

# Ultra-low-loss Optical Interconnect Enabled by Topological Unidirectional Radiation

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**Abstract**— In this talk, we present a method for realizing ultra-low-loss photonic interconnects by using topological-protected unidirectional radiation. Specifically, we employ topological unidirectional guided resonances (UGRs) to suppress the useless downward radiation with no mirror placed on the bottom. By further engineering the dispersion and apodizing the geometry of grating, we realize a grating coupler on the 340 nm silicon-on-insulator platform with a record low loss of  $-0.34$  dB and 1 dB-bandwidth exceeding 30 nm at the telecom wavelength of 1550 nm, and also demonstrate a pair of grating couplers work as an optic via that interconnects two stacked photonic chips with a loss of only  $-0.94$  dB. Our work would shed light on a systematic method to achieve energy-efficient optical interconnect for silicon photonics and pave the way to large-scale photonic integration for applications from optical communication to photonic computing.

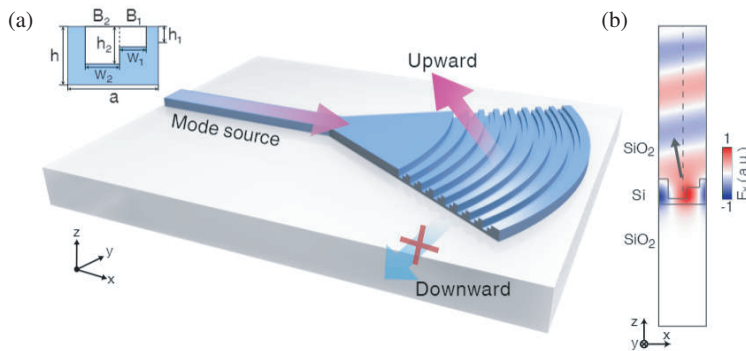


Figure 1: Schematic of unidirectional grating coupler, (a) the geometry and layout, (b) the electromagnetic field of unidirectional radiation.

## REFERENCES

1. Yin, X., T. Inoue, C. Peng, and S. Noda, “Topological unidirectional guided resonances emerged from interband coupling,” *Phys. Rev. Lett.*, Vol. 130, 056401, 2023.
2. Wang, H., Y. Zuo, X. Yin, Z. Chen, Z. Zhang, F. Wang, Y. Hu, X. Zhang, and C. Peng, “Ultra-low-loss optical interconnect enabled by topological unidirectional guided resonance,” arXiv:2306.09027, 2023.