



Physikalisches Kolloquium

Prof. Markus Roth

TU Darmstadt

The path to laser-fusion energy Focused Energy, a new startup in the fusion community

Fusion, the fundamental energy source in the universe and origin of almost all the matter we are made of. For decades scientists have worked on recreating the engine of the stars in the laboratory to harvest this energy source. As clean and safe energy is needed more than ever new developments have led to the rise of startup companies around the globe taking advantage of the science developed of the years and combining the results of the past with the technology of the 21st century to make fusion energy a reality.

Focused Energy is a US/German startup supported by the TU Darmstadt and deeply embedded in the international science community. We are focusing on the concept of laser-driven inertial confinement fusion, an alternative approach to the magnetic confinement mainstream with their flagship facilities ITER and Wendelstein 7-X.

In inertial fusion energy (IFE) a pellet is compressed by powerful lasers and the thermalization of the fuel in the central spot is supposed to reach fusion conditions and yield. After decades of research this for the first time has been achieved successfully at the National Ignition Facility in the US on August 8th 2021. However, this specific approach is not well suited for energy production.

In our approach, a small pellet containing a milligram of DT is directly irradiated by intense laser light and compressed to roughly 1000 times solid density. At the moment of maximum density, a burst of energetic, laser-driven ion beams is focused into a small part of the compressed fuel to rapidly rise the temperature above ignition temperature and start a bootstrap fusion reaction, which results in a supersonic burn wave consuming the fuel.

More than two decades of research have led to this path, which has recently been quoted the most promising approach in inertial fusion energy by international leaders in the field (see for example Physics Today).

Focused Energy plans to develop a demonstration facility within this decade to demonstrate ignition, burn and gain sufficient for attractive energy production based on the unique combination of high-energy and high-power lasers.

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