# One way reflection free polariton spin filtering channel

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Topological polariton systems are characterized by the appearance of chiral edge states, which travel in a particular direction at an edge of a topological lattice where time reversal symmetry is broken [1, 2]. In a strip geometry, chiral edge states always appear in pairs, which propagate in opposite directions on opposite edges of the strip. While there has been a very clear fundamental interest in these states, the suggestion that they can act as information carriers is hindered by this fact that they appear in pairs, as it means that in any system there will be an unwanted counter-propagating signal, potentially leading to detrimental feedback effects.

Here we consider polaritons in a strip of honeycomb lattice with zigzag edges. It is shown that the interplay between the TE-TM splitting, Zeeman splitting and an onsite potential can give rise to a band structure where one of the edge states vanishes completely while the other one resides with the gap-less bulk having opposite spin. Being surrounded by opposite spin states and the absence of one of the edge states ensures both reflection free and feedback suppressed one-way flow for polaritons with one particular spin in the system. This paves the way for feedback free polariton channels, which can be useful in transferring information in polariton networks.

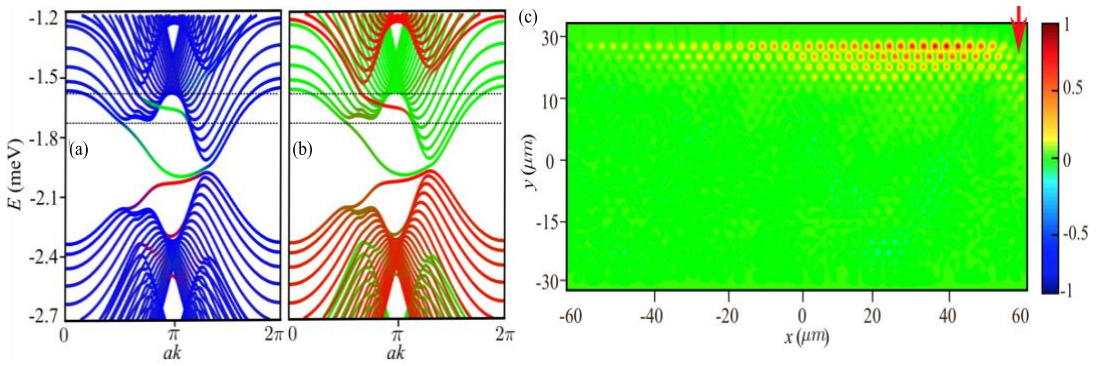


**Fig. 1.** (a) Band structure of the system under consideration with the edge states shown in red and green. (b) Same band structure plotted with colour coding corresponding to the spin degree of freedom. (c) Spatial distribution of the spin degree when the system is subjected to a linearly polarized coherent pump whose position is indicated with the red arrow.

**References**

[1] C. E. Bardyn, T. Karzig, G. Refeal, and T. C. H. Liew, Phys. Rev. B. **91**, 161413 (R) (2015).

[2] S. Klembt, et al., Nature **562**, 552 (2018).