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High Energy Electron Acceleration from Underdense Plasma Channeling Using the OMEGA EP Laser THOMAS BATSON, ANTHONY RAYMOND, AMINA HUSSEIN, KARL KRUSHELNICK, Univ of Michigan - Ann Arbor, LOUISE WILLINGALE, Lancaster University, PHIL NILSON, DUSTIN FROULA, DAN HARBERBERGER, ANDREW DAVIES, WOLFGANG THEOBALD, Laboratory for Laser Energetics, JACKSON WILLIAMS, HUI CHEN, Lawrence Livermore National Laboratory, ALEXEY AREFIEV, University of Texas, Austin — For intense, ps scale lasers, propagation through underdense plasmas results in forces which expel electrons from along the laser axis, resulting in the formation of channels. [1] Electrons can then be injected from the channel walls into the laser path, which results in the direct laser acceleration (DLA) of these electrons and the occurrence of an electron beam of 100s of MeV. [2] Experiments performed at the OMEGA EP laser studied the formation of a laser channel in an underdense CH plasma, as well as the spatial properties and energy of an electron beam created via DLA mechanisms. The 4 omega optical probe diagnostic was used to characterize the density of the plasma plume, while proton radiography was used to observe the electromagnetic fields of the channel formation. These electric fields as well as the spectra of the accelerated electrons have been studied across different plasma density profiles. The channel behavior and electron spectra are compared to 2D particle-in-cell simulations. [1] Willingale, L. et al., PRL 106 105022 (2011) [2] Willingale, L. et al., NJOP 15 25023 (2013)

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