Rotational Modes in Phononic Crystals

YING WU, PAI PENG, King Abdullah University of Science and Technology, JUN MEI, South China University of Technology — We propose a lumped model for the rotational modes in two-dimensional phononic crystals comprised of square arrays of solid cylindrical scatterers in solid hosts. The model not only can reproduce the dispersion relations in a certain range with one fitted parameter, but also gives simple analytical expressions for the frequencies of the eigenmodes at the high symmetry points in the Brillouin zone. These expressions provide physical understandings of the rotational modes as well as certain translational and hybrid mode, and predict the presence of accidental degeneracy of the rotational and dipolar modes, which leads to a Dirac-like cone in the Brillouin zone center.

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Ying Wu
King Abdullah University of Science and Technology

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