



# Advanced Digital Signal Processing in Coherent Optical Systems

*Chen Zhu*

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The main objective of this book is to investigate computationally-efficient and modulation format-flexible DSP algorithms for fibre channel impairment compensation and performance monitoring in PDM single-carrier coherent optical systems. Novel blind equalization scheme based on frequency domain block processing structure is proposed for PDM-QPSK and PDM-16-QAM systems with single-stage and two-stage convergence process, respectively. Then the combination of training-aided channel estimation and single-step multiple-input-multiple-output (MIMO) frequency domain equalization is presented and discussed. We further investigate the overhead-free training-aided equalization scheme by utilizing implicit training sequence which is carried using a small portion of the signal power. An OSNR monitoring technique based on the statistical moments of the equalized signals is then proposed for in-band OSNR estimation. Finally we address the issue of combining Nyquist matched filtering and linear channel impairment compensation in a single linear MIMO equalizer, which achieves the computationally-efficient receiver's DSP solution for Nyquist-WDM systems.

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