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Design and use of an Elsässer probe for analysis of Alfvén wave fields in a laboratory plasma D.J. DRAKE, C.A. KLETZING, F. SKIFF, G. HOWES, University of Iowa, S. VINCENA, University of California at Los Angeles
— We have designed an electric and magnetic field probe which can simultaneously measure both quantities in the directions perpendicular to the applied magnetic field. This new probe allows for the projection of measured wave fields onto modified Elsässer variables: $z^{\pm} = C_{cf}(\boldsymbol{E} \times B_0)/|B_0|^2 \pm \quad \delta B/(\mu_0\rho_0)^{0.5}$. Here the time averaged background field, B_0, and plasma mass density, ρ_0, are measured separately and the correction factor was determined from cold plasma theory to be $1/C_{cf} = \pm[(1+\{k_\perp\delta_e\}^2)(1\text{-}\omega^2/\Omega^2)]^{0.5}$. Experiments were conducted in singly ionized He plasma at 1810 G in the Large Plasma Device at UCLA. The new probe monitored the propagation of Alfvén waves in the $x - -z$ plane. Collisionless dispersion of the waves, corresponding to Eq. (1) of Kletzing *et al.* [1], was observed in the field measurements. Simulations of the data confirm these results. Further analysis showed that we are able to measure the Alfvén speed ($V_A = E/B$) from the probe data within 1.5% of that from the time of flight data. Results will be discussed further at confeence.

[1] C. A. Kletzing, D. J. Thuecks, F. Skiff, S. R. Bounds, and S. Vincena, Phys. Rev. Lett. **104**, 095001(4) (2010).

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