Integrated Photonics for Adaptive Discrete Multi-carrier Space-based Optical Communication and Ranging

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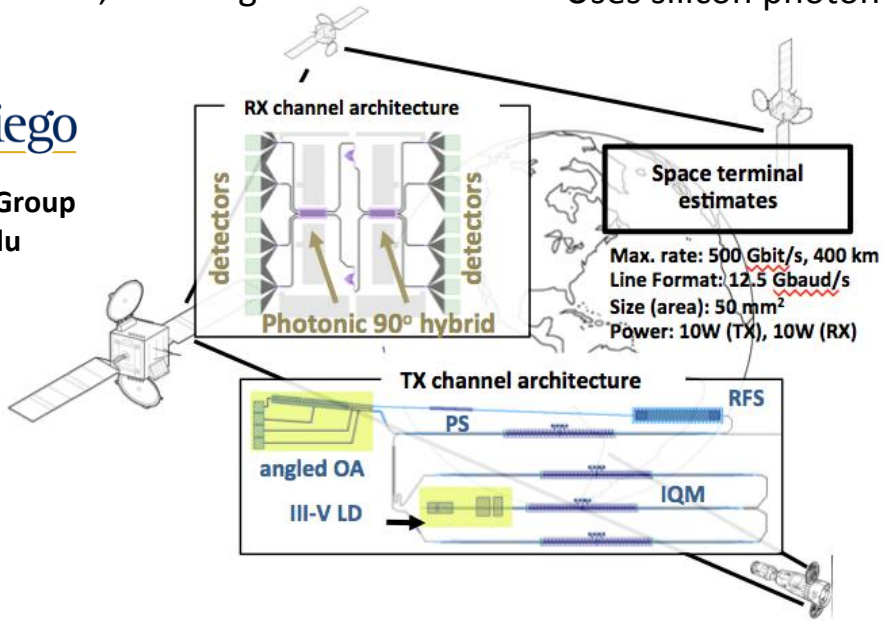
Research Objectives

- Develop chip-scale optical technology for 10 Mbit/s - 500 Gbit/s near-Earth space communication from TRL 1-2 (concept, feasibility) to TRL 3 (proof-of-concept development, breadboard characterization).
- Uses silicon photonics transceiver with monolithic and heterogeneous integration.
  Compared to SOA: Lower SWAP, higher performance, manufacturability, lower cost.



Approach

- Optical orthogonal frequency division multiplexing with variable sub-carrier generation and IQ-modulated line format.
- Create and validate library of component building blocks, enabling integrated design and detailed system link modeling.
- Breadboard demonstration of proof-of-concept leveraging photonics foundry fabrication.

Potential Impact

- Improvements in space communications permitting large data sets to be transferred rapidly, which can enable extended reach, new missions and new science.
- Significant improvements in SWAP, saving energy and space on satellites.
- Pipeline for silicon photonics, III-V and electronics integration and manufacturability.