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Experiments on Rayleigh-Taylor instability with Multi-modal initial conditions at low Atwood numbers SARAT CHANDRA KUCHIBHATLA, DEVESH RANJAN, Texas A&M University — The water channel facility at TAMU is employed for performing Rayleigh-Taylor experiments at low Atwood numbers ($\sim 10^{-3}$) using hot and cold water as working fluids. Effects of initial conditions on the onset of instability can be investigated using the novel flapper mechanism as previously presented. This mechanism using a very accurate, repeatable servo motor can induce multi-modal initial conditions consisting of up to 8 component modes. Visualization is performed using Nigrosene dye as marker with a LED backlight setting. Experiments were performed to observe the development of instability and its dependence on initial condition (wavelength and phase). Images of the flow-field for different multimodal initial conditions are presented here, and mixing layer growth estimated using ensemble-averaging technique. A measure of the molecular mixing (B_0, B_2 and θ from the BHR model of turbulence) in these flows was also performed using high-speed thermocouple measurements in the flow domain. Furthermore, bubble and spike velocities for single-mode initial experiments were measured using a seeded flow system and high-speed digital camera imaging. Velocities and growth rates are compared with Goncharov's analytical model.

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