Abstract Submitted for the DPP20 Meeting of The American Physical Society

First demonstration of a neutron-beam source using laserdriven D^+ ions accelerated from thin films of deuterated liquid crystal¹ DEREK NASIR, OSU, PAUL PETERSON, LANL, ANTHONY ZINGALE, NICK CZAPLA, GERMAN TISCARENO, LUCAS D. SMITH, REBECCA L. DASKALOVA, OSU, DANIELLE SCHAPER, UK, CHRISTOPHER HAMILTON, LANL, DOUGLASS SCHUMACHER, OSU, JUAN CARLOS FERNANDEZ, D. CORT GAUTIER, LANL — Energetic (10s MeV) neutron-beam sources have important applications including the non-destructive probing of dense materials and nuclear waste transmutation, but these applications require high average flux currently achievable only using large accelerator facilities or reactors. The use of smallscale laser facilities to generate these neutron beams is still an ongoing research effort. At the same time, free-standing thin films (<1 um) of liquid crystals (LC) have been used on PW-class lasers as plasma mirrors and ion-acceleration targets and are ideal for high repetition rate, in-situ target formation. We have developed a new technique to synthesize deuterated liquid crystals with < 2% remaining hydrogen content. Here we report on an experiment conducted at the Scarlet laser facility where thin films of LC were used to generate a beam of >4 MeV deuterons directed into a Be converter producing fast neutrons through the nuclear stripping reaction. We measured a n⁰ yield of $>2 \ge 10^7 \#/sr$.

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Date submitted: 02 Jul 2020

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