X-ray Lasers: From Star Wars to the table-top

Joseph Nilsen
Lawrence Livermore National Laboratory

Tuesday, May 26, 2015 at 4:30 PM in Steele 102 (reception at 4:00 PM)

Abstract: Dr. Nilsen will tell the story of how the X-ray laser originated as a nuclear-pumped "Star Wars" weapons system and has evolved into a table-top research tool that enables scientists to extend diagnostic techniques such as interferometry into the X-ray regime. The X-ray laser program began as part of the Star Wars strategic defense initiative in the 1980's when President Reagan challenged the scientific community to find a defense against nuclear-tipped ballistic missiles. At the same time Livermore demonstrated the first laboratory x-ray laser driven by the Novette laser, the largest laser system in the world at the time. X-ray laser research worldwide was confined to large National inertial confinement fusion programs using large laser systems to drive the X-ray laser. Since the early days tremendous progress has been made reducing the size and energy requirements needed to drive an X-ray laser. Using psec pulse laser systems X-ray lasers today operate at a 100 Hz repetition rate and are driven by optical lasers with less than one joule of energy per pulse. Today, X-ray lasers are found in University laboratories around the world.

Biography: After finishing his B. S. in Engineering Physics at Cornell University, Dr. Nilsen spent the summer working at Lawrence Livermore National Laboratory in the special studies group set up by Edward Teller before starting graduate school in the Physics Department at Caltech. At Caltech he was a Hertz Fellow and did a thesis on Phase Conjugation via Four Wave in a Resonant Medium under the supervision of Professor Amnon Yariv. After completing his Ph.D. he returned to Livermore where he has spent the last three decades designing X-ray lasers, published more than 250 papers, and holds three X-ray laser patents. His research has resulted in the demonstration of the world's shortest wavelength, highest energy experimentally demonstrated laser. He was selected a Fellow of the Optical Society of America and a Fellow of the American Physical Society for his pioneering contributions to the development and understanding of X-ray lasers and their applications.

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