Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Measurements of mid-infrared radiation from a laser wakefield accelerator[1] AMINA HUSSEIN, University of Michigan, JOSH LUDWIG, WOJCIECH ROZMUS, University of Alberta, YONG MA, University of Michigan, PAUL-EDOUARD MASSON-LABORDE, CEA, DAM, DIF, JOHN NEES, ANATOLY MAKSIMCHUK, JESUS HINOJOSA, ERIC PETERSON, ALEC THOMAS, KARL KRUSHELNICK, University of Michigan — In the bubble regime of Laser Wakefield Acceleration (LWFA), a density up-ramp at the leading edge of the plasma bubble creates a region where the driving laser pulse sees a negative gradient in refractive index. This gradient generates frequency shifts in the laser, extending its spectral content to the mid-infrared. Experiments performed using the HERCULES laser system at the University of Michigan measured the spectrum, energy and beam profile of mid-infrared radiation produced during LWFA. Spectra with wavelengths extending to 2.5 micrometers and containing up to 15 mJ of energy were obtained. Enhanced spectral broadening using tailored density targets was experimentally demonstrated. Under certain conditions, quasi-monochromatic spectral features were produced. A sensitivity analysis of the spectral features with varying laser and plasma conditions was performed to guide optimization of this process for the realization of tunable infrared sources. Supporting PIC simulations indicated that slow-moving long-wavelength radiation, which slips backward relative to the driving laser pulse, can interact with the accelerated electron bunch, and may serve as a diagnostic of bunch formation and dynamics.

[1]This work was supported by AFOSR grant number FA9550-16-1-0121.

Amina Hussein
University of Michigan

Date submitted: 03 Jul 2019 Electronic form version 1.4