Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Gas-assisted Taylor Cone-Jets[1] FRANCISCO CRUZ-MAZO, Univ. Sevilla (Spain), MAX O. WIEDORN, Center for Free-Electron Laser Science, DESY (Germany), MIGUEL A. HERRADA, Univ. Sevilla (Spain), GISEL E. PENA-MURILLO, JURAJ KNOSKA, Center for Free-Electron Laser Science, DESY (Germany), SASA BAJT, Deutsches Elektronen-Synchrotron (Germany), HENRY N. CHAPMAN, Center for Free-Electron Laser Science, DESY (Germany), ALFONSO M. GANAN-CALVO, Univ. Sevilla (Spain) — We introduce a way to produce steady micro/nano-liquid jets via electric fields together with co-flowing gas streams. We study the dripping-jetting transition of this configuration theoretically through a global stability analysis as a function of the governing parameters involved. Indeed, we derive two coupled scaling laws that predict both the minimum jet diameter and its maximum velocity. The theoretical prediction provides a single curve that describes not only the numerical computations but also experimental data from the literature for cone-jets. Additionally, we performed a set of experiments to verify what parameters influence the jet length. Due to the diameters below 1 micrometer and high speeds attainable in excess of 100 m/s, this concept has the potential to be utilized for structural biology analyses with X-ray free-electron lasers at megahertz repetition rates as well as other applications.

[1]Funded by the Ministerio de Economia y Competitividad (Spain) through the Plan Estatal 2013-2016 Retos, and the German Science Foundation (DFG) through the Gottfried Wilhelm Leibniz programme.

Francisco Cruz-Mazo
Univ. Sevilla (Spain)

Date submitted: 26 Jul 2019 Electronic form version 1.4