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Optical Beat-Wave Experiment on CTIX[1] ROBERT HORTON, UC Davis, DAVID HWANG, FEI LIU, BEN ZHU, RUSSELL EVANS — By launching intense electromagnetic waves at differing frequencies, a wave at the beat (difference) frequency can be created within a region of plasma. The beat wave is efficiently damped, and electron current generated, if the beat frequency is close to local plasma frequency, and if phase velocity is close to electron thermal velocity. Beat-wave acceleration of plasma electrons was previously demonstrated at low plasma density [1]. At the higher densities of the CTIX compact-toroid accelerator, plasma frequencies are such that CO2 lasers (f 30 THz) are a cost-effective driver. An experiment is being prepared to test beat-wave current drive using two TEA CO2 lasers on CTIX. The experiment will test models of wave mixing, quasilinear modification of the velocity distribution, and amplification of seed current by plasma kinetic effects. An application of the methods developed may be standoff current generation in a target plasma. Experimental issues to be addressed include: precisely-timed production of the compressed, target plasma; grating tuning of the CO2 lasers for frequency selection; high-peak-power, simultaneous operation of TEA lasers, design of optics; optical and plasma diagnostics. Initial results will be presented.

[1] Rogers, J. H. and Hwang, D. Q., Phys. Rev. Lett. v68 p3877 (1992).

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