Notre Dame Science
Department of Physics

STREAKED X-RAY RADIOGRAPHY EXPERIMENTS ON THE NATIONAL IGNITION FACILITY

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Project Searchlight was a campaign aimed at studying radiation transport through machined foam features on the National Ignition Facility (NIF). These experiments used a laser-irradiated gold cavity (hohlraum) to create a 200 eV x-ray source, which in turn irradiated a Ta_2O_5 foam, causing the foam to heat and evolve. The streaked radiography campaign developed an eight ns duration slot-apertured backlighter, and captured continuous images of the evolution of features in four different foam patterns on x-ray streak cameras. This backlighter created radiography images using a nickel x-ray source (8 keV), and had better than 20 μm resolution, while delivering a signal to noise of >10 until the backlighter signal was overwhelmed by the x-ray background from the hohlraum. The National Ignition Facility (NIF) is currently the largest and most energetic laser system in the world. It is currently capable of delivering up to 1.4 MJ of ultraviolet laser light to a millimeter-sized target over the course of nanoseconds. NIF can be used to probe previously inaccessible physical regimes, including creating highpressure systems (100 Mbar), intense radiation baths (350 eV hohlraums; 4 million K), and significant neutron production (predicted 1019 neutrons in a 100 ps burst, currently 4 x 1014 total neutrons).

Nuclear Seminar

All interested persons are cordially invited to attend.