Contribution ID: **62**   Type: **Oral presentation**

A digital FDIRC prototype for isotopic identification in astroparticle physics

Thursday, 8 September 2016 08:30 (25 minutes)

Experimental results obtained with a prototype of a Focused Internal Reflection Cherenkov, equipped with 16 high-granularity arrays of NUV-SiPM and tested at CERN SPS in March 2015, are discussed. The detector was exposed to relativistic ions of 13 and 30 GeV/n obtained from fragmentation of a primary Ar beam. The FDIRC included a single Fused Silica radiator bar optically connected to a cylindrical mirror and an imaging focal plane of dimensions ˜4 cm x 3 cm, covered with a total of 1024 SIPM photosensors. It was operated in photon counting mode thanks to the excellent performance of the SiPM arrays. The complete simulation of the detector was extended to the case of a planar device with multiple bars covering a sensitive area of the order of 1 m^2. Its operation inside a magnetic spectrometer (balloon or space-borne) was studied to evaluate its expected mass resolution for the identification of cosmic isotopes of astrophysical interest as ^{9}Be and ^{10}Be at energies of several GeV/amu with the goal to extend the energy reach of the present available data.

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Session Classification: Cherenkov detectors in astroparticle physics

Track Classification: Cherenkov detectors in astroparticle physics