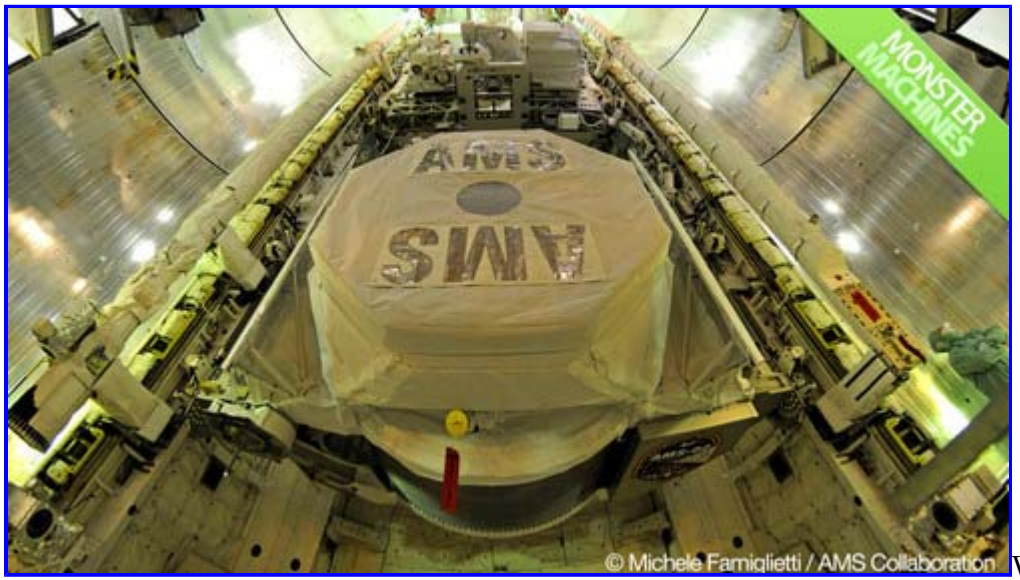
Science

The $US2b Dark-Matter-Hunting Alpha Magnetic Spectrometer

By Max Behrman on April 30, 2011 at 5:30 AM



Whenever NASA launches its next-to-last space shuttle, the Endeavour – hopefully two days from now – it'll be hauling an appropriately epic payload: the Alpha Magnetic Spectrometer.

A 6700kg, 4.5m x 4m state-of-the-art particle physics detector, the AMS's mission is nothing short of shedding light on the origins of the universe by using cosmic rays to look for antimatter and dark matter. The 1900kg magnet in the AMS generates a magnetic field 3000 times stronger than Earth's. When cosmic rays are deflected by this magnet, detectors analyse the rays' properties (e.g. charge, velocity) to learn more about the existence and composition of antimatter and dark matter. Profound discoveries aren't cheap: Estimates of its cost range from $US1.5 to $US2 billion, up there with the relativity-testing LISA project (not the Apple computer).

If you're a subscriber to the Big Bang theory, you believe that the universe originally, well, blew up. But to do this, it needed equal amounts of matter and antimatter. The AMS will therefore look to the edges of the universe for antihelium nuclei, and it does so with such precise sensitivity that it should definitively prove or disprove the existence of antimatter.

The AMS is also searching for another aspect of the universe that's been under a lot of debate in the past – dark matter. Visible matter (e.g. stars) makes up less than 5 per cent of the total mass in our universe. That leaves quite a bit of unknown universe, and scientists believe that the 95 per cent is dark matter and dark energy. The AMS is attempting to settle the dispute regarding dark matter's existence by looking for neutralinos. If such particles exist, according to NASA, they should be colliding with each other and giving off charged particles that AMS can detect.

Lastly, the AMS will be looking for cosmic rays. The results of this data are more future-oriented than anything else. Eventually, people would like to travel to more distant bodies. (Did someone say, "mission to Mars in 2030?") But before we undertake missions that would take years to undergo, we need to understand more about cosmic rays and how they change in space. Understanding these rays could end up saving astronauts' lives once our trips in the final frontier start becoming quite lengthy. [NASA, PopSci, *Top image: Michele Famiglietti/AMS*]

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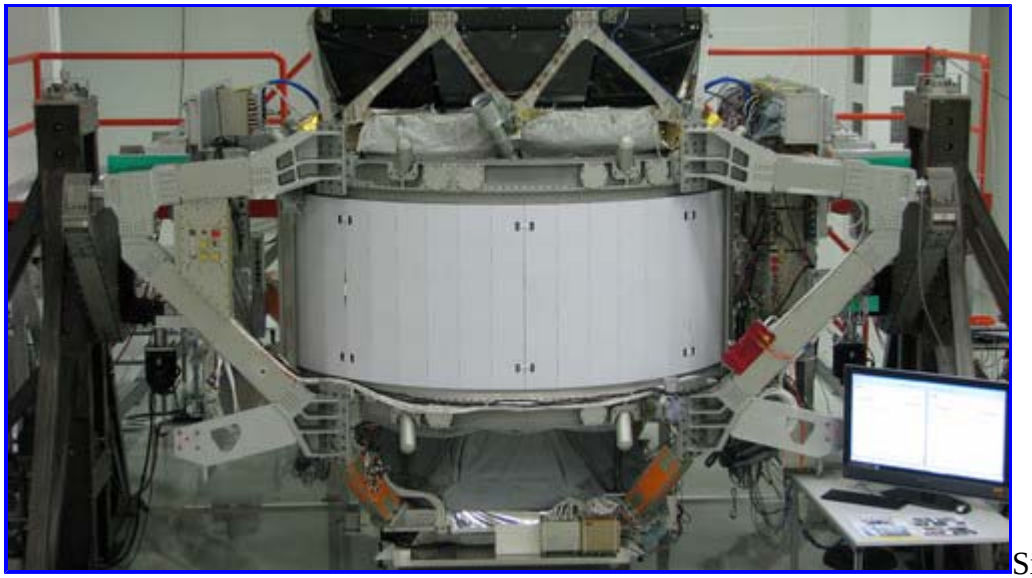
A rendition of what the AMS will look like attached to the ISS (see: left side).


Testing the AMS


Side view of AMS


Installing the AMS into the shuttle

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