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The PERDaix detector

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The PERDaix (Proton Electron Radiation Detector Aix-la-Chapelle) detector is designed to measure charged particles in cosmic rays. It can distinguish particle species up to 5 GV rigidity. PERDaix was flown on the BEXUS-11 balloon on 23rd November 2010. The detector dimensions are 60 x 60 x 85 cm3, the weight is 40 kg, the power consumption 65 W and the geometrical acceptance 32 cm2sr.
PERDaix is divided into three subdetectors: a spectrometer, a time-of-flight (TOF) system and a transition radiation detector (TRD).

The spectrometer consists of four double layers of scintillating fiber tracker arranged around a permanent magnet. The scintillating fibers are read out with 32 channel MPPC arrays produced by Hamamatsu. The channels are 1.1 mm high and have a 250 um pitch. They are read out with VA_32/75 chips.

The time-of-flight system is made of scintillator bars arranged in two double layers. It measures the velocity of charged particles, provides the main trigger for other subdetectors and distinguishes downward from upward (Albedo) flying particles. Each scintillator bar is read out with four MPPCs type Hamamatsu S1 0362-33-100C. The MPPC signals are feat into NINO discriminator chips followed by a HPTDC based digitizing board.

TOF and tracker used a passive compensation circuit to deal with the temperature dependence of the operation voltage of the MPPCs during the balloon flight.

The TRD has 8 layers of radiator
fleece followed by proportional counters. The proportional counters are
made of straw tubes filled with a Xe/CO2 (80/20)-mixture at 1.1 bar.
A tungsten wire running through the tubes serves as anode operated at 1.5 kV.
The TRD is used to discriminate electrons from protons.

Characterization measurements will be presented as well as the detector performance as a whole.

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