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Micron-Scale Vertical Beam Size Measurements Based on Transition Radiation Imaging with a Schwarzschild Objective

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Transverse beam profile diagnostics in the case of micron-scale beam sizes from modern electron accelerators is a challenging task. Backward transition radiation (BTR) imaging in the visible spectral region is usually applied but it is close to the diffraction limit, i.e. the measured beam image is dominated by the point-spread function (PSF) [1,2]. In order to improve the resolution and to measure sub-micron beam sizes, the influence of the PSF that depends both on the wavelength and optical aberrations should be decreased [3]. This can be realized by imaging in the EUV region using a multilayer Schwarzschild objective (SchO) which is free of some types of aberrations [4].

A first test experiment devoted to micron-scale beam size measurements has been carried out at the Mainz Microtron MAMI (Germany), using visible BTR and a SchO. This report summarizes first results of PSF dominated imaging with vertical beam sizes in the order of a few microns. Possibilities to extend the use of a SchO in future experiments with EUV BTR will be discussed.

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