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Properties of Maser Generated Alfvén Wave in a Large Laboratory Device ZIYAN ZHU, TROY CARTER, SETH DORFMAN, GIOVANNI ROSSI, MARY CLARK, University of California, Los Angeles — 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. When a threshold in the plasma discharge current is exceeded, selective amplification produces a highly coherent, large amplitude shear Alfvén wave that propagates out of the resonator through a semitransparent mesh anode into the plasma column where the magnetic field is uniform [1]. The discharge current threshold for maser action increases as background magnetic field strength B0 increases; this threshold influences the maser behaviors, including amplitude modulations. This maser with LaB6 source has only m = 1 mode, while the maser with BaO source has a mode transition from m = 0 to m = 1 mode. The LaB6 maser wavelength is insensitive to parameters except for discharge voltage, which is under investigation. The experimental results will motivate future Alfvén wave study in laboratory device and thus help better understand space plasma physics such as testing the theory of Alfvén-wave-induced heating of stellar atmosphere.

[1] J. E. Maggs and G. J. Morales and T.A. Carter, Phys. Plasmas. 12, 013103 (2005)

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