Quantum Features of Radiation at Small-Angle Reflection by Crystals

K.Korotchenko[a,1]***, Yu.Eikhorn***[a]***, Yu.Kunashenko***[a,b]***,***
A.Lewandowski[a]

[a] *National Research Tomsk Polytechnic University, Tomsk, Russia*
[b] *Tomsk State Pedagogical University, Tomsk, Russia*

In our recent paper [1] in the framework of quantum electrodynamics the theory of a new type of X-ray radiation emitted by relativistic electrons at the quasi-channeling conditions вГЎ Electron Radiation at Small-Angle Reflection (ERSAR) was developed beyond the dipole approximation. This radiation arises when the electron is reflected by or crossed the crystal surface which coincides with one of the crystallographic planes. It is shown that in this case one can reveals two kinds of radiation: channeling radiation by reflected particles and diffracted channeling radiation by passed particles.

The ERSAR can be applied for example for investigation of the crystal surface. The advantage of its use is that when the crystal surface does not coincide with the crystallographic plane, ERSAR not disappears (due to the quasi-channeling), but appears the Transition Radiation.

The ordinarily (inside the crystal) Diffracted Channeled Radiation (DCR) [2] is accompanied by parametric X-ray radiation (PXR) and in these conditions, the experimental investigation of DCR is very difficult. But in our case (ERSAR), the PXR is absent and possibly, the use of ERSAR might be decisive to register DCR.

In this work, using the ERSAR-theory formulas we carried out the numerical calculation of ERSAR for one of simple experimental condition.

References

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[1] Corresponding author: korotchenko@tpu.ru