

Seminar

# Direct Detection for Short-Reach Communication

This topic is offered as part of the [Seminar on Optical Communications](#) course.

For short-reach fiber-optic links of a few dozens of kilometers, direct detection (DD) receivers are increasingly used as cost-efficient alternatives to coherent receivers. Compared to coherent detection, a direct detector consists of a single photo diode, which discards phase information and outputs only the magnitude of the impinging field. Formerly, real and positive modulation alphabets, e.g., Q-PAM, were used in connection with DD receivers, as the transmitted symbols could readily be found from their squared magnitude after the DD. Whereas the DC offset in Q-PAM aids DD, it carries no information and consumes energy.

Recently communication using energy-efficient bipolar and complex-valued constellations was shown in [1,2]. Therein the authors create controlled intersymbol interference to reconstruct the phase of general complex-valued constellations from the DD output.

[1] M. Secondini and E. Forestieri, "Direct Detection of Bipolar Pulse Amplitude Modulation," in *Journal of Lightwave Technology*, vol. 38, no. 21, pp. 5981-5990, 1 Nov. 1, 2020, doi: 10.1109/JLT.2020.3007584.

[2] A. Tasbihi and F. R. Kschischang, "Direct Detection Under Tukey Signalling," in *Journal of Lightwave Technology*, doi: 10.1109/JLT.2021.3109852.

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