Laser-plasma targetry: smallscale gas jets at a near-critical level

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Recent progress in solid-state laser technologies calls for innovative and controllable targetry to increasingly unleash the tremendous potentialities of laser-plasma sciences. SourceLAB, a young spin-off of the Laboratoire d'Optique Appliquée (France), endeavors to accompany the research effort by developing new solid and gas targets with unique properties [1]. We developed in particular smallscale gas jets of less than one millimeter size and peak density higher than 10^{21} atoms/cm^3 [2]. Rare gases at pressure above 300 bar has been developed for this purpose to compensate the nozzle throat diameter reduction that affects the output mass flow rate. The fast-switching electro-valve enables to operate the jet safely for multi-stage vacuum pump assembly. Such gaseous thin targets are particularly suitable for fine laser-plasma interaction studies in the unexplored near-critical regime, of great interest for plasma astrophysics [3], electromagnetic instabilities studies [4] and particle acceleration [5,6].

[1] www.sourcelab-plasma.com
[2] F. Sylla et al., Rev. Scien. Instr., 83, 033507 (2012)
[3] A. Flacco et al., to be published
[4] F. Sylla et al., Phys. Rev. Lett., 108, 115003 (2012)
[5] F. Sylla et al., Phys. Rev. Lett., 110, 085001 (2013)
[6] T. Nakamura et al., Phys. Rev. Lett., 105, 135002 (2010)