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Exciting Alfven Waves using Modulated Electron Heating by High Power Microwaves[1] YUHOU WANG, WALTER GEKELMAN, PATRICK PRIBYL, BART VAN COMPERNOLLE, UCLA Dept of Physics, KONSTANTINOS PAPADOPOULOS, Univ of Maryland, Dept of Physics — Experiments exploring the physics of ionospheric modification with intense perpendicular propagating waves ($\vec{k} \perp \vec{B_0}$) on the Large Plasma Device (LaPD) at UCLA have been upgraded with the addition of a high power rapidly pulsed microwave source. The plasma is irradiated with ten pulses (250 kW X-band) near the upper-hybrid frequency. The pulses are modulated at a frequency of a fraction (0.1-1.0) of f_{ci} (ion cyclotron frequency). Based on a previous single-pulse experiment [1], the modulated electron heating may drive a large amplitude shear Alfvén wave ($f < f_{ci}$), making the plasma a virtual antenna. This wave driving mechanism may have important application in terrestrial radio communications by low frequency waves, which are difficult to launch directly due to their enormous wavelengths. Various heating methods involving X-mode, O-mode, and electron Bernstein mode are investigated in plasmas with controllable parameters ($n_e = 10^8 \sim 10^{12} cm^{-3}, T_e = 0.1 \sim 6eV, T_i \ll T_e, B_0 = 100 \sim 3000G, \nabla n_e/n_e = 0 \sim 1cm^{-1}$). Mode-conversion between these waves and the subsequent structural changes of the plasma near the conversion region are also under investigation.

[1] B. Van Compernolle, et al, Geophys. Res. Lett. 32.8 (2005)

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