

Researchers prove existence of antiproton radiation belt around Earth

August 5 2011, by Bob Yirka

Italian researchers using data from the satellite PAMELA have proven that theories showing there ought to be a ring of antiprotons encircling the Earth due to cosmic rays colliding with nuclei in the upper atmosphere are correct. Piergiorgio Picozza from the University of Rome, Tor Vergata, and a host of colleagues have published the results of their findings in *arXiv*.

Physicists have theorized that the constant stream of [cosmic rays](#) (generally comprised of protons, electrons and helium nuclei) generated by the sun and other little understood sources must produce a shower of sorts of smaller particles when they collide with other nuclei in the [Earth](#)'s upper atmosphere and break apart. Some of those smaller particles have been assumed to be [antiprotons](#), many of which would be annihilated when colliding with particles of ordinary matter. Those particles that don't collide with ordinary matter however, should remain in the atmosphere, forming a belt, called the Van Allen radiation belt, around the planet. It's this belt that the researchers set out to prove existed, which would in turn prove the whole theory to be correct.

Because of the earth's magnetic field, physicists suggest there actually exist two such radiation belts covering the planet, the outer and inner. The outer belt should be comprised of lighter particles such as positrons, while the inner belt would consist of much larger particles, such as antiprotons because the force of gravity would be able to hold them in.

To test the theory, the researchers turned to the Payload for Antimatter

Matter Exploration and Light-nuclei Astrophysics (PAMELA) Russian made satellite, which has a cosmic ray detector onboard and regularly passes through a particularly dense section of the Van Allen belt called the South Atlantic Anomaly.

Over a period of 850 days, between July 2006 and December 2008, sensors onboard PAMELA detected 28 antiprotons, which the team says, is about three times more than would be found from a random sample of the solar wind, and constitutes the most abundant source of antiprotons ever seen near the Earth.

Besides proving the Van Allen [radiation belt](#) theory correct, the discovery also opens the door to other possibilities, such as using the discovered antiprotons for manmade purposes, such as one day perhaps serving as fuel for rockets.

More information: arxiv.org/abs/1107.4882

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Citation: Researchers prove existence of antiproton radiation belt around Earth (2011, August 5) retrieved 19 April 2024 from <https://phys.org/news/2011-08-antiproton-belt-earth.html>

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