CFEL SCIENCE

Colloquium

10th January 2014 - 14:00

CFEL-bldg. 99, seminar rooms I, II, III

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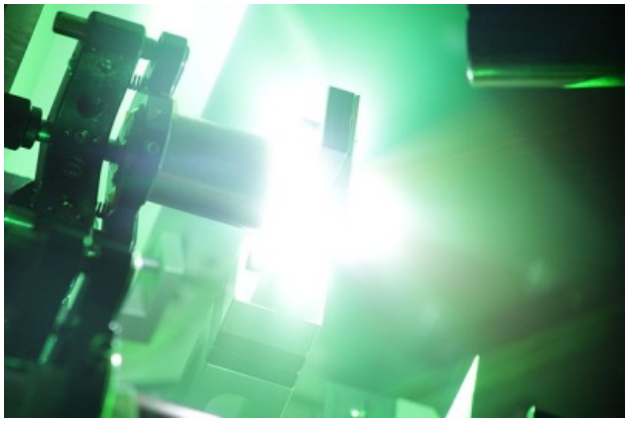
Intense ion and neutron beams from high contrast short pulse lasers

The quest for high energy ions and secondary radiation for applications like material research or even cancer treatment has been going on for some years. Recently using high contrast short pulse lasers and the concept of relativistic transparency a breakthrough has been achieved with respect to ion energy and the production of neutrons. Using the 200 TW TRIDENT laser at LANL we have achieved proton energies well exceeding 100 MeV and intense pulses of neutrons in recent experiments.

Our first short-pulse laser-driven neutron source, powerful enough for radiography is operating in the relativistic transparency regime. Based on the mechanism's advantages, a laser-driven deuteron beam is used to achieve a new record in laser-neutron production, in numbers, energy and directionality. The beam contained, for the first time, neutrons with energies of up to 150 MeV. Thus using short pulse lasers, it is now possible to use the resulting hard x-rays and neutrons of different energies to radiograph an unknown object and to determine its material composition. Our data matches the simulated data for our test sample.



With the high contrast version of PHELIX, operational since a few month, we intend to continue this endeavor using shorter pulse length and up to four times the energy of TRIDENT. Simulations indicate PHELIX being capable of reaching proton energies of about 230 MeV, using cryogenic targets.

Host: Oliver D. Mücke, CFEL-UX