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Using laser-produced energetic electrons to model ionospheric phenomena[1] STEPHEN VINCENA, UCLA Department of Physics and Astronomy, W. GEKELMAN, J. MAGGS, A. COLLETTE, P. PRIBYL — Bursts of energetic electrons are commonly observed throughout the earths auroral zone and are associated with a host of physical phenomena including VLF saucers, Alfven waves, magnetic reconnection, and (possibly) electron phase-space holes. In this laboratory experiment, a burst of field-aligned electrons is produced by the expansion of a dense, laser-produced plasma (lpp) into a uniform, low-density background plasma. The experiment is conducted UCLAs Basic Plasma Science Facility. The background plasma is He, Ne, or Ar, with plasma parameters: ω_{ce}/ω_{pe}=0.1-0.3, $T_e/T_i \approx$6, plasma radius=66r_{ci}, L=17m. A solid target is struck with a NdYAG laser (1.5J, 7ns pulse) focused to a spot size of less than one millimeter. The ions in the lpp (with energies of several keV) are initially unmagnetized. The electrons, however, remain magnetized and a fraction of them jet away from the point source of the laser impact in a field-aligned burst. We present data on the generation of lower hybrid waves by the energetic electrons and the subsequent trapping of these waves within density depletions and show preliminary data on ion heating within the cavities. We also report on the current status of measuring Debye-scale (15μm) electron holes (ion blobs) within the beam using novel miniaturized probes.

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