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Electron beam final focus system for Thomson scattering

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The design of an electron beam Final Focus System (FFS) and first experimental results aiming for high-flux laser-Thomson backscattering X-ray sources at ELBE are presented. A telescope system consisting of four permanent magnet based quadrupoles was found to have significantly less chromatic aberrations than e.g. a quadrupole triplet. Consequently, smaller focal spot sizes can be achieved, increasing the yield of X-rays from the interaction with the laser. We characterize the electron beam (divergence, spot size, bunch charge, energy and energy spread) at the interaction point and study the influence on the Thomson backscattering process. We also present the design and test results of the permanent magnet quadrupoles. Adjustable shunts allow for correction of the field strength and compensation of deviations in the permanent magnet material.

Primary author: Mr KRÄMER, Jakob (Danfysik A/S)

Co-authors: Dr IRMAN, Arie (Helmholtz Zentrum Dresden Rossendorf); Dr JOCHMANN, Axel (Helmholtz-Zentrum Dresden-Rossendorf); Dr BØDKER, Franz (Danfysik A/S); Mr KRISTENSEN, Jesper Purup (Danfysik A/S); Dr BUDDE, Michael (Danfysik A/S); Dr MICHEL, Peter (Helmholtz-Zentrum Dresden-Rossendorf); Dr LEHNERT, Ulf (Helmholtz-Zentrum Dresden-Rossendorf); Prof. SCHRAMM, Ulrich (Helmholtz-Zentrum Dresden-Rossendorf)

Presenter: Mr KRÄMER, Jakob (Danfysik A/S)

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