Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Redirection and splitting of sound waves by a periodic chain of thin perforated cylindrical shells ANDRII BOZHKO, ARKADII KROKHIN, University of North Texas, JOSE SANCHEZ-DEHESA, FRANCISCO SERVERA, Universidad Politecnica de Valencia — A perforated metallic cylindrical shell in air is a weak scatterer of sound, and so is a periodic chain of shells. However, in a narrow region of frequencies the transmission of a normally incident acoustic wave through the chain exhibits a sharp minimum due to excitation of a leaky wave which propagates along the chain. This wave is a weakly-decaying eigenmode with either symmetric profile and anomalous dispersion, or with antisymmetric profile and normal dispersion. At normal incidence, only the symmetric eigenmode can be excited, but for slightly oblique incidence both modes can be excited at close frequencies. These modes allow effective 90°-redirection of sound, and since the mode with anomalous dispersion propagates in the wrong direction, an incoming signal containing two harmonics will be split into two beams propagating along the chain in opposite directions. A rigorous scattering theory is developed for finite and infinite chains of shells, and theoretical and numerical calculations of the transmission coefficient and redirected field pattern are presented.

Andrii Bozhko
University of North Texas

Date submitted: 09 Nov 2016 Electronic form version 1.4