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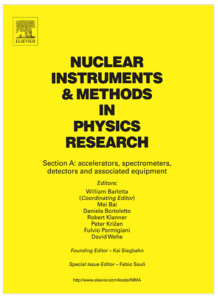

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The Top-of-Instrument Corrections for Nuclei with AMS on the Space Station

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Abstract

The Alpha Magnetic Spectrometer (AMS) is a large acceptance, high precision magnetic spectrometer on the International Space Station (ISS). The top-of-instrument correction for nuclei flux measurements with AMS accounts for backgrounds due to the fragmentation of nuclei with higher charge. Upon entry in the detector, nuclei may interact with AMS materials and split into fragments of lower charge based on their cross-section. The redundancy of charge measurements along the particle trajectory with AMS allows for the determination of inelastic interactions and for the selection of high purity nuclei samples with small uncertainties. The top-of-instrument corrections for nuclei with $2<Z\leq6$ are presented.

Keywords:
AMS, Nuclear Interactions, Inelastic Interactions, Cosmic Rays, Top-of-Instrument Correction, Nuclei fragmentation channels

1. Introduction

AMS is a general purpose high energy magnetic spectrometer installed on the ISS measuring cosmic rays with GeV to TeV energies. In its first six years in orbit it has recorded more than 100 billion cosmic ray events. The layout and description of the detector are shown in Fig. 1 and presented in Ref. [1]. The key elements of AMS used in nuclei measurements are the permanent magnet, the silicon tracker, and four planes of time of flight (TOF) scintillation counters. AMS also contains a transition radiation detector (TRD), Anti-Coincidence Counters (ACC), a ring imaging Cherenkov detector (RICH), and an electromagnetic calorimeter (ECAL).

The tracker [2] has nine layers, the first (L1) at the top of the detector, the second (L2) just above the magnet, six (L3 to L8) within the bore of the magnet, and the last (L9) just above the ECAL. L2 through L8 constitute the inner tracker. Each layer contains double-sided silicon microstrip detectors which independently measure the x- and y-coordinates. The tracker accurately determines the trajectory of cosmic rays by multiple measurements

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