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Laser Wakefield Acceleration of Quasimonoenergetic Electron Beams in Pure Nitrogen Gas Jets[1] M.Z. MO, A. ALI, Univ. of Alberta, Canada, S. FOURMAUX, P. LASSONDE, J.C. KIEFFER, INRS-EMT, Canada, R. FEDOSEJEVS, Univ. of Alberta, Canada — Nitrogen has been used as an added gas at the few percent level in He gas jets to generate 100's of MeV electrons in the ionization induced seeding scheme for laser wakefield acceleration. Recent simulations (K.P. Singh et al. Phys. Plasmas 16, 043113 (2009)) showed that quasimonoenergetic collimated GeV electrons could be also generated with pure N_2 using a chirped intense laser pulse. Here we report measurements of wakefield acceleration carried out in pure N_2 gas at the ALLS Laser facility at INRS, Varennes. Maximum energy higher than 0.5 GeV of quasimonoenergetic electron beam with a low divergence of 2.2 mrad was obtained with 80 TW, 30 fs laser pulses. Long-tail features were observed stretching from the quasimonoenergetic bunches due to continuous ionization injection. Measured peak electron energy decreased with the plasma density, which agrees with the predicted maximum electron energy gain scaling. Experiments showed a threshold density of $3x10^{18}$ cm^{-3} for self-trapping. Our experiments suggest that pure N_2 is a potential candidate gas to achieve GeV monoenergetic electrons in the ionization induced injection scheme for laser wakefield acceleration.

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Mianzhen Mo
University of Alberta

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