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MLSE receivers: Application Scenarios, Fundamental Limits and Experimental Validations

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Abstract

Electronic post-processing techniques based on MLSE (Maximum Likelihood Sequence Detection) for the mitigation/compensation of fiber linear (CD, PMD) and non-linear (SPM and other intra-channel) propagation effects are reviewed, in conjunction with IMDD, DPSK and PSBT. Fundamental limitations and experimental validations are discussed. Specific application scenarios are addressed, including both uncompensated and dispersion-managed links.

Extended Abstract

Electronic post-processing techniques based on MLSE (Maximum Likelihood Sequence Detection) for the mitigation/compensation of fiber linear and non-linear propagation effects have recently attracted considerable interest. MLSE has been found effective, both through simulations and off-line experiment, against chromatic dispersion (CD), polarization mode dispersion (PMD), self-phase modulation (SPM) and other intra-channel effects. Commercial products have also appeared on the market, with the state-of-the-art device being based on a 16-state processor.

In this paper, fundamental limitations and experimental validations of MLSE are reviewed. Penalty vs. CD is shown to be bounded to a finite and relatively small value (2-3 dB), provided that MLSE memory matches the memory of the channel. Penalty vs. PMD is also shown to be bounded and the underlying cause for it is discussed. Off-line experiments confirming the simulative results are reviewed, including a 10Gb/s, 1,040km uncompensated IMDD transmission experiment over SMF. Specific practical application scenarios are addressed, including both uncompensated and dispersion-managed WDM links. Regarding the latter, MLSE appears to be capable of greatly increasing the link robustness to impairments and its tolerance to dispersion map non-optimality. Various formats including IMDD, DPSK and duobinary (PSBT) are discussed in connection with MLSE. Finally, MLSE and BCJR are compared.

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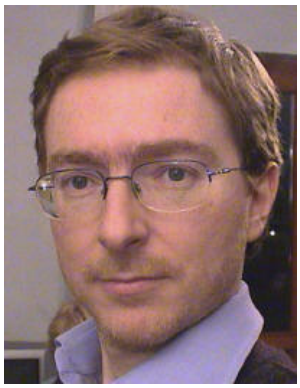

Pierluigi Poggiolini received his MS and PhD degrees from Politecnico di Torino, Turin, Italy.

From 1990 to 1995 he was with the Optical Communications Research Laboratory of Stanford University, where he worked on the STARNET and CORD all-optical packet network projects. Since 1998 he has been an Associate Professor at Politecnico di Torino, where he coordinates the Optical Communications Group (www.optcom.polito.it). His current research interests include coherent detection and electronic mitigation techniques for broadband optical transmission. He has published over 150 papers in international journals and conference proceedings. He is an elected member of the Academic Senate of Politecnico di Torino.