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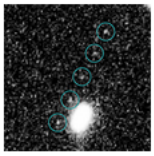
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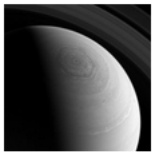
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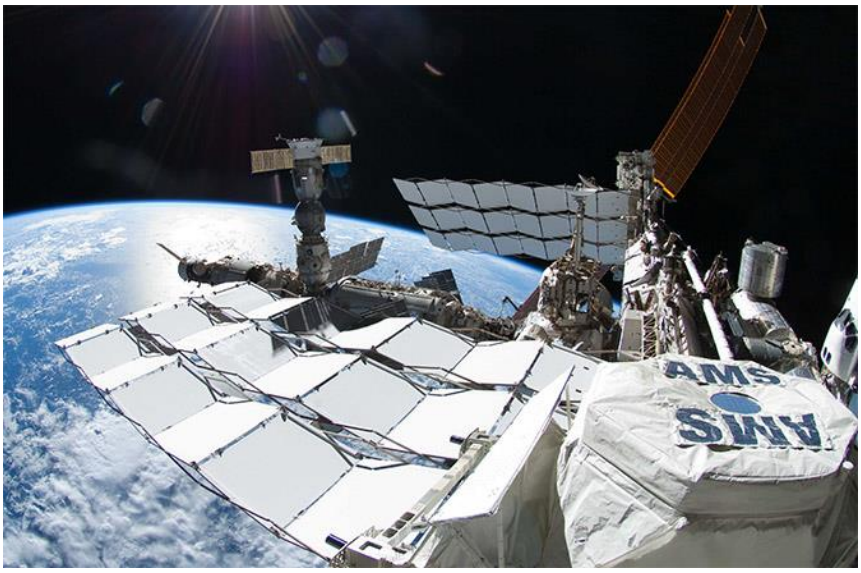
SPACE

Mystery Signal Could be Dark Matter Hint in ISS Detector

SEP 18, 2014 12:00 PM ET // BY IRENE KLOTZ



The Alpha Magnetic Spectrometer (AMS-02) experiment is a state-of-the-art particle physics detector that is constructed, tested and operated by an international team composed of 60 institutes from 16 countries and organized under United States Department of Energy (DOE) sponsorship. It is attached to the International Space Station and has been in operation since 2011.

Analysis of 41 billion cosmic rays striking the Alpha Magnetic Spectrometer particle detector aboard the International Space Station shows an unknown phenomena that is "consistent with a dark matter particle" known as a neutralino, researchers announced Thursday

Key to the hunt is the ratio of positrons to electrons and so far the evidence from AMS points in the direction of dark matter.

Positrons are the anti-matter counterparts to electrons.

The smoking gun scientists look for is a rise in the ratio of positrons to electrons, followed by a dramatic fall -- the telltale sign of dark matter annihilating the Milky Way's halo, which lies beyond its central disk of stars and dust, according to Michael Turner, director of the Kavli Institute for Cosmological Physics at the University of Chicago.

NEWS: Dark Matter Mystery Deepens

If current theoretical models are correct, a massive pool of dark matter -- perhaps as big as 1 million light-years across -- envelops the visible galaxy, which is about 100,000 light-years in diameter.

Visible matter, such as stars and galaxies, comprise less than 5 percent of the total mass in the universe. The rest is dark matter and an anti-gravity force referred to as dark energy. AMS is looking for evidence of dark matter neutralinos, which -- if they exist -- should collide with one another and release charged particles that AMS can detect.

"We have not found the definitive proof of dark matter," AMS lead researcher Samuel Ting, with the Massachusetts Institute of Technology and CERN in Switzerland, wrote in an email to Discovery News.

ANALYSIS: Dark Matter Mystery Could Be Solved in 10 Years

"Whereas all the AMS results point in the right direction, we still need to measure how quickly the positron fraction falls off at the highest energies in order to rule out astrophysical sources such as pulsars," said Ting, a Nobel laureate who oversees the AMS team in 60 institutes from 16 countries.

A second line of evidence will come from upcoming measurements of the ratio between antiprotons and protons, which likewise can rule out pulsars as the energy source.

The AMS was installed on the space station during the next-to-last space shuttle mission in May 2011. Since then, the $2 billion instrument has been amassing a mountain of data from 54 billion cosmic ray events, 41 billion of which have been analyzed. Of those, 10 million particles were identified as electrons and positrons.

ANALYSIS: Is Earth Surrounded by Dark Matter?

Over the life of the space station, AMS is expected to measure hundreds of billions of cosmic rays.

The AMS is not the only instrument on the hunt for dark matter. The Large Hadron Collider, for example, aims to produce the parent and grandparent particles of dark matter. LHC is being returned to service after a two-year shutdown for upgrades.

The AMS results are published in Physical Review Letters.