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Evolution of Relativistic Plasma-Wave front in LWFA[1] FANG FANG, CHRISTOPHER CLAYTON, KENNETH MARSH, JOSEPH RALPH, ARTHUR PAK, UCLA, NELSON LOPES, Universidade Técnica de Lisboa, CHANDRASHEKHAR JOSHI, UCLA — In a laser wake field accelerator experiment where the length of the pump laser pulse is several plasma period long, the leading edge of the laser pulse undergoes frequency downshifting as the laser energy is transferred to the wake. Therefore, after some propagation distance, the group velocity of the leading edge of the pump pulse, and therefore of the driven electron plasma wave, will slow down. This can have implications for the dephasing length of the accelerated electrons and therefore needs to be understood experimentally. We have carried out an experimental investigation where we have measured the velocity v_f of the 'wave-front' of the plasma wave driven by a nominally 50fs (FWHM), intense (a0 $\sim$ 1), 0.8μm laser pulse. To determine the speed of the wave front, time- and space-resolved reflectometry, interferometry, and Thomson scattering were used. Although low density data ($n_e \sim 1.3 * 10^{19}cm^{-3}$) showed no significant changes in v_f over 1.5mm (and no accelerated electrons), high-density data ($n_e \sim 5*10^{19}cm^{-3}$) shows accelerated electrons and an approximately 5% drop in v_f after a propagation distance of about 800μm.

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