The ScIDEP Project at the Egyptian Pyramid of Khafre

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Abstract

The ScIDEP (Scintillator Imaging Detector for the Egyptian Pyramids) Collaboration is constructing a scintillator-based muon telescope to investigate the internal structure of the Egyptian Pyramid of Khafre. This pyramid is only slightly smaller than the Great Pyramid, however its known internal structure seems much simpler compared to the latter and hence raises the question if there are any hidden rooms or structures that have yet to be discovered. The previous and very first muography campaign at this pyramid conducted by Alvarez et al. in the 1970s yielded no indications of any hidden structures.

The current project aims to install a new muon telescope inside the king's burial chamber which is located at the very bottom of the pyramid, slightly off-center from the central axis. The base detector that has been developed consists of two 61x61x2cm^3 plastic scintillator planes with wavelength shifting fibers embedded in orthogonal orientations in both faces of each scintillator, to retrieve 2D hit information from each plane for muon tracking. The scintillation light is read out by SiPMs connected to each individual fiber. The data-acquisition system is based on commercial CAEN Petiroc2A-ASIC based digitizer modules. The detector construction has recently been completed and commissioning of the setup in the lab is currently ongoing.

In parallel to the detector commissioning, a detailed simulation package for the full setup is being developed. The cosmic ray spectrum is taken from the CRY generator, while the particle transport through the pyramid and the detector is modelled both in the Geant4 and MCNP packages.

An overview of this project will be given, including the detector description and initial results, plus results from the simulation studies.

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