Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Gravity-capillary hexagonal waves generated by sinusoidal wave-maker oscillation CHANG XU, MARC PERLIN, Dept. of Ocean Engineering, Texas A&M University — Cross-waves are standing waves with crests perpendicular to a wave-maker; they are subharmonic waves excited by parametric instability. The modulational and chaotic behaviors of nonlinear cross-waves have been studied widely since the 1970s. When surface tension is negligible, cross-waves are usually trapped near the wave-maker and often exhibit a long modulation. However, investigation of capillary effects on cross-waves is lacking. In this work, we study cross-waves that are highly dependent on surface tension as well as gravity. By oscillating a plate vertically with frequencies of 25Hz to 45Hz at one end of a rectangular basin, a new progressive wave pattern is realized. Unlike most cross-waves that occur adjacent to the wave-maker, these wave patterns travel downstream in the form of a hexagonal pattern. To quantify the surface elevations, the water surface is measured using a synthetic Schlieren technique. Experiments show that two oblique progressive waves with subharmonic frequency are generated. They form a hexagonal pattern when the lateral components of these waves are in resonance with the parametric sloshing modes of the tank, which then causes a selective amplification of subharmonics.

Marc Perlin
Texas A&M University

Date submitted: 08 Aug 2020 Electronic form version 1.4