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David P. Nicholls* (nicholls@math.uic.edu), Department of Math, Stat., and C.S., 851 South Morgan Street (MC 249), University of Illinois at Chicago, Chicago, IL 60607, and **Fernando Reitich**, School of Mathematics, University of Minnesota, Minneapolis, MN 55455. *Boundary Perturbation Methods for High-Frequency Acoustic Scattering: Shallow Periodic Gratings.*

In this talk we will present new, Boundary Perturbation algorithms for the robust numerical simulation of high-frequency acoustic scattering returns from both two and three dimensional periodic diffraction gratings. We will present the algorithm, along with numerical results, for the case of shallow gratings where the possibility of multiple reflections is precluded. However, once such capabilities are achieved, iterative procedures (e.g. based upon Geometrical Optics) can be designed to account for multiple reflections. Even for single-scattering configurations, the approach presented here gives significant gains in accuracy when compared with asymptotic theories (e.g. Kirchhoff Approximation) with modest additional computational cost. (Received August 02, 2007)