Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Period Doubling, Tripling, and Quintupling in the Break-up of a Liquid Jet Driven Transversely to Axis of Motion[1] SALOME HUSSEIN, STUART BRADLEY, GEOFF WILLMOTT, University of Auckland — The Rayleigh-Plateau instability has been the subject of study for over a century. Many modern technologies now actively take advantage of this phenomenon, from ink-jet printing to fuel injection systems. In pursuit of a precision fluid delivery system, we aimed to design a monodisperse droplet generator. One approach used a piezoelectric element to oscillate the jet transversely to the axis of motion. While at certain frequencies (approx. 1.0kHz) we observed the expected and desired jet breakup behavior, lower frequencies yielded a serpentine profile along the jet, with a node and anti-node, before breaking up. In addition, within a range of driving frequencies, we observed the jet splitting into multiple discrete drop trajectories, intermittently converging back into one in between those instances, then finally entering the region where the RP instability dominated. While initially considered an undesirable aspect of the design, we will demonstrate that these regions are predictable and robust enough to offer a much finer degree of control over spray coverage – as opposed to a binary choice between the pinpoint precision of a monodisperse stream and an imprecise conventional spray.

[1]New Zealand Ministry of Business, Innovation, and Employment

Salome Hussein
University of Auckland

Date submitted: 31 Jul 2017 Electronic form version 1.4