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Open-Sky muon tomography on Glacier: first prototype results

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We present a design project for a muon tomography detector aiming to the
monitoring of glacier thickness: the glacier melting process is not completely understood and is considered a hot topic in view of the global warming.
Muon Tomography is a widely used technique, employed to perform imaging
of the inner structure of large objects, as volcanoes, container, and pyramids.
This technique takes advantages of the muon flux reaching Earth surface
(~ 70 m-2s-1sr-1). In case of glaciers, thanks to the different density ofice and rock, a directional flux measurement provides information on the bedrock-ice interface depth.
The goal of our project is the development of a detector able to measure
the glacier thickness with short exposure time, and with a real time data taking and processing, in order to perform studies of the seasonal behavior, and the glacier melting trend through the years. The detector will also be operable in open-sky and be replicable.
We present the first results obtained using a small-scale detector based on scintillation fibers disposed organized in layers, and read by SiPMs driven by FERS boards (A5202), developed by CAEN s.p.a., that both provide a power supply and the read-out system for the detector.
In this contribution we will results of a set of simulations aimed to optimize the detector design, and the foreseen performances of the designed detector and we will also report the result of the tests on the read-out chain, that are performed in collaboration with CAEN s.p.a.. In conclusion we will report the first results obtained with open-sky measurements of test-targets, reporting the prototype resolution and reconstruction capabilities, along with a match with the aforementioned simulations. The results obtained show that the detector can achieve the resolution and angular uniformity in target reconstruction needed for glacier tomography.

Collaboration

Role of Submitter

I am the presenter

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