

Muon Tomography imaging improvement using optimized scattering tracks data based on Maximum Likelihood Method.

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Point of colsest Approche algorithm (PoCA) based on the formalism of muon radiography using the Multiple Coulomb scattering (MCS) as information source is previously used to obtain the reconstruction images of high Z materials. The low accuracy of reconstruction image is caused by two factors: the flux of natural muon and the assumption of single scattering in PoCA algorithm. In this paper, the maximum likelihood method based on the characteristics of Gaussian-like distribution of muon tracks by MCS is used to predict the optimal track of outgoing muon. The receiver operating characteristic (ROC) and the localization ROC (LROC) are used as two analysis methods to evaluate the quality of reconstruction image. From the results of simulation, the perfect discrimination of longitudinal materials could be well achieved by maximum likelihood algorithm and the discriminate ratio that is predicted by the maximum likelihood method is about 20% higher than that of predicted by the PoCA algorithm method. It is seen that the maximum likelihood method can greatly improve the accuracy of the muon reconstruction image. At the end of this paper, the preliminary results of spatial resolution and APV25 multichannel electronics in TripleGEM detector are presented, which will prepare the muon imaging based on the TripleGEM detector in the later stage.

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