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High technology research, development and consulting in plasma physics, X-ray sources, and Focus Fusion

LPP Focus Fusion Report
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Summary:

- **Vacuum Chamber gets Titanium Nitride Coating as Tests Near**
- **Fusion Innovation Act Introduced into U.S. Congress**
- **IEEE Spectrum Features LPPFusion**

Vacuum Chamber gets Titanium Nitride Coating, New Window as Tests Near

As preparations for the next set of experiments accelerate, LPPFusion has received the newly coated vacuum chamber parts back from suppliers in Ohio and NJ. The parts have been coated with titanium nitride in order to minimize the oxygen in the chamber. On the one hand, the coating will act as a sponge soaking up any hot oxygen produced during the shots of the FF-1 experimental device. On the other hand, the titanium will tightly grip the oxygen, not allowing it to be torn away during a following shot.

The point of greatly reducing the oxygen is to prevent the formation of tungsten oxide on the tungsten electrodes. Since the metal tungsten is extremely heat resistant, while tungsten oxide is not, reducing tungsten oxide also reduces the tungsten impurities released into the plasma. Reducing the impurities is the key to increasing the density of the plasma and thus the fusion energy produced.

The vacuum chamber assembly will begin within days. Other upgrades to the chamber include a large quartz window, replacing a copper one, for x-ray instruments. The quartz window is far more resistant to giving up oxygen than the copper one. It will also afford the research team a good view of the electrodes and insulator during the experiment as it is transparent. Once the chamber is assembled and pumped down to a vacuum, it will be wrapped in a heating and insulating blanket, currently being fabricated, which will bake it for five days at 150° C. The baking will eliminate the vast majority of the oxygen that inevitably clings to metal parts. That will prepare the device for the next experimental series before the end of December.

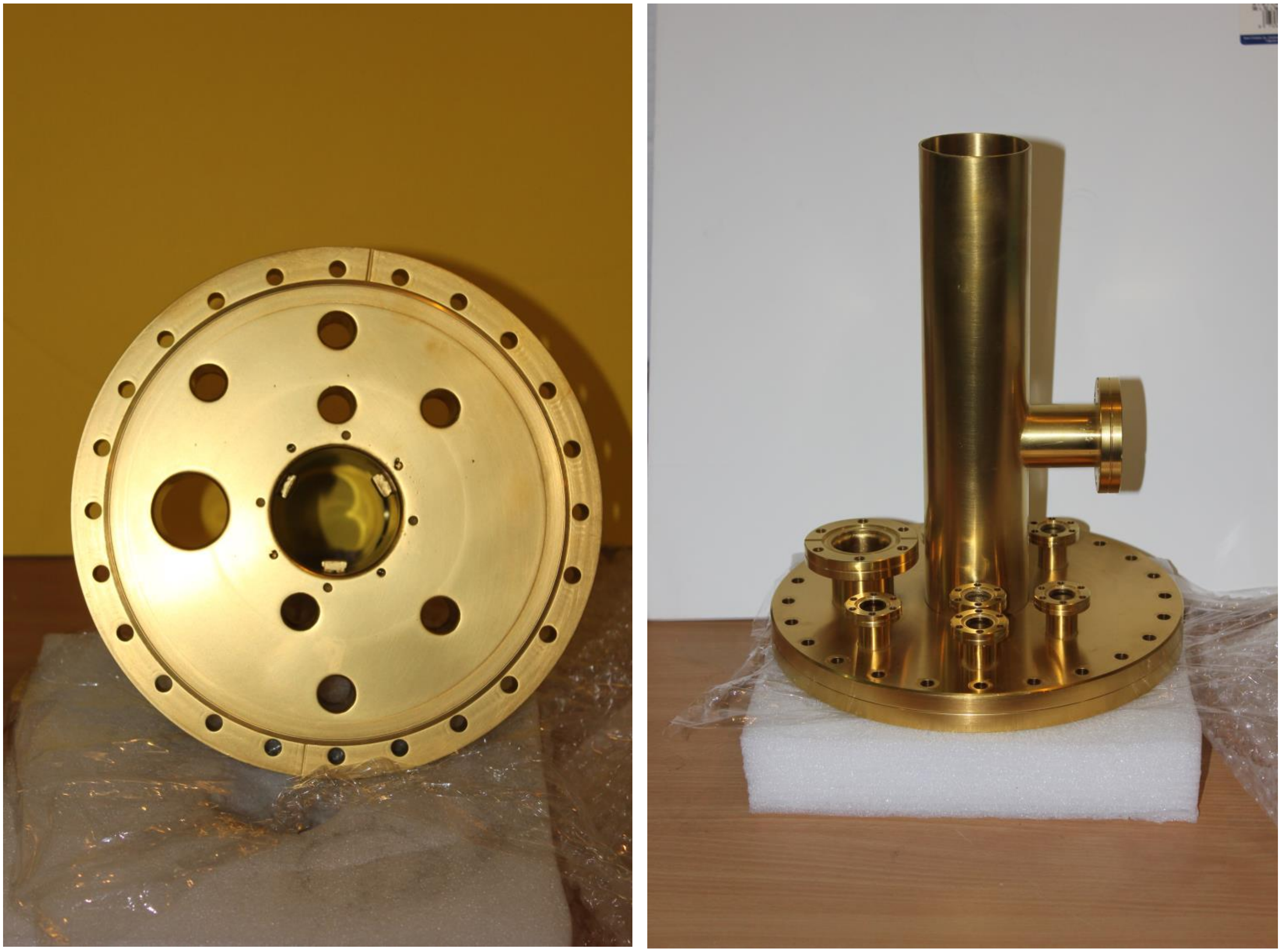

Figure 1. FF-1's drift tube looks good as gold with its titanium nitride coating. The surface shown on left is the top of the drift tube and the bottom of the main vacuum chamber. The outer surface (right) was also coated during the plasma-based deposition process, although since it is not exposed to the plasma, the coating serves no purpose (except possibly decorative!). The tube had to be cut to this size to fit in the coating chamber. It will be welded to an uncoated lower section. Coating is not needed on the lower section as it will not be exposed to high enough temperature to tear off oxygen.

Fusion Innovation Act of 2015 Introduced into U.S. House of Representatives

A bill has been introduced into the U.S. House of Representatives to fund a range of fusion concepts that have "the potential to demonstrate net energy production not later than 7 years" after the start of the program. The bill The Fusion Innovation Act of 2015, sponsored by Rep. Alan Grayson (Dem, FL), is the first such initiative to focus on funding fast routes to fusion. If enacted, it would instruct the US Department of Energy to award grants to companies or other efforts that can show in design studies that their concepts can be rapidly developed to actual power production.

“Such a law would clearly benefit programs like ours,” commented LPPF’s President Eric Lerner, “as well as ending the DOE’s present misguided policy of concentrating solely on the ITER route to fusion. ITER can’t possibly produce net energy in seven years, if at all.”

The Fusion Innovation Act also would instruct DOE to share with universities and private companies such important resources as advanced computing platforms and simulation codes. It would establish as well a process for fusion researchers from the national laboratories to serve residencies at private fusion companies. “Together these steps would enormously accelerate the process of getting to a working fusion generator,” says Lerner.

But to enact such a bill a broad mobilization of popular support is needed. LPPF took a first step by conveying to Rep. Grayson the “Open Letter on Fusion” signed by over 50 scientists from around the world that urges a broader approach to fusion. Rep. Grayson is already circulating the letter to colleagues on the House Science Committee, which is considering the bill, according to his staff. But more must be done to show committee members that people all across the world, as well as in the U.S., consider a broad and rapid path to fusion essential.

“Together with the Focus Fusion Society, we’re asking everyone to contact the Science Committee to urge that they co-sponsor this bill, hold hearings on it, and rapidly recommend it to the full House for passage,” says Lerner. Letters of support can be sent to the Science Committee through their website. Please send copies of letters to Focus Fusion Society at this e-mail address so we can keep track of support. Support can also be expressed publically at popvox, countable, simpolfy and policynow.

IEEE Spectrum Features LPPFusion Progress

LPPFusion’s FF-1 device was one of three fusion projects featured by *IEEE Spectrum* in their November news article, "Three alternative fusion projects that are making progress". Spectrum is sent out monthly to over 400,000 members of the Institute of Electrical and Electronic engineers, the world’s largest organization of technology professionals. The article started with a photo of FF-1’s new tungsten electrodes. The article also featured a second effort to get hydrogen–boron fusion, the laser-based approach of Heinrich Hora and his colleagues. The third approach was MIT’s compact tokamak, ARC, which uses higher magnetic fields than the huge ITER project in France.