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Generation of Shear Alfvén Waves by Repetitive High Power Microwave Pulses Near the Electron Plasma Frequency – A laboratory study of a "Virtual Antenna"[1] YUHOU WANG, WALTER GEKELMAN, PATRICK PRIBYL, BART VAN COMPERNOLLE, UCLA, KONSTANTINOS PAPADOPOULOS, University of Maryland, College Park — ELF / ULF waves are important in terrestrial radio communications but difficult to launch using ground-based structures due to their enormous wavelengths. In spite of this generation of such waves by field-aligned ionospheric heating modulation was first demonstrated using the HAARP facility [1]. In the future heaters near the equator will be constructed and laboratory experiments on cross-field wave propagation could be key to the program's success. Here we report a detailed laboratory study conducted on the Large Plasma Device (LaPD) at UCLA. In this experiment, ten rapid pulses of high power microwaves (250 kW X-band) near the plasma frequency were launched transverse to the background field, and were modulated at a variable fraction (0.1-1.0) of f_{ci}. Along with bulk electron heating and density modification, the microwave pulses generated a population of fast electrons. The field-aligned current carried by the fast electrons acted as an antenna that radiated shear Alfvén waves. It was demonstrated that a controllable arbitrary frequency ($f < f_{ci}$) shear Alfvén wave can be generated by this method. The radiation pattern, frequency variation and power dependence of the virtual antenna is also presented. [1] K. Papadopoulos, et al, Geophys. Res. Lett., 38, L20107, (2011)

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