinsk, 456770
Chelyabinsk region, Russia

Inna N.Bukreeva and Igor V.Kozhevnikov

Lebedev Physical Institute, Leninsky prospect 53, 117924
Moscow, Russia

The use of the whispering gallery (WhG) effect in x-ray optics is considered. The effect consists in that an x-ray beam falling onto a concave surface under a small grazing angle slides along a surface due to successive total external reflections. It is experimentally demonstrated that a soft x-ray beam with the wavelength of 6.76 nm may be turned by a cylindrical surface through an angle of 45 degrees with an efficiency of about 50%. The spatial and angular distributions of the deflected beam intensity have been measured and the results are found to be in a good agreement with the theoretical calculations. It is shown that the WhG effect can be used for the control of the roughness of concave surfaces. The experimental results on the study of toroidal x-ray concentrators based on the WhG effect are discussed. Applications of the effect for the synchrotron radiation beam steering are also considered.