Dark Matter Hunter Results Coming in March

Irene Klotz - Discovery News

Scientists are preparing to release the first round of results from a key experiment aboard the International Space Station that has been sampling a soup of high-energy particles in space.

The Alpha Magnetic Spectrometer particle detector was installed on the station during the next-to-last space shuttle mission in May 2011. Since then, the $2 billion instrument, a collaboration of 60 research institutes in 16 countries, has been amassing a proverbial mountain of data, including a headcount of 7.7 billion electrons and positrons (the antimatter counterpart to electrons).

In the overall numbers of particles interests scientists less than the ratio between the two. The idea is to determine if there are more antimatter particles than matter, and, if so, at exactly what energy level the disparity occurs.

“The smoking gun that we’re looking for in the positron-to-electron ratio is a rise and then a dramatic fall. That’s the key signature that would come from the dark matter annihilating the halo,” said Michael Turner, director of the Kavli Institute for Cosmological Physics at the University of Chicago.

The halo Turner is referring to is the halo of the Milky Way galaxy, the region beyond the central disk of stars and dust. If current theoretical models are correct, there’s a massively massive pool of dark matter — perhaps as big as 1 million light-years across — that envelopes the visible galaxy, which is about 100,000 light-years in diameter.

Behind the AMS numbers is an 80-year-old mystery about why our galaxy — and the universe for that matter — hangs together because despite the apparent plethora of stars, galaxies and gas, there is simply far too little of it to gravitationally bind it together.

Physicists estimate that visible (i.e. detectable) matter accounts for a mere 4 percent of the universe’s contents. Dark matter, which is not dark as in “black” but dark as in undetectable with electromagnetic radiation, comprises about another 24 percent. The rest is an even more exotic and less-known force called dark energy.

One idea about dark matter is that even though we can’t, by definition, detect it directly, we can scout for its footprints.

“It’s really not interacting a lot. The hope is it interacts a little bit,” Lisa Randall, a theoretical physicist at Harvard University, said at the American Association for the Advancement of Sciences meeting in Boston.

The AMS is not the only instrument on the hunt for dark matter. The Large Hadron Collider, for example, has been trying to produce parent and grandparent particles of dark matter — so far to no avail — and will do so again at even higher energies following a two-year upgrade.

Massachusetts Institute of Technology physicist Samuel Ting, the Nobel prize laureate who oversees the AMS team, said that so far, about 10 percent of the data collected by AMS has been analyzed. Those results will be published in March.

http://news.discovery.com/space/1st-results-from-space-station-particle-detector-experiment-coming-in-march.htm