Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Numerical and experimental study of the dynamics of a superheated jet AVICK SINHA, SHIVASUBRAMANIAN GOPALAKRISHNAN, SRIDHAR BALASUBRAMANIAN, Department of Mechanical Engineering, Indian Institute of Technology Bombay, India — Flash-boiling is a phenomenon where a liquid experiences low pressures in a system resulting in it getting superheated. The sudden drop in pressures results in accelerated expansion and violent vapour formation. Understanding the physics behind the jet disintegration and flash-boiling phenomenon is still an open problem, with applications in automotive and aerospace combustors. The behaviour of a flash-boiling jet is highly dependent on the input parameters, inlet temperature and pressure. In the present study, the external (outside nozzle) and the internal (inside nozzle) flow characteristics of the two-phase flow has been studied numerically and experimentally. The phase change from liquid to vapour takes place over a finite period of time, modeled sing Homogeneous Relaxation Model (HRM). In order to validate the numerical results, controlled experiments were performed. Optical diagnostic techniques such as Particle Image Velocimetry (PIV) and Shadowgraphy were used to study the flow characteristics. Spray angle, penetration depth, droplet spectra were obtained which provides a better understanding of the break-up mechanism. Linear stability analysis is performed to study the stability characteristics of the jet.

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Date submitted: 31 Jul 2015 Electronic form version 1.4