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Single wavelength multi-dimensional modulation with direct detection

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Driven by the unabated growth of data center hosted cloud applications and services, the demand for faster short reach optics is growing incessantly. Meeting these huge increases of data center traffic requires architectural and technological advances to the underlying transceivers. Advances are needed in order to enable scalable growth of both intra- and inter-data center traffic volumes, while simultaneously decreasing transceiver size, cost and power consumption. One way to achieve such a goal lies in the reduction of the number of optical signal lanes and the use of advanced modulation formats to increase the transfer rate per wavelength. Modulating multiple dimensions of a single lightwave over numerous levels while maintaining a direct detection scheme allows a cost effective solution to increase spectral efficiencies and binary throughputs in short reach transceivers. In this work, we present a review of direct detection systems and their underlying transmitter and receiver architectures, with focus on spectral efficiencies of varying modulation formats and their underlying receiver signal processing complexity for cost and power efficient high speed optical modems in short reach applications.

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Generation of milli-Joule femtosecond micro-Bessel beams

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In this presentation, we report design and experimental demonstration of a setup for milli-Joule Bessel beam generation capable of handling sub 50 fs laser pulses using a conical prism. Hence, permitting delivery of intensities (1015 W cm^{-2}) exceeding the breakdown threshold of any dielectric material over micrometer dimension with motivation to achieve high precision surface machining of the target. This could possibly provide an alternative to extend the longitudinal machining region by leaps and bounds, further leading to machined channels with unprecedented aspect ratio.

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