Pulsed Alfvén Wave Experiments in a Helicon Plasma Source

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Experiments to test a model for ion heating in the fast solar wind based on ion cyclotron damping of MHD turbulence driven by nonlinearly interacting, low frequency Alfvén waves (Matthaeus et. al., 1999), are being conducted in the West Virginia University HELIX (Hot hELIcon eXperiment) device in argon and helium plasmas. It is argued that counter-propagating waves arise from reflection of the waves off of a gradient in the Alfvén speed. The HELIX device has a similar speed gradient profile to that found in the solar corona: a short region of high Alfvén speed followed by an expansion region of lower Alfvén speed.

Here we present measurements of pulsed Alfvén waves that have been launched via amplitude modulation of the steady-state RF drive of the plasma-creating ($m = 1$) helicon antenna. Measurements of wave magnetic field structure, wave phase speed, and the radial profile of the wave amplitude will be presented as a function of plasma density and magnetic field strength in the helicon source. These results include both continous-wave and short pulse experiments.