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Atmospheric ray tomography for low-Z materials

Thursday, 25 November 2021 16:35 (20 minutes)

Atmospheric ray tomography (ART) uses the muons and electrons for detecting objects and their composition. In this talk I will describe some new methods and **a proof-of-concept tomography system developed for the ART of low-Z materials**. Recently we introduced the Particle Track Filtering (PTF) and Multi-Modality Tomographic Reconstruction (MMTR) methods. Having Geant4 models we optimized the tomography system, the parameters of PTF and MMTR. Appling plastic scintillating fiber arrays in our tomography system, we achieved the spatial resolution 120 μm and 1 mrad angular resolution in the track reconstruction. We developed a novel edge detection method to separate the logical volumes of scanned objects. We showed its effectiveness on single (e.g. water, aluminum) and double material (e.g. explosive RDX and biological tissue) objects. **The tabletop tomography system we built showed excellent agreement between simulations and measurements**. We are able to increase the discriminating power of ART on low-Z materials significantly. This work opens up new routes for the commercialization of ART tomography in the security and custom field. I will discuss possible applications in industry and medicine. The talk is based on a recent preprint, https://arxiv.org/abs/2102.12542

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