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An instrumented absorber detector for hadronic interaction measurements

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A new generation of parasitic beam extraction of high energy particles from an accelerator is proposed in CRYSBEAM. Instead of massive magnetic kickers, bent thin crystals trapping particles within the crystal lattice planes are used. This type of beam manipulation opens new fields of investigation of fundamental interactions between particles and of coherent interactions between particles and matter.
An experiment in connection to Ultra High Energy Cosmic Rays study in Earth's high atmosphere can be conducted. Several TeV energy protons or ions are deflected towards a chosen target by the bent lattice planes only when the lattice planes are parallel to the direction of the incoming particle.
A smart absorber, which simulates the Earth's atmosphere, where particles are smashed and secondary showers are initiated, is an essential part of CRYSBEAM. This device has been designed and built with alternating layers of carbon or tungsten and fused silica Cherenkov radiators. This sets the path to measure hadronic cross sections at a relevant energy for cosmic rays investigation.
A 64 channels digitizer system, based on WaveCatcher boards, connected via 480-Mbits/s USB interface to a PC running the WaveCatcher's acquisition software, is the readout of the system and enable to perform coincidences between the layers of Smart Absorber.
A first, simplified version of the detector, with only 3 Cherenkov layers, was used on the first LEMMA (Low EMittance Muon Accelerator) test beam, at the H4 beamline at CERN North experimental area, to discern electrons and muons.

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