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Plasma and Radio Wave Generation by an Electron Beam in a Laboratory Plasma[1] S DORFMAN, V ROYTERSHTEYN, Space Science Institute, B VAN COMPERNOLLE, UCLA, C CATTELL, C COLPITTS, UMN, GL DELZANNO, B CARLSTEN, K NICHOLS, LANL — Interaction between relativistic electron beams and a magnetized plasma is a fundamental and practical problem relevant to many challenging issues in space physics and astrophysics. For example, compact high-energy electron beam sources may be used on future spacecraft to map magnetic field lines during substorms, provided the beam is not disrupted by wave generation. Similar classes of waves (x-mode, Langmuir, etc.) may also be generated by naturally occurring electron beams, possibly explaining type II/III solar radio emissions. We present preliminary results from a 20 keV beam setup on the Large Plasma Device (LAPD) at UCLA aimed at addressing wave generation mechanisms, wave properties, and dependence on plasma parameters. Results show strong emission between the plasma and upper hybrid frequencies; the emission peaks on the edge of the beam profile and is detectable as radiation outside the plasma. The parallel phase speed is measured to be consistent with wave production via a Landau resonance process. Observed second harmonic power suggests a role for non-linear processes under certain parameters. Future experiments will extend our parameter space to a $\sim$ 1 MeV electron beam. Comparison of experimental results with theory and kinetic simulations is presented.

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