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Recent Developments and Future Applications for Laser-Driven Neutron Sources

Thursday, 19 September 2019 11:40 (30 minutes)

Laser-driven accelerators drive ultra-short pulse beams of MeV ions and photons that can be utilised as deployable neutron sources for science and industry. This talk will summarise recent results from groups around the world focusing on the optimisation of laser-driven neutron sources for applications relevant to security, industry and science. Topics covered include neutron beam characterisation in flux, energy and divergence, neutron energy moderation, and applications in imaging and active interrogation. With the recent delivery of multi-Hz PW-class laser systems, high flux laser-driven based neutron beamlines for applications can now be envisioned with this advanced accelerator innovation
An extreme photon intensity (> 10^18 W/cm^2) interaction with a solid target seeds the acceleration of a dense bunch of suprathermal electrons which give rise to a bright picosecond-pulse beam of ions via the establishment of a TV/m charge-separation electrostatic sheath field. The MeV-temperature of these beams makes them suitable for driving neutron emission via a number of nuclear reactions, depending on the primary target material or the use of a secondary foil that the ions are directed into (a 'catcher'target). The most commonly used materials are deuterated plastic, lithium, beryllium, and copper.

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