AMS particle detector heads for the International Space Station

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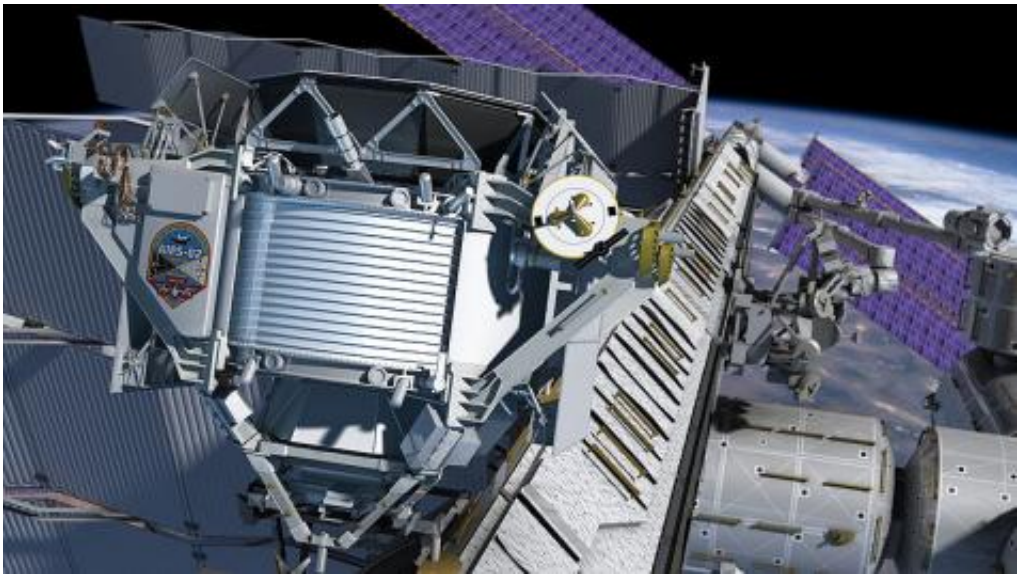

A computer generated image showing AMS-02 mounted to the ISS S3 Upper Inboard Payload Attach Site. Image: NASA

(PhysOrg.com) -- The AMS particle detector will take off on 29 April 2011 at 21.47 CEST onboard the very last mission of the space Shuttle Endeavour. AMS, the Alpha Magnetic Spectrometer, will then be installed on the International Space Station from where it will explore the Universe for a period of over 10 years. AMS will address some of the most exciting mysteries of modern physics, looking for antimatter and dark matter in space, phenomena that have remained elusive up to now.

In laboratories like CERN, physicists observe matter and antimatter behaving in an almost identical way. Each matter particle has an equivalent antiparticle, very similar but with opposite charge. When particles of matter and antimatter meet, they annihilate. Matter and antimatter would have been created in equal amounts at the Big Bang, yet today we live in a Universe apparently made entirely of matter. Does nature have a preference for matter over antimatter? One of the main challenges of AMS will be to address this question by searching for single nuclei of antimatter that would signal the existence of large amounts of antimatter elsewhere in the Universe. To achieve this, AMS will track cosmic rays from outer space with unprecedented sensitivity.

"The cosmos is the ultimate laboratory," said Nobel laureate and AMS Spokesperson Samuel Ting. "From its vantage point in space, AMS will explore such issues as Antimatter, Dark Matter and the origin of Cosmic Rays. However, its most exciting objective is to probe the unknown because whenever new levels of sensitivities are reached in exploring an unchartered realm, exciting and unimagined discoveries may be expected."

In the same way that telescopes catch the light from the stars to better understand the Universe, AMS is a particle detector that will track incoming charged particles such as protons, electrons and atomic nuclei that constantly bombard our planet. By studying the flux of these cosmic rays with very high precision, AMS will have the sensitivity to identify a single antinucleus among a billion other particles.

"This is a very exciting moment for basic science," said CERN Director General Rolf Heuer. "We expect interesting complementarities between AMS and the LHC. They look at similar questions from different angles, giving us parallel ways of addressing some of the Universe's mysteries."

AMS may also bring an important contribution to the search for the

mysterious dark matter that would account for about 25% of the total mass-energy balance of the Universe. In particular, if dark matter is composed of supersymmetric particles, AMS could detect it indirectly by recording an anomaly in the flux of cosmic rays.

"Never in the history of science have we been so aware of our ignorance," said AMS Deputy Spokesperson Roberto Battiston. "Today we know that we do not know anything about what makes up 95% of our Universe."

AMS is a CERN recognized experiment and as such has benefited from CERN's expertise in integrating large projects, from CERN's vacuum and magnet groups and from test beam facilities for calibrating the detectors. In addition, the Payload Operation Centre (POC) of AMS will open in June 2011 at CERN, very near to the place where the AMS detector was assembled in clean room facilities. From the POC, physicists will be able to run the AMS detector as well as receive and analyse data arriving from the International Space Station.

AMS is the result of a large international collaboration with a major European participation. It is led by Nobel laureate Samuel Ting and involves about 600 researchers from CERN Member States (Denmark, Finland, France, Germany, Italy, the Netherlands, Portugal, Spain, Switzerland) as well as from China, Korea, Mexico, Taiwan, and the United-States.

Provided by CERN