Contribution ID: **257** Type: **Talk**

A Prototype Scintillating-Fibre Tracker for the Cosmic-ray Muon Tomography of Legacy Nuclear Waste Containers

Wednesday 13 February 2013 09:00 (20 minutes)

Cosmic-ray muons are highly penetrative charged particles observed at sea level at a rate of 1 per square cm per min. They interact with matter primarily through Coulomb scattering. These properties are exploited in muon tomography to image objects inside industrial nuclear waste containers. A prototype scintillating-fibre detector has been developed at the University of Glasgow in collaboration with the UK National Nuclear Laboratory. This consists of two tracking modules above and two below the container to be assayed. Each module consists of two orthogonal planes of 2mm-pitch fibres yielding one spacepoint. Per plane, 128 fibres are read out by a Hamamatsu H8500 64-channel MAPMT with two fibres multiplexed onto each pixel. A dedicated mapping scheme has been developed to avoid spacepoint ambiguities and retain the high spatial resolution provided by the fibres. The configuration allows the reconstruction of the incoming and scattered muon trajectories, thus enabling the container content, with respect to atomic number Z, to be determined. A likelihood-based image reconstruction algorithm was developed and tested using a dedicated GEANT4 simulation of the prototype system and detailed modeling of muonic properties. Images reconstructed from this simulation are presented in comparison with preliminary results from data taken on a test setup. The experimental results verify the simulation and show clear discrimination between the low, medium and high-Z materials imaged.

quote your primary experiment

Glasgow Muon Tomography

Primary author: MAHON, David (University of Glasgow)

Co-authors: CLARKSON, Anthony (University of Glasgow); MCKINNON, Bryan (University of Glasgow); STAINES, Cassie (National Nuclear Laboratory); ZIMMERMAN, Colin (National Nuclear Laboratory); SHEARER, Craig (National Nuclear Laboratory); HAMILTON, David (University of Glasgow); IRELAND, David (University of Glasgow); YANG, Guangliang (University of Glasgow); HOEK, Matthias (University of Glasgow); MURRAY, Morgan (University of Glasgow); KAISER, Ralf (University of Glasgow); JOHNSTONE, Russell (National Nuclear Laboratory); LUMSDEN, Scott (University of Glasgow); NUTBEAM-TUFFS, Sian (University of Glasgow); KERI, Tibor (University of Glasgow)

Presenter: MAHON, David (University of Glasgow)

Session Classification: Scintillating Detectors