

# Dynamic Physical Impairment-Aware Routing and Wavelength Assignment in 10/40/100 Gbps Mixed Line Rate Optical Networks

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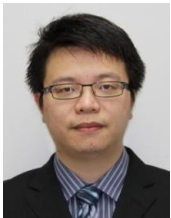
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**Abstract**— The growing global Internet traffic will inevitably lead to a serious upgrade of the current optical networks' capacity. Instead of upgrading the data rate of each wavelength in every fibre link across the entire optical WDM network infrastructure, it is more efficient and cost-effective to support different data rates within one fibre link (e.g., 10, 40 and 100 Gbps). This is called optical network with mixed line rates (MLR). Moving to higher than 10Gbps data rates that can be used within the same fibre requires the implementation of phase modulation schemes. Nevertheless, the co-existing OOK channels cause a critical physical impairment to the phase modulated channels, namely cross-phase modulation (XPM), that limits the network's performance. In order to mitigate this type of impairment a more sophisticated physical impairment aware routing and wavelength assignment scheme needs to be adopted. In this paper, the critical impairment for each data rate and the way it affects quality of transmission (QoT) is presented. Secondly, QoT aware RWA schemes for a MLR optical network are presented and evaluated in terms of performance through simulations.

**Keywords**—Mixed Line Rate, Optical Network, XPM, ASE, Physical Impairment, RWA



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