Abstract Submitted
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Self-compression of few-millijoule laser pulses in non-linear plasma waves[1] ZHAOHAN HE, BIXUE HOU, JOHN NEES, KARL KRUSHELNICK, ALEXANDER THOMAS, Center for Ultrafast Optical Science, University of Michigan Ann Arbor — Study of relativistic short laser pulse propagation in underdense plasma is of great interest in high field science, attosecond physics and applications such as plasma based accelerators. Temporal shortening of a laser pulse that drives nonlinear plasma wakefield has been observed using 100TW-class lasers interacting with millimeter scale plasma [1,2]. Here we report on experiments performed using the high repetition rate Lambda-cubed laser at the University of Michigan - a table-top sub-TW power laser systems operating at 500 Hz. The laser (pulse energy up to 8 mJ) was tightly focused (peak intensity $\sim 3\times10^{18}$W/cm^2) into a 100 μm scale length gas jet to generate a plasma with electron density $\sim 10^{19}$cm^{-3}. The temporal and spectral intensity and phase of the transmitted pulse was measured using second-harmonic-generation (SHG) frequency-resolved optical gating (FROG). The laser pulse was shortened from 37 fs to 16 fs with >90% energy transmittance. The dependence on focusing condition, laser intensity and plasma density will be discussed.

[1] J. Faure, *et al.*, Phys. Rev. Lett, **95**, 205003 (2005).
[2] J. Schreiber, *et al.*, Phys. Rev. Lett. **105**, 235003 (2010).

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