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Invited paper

Compensation of fibre impairments in digital coherent systems

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Abstract

Coherent detection combined with digital signal processing (DSP) is a symbiotic relationship. Not only does DSP relax the requirements on the coherent receiver but it permits digital compensation of fibre impairments. We will outline the principles of 40GBit/s and 100GbE digital coherent transmission systems and review the latest research.

Extended Abstract

As systems move towards 100GbE, the chromatic dispersion and polarisation mode dispersion (PMD) become a severe limitation for conventional intensity modulated direct detection systems. One of the most promising approaches to overcome the impairments due to dispersion and PMD uses coherent detection. Not only does coherent detection permit the use of more spectrally efficient modulation formats such as polarisation division multiplexed QPSK or OFDM (orthogonal frequency division multiplexing), but also it maximises the efficacy of the digital signal processing (DSP), which in turn relaxes the requirements on the coherent receiver. By using coherent detection to map the optical field into the electrical domain it becomes possible to overcome the fibre transmission impairments due to chromatic dispersion and polarisation mode dispersion using DSP such as multiple input multiple output (MIMO) finite impulse response filters (FIR). While linear MIMO-FIR filters are suitable for compensating linear impairments, by modifying the DSP it is possible to reduce the impact of fibre nonlinearities. We will outline the principle of digital coherent receivers focusing on their potential to overcome fibre impairments, before discussing digital coherent transceivers and their prospects for next generation optical transmission systems.

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CV

Seb Savory received the MA, MEng and PhD degrees from Cambridge University and the MSc(Maths) degree from the Open University. He is a lecturer at University College London (UCL), where he is engaged in research into digital coherent receivers within UCL's Optical Networks Group. Previously he was at Nortel's Harlow Laboratories, where he worked on advanced optical transmission systems. Dr Savory is an Associate Editor for IEEE Photonic Technology Letters, a Technical Committee member for OFC, and has authored/co-authored 40 journal and conference papers and 9 patents. In 2005 he was awarded a Leverhulme Trust Early Career Fellowship.