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Capillary wave motion excited by high frequency surface acoustic waves MING TAN, Monash University, OMAR MATAR, Imperial College London, JAMES FRIEND, LESLIE YEO, Monash University — We present the results of a numerical and experimental study of capillary wave motion excited by high frequency surface acoustic waves (SAWs). A two-dimensional numerical model is constructed that couples the motion of the piezoelectric substrate to a thin liquid layer atop the substrate. A perturbation method, in the limit of small-amplitude acoustic waves, is used to decompose the equations governing fluid motion to resolve the widely differing time scales associated with the high frequency excitation. Transformation of time series data from both experiments and simulations into the frequency domain reveals that, in the low-amplitude regime, a fundamental resonant frequency, identical to that of the applied SAW, and a superharmonic frequency are found in the frequency spectra. The free surface displacement magnitude is comparable to that of the the substrate displacement. In the high-amplitude regime, strong nonlinearities shift the acoustic energy to a lower frequency than that of the SAW. Comparisons with experiments are also carried out yielding good qualitative agreement.

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