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Open-sky muon tomography for Glacier monitoring

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The use of muon tomography in geoscience, and in glacier monitoring, is being increasingly used, and showed how these detectors can provide insights on relevant topics as the time evolution and dynamics of glacier melting. The latest experiments results present in literature make use of detectors to be placed in tunnels beneath the target of the study. This approach limits the number of glaciers to be studied due to the limited number of places the experiments can take place.
We here present a novel concept for a muon tomography detector to be used in open-sky applications, lightweight, and with limited costs, so that can be used in the field and can be produced in large numbers to provide for a large area monitoring for glacier evolution. The aim of the detector is to measure the directional flux of muons with an angular accuracy better than 0.010 radiants. The results presented show the feasibility and optimization of a detector based on scintillating fibers bundles, read out by silicon photomultipliers. As well we will show the speed of such detector is enough to detect and reject backgrounds muons not transversing the target under study, and is able to measure the ice thickness with resolution of order of 5 meters. This resolution would allow us to measure the seasonal increase and reduction of ice thickness and the melting trend of the glacier under study, and also to monitor the formation of the melting channels inside the glaciers, which are one of the hot topics in the glacier evolution studies.

Collaboration

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