

Department of Mathematics

University of Houston

Scientific Computing Seminar

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Pulse reflection in a random waveguide with a turning point

Thursday, March 2, 2017

1:30 PM- 2:30 PM

Room 646 PGH

Abstract: Guided waves arise in a variety of applications like underwater acoustics, optics, the design of musical instruments, and so on. We present an analysis of wave propagation and reflection in an acoustic waveguide with random sound soft boundary and a turning point. The waveguide has slowly bending axis and variable cross section. The variation consists of a slow and monotone change of the width of the waveguide and small and rapid fluctuations of the boundary, on the scale of the wavelength. These fluctuations are modeled as random. The turning point is many wavelengths away from the source, which emits a pulse that propagates toward the turning point, where it is reflected. We consider a regime where scattering at the random boundary has a significant effect on the reflected pulse. We determine from first principles when this effects amounts to a deterministic pulse deformation. This is known as a pulse stabilization result. The reflected pulse shape is not the same as the emitted one. It is damped, due to scattering at the boundary, and is deformed by dispersion in the waveguide. An example of an application of this result is in inverse problems, where the travel time of reflected pulses at the turning points can be used to determine the geometry of the waveguide.

This seminar is easily accessible to persons with disabilities. For more information or for assistance, please contact the Mathematics Department at 743-3500.