Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

**Spreading Characteristics of Newtonian Free Surface Liquid Jets Impacting a Moving Substrate** HATEF RAHMANI, YUCHEN GUO, SHELDON GREEN, Department of Mechanical Engineering, University of British Columbia, ALI VAKIL, Department of Mechanical Engineering, University of British Columbia and Coanda Research and Development Corp — The impingement of high-speed liquid jets on a solid substrate is salient to a number of industrial processes, including surface coating in the railroad industry. The impingement of Newtonian liquid jets is studied both experimentally and through simulation. On impingement the liquid jet spreads laterally from the impingement location to form a lamella that is then convected downstream, producing an overall U-shaped liquid surface. A variety of jet and substrate velocities, liquid viscosities, and jet diameters were studied. It is found that the lamella dimensions (width (W), radius (R), thickness (h)) vary with the jet Reynolds number ($Re_{jet}$) and vary inversely with the substrate Reynolds number ($Re_{sub}$). Interestingly, the ratio W/R is almost constant, independent of the jet viscosity, diameter, and speed, and also independent of the substrate speed. Furthermore, the lamella radius and width scale as $Re_{jet}/\sqrt{Re_{sub}}$ and the lamella thickness scales as $1/\sqrt{Re_{sub}}$. The experimental results were in good agreement with volume-of-fluid (VOF) CFD simulations, which implies that the simulations may be used to probe the physics of impingement.

Hatef Rahmani
Department of Mechanical Engineering, University of British Columbia

Date submitted: 01 Nov 2016 Electronic form version 1.4