

Coherent Optical Communication - Architecture, Modeling and Optimization

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Abstract

The development challenges of a *coherent optical communication* system (VectorWave) over long distance DWDM infrastructures with variable high spectral efficiency will be visualized. The top-down synthesis and bottom-up embodiment of a hierarchical multi-level system architecture using multidisciplinary modeling, simulation and optimization tools and techniques will be analyzed with emphasis on:

- LiNbO₃ based design of an integrated coherent QPSK modulator with polarization multiplexing, optimal optical pulse shaping.
- Design and fabrication of an integrated coherent, LiNbO₃ based self-Homodyne and Homodyne receiver with polarization tracking using inverse Jones matrix techniques.
- Simulation, modeling and optimization of the propagation and interaction of multiple coherent optical signals within an ultra-long DWDM fiber plant in the linear and non-linear regimes.
- Parametric analysis and derivation of noise sensitivities and boundaries in the practical embodiment of a coherent transmitter-receiver link.
- Derivation and optimization of the cost-performance envelop of a complete coherent communications system utilizing adaptive optical pulse shaping and variable symbol packing techniques.

A vision of the evolutions of required methods and tools to approach theoretical boundaries for optical coherent communications, based on the experience gained by the author and the technical team at Celight will be shared.