Report September 9, 2024

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LPPFusion Publishes Paper on pB11 Plans

Frontiers in Physics has published LPPFusion's latest peer-reviewed paper, "Preparations for pB11 tests in the FF-2B dense plasma focus" by Chief Scientist Eric Lerner and Research scientist Dr. Syed Hassan. The paper is based on Lerner's invited presentation last year to the 3rd International Workshop on Proton-Boron Fusion in Prague. It is being published as part of a collection of papers from the conference that will serve as a valuable resource for journalists investors and others wanting to learn about the burgeoning field of proton-boron fusion (also called hydrogen-boron or pB11 fusion).

The paper describes LPPFusion's planned use of decaborane fuel and of diagnostic instruments to determine what is happening in the hot plasma. While the main pB11 fusion reaction produces no neutrons, two side reactions do produce small amounts of neutrons and radioactive C-11. The paper shows how these reaction products can be used with suitable detectors to provide accurate data on fusion yield, and the density and ion energy of the confined fusion-producing plasma. We'll soon be putting these preparations to use in our first pB11 experiments.

Winding up Reg D with A Bang!

With only six days left in LPPFusion's 2024 Reg D share offering for accredited investors, we are still $93,000 short of our all-important goal of $ 1 million in cash and pledges. Achieving this goal will turn at least half a million in pledges into immediate investments. This money in turn will allow us to immediately start our search for a new research scientist to help accelerate our fusion work. Any accredited investor can invest $5,000 or more. We only need 10 of you at $10,000 each or 4 at $25,000 each. We're closing in, thanks to investments and pledges from Ben Ferris, Warren Upham, Vincent Tabone, David Marcus, Dr. Tim Eastman and Dave Bright. But we need to get this done right now!

If you are not an accredited investor, you can still invest in our Wefunder campaign, but that is also closing soon, so hurry!

Anti-Helium Confirms Alfven's Ambiplasma Hypothesis

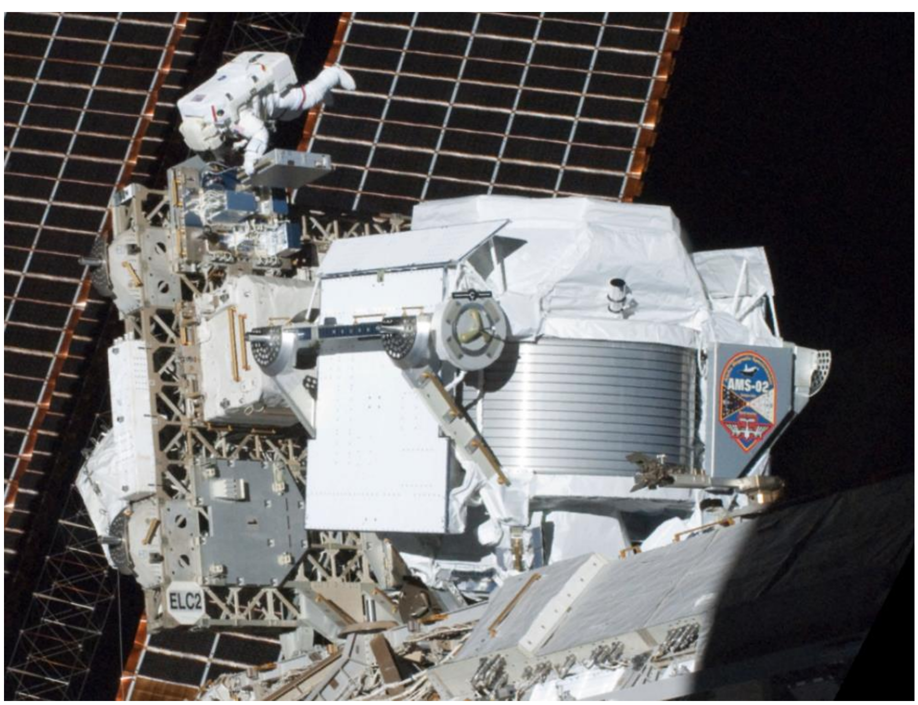
Note: We've been so busy in the lab, we have not had time to keep up with developments in cosmology in our reports. A lot has happened this year and with this report we will start catching up.

As more and more contradictions pile up between the predictions of the Big Bang theory and observations, some get a lot more attention than others. The too-old, too-small galaxies discovered by the JWST telescope got a good deal of media attention. But sometimes contradictory data just quietly leaks out, as researchers don't know exactly what to do with it. That's the case with the discovery of anti-helium by the Alpha Magnetic Spectrometer on board the International Space Station. Data for this discovery has been accumulating since 2016, but it is only getting widespread notice now, since it was reported just in conference presentations, not in published papers.

What is anti-helium (anti-He) and what so exciting about the AMS finding nine anti-He ions? First, let's ask what is anti-matter? Unlike dark matter, anti-matter is real stuff, observed in the laboratory. Every particle of matter, like protons, electrons and neutrons, has an anti-matter twin, which is identical in mass and almost all other properties, but has an opposite electric charge. For example, anti-protons have negative charge.

When high energy particles collide, some of their energy can be converted to mass, which always appears in the form of matter-antimatter pairs, such as electrons and positrons or protons and anti-protons. Conversely, when anti matter particles collide with their matter twins, they annihilate each other producing only energy in the form of photons.

Antimatter has long posed a big problem for the Big Bang theory. If the universe originated, as the theory hypothesizes, in an extremely hot, dense state, vast number of matter-anti-matter pairs would have first been created and then, as the universe cooled, annihilated each other so thoroughly that the density of matter left over would be one hundred billion times less dense than that we've observed in the cosmos.



The giant Alpha Magnetic Spectrometer (see space-walking astronaut at top for scale) on board the International Space Station.

To save the theory, Big Bang cosmologists have long hypothesized some tiny asymmetry between matter and anti-matter that allowed far more matter to survive. But laboratory evidence for this asymmetry has never been found.

But even ignoring the Big Bang (BB) theory, there is a mystery with anti-matter: where is it all? If matter and anti-matter are always created in equal amounts, why is the world that we see made up almost entirely of matter? In 1961, Hannes Alfven, the pioneer of the modern plasma physics that we and all fusion researchers use today, hypothesized that antimatter does exist in an amount equal to matter—but that matter and antimatter had been naturally separated out by the working of magnetism and gravitation on a hypothetical primordial "ambiplasma"—a highly dilute cosmic plasma made up of both matter and antimatter. He and his colleagues worked out in mathematical detail how this separation would have occurred before dense structures formed in a universe with no Big Bang and no origin in time.

However, there was never any observational evidence for this theory. Now, that's changed. Starting in 2016 the AMS (attached to the ISS because of the need for so much power to drive the magnets on the instrument) has been detecting occasional anti-helium nuclei. The AMS magnet causes particle trajectories to bend, allowing both charge and mass to be measured, and by these means the instrument has detected a handful of He4 as well as He3 and deuterium nuclei. This has been shocking because by the Big Bang theory, it should have detected none.

With the BB, no antimatter should have survived the initial hot dense period. Current antimatter detected in cosmoramas could be produced by collisions of high-energy protons. Producing anti deuterons would be 10,000 times rarer, anti-He3 100 million times rarer and anti He4 a trillion times rarer. But AMS detected one anti-helium nucleus for about 100 antiprotons, a factor of **ten billion more than predicted from BB assumptions,** and also observed about the same number of anti He3 and anti-deuterons.

While totally contradicting the Big Bang predictions(again), these observation completely confirm Alfven's predictions. In his theory, the separated clouds of matter and antimatter would evolve in identical ways into galaxies and stars, so thermonuclear process in anti-stars would produce anti-Helium nuclei. As occurs in our Sun and other stars, some of the helium would be accelerated to high energy to become cosmic rays. Over tens of billions of years, some of these cosmic rays would find their way across the vast distance separating matter and antimatter clouds and show up in our own galaxy—and eventually in the AMS. The number of anti-helium cosmic rays are about a million times less than ordinary matter helium cosmic rays, just the density Alfven and colleagues predicted over 50 years ago.

In addition, as the He4 cosmic rays circulated in our galaxy, some of them would run into protons, causing a proton or neutron to be annihilated, producing He3 after one collision and deuterium after two collisions. The almost one for one ratio among the three antiparticles would thus be neatly explained. The handful of helium and deuterium nuclei are our first tiny ambassadors from anti-matter stars and galaxies—the first evidence that such worlds exist.

Of course, Big Bang cosmologists have invented ad hoc, after-the-fact dark matter explantions of where the antihelium could come from. But as we have emphasized many times before, science works on the basis of confirmed predictions that are made before observations, and the antihelium discovery confirm the predictions of the ambiplamsa hypothesis, not the Big Bang. Inventing fairy dust or dark matter to fit observation already made is not the scientific method.

Some mysteries still remain. Most important, is the question how far away these little astronauts have traveled. For that more research will be needed, but they almost certainly come from as far as the nearest superclusters 100 million light years away, and perhaps further. More research will shed light on this.

New Videos Online

Two new videos are available on LPPFusion's YouTube channel. The first is the Q and A session from the panel at the ITER Inaugural Private Public Fusion Workshop on May 27th which Lerner participated in. The second is the latest study group in the Evolution of Physics series, continuing the discussion of the Second law of Thermodynamics.