Overview of the Basic Plasma Science Facility: the physics of waves relevant to space, astrophysical and fusion plasmas


Dept. of Physics and Astronomy, UCLA

The Basic Plasma Science Facility (BaPSF) at UCLA is a US national user facility for studies of fundamental processes in magnetized plasmas. The centerpiece of the facility is the Large Plasma Device (LAPD), a 20m long, magnetized linear plasma device [1]. This LAPD has been utilized to study a number of fundamental processes, including: collisionless shocks [2], dispersion and damping of kinetic and inertial Alfvén waves [3], flux ropes and magnetic reconnection [4], three-wave interactions and parametric instabilities of Alfvén waves [5], turbulence and transport [6] and interactions of energetic ions and electrons with plasma waves [7]. A brief overview of research using the facility will be given, followed by a more detailed discussion of studies of the nonlinear physics of Alfvén waves [8]. Recent experiments have resulted in the first laboratory observation of the parametric instability of shear Alfvén waves. Shear waves with sufficiently high $\omega/\Omega_{ci} (> 0.6)$ and above a threshold wave amplitude are observed to decay into co-propagating daughter waves; one a shear Alfvén wave and the other a low-frequency quasimode. The observed process is similar to the modulational decay instability.

References


