# DEPARTMENTAL LECTURE 2018

## Title: Laser Driven Fusion

Physics Department was organized a lecture/talk on "Laser Driven Fusion" by eminent professor V.K.Tripathi (IIT),Delhi on Feb 1, 2018.Around 120 students attended this lecture.A laser-driven technique for creating fusion that dispenses with the need for radioactive fuel elements and leaves no toxic radioactive waste is now within reach.Dramatic advances in powerful, high-intensity lasers are making it viable for scientists to pursue what was once thought impossible: creating fusion energy based on hydrogen-boron reactions.The path to hydrogen-boron fusion is now viable, and may be closer to realization than other approaches, such as the deuterium-tritium fusion approach being pursued by U.S. National Ignition Facility (NIF) and the International Thermonuclear Experimental Reactor under construction in France.

"I think this puts our approach ahead of all other fusion energy technologies," said Hora, who predicted in the 1970s that fusing hydrogen and boron might be possible without the need for thermal equilibrium. Rather than heat fuel to the temperature of the Sun using massive, high-strength magnets to control superhot plasmas inside a doughnut-shaped toroidal chamber (as in ITER), hydrogen-boron fusion is achieved using two powerful lasers in rapid bursts, which apply precise non-linear forces to compress the nuclei together.

Hydrogen-boron fusion produces no neutrons and, therefore, no radioactivity in its primary reaction. And unlike most other sources of power production - like coal, gas and nuclear, which rely on heating liquids like water to drive turbines - the energy generated by hydrogen-boron fusion converts directly into electricity. But the downside has always been that this needs much higher temperatures and densities - almost 3 billion degrees Celsius, or 200 times hotter than the core of the Sun.

However, dramatic advances in laser technology are close to making the two-laser approach feasible, and a spate of recent experiments around the world indicate that an 'avalanche' fusion reaction could be triggered in the trillionth-of-a-second blast from a petawatt-scale laser pulse, whose fleeting bursts pack a quadrillion watts of power