The Anticoincidence Counter System of AMS-02

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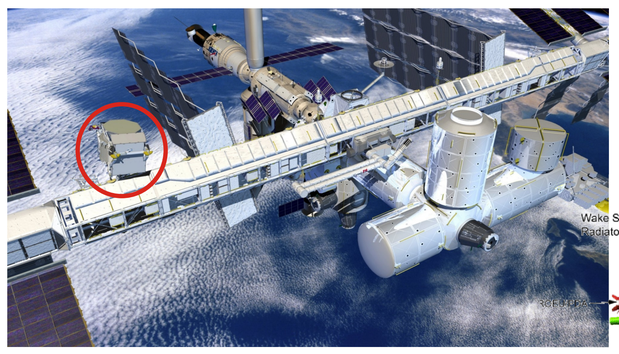
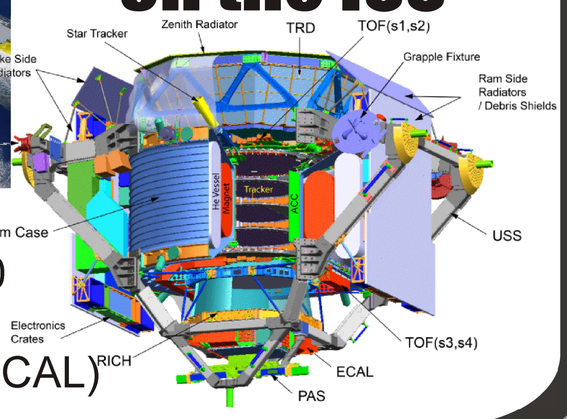
The AMS-02 experiment will be installed on the International Space Station at an altitude of about 400km in 2010 to measure for three years cosmic rays. The total acceptance including the electromagnetic calorimeter is 0.095m^{2}sr. This work focuses on the anticoincidence counter system (ACC). The ACC is a single layer composed of 16 interlocking scintillator panels that surround the tracker inside the inner bore of the superconducting magnet. The ACC needs to detect particles that enter or exit the tracker through the sides with an efficiency of better than 99.99%. This allows to reject particles that have not passed through all the subdetectors and may confuse the charge and momentum measurements which is important for an improvement of the antinuclei-measurements.
In 2007/2008 all subdetectors were integrated into the AMS-02 experiment and atmospheric muons were collected. These data were used to determine the ACC detection efficiency.

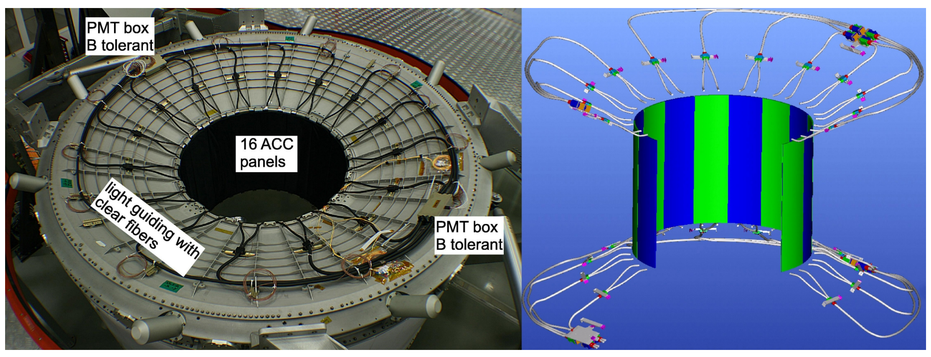
AMS-02 on the ISS

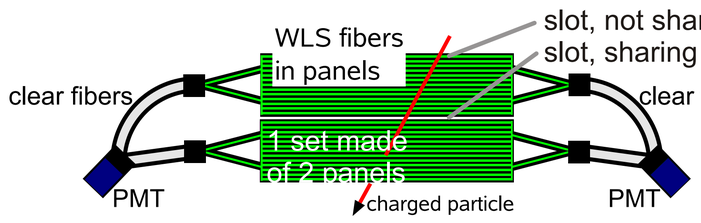


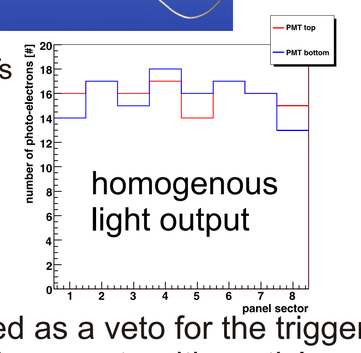


Properties:
- will be installed on ISS in 2010
- measurement time: 3 years
- acceptance: 0.095m^{2}sr (with ECAL)

Anticoincidence Counter (ACC)

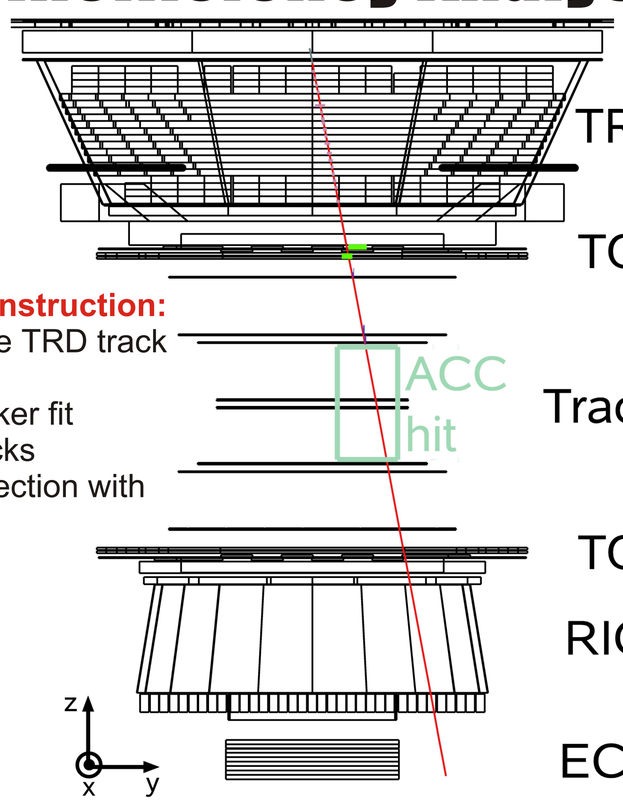






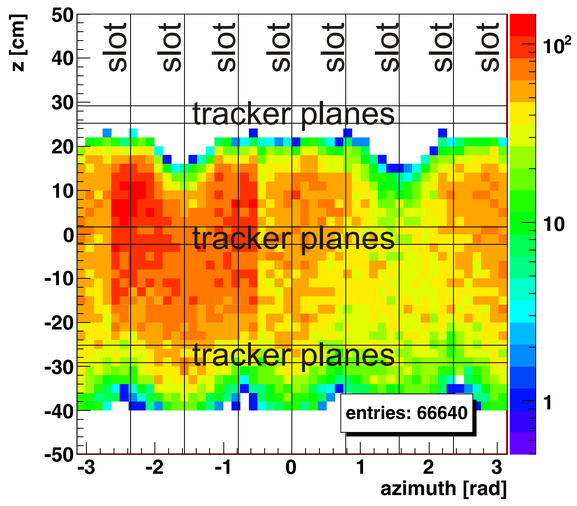
The ACC surrounds the silicon tracker and can be used as a veto for the trigger decision made by the TOF. This is important for rejecting events with particles entering the detector from the side or with particles from secondary interactions inside the detector which could distort the charge measurement.
To improve existing upper limits on antihelium an inefficiency of the ACC smaller than 10^{-4} is needed.

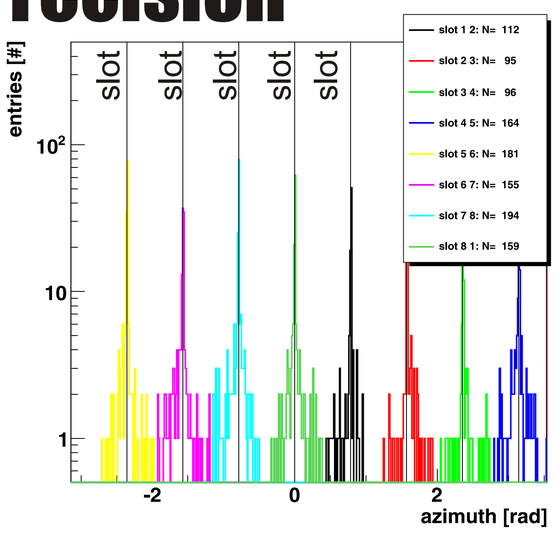
ACC Inefficiency Analysis



Event reconstruction:
- extrapolate TRD track to tracker
- make tracker fit
- match tracks
- find intersection with ACC

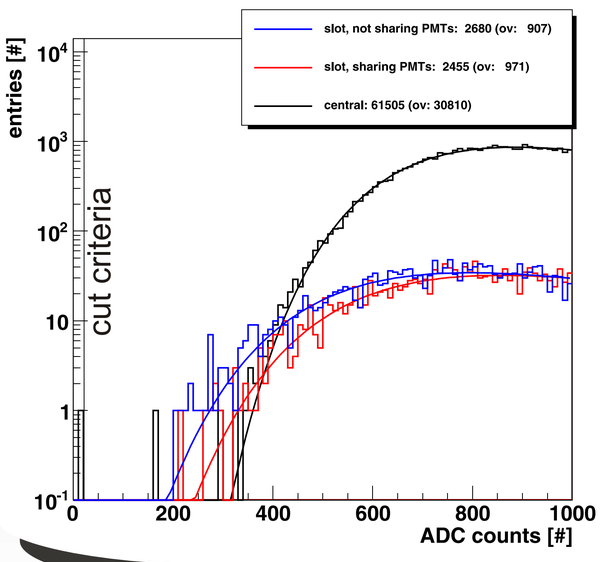
Reconstruction Precision

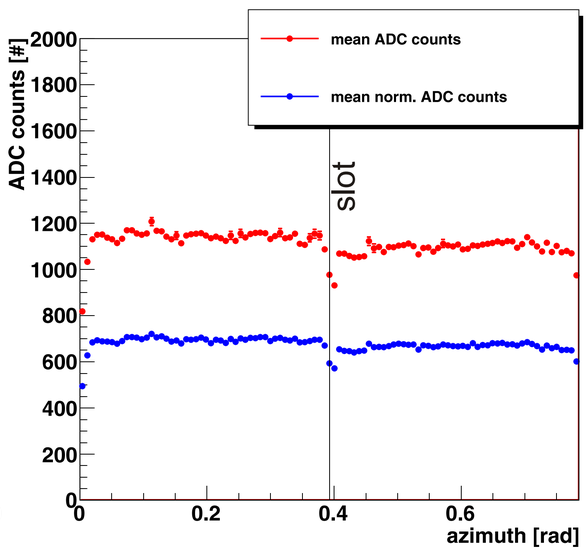




On average, the intersection of the track on the ACC cylinder can be extrapolated with a mean RMS of about 0.7mm. The track occupancy distribution in azimuth angle and z on the ACC cylinder shows a structure due to the shape of the TRD, the TOF and the tracker planes. The position of the seven slots between the eight ACC sectors is determined by requiring all four ACC PMTs of adjacent sectors to show clear signals.
The analysis shows that the used tracker fit is able to reproduce the geometry of the ACC and proof the high integration precision.

Inefficiency Determination





A good ACC event is defined to show at least in one PMT of the sector to which the fitted track is extrapolated an **ADC value larger than 21 ADC counts**.
The slot between two sectors shows the smallest MOP value. Within a sector the mean ADC values as a function of azimuth angle show clear drops at the slot positions.The mean drop for the slot region between panels sharing their PMTs is not as strong as for the slots between sectors.
The spectrum of the central part shows one missed event. **The inefficiency of the complete ACC system is calculated to be smaller than $7.2 \cdot 10^{-5}$ @ 95% C.L..**