

Material budget imaging with multi-GeV electrons - calibration and applications for 2D material scanning

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The technique of material budget imaging (MBI) uses multi-GeV electrons to directly measure the material budget $= X/X_0$ of a material with thickness X and its radiation length X_0 . The beam particles are deflected by multiple Coulomb scattering and the deflection angle distribution is centered at zero with a width depending on the traversed material.

Hence, a reconstruction of kink angles using individual electron trajectories measured in high resolution beam telescopes allows to estimate the material budget by applying appropriate models of multiple scattering theory, such as the Highland formula.

Measurements at the DESY II testbeam are performed with various materials in terms of thickness and type for a calibration of the MBI technique.

The material budget is an important quantity for the design of high-energy particle detectors. Therefore, the material budget of unknown materials can be experimentally measured as well as complex material distributions can be imaged in 2D.

TIPP2020 abstract resubmission?

No, this is an entirely new submission.

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Author: ARLING, Jan-Hendrik (Deutsches Elektronen-Synchrotron (DE))

Co-author: GREGOR, Ingrid-Maria (DESY & Bonn University)

Presenter: ARLING, Jan-Hendrik (Deutsches Elektronen-Synchrotron (DE))

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