



Lawrenceville Plasma Physics, Inc

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

Focus Fusion Report

March 22, 2012

Summary:

- **FF-1's confinement of 150 keV ions to be published in peer-reviewed journal**
- **LPP's Lerner, Iranian Scientists to Propose "Fusion for Peace" aneutronic research project**
- **Machining problems hold back testing, new cathode design developed**
- **Board of Advisors welcomes Alvin Samuels**

Publication of 150-keV confinement adds to LPP credibility

LPP's team received word on February 27th that our paper describing the achievement of fusion reactions from ions confined at energies equivalent to over 1.8 billion degrees C was accepted by [Physics of Plasmas](#), "the most highly cited journal devoted fully to plasma physics."

The paper, titled "Fusion reactions from >150 keV ions in a dense plasma focus [DPF] plasmoid," also resolves a long-standing scientific controversy with major implications for whether the DPF is a viable source of useful fusion energy. If fusion reactions in a DPF come primarily from an unconfined beam, then the fusion yields are unlikely to scale to useful quantities of energy. On the other hand, if the fusion reactions take place primarily between ions confined within a concentrated ball of plasma (a "plasmoid"), the DPF (and LPP's technology suite) are much more promising as a clean energy source.

The results detailed in the paper show conclusively that the majority of fusion reactions in a DPF using LPP's patented design come from the plasmoid, not a beam. Furthermore, the high temperatures achieved are hot enough to ignite the ultimate clean fusion fuel, a mixture of the common elements hydrogen and boron that produces only a tiny quantity of harmless helium as waste.

LPP is about to issue a press release on this development. While we announced some of these results last year, we feel that publication in a respected peer-reviewed journal will

make our work more news-worthy and credible, leading to wider awareness and more investment.

LPP's Lerner joins Iranian fusion researchers to call for US-Iran aneutronic research project

We at LPP have been aware for some time that Iran has developed one of the most vigorous DPF research programs in the world, and we also were in touch with an Iranian fusion scientist who was inspired by our work to theoretically research Focus Fusion. Recently LPP President Lerner learned that not only were there other groups in Iran working on hydrogen-boron fusion, but the Iranian fusion program was explicitly aiming to leapfrog DT efforts to arrive at boron fusion.

In light of the tension between the governments of the US and Iran over uranium enrichment, and acting as a concerned citizen and physicist, not officially on behalf of LPP, Lerner has joined with two of his Iranian fusion colleagues, Dr. Hamid Yousefi and Dr. Morteza Habibi, in issuing a call for a joint US-Iranian aneutronic research project. Such a project, joining together the efforts of the two countries most involved in aneutronic fusion work, could start to decrease tensions and, if successful, could “make uranium enrichment obsolete, block nuclear weapons proliferation everywhere, liberate the world from oil, and open up a new source of cheap, clean unlimited energy.”

This call for a “Fusion for Peace” Project was published in [OpEdNews](#) on March 22. Lerner hopes that such a call will generate support for such a project and in the short term draw attention both to alternatives to confrontation and to the possibilities of aneutronic fusion.

Machining problems hold back testing, new cathode design developed

We have also had a frustrating month in the technical work. While we had hoped to replace a broken cathode plate by mid-February, the tiny holes that held the tungsten pins on the inside edge of the plate proved extremely challenging for our regular machinist. The tungsten pins are critical to the functioning of FF-1, as it is from them that the current starts to flow and forms into filaments. As a result of the machinist's difficulties, the plate was not completed until mid-March. Unfortunately, while the machinist had in the past been able to level the tungsten pins successfully, on this attempt he seriously bent most of them, rendering them useless.

However, during the long delay, LPP research team members Aaron Blake and Derek Shannon designed a more robust substitute for the pins—a serrated ring of tungsten, with the saw tooth points substituting for the points of the pins. We also have located a much larger machine shop which uses electrical discharge machining (EDM), a highly precise method of machining with intense electric currents. We now expect the new shop to complete the new cathode plate by early April, allowing us to resume firing, confident that we will have a highly symmetric set of electrodes. This symmetry is essential to achieving good compression of the plasma and producing higher fusion yields.

Board of Advisors welcomes Alvin Samuels

Lawrenceville Plasma Physics is pleased to welcome long-time LPP investor Alvin Samuels to our [Advisory Board](#). Mr. Samuels has many years of extensive experience in oil-drilling engineering, well-head treating of gas and hydrocarbons, and research and development. As a Staff Drilling Engineer for the Shell Oil Company, Offshore West Division, and advisor to their deep-drilling study group, Mr. Samuels has ensured the safety of some of the most dangerous wells ever drilled, while recognizing that incidents like the Deepwater Horizon spill demonstrate that we must move beyond fossil fuels.

Post-Shell, Mr. Samuels founded Ironite Products Company, Gas Sweetener Associates, and The Sulfatreat Company. He was directly involved in every aspect of research, development, marketing, and sales. He holds more than twenty patents related to reactions with hydrogen sulfide, mercaptans, oxygen and various iron oxide compounds. Al has proven experience in guiding a start-up to exit, as he was instrumental in selling his company to major oilfield service provider Smith International (now Schlumberger).

His extensive career in the field and in the factory, his hands-on experience with new, unproven technology, and his confidence in the promise of LPP's Focus Fusion will make Al an invaluable partner in our success.