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Surface acoustic wave driven oscillatory instability of sessile droplets NICOLAS CHASTRETTE, Univ Paris Diderot , MICHAEL BAUDOIN, OLIVIER BOU-MATAR, Universite lille 1, LAURENT ROYON, PHILIPPE BRUNET, Univ Paris Diderot, REGIS WUNENBURGER, Universite pierre et marie Curie — Surface acoustic waves (SAW) of frequency larger than say 1 MHz constitute an efficient and reconfigurable technique for transporting sessile droplets. It has been observed that the excitation of sessile droplets with SAWs of frequency of the order of 20 MHz leads to some low frequency ($\sim$ 100Hz) inertial-capillary vibrations, which dramatically improve the mobility of the drop. The nonlinear mechanism responsible for the transfer of energy from the acoustic wave to these low frequency inertial-capillary waves remains unexplained in the literature. In order to determine its origin, we have studied a simplified system consisting in a larger sessile drop (10 μl) excited at lower frequency (800 kHz to 2 MHz) by a plane SAW. By combining high speed imaging of the oscillating free surface of the droplet and pressure measurements inside the acoustic cavity using a needle hydrophone, we correlate the structure of the excited oscillation eigenmodes, their instability threshold, and the frequency and amplitude of the intracavity acoustic standing wave. We propose an instability mechanism combining the phase modulation of the acoustic wave by the oscillating free surface and the acoustic radiation pressure exerted by the acoustic wave on the free surface as feedback.

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