Acoustic wave diffraction by a quadrant of sound-soft scatterers

Matthew Nethercote*†[1], Anastasia Kisil[2], and Raphaël Assier[2]

[1]University of Cambridge [UK] – United Kingdom
[2]University of Manchester [Manchester] – United Kingdom

Abstract

Motivated by research in metamaterials, we consider the challenging problem of acoustic wave scattering by a doubly periodic quadrant of sound-soft scatterers arranged in a square formation, which we have dubbed the quarter lattice. This leads to a Wiener–Hopf equation in two complex variables with three unknown functions for which we can reduce and solve exactly using a new analytic method. After some suitable truncations, the resulting linear system is inverted using elementary matrix arithmetic and the solution can be numerically computed. This solution is also critically compared to a numerical least squares collocation approach and to our previous method where we decomposed the lattice into semi-infinite rows or columns.

*Speaker
†Corresponding author: mn598@cam.ac.uk