Diffraction Radiation Generation by the Internal Target of the Cyclic Accelerator

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The observation and study of the properties of the diffraction radiation (DR) of relativistic electrons in the ultra-soft X-ray region ($E_{ph} \sim 100$ eV) have troubles with the usage of the extracted charge particle beam because it is necessary to establish the very small impact parameter $b \sim \gamma\lambda/2$ in the experiment. Here b is the distance from the particle trajectory to the target edge,γ is the Lorentz factor of a charged particle, γ is the wavelength of the generated radiation. These values are for electrons with the energy of 25 MeV and $\gamma = 10nm$ $b \cong 0.25\mu m$

However, while using the target set into a cyclic accelerator [3] or a storage ring [4, 5], one can expect the enhanced yield of DR due to the multiple passages of the electron beam near the target's edge and slow decrease of the parameter b, cycle by cycle, up to the moment of the interaction with the body of the target. During the slow transverse drawing together of the beam and the target the contribution of DR can become comparable with the contribution of the transition radiation (TR) from the target.

In this report, we compare the results of TR and DR contributions calculations, taking into account multiple passages of a charged particle near the target's edge and experimental results presented in [4,5]. The calculations of TR and DR were performed using the theory [1,2].

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References

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