The ROSSINI project at GSI*

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Overview

The mitigation of health risks induced by the radiation environment in space, which consists of high energy protons from solar particle events (SPE), fast heavy ions coming from galactic cosmic rays (GCR) and trapped particles in the Earth magnetic field, is one of the most serious challenges in space exploration [1]. The radioprotection strategies applied nowadays include the preselection of astronauts, mission planning for low SPE probability, dietory factors, radioprotective agents and passive shielding [2]. The aim of the ROSSINI project (**R**adiati**O**n **S**hielding by I**S**RU and/or **IN**novative mater**I**als for EVA, Vehicle and Habitat) is to select innovative shielding materials and provide recommendations on space radioprotection for different mission scenarios. The project is a common effort of Thales Alenia Space, GSI, SpaceIT and ESA.

Experiments

The shielding effectivness of all candidate materials is characterized through dose reduction curves (setup similar to [3]) and for the most promising ones the mixed radiation field produced by heavy ions impinging on the target is investigated. Particle identification is performed using a dE/E-telescope and kinetic energy spectra are obtained using time-of-flight (setup similar to [4]). Numerous experiments where performed starting in 2012 at NSRL/Brookehaven National Lab (USA) and at Cave A/GSI using high energy heavy ion beams.

Status and outlook

Compared to prior experiments [5] major changes were introduced to the experimental setup as well as to the experimental side Cave A.

- The time-of-flight distance and therefore the energy resolution were improved by removing parts of the beamline.
- The data acquisition system was changed from CAMAC-based to VME to improve readout-rate and deadtime [6].
- Additional detectors added to complement the aquirred date, e.g. liquid scintillator.

An example plot obtained in a recent experiment performed at Cave A/GSI using 1 GeV/u ^{56}Fe impinging on Radel is shown in figure 1. Currently the measurred data is analyzed and the effects of the experimental optimization looks highly promising.

Additional experiments are planned for 2014 at GSI and BNL.

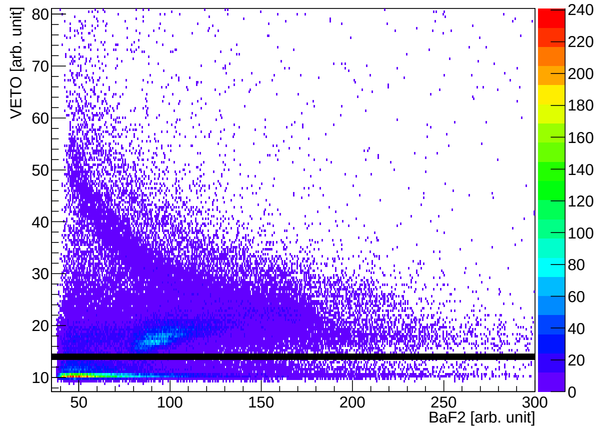

Figure 1: Recent measurement of 1 GeV/u ^{56}Fe impinging on 3.2 cm Radel at 30 degree. The corellation of the 9 mm VETO plastic scintillator signal and the signal of the BaF_2 scintillator can be used for particle identification. Uncharged fragments and photons are located below the black line, charged fragments, mainly hydrogen, are located above.

References

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