Abstract Submitted
for the NWS10 Meeting of
The American Physical Society

Capillary wave scattering by an infinitesimal barrier: effect of contact line dynamics[1] LIKUN ZHANG, DAVID THIESSEN, Washington State University — In microgravity, capillary instabilities could be countered by minimal solid support structures such that novel fluid configurations are possible. A capillary channel that could be easily realized consists of an array of solid rings or a helix to stabilize large aspect ratio liquid cylinders. The propagation of capillary waves on such channels is of importance for some envisioned applications. In this work, the scattering of capillary waves on liquid cylinder by an infinitesimal transverse barrier is considered theoretically by the method of matched evanescent wave expansion. To account for contact line dynamics on the barrier, an effective-slip boundary condition is applied which assumes that the contact-line velocity is proportional to the deviation of the contact angle from its equilibrium value. We find that energy dissipation at the barrier is most effective for incident waves whose phase velocity is close to the phenomenological slip coefficient. The scattering agrees in the short-wave limit with the theory of gravity-capillary wave scattering by a transverse surface-piercing vertical barrier in the limit of zero barrier depth and zero gravity.

[1]Supported by NASA.

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Date submitted: 20 Aug 2010 Electronic form version 1.4