Division Multiplexing of 10 Gbit/s Ethernet Signals Synchronized by All-Optical Signal Processing Based on a Time-Lens - DTU Orbit (16/05/2019)

This Thesis presents 3 years work of an optical circuit that performs both pulse compression and frame synchronization and retiming. Our design aims at directly multiplexing several 10G Ethernet data packets (frames) to a high-speed OTDM link. This scheme is optically trans-parent and does not require clock recovery, resulting in a potentially very efficient solution.

The scheme uses a time-lens, implemented through a sinusoidally driven optical phase modulation, combined with a linear dispersion element. As time-lenses are also used for pulse compression, we de-sign the circuit also to perform pulse compression, as well. The over-all design is: (1) Pulses are converted from NRZ to RZ; (2) pulses are synchronized, retimed and further compressed at the specially de-signed time-lens; and (3) with adequate optical delays, frames from different input interfaces are added, with a simple optical coupler, completing the OTDM signal generation.

We demonstrate the effectiveness of the design by laboratory experi-ments and simulations with VPI and MatLab.

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