Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Properties of Maser-generated Alfvén wave in a Large Laboratory Device[1] ZIYAN ZHU, SETH DORFMAN, TROY CARTER, GEORGE MORALES, MARY CLARK, GIOVANNI ROSSI, UCLA — This research is motivated by the investigations of the natural Alfvén wave maser, which refers to the resonant amplification of Alfvén wave in the earth-surrounding plasmas. A resonant cavity that results from applying a locally non-uniform magnetic field to a plasma source region between the anode and cathode of the Large Plasma Device creates the maser. In this research, a lanthanum hexaboride (LaB6)) cathode is used as the plasma source. Above an excitation threshold, selective amplification produces a highly coherent, large amplitude Alfvén wave that propagates out of the resonator through a semitransparent mesh anode into the plasma column where the magnetic field is uniform. The excitation threshold depends on the discharge voltage, and it increases as background magnetic field strength increases; this threshold influences the maser behaviors, including amplitude modulations. The maser with LaB6 source has m = 1 mode and exhibits a right-handed rotation, which is consistent with the electron diamagnetic drift rotation, supporting the possibility of a drift Alfvén wave maser. To distinguish between drift and shear Alfvén waves, a new experiment with the maser cavity excited by a driving circuit was performed. This allows us to access low frequencies (compared to ω^*) that cannot be spontaneously driven. The dispersion relation of this driven maser is under investigation. The experimental results will motivate future Alfvén wave study in laboratory devices and thus help better understand space plasma physics such as testing the theory of Alfvén-wave-induced heating of stellar atmosphere.

[1]Work supported by the U.S. Department of Energy Office of Science.

Ziyan Zhu
UCLA

Date submitted: 15 Jul 2016 Electronic form version 1.4