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Scattering of acoustic waves with loss, gain and symmetry

V. Pagneux[a], V. Achilleos[b] et Y. Aurégan[c]
[a]LAUM, UMR 6613 CNRS, Av. Olivier Messiaen, 72085 Le Mans, France
[b]Le Mans Université, LAUM, Av. Olivier Messiaen, 72085 Le Mans cedex 9, Franc, 72085 Le Mans, France
[c]LAUM, Av. O Messiaen, 72000 Le Mans, France
vincent.pagneux@univ-lemans.fr

Different aspects of the effects of gain and loss with symmetry on the scattering of acoustic waves will be presented: PT symmetric scattering in flow ducts, perfect transmission resonances and perfect absorption by resonators. First, we will present theoretical and experimental results on the propagation of an acoustic wave in an airflow duct going through a pair of diaphragms, with equivalent amounts of mean-flow-induced effective gain and loss, displays all the features of a parity-time (PT) symmetric system. Second, we will the inspect the transmission properties of one-dimensional finite periodic systems with PT symmetry. A simple closed-form expression is obtained for the total transmittance from a lattice of N cells, that allows us to describe the transmission minima (maxima) when the system is in the PT -unbroken (broken) phase. Utilizing this expression, we provide a recipe for building finite periodic structures with near perfect absorption and extremely large amplification.