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Material budget measurements with beam telescopes

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The material budget of a particle physics experiment is a characteristic figure governing its overall performance and detailed knowledge of the material budget of the single components is required for precise modelling of the detector. Beam telescopes, a standard tool in sensor R&D for high-energy physics, allow for the measurement of position-resolved material budgets delivering valuable input to the experiment and the community as a whole.

This contribution covers the basics of multiple Coulomb scattering of charged particles whilst traversing matter, the measurement set-up using a EUDET-type beam telescope, the implementation of a dedicated track model for the precise extraction of the deflections angles, and results from various gauge samples and actual modules. A plug-and-play analysis code is presented, which is open to the community. Additionally, the application of material budget measurements enables a new type of tomography, the track-based multiple scattering tomography, which is discussed in terms of contrast and resolution. This serve as an example for technology transfer from high-energy physics to non-destructive material testing.

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