Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Stability of film boiling on inclined plates and spheres[1] ESKIL AURSAND, Norwegian University of Science and Technology (NTNU), MORTEN HAMMER, SVEND TOLLAK MUNKEJORD, SINTEF Energy Research, BERNHARD MLLER, TOR YTREHUS, Norwegian University of Science and Technology (NTNU) — In film boiling, a continuous sub-millimeter vapor film forms between a liquid and a heated surface, insulating the two from each other. While quite accurate steady state solutions are readily obtained, the intermediate Reynolds numbers can make transient analysis challenging. The present work is a theoretical study of film boiling instabilities. We study the formation of travelling waves that are a combination of Kelvin–Helmholtz and the Rayleigh–Taylor instabilities. In particular, we study how the nature of this process depends on the Reynolds number, the Bond number, and the inclination of the submerged heated plate. In addition we extend the analysis to the case of a submerged heated sphere. Modelling of the transient dynamics of such films is important for answering practical questions such as how instabilities affect the overall heat transfer, and whether they can lead to complete film boiling collapse (Leidenfrost point).

[1]This work has been financed under the MAROFF program. We acknowledge the Research Council of Norway (244076/O80) and The Gas Technology Centre NTNU-SINTEF (GTS) for support.

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Date submitted: 13 Jul 2017 Electronic form version 1.4