Report April 2, 2025

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Wefunder Almost to $50,000—Boost Us Over!

LPP Fusion’s new crowdfunding campaign on Wefunder has reached $44,000. Thanks to all our 38 early-bird investors. We’re only $6,000 short of our first goal of $50,000. That’s important, because at this goal, Wefunder will make us visible to their 700,000 investors, many of whom have not yet heard of us. In addition, we will be able to access the money raised so far for our ongoing research needs. Whoever puts us over will get a big shout out! So let’s get this done this week.

First Pinch With Hydrogen-Boron

As forecast in the last report, we were able to get steadily better breakdowns, with less voltage oscillation. When we got the oscillations below the threshold of about 28 kV, **we got our first pinch on shot 1 of March 7**. A “pinch” is when the current twists itself up into a plasmoid, generating increased density and high temperatures. This is a big step forward, even though no fusion reaction were observed. It shows that with a mix that is still mostly boron by mass we can get an adequate breakdown for a substantial pinch.

The HVP and MRC data indicate why no fusion happened. Three distinct pinches are observed, with the first and third being considerably larger than the second. The first pinch was at 1.49 microsecond and the third at 1.92 microseconds. In each pinch, the voltage rises and the current falls, indicating energy being drawn into the plasmoid.

The likely hypothesis is that the first sheath was almost entirely hydrogen and the third almost entirely boron ions. Because of what is known as the “Alfven critical velocity” phenomenon, the boron ions have a “speed limit” in the rundown of about 7 cm/microsecond. Beyond that velocity the tightly bound inner electrons of each boron ion start getting stripped off and the energy loss prevents the boron ions from accelerating beyond that velocity. This is a similar phenomenon to boiling water—it can’t reach temperatures above 100 C (at standard pressure). The third sheath in this shot was traveling at very close to that velocity.

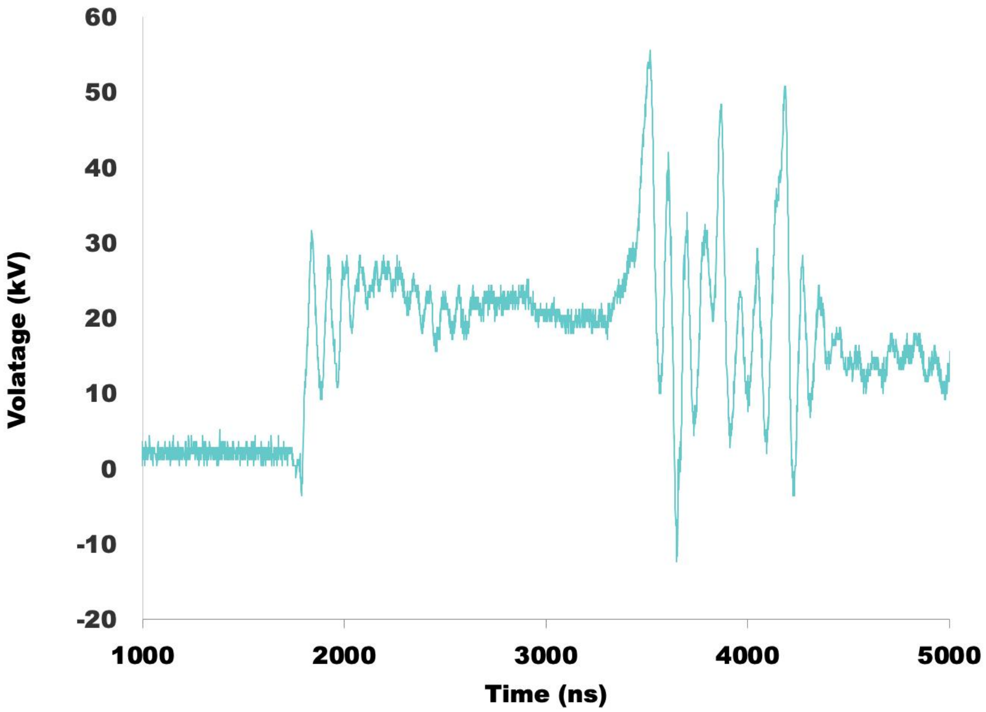

Figure 1 The voltage graph from shot 1, March 7, shows the first pinch with a hydrogen-boron mix. The voltage spike at 3300 ns show the initial pinch—the formation of a dense, hot plasmoid. However, the subsequent spikes show that more than one current sheath was formed. We think the hydrogen was in the first sheath and the boron in the third one, preventing fusion of the two elements.

However, given the observed fill pressures of boron and hydrogen, there is magnetic field energy left over once the boron ions reach the critical velocity. This is available to accelerate the protons in a separate sheath since the protons, being fully stripped of electrons, can accelerate to as fast a velocity as there is energy for. So a separation is possible and would of course eliminate any fusion reactions.

The evident cure is to add enough more boron so that there is no extra energy left over to accelerate the protons in a separate sheath.

Near-Record Shot Shows Importance of Cleaning

We described in the last report that we found we needed two "cleaning " shots with deuterium to remove boron deposits on the anode and insulator. In our most recent tests, we had dramatic evidence of the critical importance of these shots and of getting rid of the deposits.

In the first deuterium cleaning shot after the decaborane shot, we got a very low fusion yield, only a bit more than 1 mJ or a billion neutrons. This is what we often get for the first cleaning shot—which occurs with a heavy coating of boron. We then did a deuterium-nitrogen mix shot, which cleans the anode while the pure deuterium shot cleans the insulator. Because we were testing a switch repair, we then repeated the deuterium shot and got a pleasant surprise.

Figure 2. LPPFusion's silver activation counter shows 220 billion neutrons, or about 1/4 of a joule of fusion energy, from cleaning shot 1, March 27 with deuterium fuel. This matches, within 10%, our record fusion yield.

The yield jumped to 220 mJ or 220 billion neutrons—over one hundred times more than the first deuterium shot! This was the highest deuterium yield we have achieved since our all-time record shot back in May 2016 and was only 10% lower fusion yield than that shot.

The improvement in yield shows that with decaborane we must achieve clean electrodes and insulator before we can get fusion with boron. But it also gives us confidence that once we do achieve this—for example with better heating—we can make rapid progress.

Progress on Heating

We've made more progress on the heating problems we mentioned in the last report, but we have not yet completely resolved this problem. The first part of the problem was not delivering the decaborane gas efficiently to the vacuum chamber because it was condensing on various cold spots on the way. Since the mix chamber and sample container that stored the decaborane had no sensitive components that were heat-sensitive we decided to try higher heat (100 C). This led to the decaborane melting and then boiling, producing plenty of gas, while the high heat eliminated the cold spots enroute to the vacuum chamber. We are now able to get many "fills" of the chamber for a single 4-gm fill of the sample container with decaborane powder.

However, we still have problems within the vacuum chamber itself. We found out that our gauges were not accurately reading the decaborane pressure, so recalibrated them against the pressure of a different gas—hydrogen. We did this just by filling the mix chamber with a known pressure of hydrogen, and then filling the main chamber with decaborane until the gas pressure in the two chambers was balanced and gas did not flow in either direction.

When we did this, we found that we had about half as much decaborane in the chamber as the gauges had earlier been reading. We need to double the amount of decaborane to get to where we should be. But at this point we found that after we filled to the target pressure, the pressure in the chamber fell rapidly, indicating that the decaborane was condensing on cold spots in the chamber itself, especially on the anode, which was much cooler than our goal. As the cleaning shots showed, we can't get good results, and measurable fusion if we fire a shot with a boron or decaborane coating on the key parts.

We also can't just arbitrarily increase the heat on the electrodes however, without endangering the heat-sensitive Mylar insulator layers. We are now upgrading the insulation on the anode to get its temperature above our goal. Once we do that, we expect rapid improvement towards boron fusion shots.

New Cosmology Videos Make A Splash

This month LPPFusion released two new videos in our cosmology series. Catching up with the discoveries contradicting the Big Bang, we reported on "Lithium Between Stars, Nails in Big Bang Coffin" which describes new evidence that there is far less lithium in interstellar space than predicted by the Big Bang hypothesis, something readers of these reports have read about. Then we released the second episode in our major series "Cosmic Evolution—If the Big Bang Didn't Happen, What Did?" In Episode 2, "Stars and Galaxies, but No Big Bang" Lerner explains how the giant filaments of plasma, whose formation was described in episode 1 of this series, gave rise to the present-day hierarchy of superclusters and clusters of galaxies, galaxies, molecular clouds, stars and planets. Only the interaction of gravity and electromagnetism was needed for this process--no dark matter, dark energy or Big Bang.

In a sign that more people are becoming aware of the debate in cosmology, the two videos have together garnered almost 90,000 views, far more than most of our videos.

We also released a short video of us taking a recent shot, which got 12,000 views so far. Thanks to our new IT Assistant, Sam Grund!