Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Plateau-Rayleigh Instability and Capillary Droplet Propulsion on a Fiber[1] SABRINA HAEFNER, Saarland University, Experimental Physics, D-66041 Saarbruecken, Germany, MICHAEL BENZAQUEN, PCT Lab, UMR CNRS 7083 Gulliver, ESPCI ParisTech, PSL Research University, Paris, France, OLIVER BAEUMCHEN, Max-Planck Institute for Dynamics & Self-Organization (MPIDS), 37077 Goettingen, Germany, THOMAS SALEZ, PCT Lab, UMR CNRS 7083 Gulliver, ESPCI ParisTech, PSL Research University, Paris, France, ROBERT PETERS, McMaster University, Dept. of Physics & Astronomy, Hamilton, ON, Canada, JOSHUA D. MCGRAW, KARIN JACOBS, Saarland University, Experimental Physics, D-66041 Saarbruecken, Germany, ELIE RAPHAEL, PCT Lab, UMR CNRS 7083 Gulliver, ESPCI ParisTech, PSL Research University, Paris, France, KARI DALNOKI-VERESS, McMaster University, Dept. of Physics & Astronomy, Hamilton, ON, Canada — The Plateau-Rayleigh instability (PRI) of a liquid column underlies a variety of hydrodynamic phenomena. Compared to the classical case of a free liquid column, the description of a liquid layer on a fiber requires the consideration of the solid-liquid interface in addition to the free surface. We revisit the PRI of a liquid layer on a solid fiber by varying the hydrodynamic boundary condition at the fiber-liquid interface from no-slip to slip. We find that the growth rate depends on the system geometry and the boundary condition, which is in agreement with theory. In the late stages of liquid column breakup on slip-fibers, a three-phase contact line can be formed on one side of the droplet. The resulting capillary imbalance leads to droplet propulsion, which is studied as a function of temperature and molecular weight.

[1]Graduate school GRK 1276, NSERC of Canada, German Research Foundation (DFG) under grant numbers BA3406/2 and SFB 1027.

Sabrina Haefner
Saarland University, Experimental Physics, D-66041 Saarbruecken, Germany

Date submitted: 13 Nov 2014 Electronic form version 1.4