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The AMS-02 spectrometer: first data and detector performance

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The Alpha Magnetic Spectrometer (AMS-02) is a high-energy physics experiment designed to operate in space on board the International Space Station (ISS), where it has been installed on May 16th 2011, taking data continuously since then. Thanks to the very large acceptance (˜ 0.5 m2 sr) and an exposure time that will match the ISS lifetime, AMS-02 will measure a wealth of data to study with unprecedented accuracy the composition and the energy spectrum of charged CRs and gammas up to the TeV energy scale. AMS-02 is able to measure the energy spectrum of the most rare cosmic ray components (antideuteron, antiproton, positron, ···) allowing for the search of primordial antimatter and dark matter annihilation products.
The magnetic spectrometer consists of 7 layers of Silicon sensors in the permanent magnet bore (B field ˜ 0.15T) complemented by 2 layers at both ends of the detector. The measurement of the curvature radius of the charged particles bent trajectories - through the precise location (resolution of 10 ⊠m) of the particle impact points on the Si Tracker planes - allows for the computation of the particle rigidity and charge sign. With an effective sensible area of 6.2m2 the AMS-02 Silicon Tracker is among the largest tracker built for space application. It is composed by 2264 double-sided Silicon sensors (72x41mm2, 300μm thick) assembled in 192 read-out units, for a total of 200.000 read-out channels.
At the end of July 2010 the AMS-02 Silicon Tracker has been successfully integrated and installed within the AMS-02 detector. Then an extensive period of muon data acquisition on ground, a beam test, and the first months of data taking in space, allowed for the study of the spectrometer performances.
The design and construction of the AMS-02 Silicon Tracker are reviewed, as well as the operation in space. The main characteristics in terms of spatial resolution, charge distinction and alignment strategy, both from beam test and cosmic-rays data taking results will be presented.

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Oral

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