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Generated Wave Behavior from Laser-Driven Magnetic Pistons Relevant to Magnetized Collisionless Shock Formation E.T. EVERSON, D.B. SCHAEFFER, A.S. BONDARENKO, S. VINCENA, B. VAN COMPERNOLLE, S.E. CLARK, C.G. CONSTANTIN, C. NIEMANN, UCLA — The dynamics of energetic plasma explosions through a tenuous, magnetized plasma is of relevance to many astrophysical, ionospheric, and magnetospheric phenomena, such as the formation of collisionless shocks. Recent experiments at the University of California at Los Angeles (UCLA) utilized the LArge Plasma Device (LAPD) and the Raptor laser system to drive super-Alfvénic laser-plasma explosions through the uniform, magnetized background plasma of the LAPD. The 100 J, 25 ns FWHM Raptor laser ablated a graphite target directing the exploding debris-plasma quasi-perpendicularly to the background magnetic field (300 G). The debris-plasma interacted with the low-density ($2 - 5 \times 10^{12}$ cm^{-3}), He plasma of the LAPD for 60 cm across the field lines and about 8 m along the field lines. Magnetic flux probes were used to measure wave behavior both perpendicular and parallel to the background field. Across field behavior shows signs of collisionless coupling between the debris and ambient plasma, leading to a field compression on the order of the Alfvénic Mach number (~ 1.4). The debris-explosion also produced strong parallel wave behavior resulting in large amplitude whistler ($\Delta B/B_o \sim 4\%$) and Alfvén ($\Delta B/B_o \sim 10\%$) waves.

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