

5 - 1 Beam Test of the PSD EQM at CERN

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Dark Matter Particle Explorer (DAMPE) is a powerful space telescope for high energy cosmic rays detection such as γ -ray, electron and heavy ions. The main motivation of DAMPE is to find the evidence of dark matter existence, and the satellite is scheduled for launching before the end of 2015.



Fig. 1 (color online) DAMPE at PS(topmost is PSD).

The Plastic Scintillator Detector (PSD), which is one of the key components of the DAMPE system, has two major functionalities: distinguish photons from charged particles by anti-coincidence and measure the charge of heavy ions. The PSD is designed and fabricated by the institute of modern physics, CAS. It consists of 82 plastic scintillator strips, each of which is readout by PMT at both ends, and a double-dynode readout scheme for PMT is utilized in order to cover the large dynamic range (from H to Ca).

As the Engineering and Qualification Model (EQM) of the DAMPE is a replica of the final flight model, testing it with high energy beam, which can simulate the real case in space, will give us valuable information on the design and performance. The EQM of DAMPE has been shipped to CERN at Switzerland and undergone a thorough beam test at October/November 2014(Fig. 1). The electron and hadron (mostly are protons) beams with different energies are utilized, and the general beam conditions are listed in Table 1.

Table 1 Beam conditions at PS/SPS.

Accelerator	PS	SPS
Particle type	Proton, muon, pion, electron, photon	Same as PS
Energy	1~10 GeV	Up to 400 GeV
Terminal	T9	H4

The PSD worked well and stable during the whole test period. The performances of PSD and the function as an anti-coincidence detector are fully verified. Fig. 2 shows the deposited energy spectrum of 5 GeV/c electrons. The MIP peak is clearly separated from the noise, which is smaller than 10 ADC counts, corresponds to about 0.025 MIPs, and this result is consistent with the previous cosmic-ray tests.

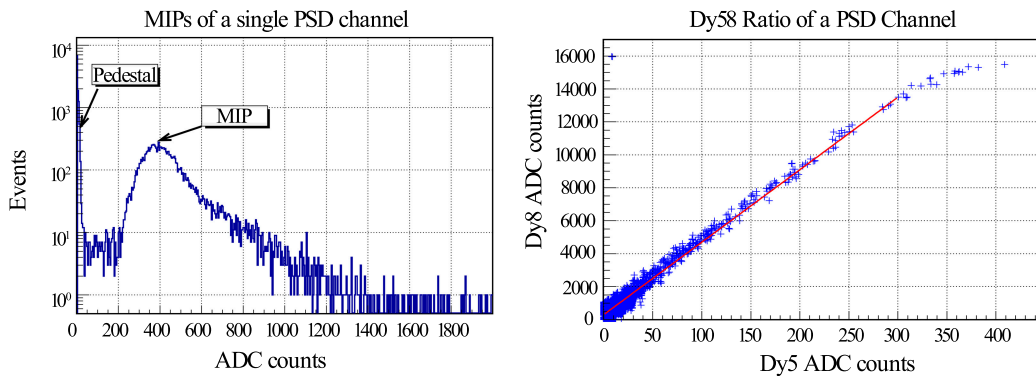


Fig. 2 (color online) MIPs peak and Dy5/Dy8 ratio.