Optical interconnects and filters based on waveguide arrays

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Rapidly increasing demand for higher data bandwidths has motivated exploration of new communication channels based on spatially multiplexed in-fibre and on-chip coupled light guides [1]. However, the conventionally used periodically arranged coupled waveguides display complicated light propagation patterns, ranging from quasiperiodic to nearly chaotic. Taking a different approach, we spectrally engineer interwaveguide coupling to instigate self-imaging of the input light state at the array output and thus enable construction of novel high-fidelity interconnects [2]. Simple implementation via modulation of the interwaveguide separations makes these interconnects realizable in all fabrication platforms.
Moreover, the wavelength dependent self-imaging opens up possibilities for construction of new multiplexing devices [3]. Here, we present designs of band-pass filters and dichroic splitters for VIS and NIR and propose the strategies for selection of their central wavelengths and bandwidths.

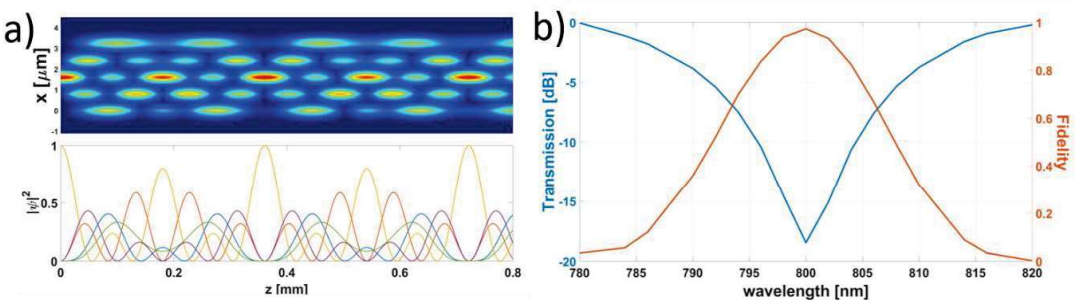

Figure 1. a) Self-imaging in a SiN array composed of 5 waveguides. b) Transmission and fidelity of transfer after the 1st revival period at z = 0.36 mm [3].

REFERENCES
[1] B.J. Puttnam *et al.*, Optica 8, 1186 (2021).
[2] J. Petrovic, J. Veerman, Ann. Phys. 392, 128 (2018).
[3] J. Petrovic *et al.*, J. Opt. Las. Technol. 163, 109381 (2023).