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Laser and electron beam propagation and stability in laser wakefield accelerators[1] ALEC THOMAS, C. HUNTINGTON, C. MCGUFFEY, S. BULANOV, P. CUMMINGS, V. CHVYKOV, F. DOLLAR, P. DRAKE, Y. HOROVITZ, G. KALINTCHENKO, K. KRUSHELNICK, A. MAKSIMCHUK, T. MATSUOKA, P. ROUSSEAU, V. YANOVSKY, University of Michigan, S. KNEIP, S. MANGLES, Z. NAJMUDIN, C. PALMER, Imperial College — Presented here are recent experimental and simulation results on laser and electron beam propagation and stability in laser wakefield accelerators (LWFAs) using the HERCULES laser. By using various gas jet nozzles with opening diameters ranging from 0.5 to 5 mm, electron injection, acceleration and laser propagation were studied. Electron beams produced in plasma channels significantly longer than the laser depletion length were observed to break into a number of filaments. This is likely due to a current filamentation instability as the electron beam propagates through unperturbed plasma after pump depletion. Experiments and simulations also reveal that stimulated Raman side scattering occurs at the beginning of the interaction, that it contributes to the evolution of the pulse prior to wakefield formation, and that it affects the quality of electron beams generated.

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