MEASUREMENT OF THE CHARGED PARTICLE BEAMS DIVERGENCE FROM DIFFRACTED X-RAY TRANSITION RADIATION SPECTRA

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Here we propose a new method for measuring the divergence of charged particle beams via broadening of the spectral peak of X-ray transition radiation (XTR) diffracted on a single crystal. The capabilities of the method were demonstrated by measuring the divergence of the 2.8-GeV electron beam at Test Beam Facility (TB21) of DESY /1/. Beam current was about 1.2 × 103 electrons per second. As an XTR source, 32 aluminum foils 13 μm thick each installed in the beamline were used. The use of a multilayer target increases the yield of XTR and allows measurements with low-intensity beams. The XTR generated in the target is diffracted from the (111) silicon crystal plane at Bragg angle of 7.9° and is registered by semiconductor Amptek XR-100SDD X-ray detector. The width of the observed spectral peak allows us to estimate the beam divergence at the location of the target. Under the measurement conditions, the beam divergence was about 3.7 mrad.

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