Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

A Unique Facility for the Study of Transient Single-Species Annular Flow Near Total Film Evaporation ROMAN MORSE, University of Wisconsin, KRIS DRESSLER TEAM, BRIAN FEHRING TEAM, JAMES DOHERTY TEAM, SIMON LIVINGSTON-JHA TEAM, ARGANTHAL BERSON TEAM — A new facility was built for the study of transient effects in two-phase vertical annular flow near dry out. The facility uses two water/glycol loops and two 10kW heat pumps to vaporize and condense the working fluid in the annular flow experiment, R-245fa. The annular flow is created by mixing a steady flow of slightly superheated vapor refrigerant with a steady flow of subcooled liquid refrigerant in a junction specifically designed to minimize droplet entrainment. In a separate tank, saturated refrigerant is heated to generate additional vapor to add to the steady state vapor to create transient conditions. Trains of vapor pulses can be created with controlled amplitude and frequency. The effects of the transient flow on dry out are characterized in a test section 110 diameters downstream of the vapor-liquid mixing junction. The test section consists of 14 transparent windows, which are coated with conductive fluorine-doped tin oxide. Current is passed through each of the windows, providing up to 1.4 kW of additional heating power to create film evaporation, or dry out conditions. The transparent windows also allow for simultaneous laser-based film-thickness and wall-temperature measurements.

Roman Morse
University of Wisconsin

Date submitted: 03 Aug 2017 Electronic form version 1.4