

Correlation between multiple scattering angle and ionization energy loss in electron detectors

Wednesday, May 29, 2024 3:30 PM (12 minutes)

There is a significant correlation between the angle of multiple scattering and the ionization energy loss for relativistic electrons in an amorphous medium, which can be used in high-energy electron and positron detectors [1]. The correlation is found to be the most pronounced at deflection angles larger than typical, reflecting the underlying single-scattering kinematical correlation, but is also sizable at typical deflection angles, where the width of the angular distribution increases with the increase of the energy loss.

Experimental verification of the predicted correlation should be feasible with silicon targets, by observing 10% differences between angular distributions measured at different values of the ionization energy loss. Stronger (~20%) correlation effects may be measurable with the aid of organic semiconductors.

[1] M. V. Bondarenko, Phys. Rev. D 103, 096026 (2021).

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Session Classification: Session VI

Track Classification: Detectors for LHC and future colliders