Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Role of initial perturbation on the droplet breakup characteristics levitated in an electrodynamic balance MOHIT SINGH, NEHA GAWANDE, Y.S MAYYA, ROCHISH THAOKAR, Indian Institute of Technology Bombay — Experimental observations are reported on the effect of the initial perturbation on the mechanism of Rayleigh breakup phenomenon of a charged droplet (diameter˜100-250 m), levitated in an electrodynamic (ED) balance. As the droplet undergoes evaporation, the droplet size decreases with a corresponding increase in the surface charge density near to the Rayleigh limit, finally leading to its breakup. All the successive events such as droplet deformation, breakup and relaxation of the drop after jet ejection have been captured using a high- speed camera at around 200 thousand fps. It is observed that the droplet surface exhibits finite amplitude of oscillations with higher prolate deformation on account of unbalanced gravity. These perturbations lead to subcritical Rayleigh breakup of the droplet. There exists a "π" phase shift between the centre of mass motion and applied field which causes the asymmetric breakup in such a way that the droplet breaks in the upward direction. The experimental observations are validated with BEM simulations and a reasonable agreement is observed between the two.

Mohit Singh
Indian Institute of Technology Bombay

Date submitted: 19 Jul 2019 Electronic form version 1.4