Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Experimental Investigation of Surface Temperature Changes due to Flow Instability in a Micro/Mini Channel During Flow-Boiling Heat Transfer with Non-Uniform Circumferential Heat Fluxes at Different Inclinations MARIUS VERMAAK, JACO DRIKER, University of Pretoria, KHELLIL SEFIANE, University of Edinburgh, JOSUA MEYER, University of Pretoria — Flow instability was analysed during flow-boiling of Perfluorohexane (FC-72) in a rectangular micro/mini channel at different inclinations with one-sided heating. The flow passage had a hydraulic diameter of 909 μm and an aspect ratio of 10 (5mm x 0.5mm). Inclination angles ranged from -20^o(downward flow) to 0^o(horizontal flow), and up to +90^o(vertical upward flow) at mass fluxes of 10, 20 and 40kg/m^{2}s. Pressure measurements and highspeed images were used to determine the effect of instability events on the heated surface's temperature measured using infrared thermography. Inlet pressure measurements identified reverse flow events while outlet pressure measurements identified two-phase mixing events. The frequency of instability events was determined using pressure transducer data and an instability threshold pressure. Flow instability was shown to decrease surface temperatures by up to 14.1^{o}C. Negatively inclined channels and +90^{o}experienced negligible instability frequencies. Horizontal and positively inclined channels had instability frequencies of up to 1.8Hz and 2.1Hz at the inlet and outlet.

Marius Vermaak
University of Pretoria

Date submitted: 09 Aug 2020 Electronic form version 1.4