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Propagation of axisymmetric capillary waves along a periodically-pinned liquid cylinder: Bloch waves and scattering[1] LIKUN ZHANG, DAVID THIESSEN, Washington State University — An open capillary channel consisting of a water-filled helical wire is useful for phase separation because of its ability to capture impacting droplets. Capillary wave packets are generated by the impact and transport energy from the impact zone. In order to understand the propagation characteristics, we develop a theoretical model for a simplified axisymmetric channel consisting of a liquid cylinder with the free surface pinned by a periodic array of rings. The theory is based on the Bloch theorem and an eigenfunction expansion. From the semi-analytical solution we have computed the band structure, dispersion relation, phase speed, group speed, and energy flux, as well as their dependence on channel parameters. Results are interpreted in terms of the single-ring scattering properties and compared to multiple scattering for finite ring arrays.

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