Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Dynamics of the ejecta sheet at extreme impact velocity[1]
ABDULRAHMAN B. ALJEDAANI, Y.S. TIAN, TARIQ ALGHAMDI, S. T. THORODDSEN, King Abdullah University of Science and Technology (KAUST)
— We have constructed a 26-meter-tall vacuum tube to study drop impacts at very high velocities, in a controlled manner. Under reduced ambient pressure we can attain impact velocities up to 23 m/s and Reynolds numbers as large as 10^5. We focus on the ejecta sheets produced when the drop impacts on a thin layer of liquid. The ejecta dynamics are captured with two simultaneous high-speed video cameras, one focused on the ejecta details and the other on the overall crown evolution. Experiments are performed over a wide range of drop and liquid viscosity combinations. The ejecta breakup and splashing are greatly affected by the ambient air pressure, where air-drag and Bernoulli suction pressure can bend the sheets into intricate shapes. The tip of the sheet can bend up or down depending on the viscosity ratio between the two liquids. Under some impact conditions the sheet entraps a toroidal bubble as the crown rises away from the substrate. The sheets finally rupture to produce a spray with a myriad of micro-droplets. We construct a simplified model to describe the shape evolution.

[1]This work was funded by King Abdullah University of Science and Technology (KAUST) under grant URF/1/3727-01-01.

Abdulrahman Aljedaani
King Abdullah University of Science and Technology (KAUST)

Date submitted: 01 Aug 2019 Electronic form version 1.4