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Simultaneous Turbulence Compensation of Multiple Orbital Angular Momentum 100-Gbit/s Data Channels

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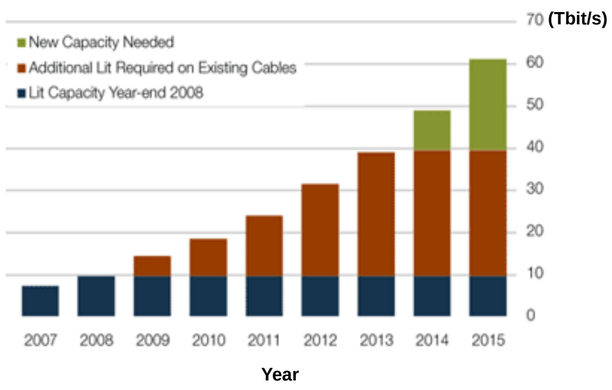
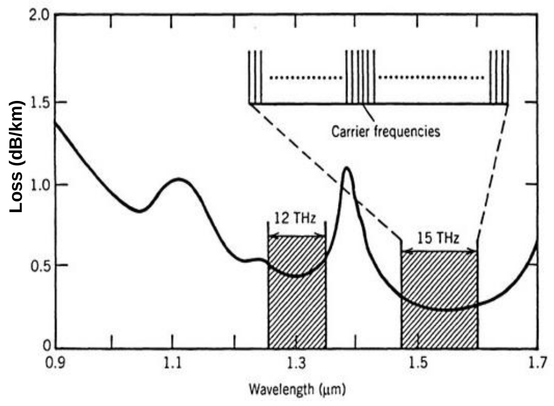
Problem: Bandwidth demand > Spectral resource

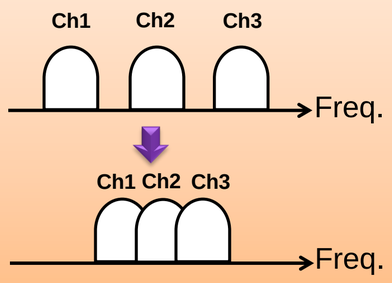




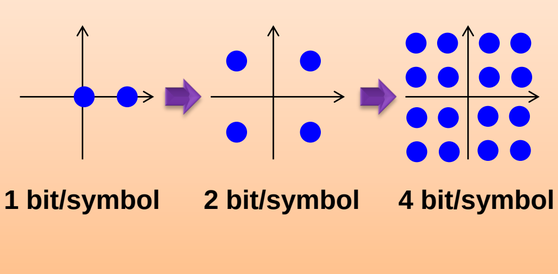
- >60 Tbit/s capacity is needed by 2015.

Existing Solutions to Boost Data Capacity

- squeeze the channel spacing



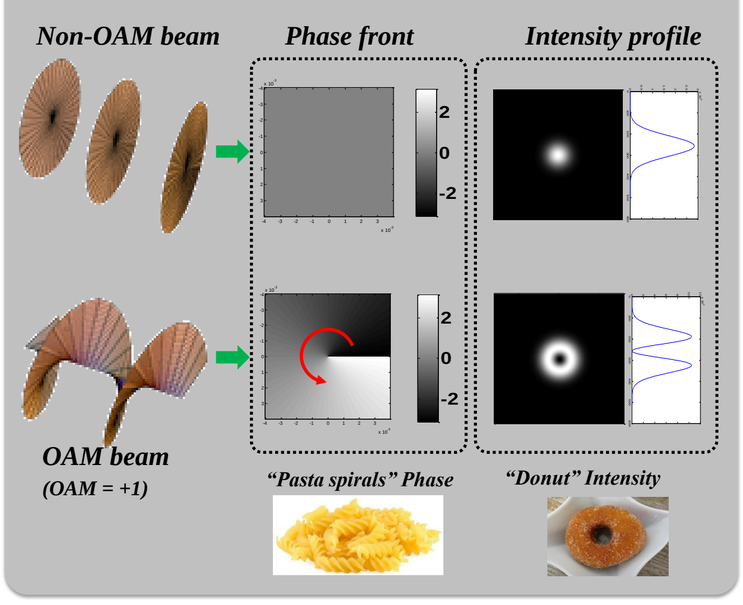
- High-order Modulation Format



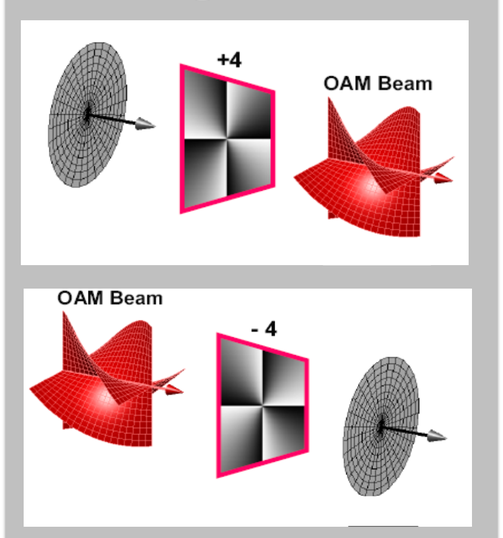
- Spectral resource is limited, even for optics.

OAM Background

Orbital Angular Momentum(OAM)

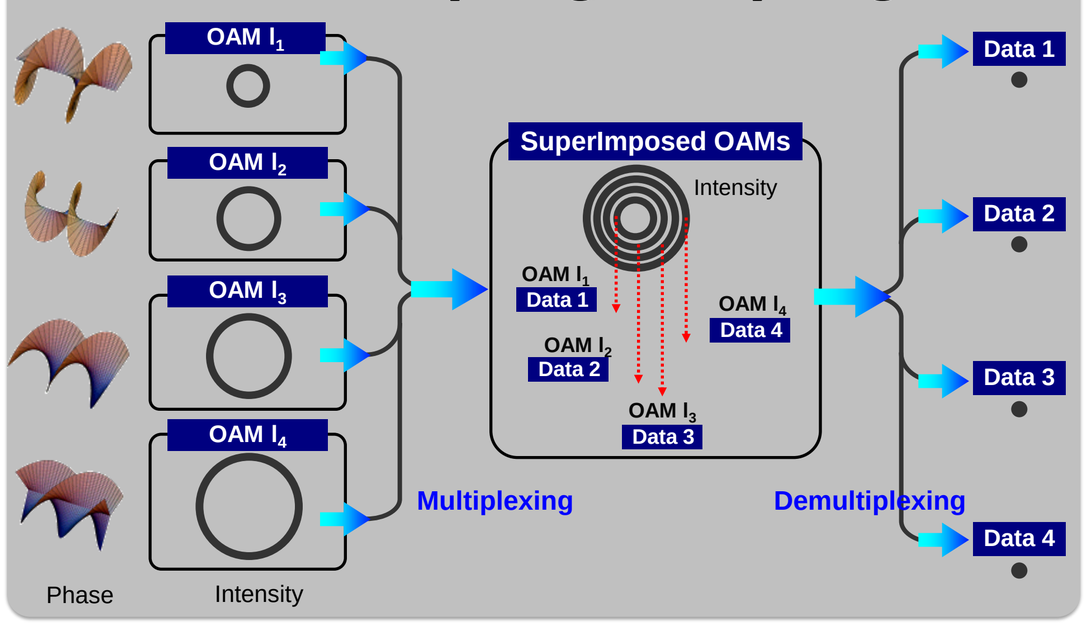


How to generate OAM



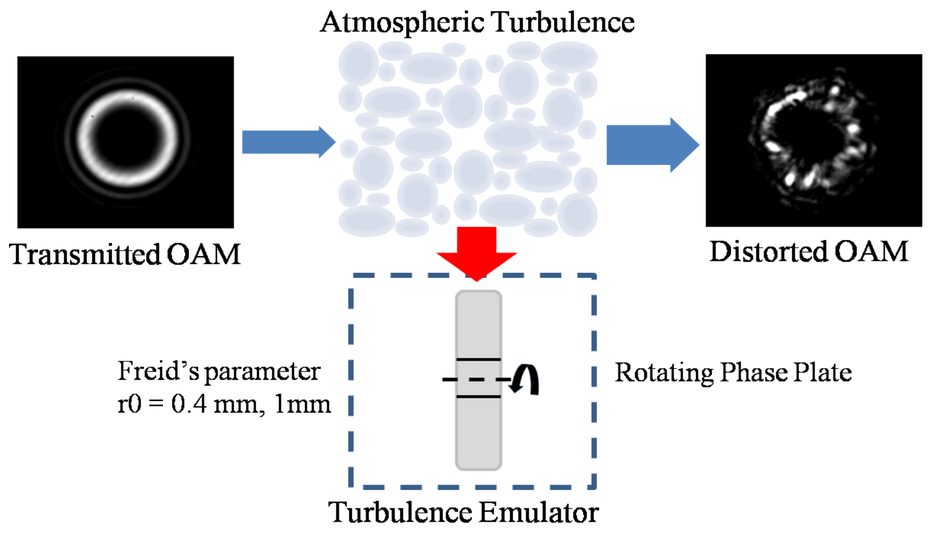
How to detect OAM

OAM multiplexing/demultiplexing



OAM Beam Propagating Through Turbulence and Adaptive Optics Compensation

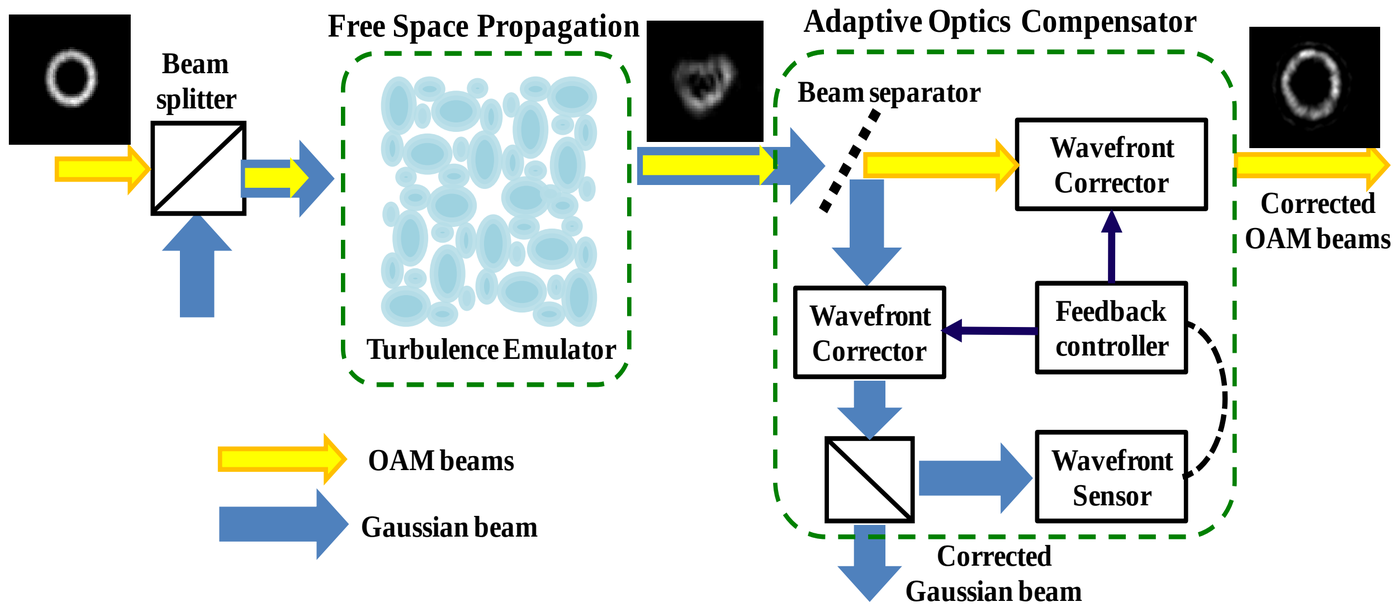
Turbulence Emulator for OAM Beams



- Rotating Phase Plates with phase distribution obeying Kolmogorov Spectrum Statistics is used to emulate atmospheric turbulence

Y. Ren et al, CLEO2013, paper CM2G.4 (Invited Paper)

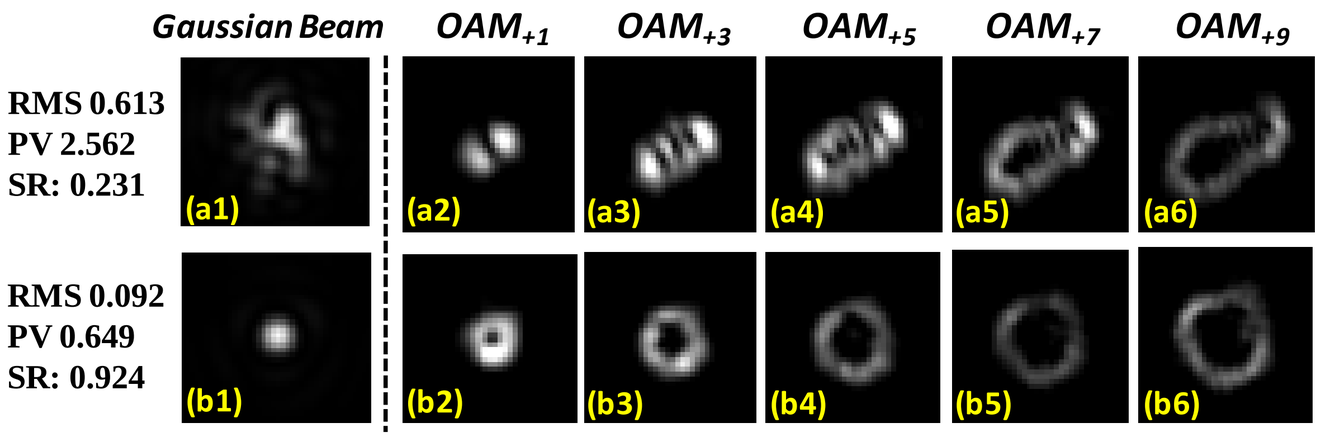
The Proposed Turbulence Compensation for OAM Modes



- Traditional adaptive optics compensation scheme could not work for OAM beams.
- A Gaussian beam acts as a probe beam for wavefront sensing to obtain correction pattern.

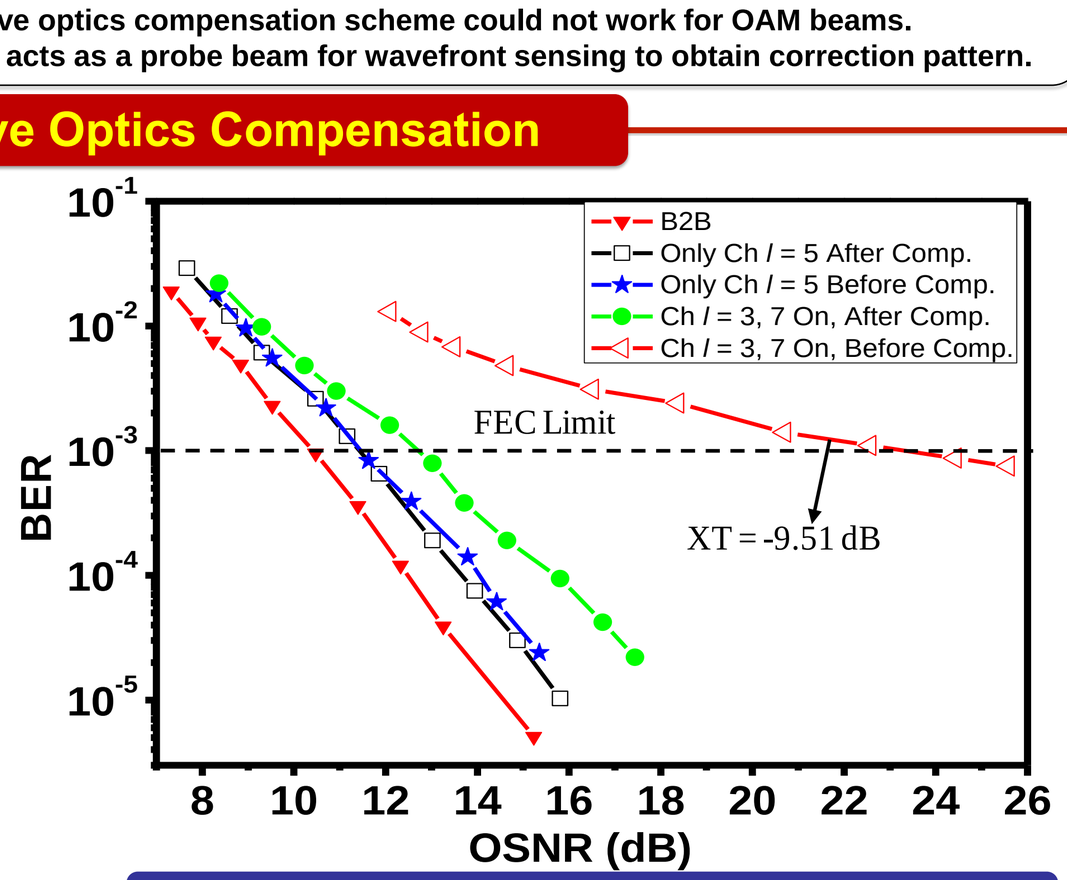
Experimental Results — Adaptive Optics Compensation

Far-field Intensity Before/After Turbulence Compensation



- By using the correction pattern obtained from the Gaussian probe beam in the closed-loop adaptive optics, the distorted OAM beams up to *l*=9 are efficiently compensated.
- The crosstalk is mitigated efficiently by 10. 4dB, reduced from -9.51 dB to -19.95 dB.

Y. Ren et al, ECOC2013, paper We.3.D.1 *Y. Ren et al, Optics Lett. 38 20 (2013)*



Bit-error-rate Before/After Compensation

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