1. Electronics Cooling Testbed

- Purpose: This setup (a) enables the visualization and characterization of advanced phase-change heat transfer mechanisms for next-generation electronics cooling such as electric-field enhanced jumping droplet condensation. Through large view-ports (b) both high speed videos and long-exposure photographs of these phase-change heat transfer pathways can be obtained. A custom-light source ensures superior illumination of the samples. This unique capability of the electronics cooling testbed cannot be understated because traditional vapor chamber design does not enable this type of visualization. Thus, the electronics cooling testbed facilitates the exploration of the fundamental physics during different modes of the enhanced heat transfer process.
- Imaging: (1) High speed camera – Phantom VEO 640 L (2) DSLR camera with InfiniProbe TS-160 lens.
- Data acquisition: National Instruments PXIe systems
- Feedthroughs: K-type thermocouple, electrical ports for passing high current (50 Amp maximum), RTDs, Baratron capacitive pressure and transducer, and hot/cold liquid lines
- Edwards E2M30 roughing pump enables evacuation of the chamber to 1.33 Pa (10 mTorr) for the removal of non-condesable gases
- Thermo Fischer Scientific SYS-III chiller with TU-7 pump to regulate the flow rate through the hot/cold liquid lines connected to cold plates inside of the vapor chamber.
- Various power supplies (i.e. HP6031A, Agilent E3631, HP6033A) provide the gate voltages, drain currents, and any external electric field requirements depending on the needs for the experiment.
- Hot water vapor is supplied to the setup from an external degassed, heating tank. Experiments are often performed around 1.5 kPa after releasing hot vapor into the chamber. Electrical heaters are used to heat this liquid and to heat the walls of the chamber so that condensation will only form on the functionalized cold plate.