Impact of variability in a topological non-trivial phononic waveguide

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Abstract

We report experimental studies of topological non-trivial phononic interface waveguides in silicon at room temperature based on two valley Hall phononic crystals. These are realised in membranes of nanocrystalline Si (nc-Si) and are studied by launching a surface acoustic wave tracked by laser Doppler vibrometry. The 2 GHz phononic wave amplitude and phase are measured along the path of the interface as well as at the waveguide input and output. We have mapped the impact of variations in critical dimensions and showed that both band gap and the guided modes are highly sensitive to variation in the nm range. The distribution of mass in the unit cell plays a strong role as it affect the symmetry and the ensuing modes. On the experimental front our preliminary observations indicate state of the art losses. We will report the modelling and experiments and discuss the significance of this finding in this frequency regime.

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