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SPATIAL DISTRIBUTION OF PXR GENERATED BY 855 MEV ELECTRONS. COMPARISON OF SIMULATION RESULTS WITH EXPERIMENTAL DATA

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The authors of the papers [1,2] proposed to measure the transverse size of an electron beam using the PXR spatial distribution at short distances between a crystalline target and a detector. The experiment described in Ref. [3] was performed with the 855 MeV electron beam of the MAMI-B microtron and a 50 μm thick silicon crystal (100) acting as target, which was oriented under a Bragg angle of 11.25 deg. PXR with energies $h\omega(220) = 16.55$ keV and $h\omega(400) = 23.40$ keV was detected using an X-ray camera (ProxiVision HR-25) with spatial resolution of about 30 μm [4]. The obtained results confirmed the possibility to utilize such measurements for electron beam size estimation. However, the results of this experiment are not well described by the kinematic PXR theory.

The detailed data treatment of the experiment [3], taking into account the contribution of both diffracted transition radiation and bremsstrahlung, is presented in this report. The X-ray camera efficiency was additionally taken into account. The simulated PXR pattern as a whole agrees with the experimental one. However, along the Bragg direction where the influence of the beam size on the PXR spatial distribution is most noticeable, a discrepancy between the model and the experiment is observed. Possible reasons of such discrepancy will be discussed.

References

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