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PIC simulations of mid-infrared radiation from a laser wakefield accelerator. JOSHUA LUDWIG, University of Alberta, AMINA HUSSEIN, University of Michigan, WOJCIECH ROZMUS, University of Alberta, PAUL-EDOUARD MASSON-LABORDE, CEA, KARL KRUSHELNICK, University of Michigan — The formation of a plasma "bubble" during Laser Wakefield Acceleration (LWFA) results in a co-propagating refractive index (electron density) gradient that produces time dependent frequency shifts in the driving laser pulse[1,2]. High-resolution spectral measurements of mid-infrared radiation extending to 2.5 microns during LWFA in the bubble regime were obtained on the HERCULES laser system at the University of Michigan. Particle-in-cell (PIC) simulations with OSIRIS show radiation extending briefly up to 50 microns in this regime. The PIC simulations indicate that the slow-moving long-wavelength radiation, which slips backward relative to the driving laser pulse, can interact the accelerated electron bunch. The interaction blue-shifts and scatters the long-wavelength radiation while decreasing the energy of the electron beam. These results suggest that measurements of side-scattered radiation may serve as a diagnostics of electron dynamics and bunch formation. [1]J. D. Ludwig, P.-E. Masson-Laborde, S. Hüller, et al. Phys. Plasmas **25**, 053108 (2018) [2]Zan Nie, Chih-Hao Pai, Jianfei Hua, et al. Nature Photonics vol. **12**, 489–494 (2018)

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