PPPL
PRINCETON PLASMA PHYSICS LABORATORY

Colloquium

Fusion Energy, Based on Lasers and Direct Drive Targets

DR. JOHN SETHIAN

Physicist
Naval Research Laboratory, Washington, D.C.

We are developing the science and technologies needed for a commercial fusion energy source based on lasers and direct drive targets. The "business model" for this program is based on two basic precepts. We are developing the key components in concert with one another to ensure an efficient, coherent system, and we maintain close coupling between the technology, science, and final application of an economically and environmentally attractive power source. Two lasers are under development, diode pumped solid state lasers and krypton fluoride gas lasers. Both have demonstrated repetitive (5-10 Hz) operation for long duration (>10,000 shot) runs. Significant progress has been made in other areas, including: final optics, target fabrication, target injection and tracking, and chamber/blanket technologies. Recent advances in target physics show we could realize meaningful gains (~ 60) with KrF laser energies of 500 kJ. These have led us to propose the Fusion Test Facility (FTF), which will be a less expensive, lower risk development path to demonstrating inertial fusion energy. The high-repetition FTF would build upon and extend the target physics underpinnings provided by large single-shot ICF facilities. The FTF will demonstrate the target physics, integrate the key technologies, develop materials and components (for both MFE and IFE), and would be used to gain operational experience with a working fusion system. The FTF could become operational in 2019, and would be the basis for follow on power plants. Over fifty scientists and engineers, from more than 25 institutions (including PPPL!), are responsible for this progress.

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