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APPLICATIONS OF EDFAS IN HIGH SPEED AND HIGH SENSITIVITY ALL-OPTICAL NETWORKS

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The recent advent of the EDFA has allowed significant advances in telecommunications network technology. Optical power- and pre- amplifiers have allowed transmission distances and bit-rates to be increased almost indefinitely. In addition, in-line amplifiers have made the goal of a transparent optical network a near reality. In this paper we will discuss several recent advances in this technology.

The noise of an efficient EDFA is characterised and it is shown that at optimum gain efficiency the EDFA exhibits an increased NF. In addition, with the conventional (co-directionally pumped) configuration it is virtually impossible to obtain a combination of high gain (>30dB) and quantum-limited NF. Incorporating an isolator in the middle of the EDFA overcomes these problems and we have demonstrated an amplifier with 51dB gain and 3.1dB NF for only 45mW of pump power.

Constatnt power optical amplifiers are discussed and it is shown that by simply inducing a differential loss between pump and signal in the middle of the EDFA achieves an optical power limiting action with a >30dB dynamic range. Experimental results confirming this are given.

Finally, we report the generation of a high-purity 70Gbit/s cw soliton train. The technique is based on the non-linear propagation and compression of a dual-frequency beat signal, amplified with an erbium-doped power amplifier and propagated through a dispersion decreasing fibre.