



Optical Communications Laboratory

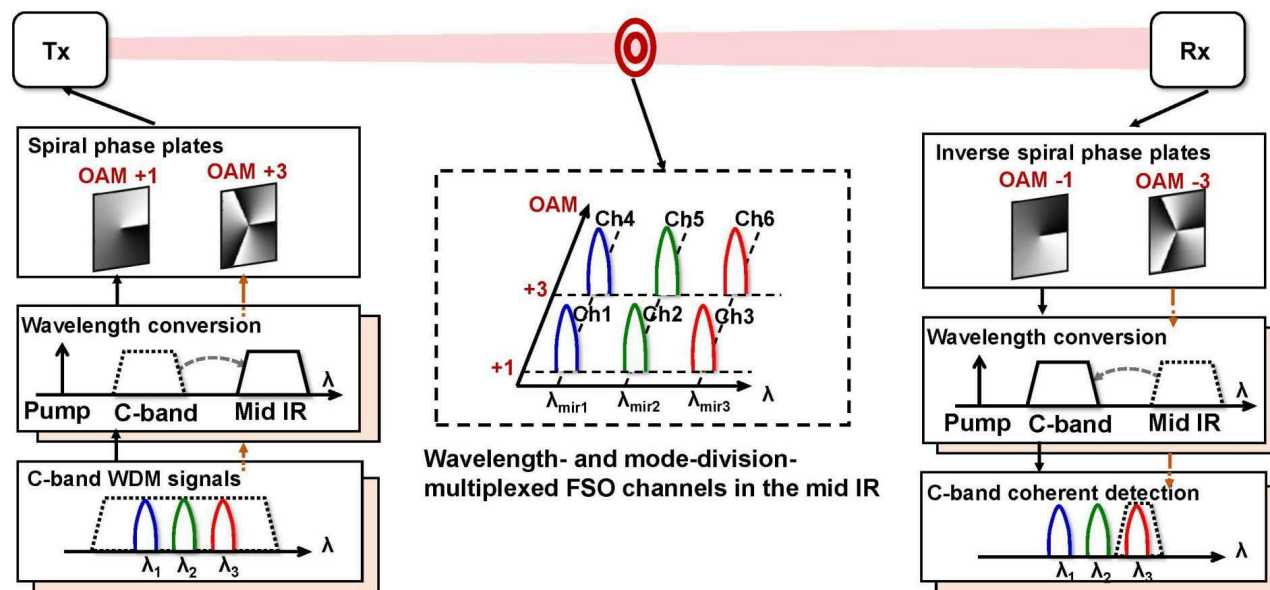


Research

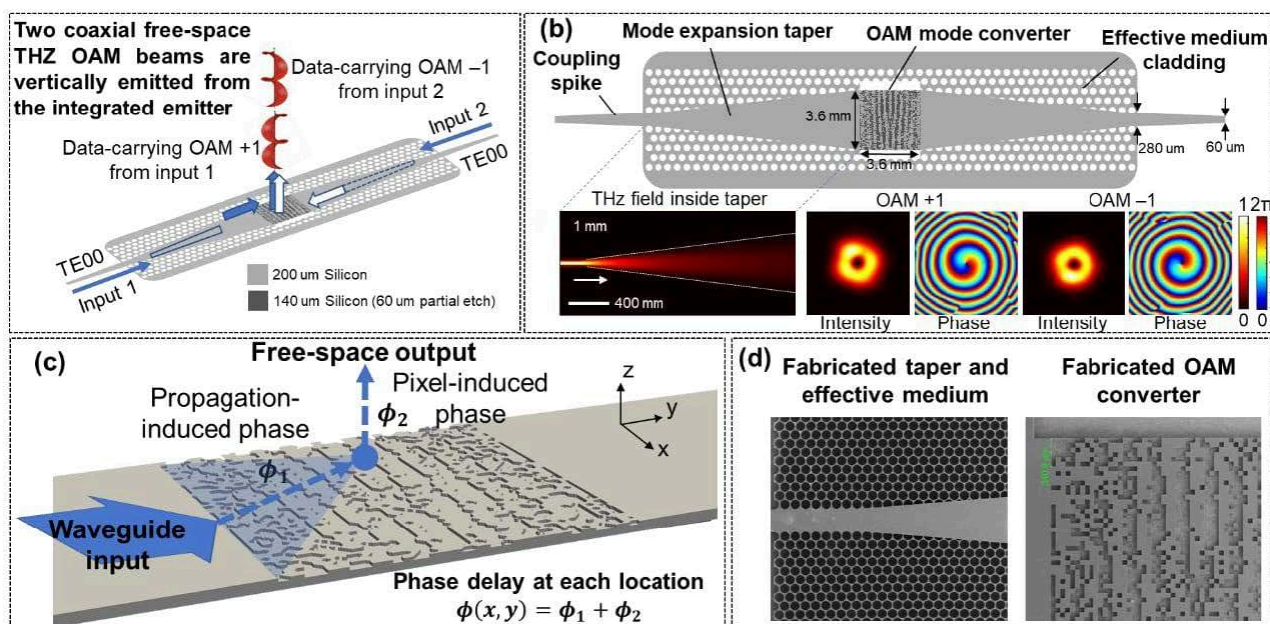
Overview:

Our projects cover optical communications and relevant phenomena at various wavelengths, for fiber and free space, in linear and nonlinear regimes, and using Gaussian and structured beams. Examples include:

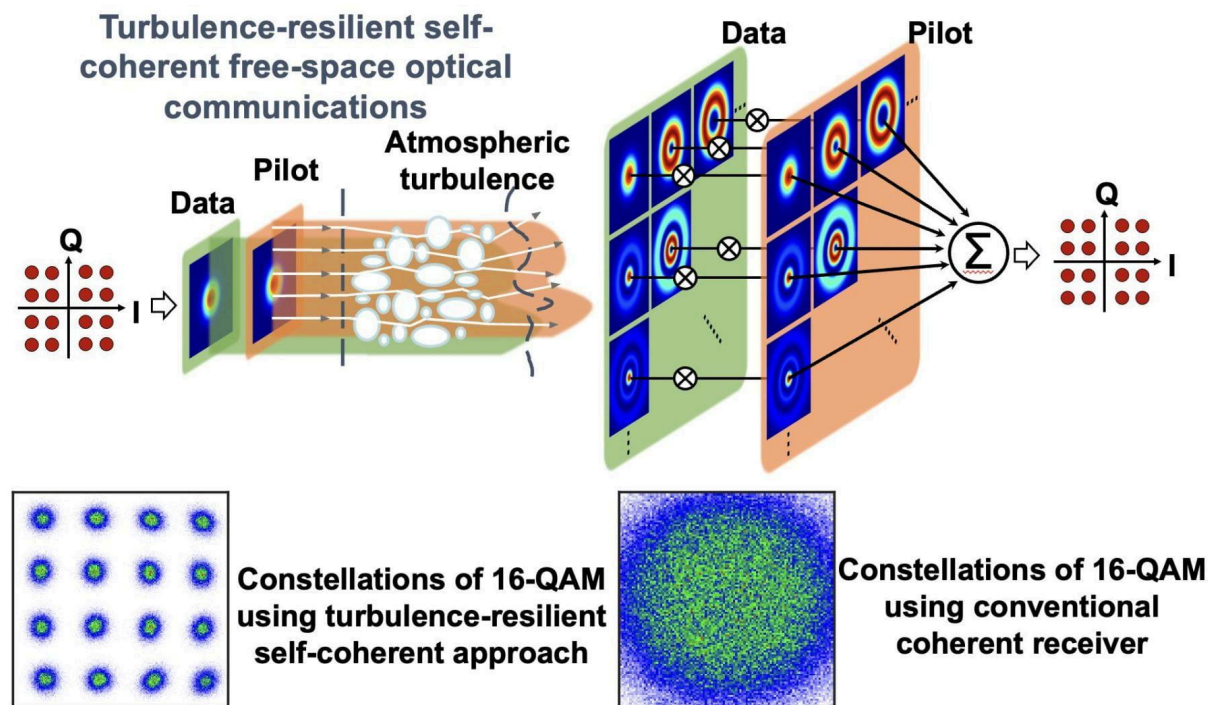
- structured modal beams for optical communications, such as using orbital-angular-momentum (OAM) for space-division-multiplexing to increase data capacity.
- effects of media on free-space beam propagation (e.g., atmospheric turbulence) in-ground station, drone, airplane, and underwater links.
- high-speed optical signal processing for fiber networks utilizing tapped-delay lines, linear and nonlinear optical filters, and nonlinear wave mixing.
- tunable photonic integrated circuits for the generation of spatial modes and frequency combs.



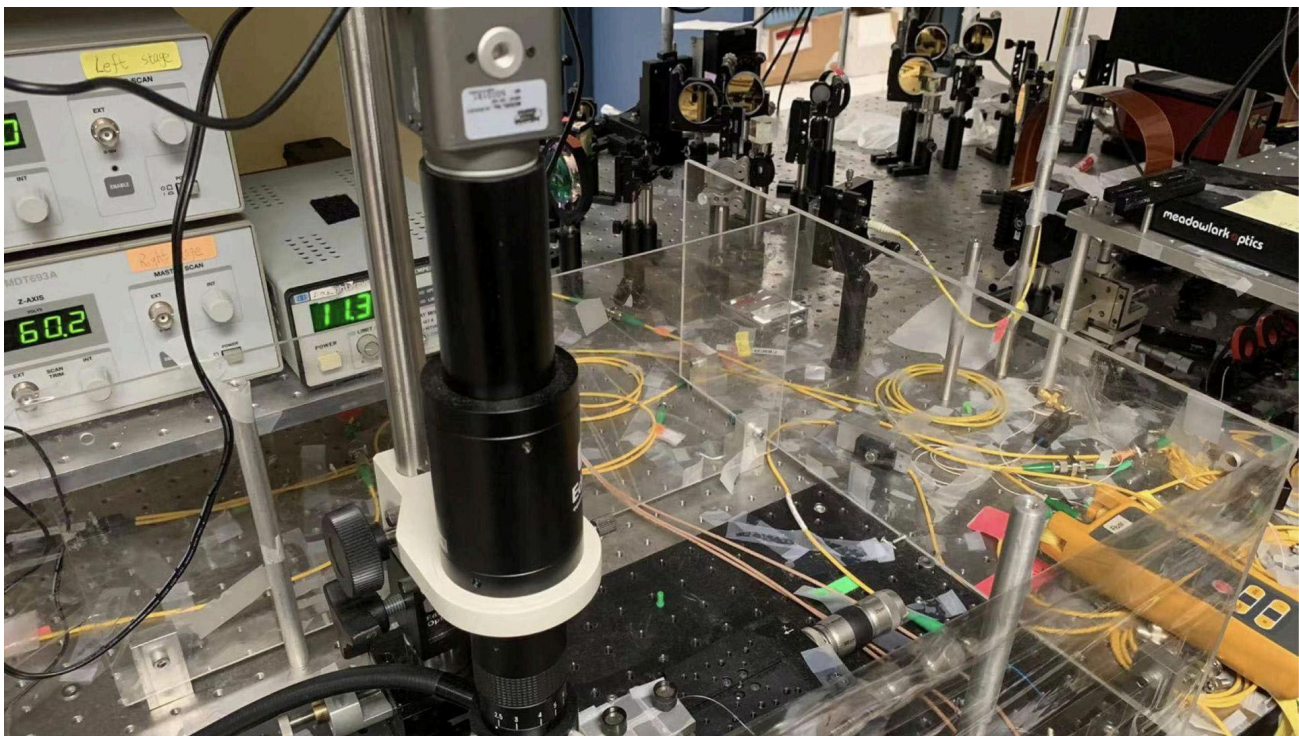
High-capacity free-space optical communications using wavelength- and mode-division-multiplexing in the mid-infrared region (K. Zou, et al., *Nature Communications*, 2022)



THz integrated circuit with a pixel array to multiplex two 10-Gbit/s QPSK channels each on a different OAM beam for mode-division-multiplexing (X. Su, et



Pilot-assisted self-coherent free-space optical communications to improve system performance through turbulence (*R. Zhang, et al., Nature Photonics, 2021*)



Experiment setup to measure photonic integrated circuits and demonstrate performance in systems

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University of Southern California

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