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Experimental Exploration of the Dispersion Relation of Rayleigh-Taylor Instability MARIE-CHARLOTTE RENOULT, CHIA-LING CHEN, SAMEH FERJANI, PIERRE CARLÈS, CHARLES ROSENBLATT, Case Western Reserve University — Investigating arbitrary initial configurations in the Rayleigh-Taylor instability presents an experimental challenge due to the difficulty controlling the initial interface shape. To overcome that, we pioneered in 2006 the use of magnetic levitation. In our current set-up, the denser paramagnetic fluid is levitated above the lighter fluid, using a quasi-homogeneous magnetic force. In order to modulate the static interface shape as desired, magnetically permeable elements such as straight pieces of magnetically permeable wire are added in the device. The initial interface thus is no longer flat and the destabilization of the interface is observed after the magnetic field is turned off. We will show our recent results of a systematic exploration of the dispersion relation of the instability by using straight segments of wires of different lengths. We will concentrate on the linear growth rate calculation with two different independent approaches and point out the consistency of the two methods. Beyond the verification of a known theory, this first attempt paves the way for a new systematic exploration of non-linear growth and mode couplings in the Rayleigh-Taylor instability for more original distributions of initial perturbations.

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