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Oliver Botta, 4. Mai 2011

Fact Sheet

The Alpha Magnetic Spectrometer (AMS)-02

The Alpha Magnetic Spectrometer (AMS)-02 is a particle physics experiment to be installed and operated on board the International Space Station (ISS). Its scientific objective is to search for dark matter and antimatter from space while performing precision measurements of the composition and flux of cosmic rays composition and flux. The PI of AMS-02 is physicist and Nobel laureate Sam Ting of MIT, who leads a consortium of more than 600 researchers from 56 scientific institutions around the globe. AMS-02 was integrated at CERN in Geneva, where the science control center is also located. The launch is foreseen on board Space Shuttle *Endeavour*'s final mission STS-134 on 16 May 2011.

Scientific Background

The AMS-02 is a gigantic particle detector that aims at detecting cosmic ray particles while attached to the International Space Station (ISS) outer truss elements. The ISS is the only satellite that is able to provide the support for AMS-02 in terms of its mass and power consumption. The core feature of AMS-02 is a large circular permanent magnet that bends the pathway of particles passing through it. The direction of bending is characteristic of the nature of that particle. A variety of detectors on each side of the magnet allows the identification of the type of particles as well as the determination of their energy and velocity. All the information gathered for each event will be collected by the on-board electronics and transmitted to the ground for analysis by the scientific teams.

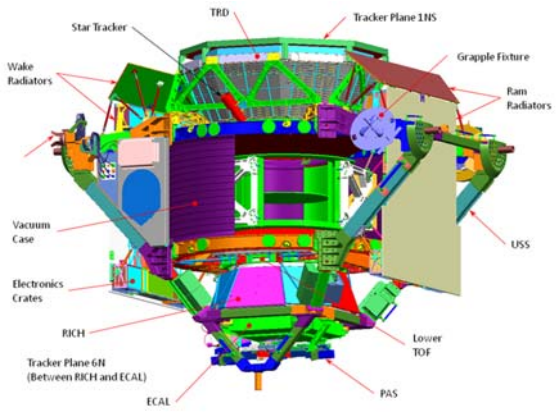

Image 1: Graphical overview of the Alpha Magnetic Spectrometer (AMS)-02 experiment (Credit: AMS Team).

AMS has already flown once on board a Space Shuttle on STS-91 in 1998. During this 11-day flight, a mission of Orbiter *Discovery* to dock with the Russian space station *Mir*, the astronauts activated AMS-01 to test its detectors and the permanent magnet. This flight was a test flight in preparation for the AMS-02 experiment, which was planned for a much longer period on board the ISS. Unfortunately, several events during the last decade significantly delayed the launch of AMS-02. The significance of

this experiment is underlined by the fact that the US-Congress specifically demanded from NASA to add an additional Shuttle mission to deliver AMS-02 to the ISS before the retirement of the fleet.

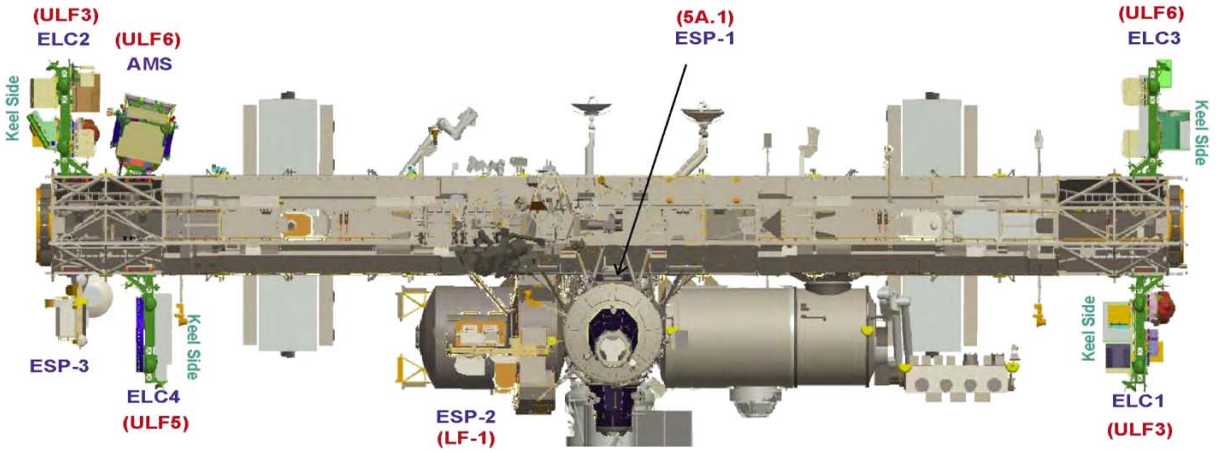

Image 2: The AMS-02 experiment will be installed on the starboard side of the ISS truss backbone structure during mission STS-134 (ULF-6).

AMS-02 Team

The AMS-02 instrument is the result of longstanding collaborations between scientists and institutes all over the globe. In total, more than 600 researchers at 56 scientific institutions are involved in AMS-02. The PI of AMS is physicist and Nobel laureate Sam Ting of Massachusetts Institute of Technology (MIT).

From Switzerland, both the University of Geneva and the ETHZ Zürich are involved. The leadership in Geneva is at the Département de Physique Nucleaire et Corpusculaire (DPNC), where Prof. Martin Pohl and his team played a significant role in the development of the Silicon detectors used in the Tracker system of AMS-02. The scientific contribution from ETHZ is led by Professor André Rubbia at the Institute for Particle Physics.

Geneva has been playing additional important roles in AMS-02. Firstly, final integration of the AMS-02 instrument occurred at the premises of the CERN research center. The original AMS-02 foresaw a cryocooled superconducting magnet, for which the tank was also bulit in Switzerland. The extensive testing at the ESA technology center at ESTEC demonstrated that the leak rate of the liquid Helium was too high and the experiment was returned to Geneva again. It was fitted with a permanent magnet that allows the experiment to last for the entire lifetime of the ISS. Once assembly was completed, the instrument was tested at one of CERN's beamlines before it was delivered to the launch site at Kennedy Space Center directly from Geneva airport on 26 August 2010. Secondly, the AMS control center will be installed at CERN. From there data will be collected, processed and distributed to AMS science team members.

Switzerland's contribution to AMS-02 was directly through research grants from the National Science Foundation. In addtion, Switzerland indirectly, through its participation in CERN and ESA, contributed to the assembly, integration and testing campaigns for AMS-02.

Detailed information can be found under the following URLs:

http://www.ams02.org/
http://ams.nasa.gov/
http://ams.cern.ch/
http://www.nasa.gov/mission_pages/station/research/experiments/AMS-02.html
http://en.wikipedia.org/wiki/Alpha_Magnetic_Spectrometer

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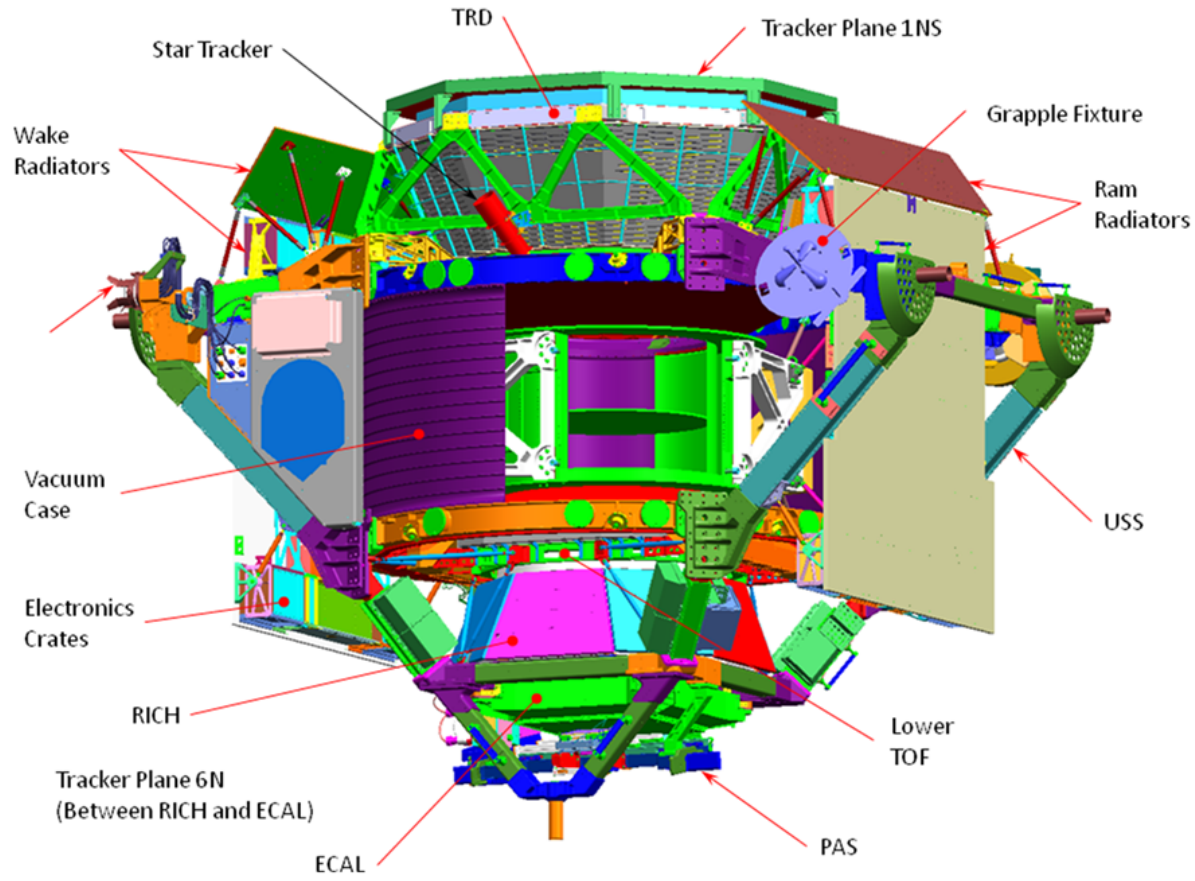
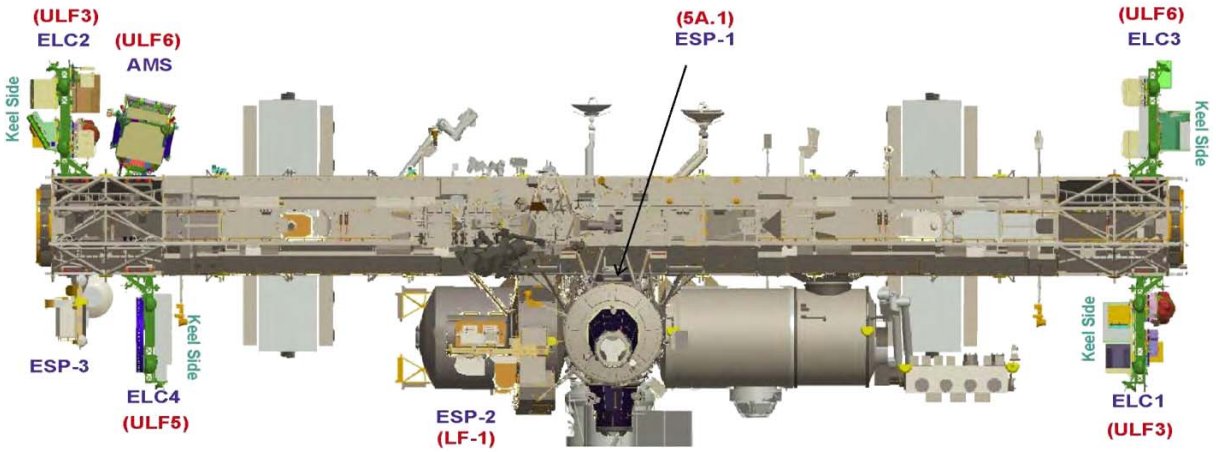
Image 1:



Graphical overview of the Alpha Magnetic Spectrometer (AMS)-02 experiment (Credit: AMS Team)

Image 2:



The AMS-02 experiment will be installed on the port side of the ISS truss backbone structure during mission STS-134 (ULF-6).