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Experiments on Self-Guiding Mechanisms of High Power Laser Pulses in a Plasma JOSEPH RALPH, ARTHUR PAK, KENNETH MARSH, CHRISTOPHER CLAYTON, FANG FANG, UCLA, CHANDRASHEKHAR JOSHI
— Recent 3D theory and PIC simulations in the blowout regime, wherein the pondermotive force of laser with a pulse length on the order of a plasma wavelength expels all electrons, has predicted a range of parameter space where stable laser propagation can occur [1]. In this theory, the density depression caused by electron blow out is the dominant mechism responsible for self-guiding. In this paper we examine experimentally and with PIC simulations laser beam guiding of a multi terwatt TiSapphire laser in a supersonic Helium gas jet. Gas jet density was varied from 2*E18 to to 2*E19 and the length of the plasma was varied from 2 to 5 mm using several gas jets with different diameters. Pondermotive and relativistic effects are considerd by varying laser and plasma parameters. Diagnostics include interferometric and Schlieren techniques. Images of the guided mode are taken at the exit of the gas jet. In addition, the forward images were sent to an imaging spectragraph to observe photon deceleration and deceleration [2].
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