Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Ultra-bright laser-driven neutron source M. ROTH, Tech Univ Darmstadt, A. FAVALLI, LANL, V. BAGNOUD, GSI, J. BRIDGEWATER, LANL, O. DEPPERT, TUD, M. DEVLIN, LANL, K. FALK, ELI Beamlines, J. FERNNDEZ, D. GAUTIER, N. GULER, D. HENZLOVA, LANL, J. HORNUNG, TUD, M. ILIEV, K. IANAKIEV, LANL, A. KLEINSCHMIDT, TUD, K. KOEHLER, S. PALANIYAPPAN, LANL, P. POTH, G. SCHAUMANN, TUD, M. SWINHOE, T. TADDEUCCI, LANL, A. TEBARTZ, TUD, FLORIAN WAGNER, GSI, G. WURDEN, LANL — Short-pulse laser-driven neutron sources have become a topic of interest since their brightness and yield have recently increased by orders of magnitude. Using novel target designs, high contrast - high power lasers and compact converter/moderator setups, these neutron sources have finally reached intensities that make many interesting applications possible. We present the results of two experimental campaigns on the GSI PHELIX and the LANL Trident lasers from 2015. We have produced an unprecedented neutron flux, mapped the spatial distribution of the neutron production as well as its energy spectra and ultimately used the beam for first applications to show the prospect of these new compact sources. We also made measurements for the conversion of energetic neutrons into short epithermal and thermal neutron pulses in order to evaluate further applications in dense plasma research. The results address a large community as it paves the way to use short pulse lasers as a neutron source. This can open up neutron research to a broad academic community including material science, biology, medicine and high energy density physics to universities and therefore can complement large scale facilities like reactors or particle accelerators.

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Date submitted: 23 Jul 2015 Electronic form version 1.4