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

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New Video Ranks Top Fusion Project Results-- FF-1 Leads Many Giants

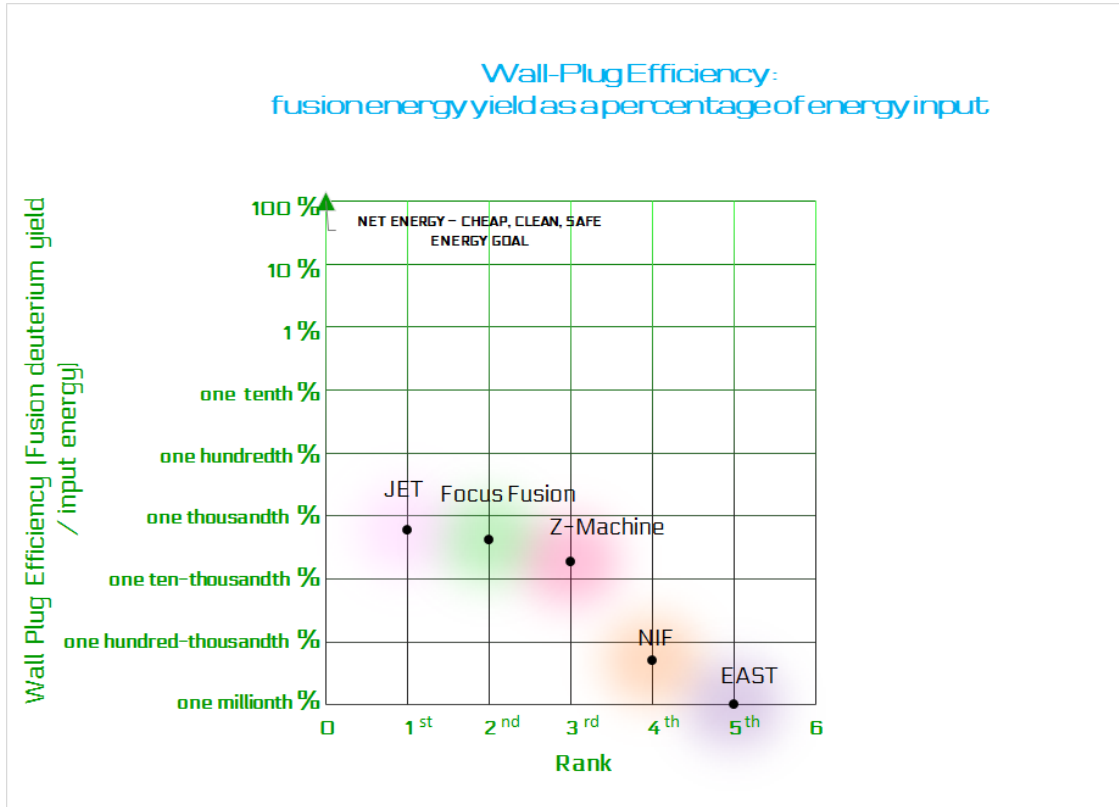
LPP Fusion released on April 10, 2017 a new video series, “The New Fusion Race”, providing the first ranking of the world’s leading efforts to achieve fusion energy. The film compares objective measures of the results that various projects have achieved in the race to produce more energy output than the fusion devices consume. It also explains the different approaches. By some important measures, LPP Fusion’s results are ahead of giant government-funded and private efforts that have far larger financial resources. “We’ve compared the leading projects using published, quantitative measures,” explains Ivy Karamitsos, the film’s producer, “and we are making available all the [references](#) that we based our work on. We’re sure that anyone will reach the same conclusions.”

Perhaps the most important comparison is the ratio of fusion energy output to the energy used by the devices, a measure called “wall-plug efficiency”. This measures how far the fusion efforts are from the key goal of producing more energy from a machine than is put into it, a necessary condition for practical power production. The video compares projects which have published results using the same fuel, deuterium (an isotope of hydrogen). **Here, LPP Fusion’s, \$5-million-dollar Focus Fusion-1 (FF-1) device comes in a close second to the largest functioning tokamak device, the Joint European Torus (JET), which has cost nearly a thousand times more. While JET leads FF-1 by only 50% in wall plug efficiency, FF-1 is a factor of 80 ahead of the multibillion-dollar National Ignition Facility (NIF) by the same measure. (See charts from the video included below). Given its strong results and small investment, FF-1 ranks first in the world in efficiency per dollar invested.**

The large government-funded devices look better with a different measure, the video points out. Achieving net energy from a fusion fuel requires a combination of high temperature, density and confinement time. The product of these three numbers, called $n\text{-}\tau\text{-}T$ for the symbols used to represent them, is another measure of fusion results. Equivalently, the same data can be expressed as the product of pressure and time. By these measures, the Chinese tokamak EAST and NIF are number one and two. Yet even here, **FF-1 leads all other privately-funded fusion devices by over a factor of 100**, while remaining nearly the same factor below EAST. “Of course” adds LPP Fusion Chief Scientist Eric Lerner, “this is just a snap-shot of the race. No one is yet within a factor of a thousand of the goal, so things can change. But we think this is a good way to show the world where the race for fusion stands now.”

The video is based on an October 2016 presentation in New York City by Lerner and contains new original animation by Torulf Greek. It is being released as a 70-minute, six-part series, with each section 8-20 minutes long. Part 1, “The Old Fusion Race”, describes and compares the large government projects based on deuterium-

tritium fuel. Part 2 “Aneutronic Fusion”, turns to the mostly privately funded aneutronic projects, using fuels that produce no neutrons and thus no radioactive waste. Part 3, “Focus Fusion: How It Works”, describes LPP Fusion’s own FF-1 effort. Part 4, “Fusion Race: Who is Ahead?”, the core of the series, compares all the projects, while Part 5 “Focus Fusion, Next Steps”, details FF-1’s experimental challenges and progress. Part 6 “Fusion Race- Stats 2017”, summarizes all funding and fusion yield data with graphs, pie charts and Venn diagrams. The video is intended for a wide non-technical audience, but is accompanied by [background material](#) for journalists and researchers. It is available on [YouTube](#) and [Vimeo](#).



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