Dark-matter search from the space station continues to tease

17 Feb 2013 | 22:54 GMT | Posted by **Eugenie Samuel Reich** | Category: **Physics & Mathematics**

Nobel prize winner Samuel Ting (pictured) likes to keep people guessing. Nowhere was this more true than at his press conference this morning at the American Association for the Advancement of Science (AAAS) meeting in Boston, Massachusetts. The AAAS had **suggested** that Ting would be ready to present the first dark matter results from his brainchild, **the US$1.5 billion Alpha Magnetic Spectrometer** (AMS), basically a giant magnet and antimatter detector fixed to the outside of the International Space Station. Ting was prefaced by a line-up of physicist colleagues who described themselves as "very excited". But Ting ended up only disappointing them and around 100 reporters who had gathered for the press conference. Ting said that he wasn't ready to make an announcement yet. "In two to three weeks, we should be ready," he said.

Ting did say that he is on the verge of releasing a paper showing how the ratio of positrons (the antimatter counterpart of electrons) to electrons passing through the space station's near-Earth orbit varies with energy. That ratio is a key parameter in the search for dark matter, which is thought to make up 85% of the matter in the Universe. Some theories predict that dark-matter particles will annihilate in space, producing an excess of positrons that particle detectors can capture. At least two space missions, the Payload for Antimatter Exploration and Light-nuclei Astrophysics (PAMELA) and the Fermi space telescope, have **already seen hints** of such an antimatter excess, but they have not **captured a killer signature**. Ting hopes that his more sensitive spectrometer can nail the signal, which would show up as an abrupt bump in the excess at a particular energy. Alternative astrophysical sources, such as pulsars, could also produce an excess, but couldn't as easily produce a sharp bump.

Ting says that he has used some 8 million particle events to map the excess across an energy spectrum from 0.5 gigaelectronvolts to 350 gigaelectronvolts, and that he plans to report it in a paper to be sent to a high-energy physics journal in a couple of weeks. He does not yet have sufficient data to report the entire energy range that the AMS is sensitive to — up to 1 tera-electronvolt — in a statistically meaningful way. Ting had reporters hanging on his every word as he appeared at one point to hint that spectrum might drop off at some energy in a way that could be consistent with a theory of dark matter. But then he added in response to direct questions that he might also have no signal.

"It's a let-down,"says Fermilab physicist and dark-matter expert Dan Hooper, who had tuned in online to follow the press conference live from Batavia, Illinois. The AMS will undoubtedly contribute our knowledge of the positron excesses seen by Fermi and PAMELA, he says, but today was not the day.

Neal Weiner, a theoretical physicist at New York University in New York who was present in the audience, says that even if Ting does announce a potential dark-matter signal, it will need to be interpreted with care. A very abrupt bump of the type that would point unambiguously to dark matter should already have shown up in existing data, he says. Probably, then, even if Ting's events do show a positron excess, physicists will continue to debate whether that is produced by some more ordinary astrophysical source, or dark matter.

http://blogs.nature.com/news/2013/02/dark-matter-search-from-the-space-station-continues-to-tease.html