2 GHz Phonon propagation in a topological non-trivial phononic waveguide

Clivia M. Sotomayor Torres
O.R. Ranjbar-Neini, G. Conte
International Iberian Nanotechnology Laboratory, 4715-330 Braga, Portugal. Address, City, Country (Calibri 10)
O. Ylivaara, S. Pourjamal, T. Makkonen, J. Ahopelto
VTT Technical Research Centre of Finland Ltd, P.O. Box 1000, FI-02044 VTT, Espoo, Finland.
M.D. Koijam, Y. Pennec, B. Djafari-Rouhani
IEMN (UMR CNRS 8520), University of Lille, Lille 59650, France.

clivia.sotomayor@inl.int

We report experimental studies of topological non-trivial phononic interface waveguides in silicon at room temperature [1]. Theoretical work complements these studies considering band structure and modes of two valley Hall phononic crystals at their interface [2].
The phononic crystals are realised in membranes of nanocrystalline Si (nc-Si) and are studied by launching a surface acoustic wave tracking it 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.
Our preliminary observations indicate state of the art losses. This work is in progress to confirm the role of, among others, critical dimension variability [3].
We will report the modelling and experiments and discuss the significance of this finding in this frequency regime useful for information processing.

References

[1] O.R. Ranjbar-Neini et al., in preparation.
[2] M.D. Koijam et al., inpreparation
[3] O.R. Ranjbar-Neini et al., in preparation.

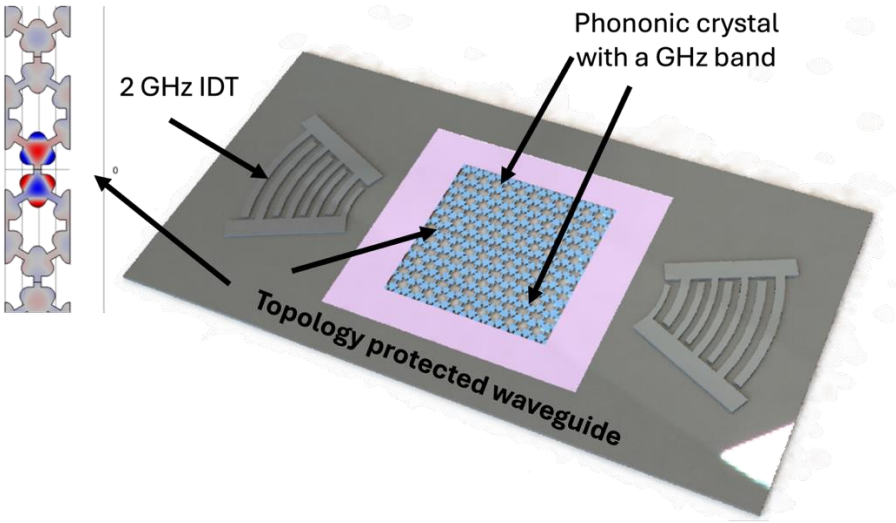

Figure: Schematics of the nc-Si membrane containing two phononic crystal patterned into a non-trivial topological phononic interface waveguide[1].