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Single-channel 2R Regeneration in Quasi-Continuous Dispersion-Managed Nonlinear Medium

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Abstract: We demonstrate single-channel 1.5-dB eye-opening improvement in a dispersion-managed modification of Mamyshev's regenerator. This is a first step toward realization of multi-channel 2R regeneration via dispersion management.

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We have recently proposed [1] a dispersion-managed 2R regenerator scheme capable of handling multiple WDM channels simultaneously. The scheme modifies the Mamyshev's regenerator [2] by splitting the conventional highly nonlinear fiber (HNLF) into short sections, each followed by a periodic group-delay device (PGDD). In this report, we present the experimental results proving that our scheme does not adversely affect *single-channel* regeneration, which is the first step toward achieving the multi-channel 2R (the next step being demonstration that dispersion management greatly improves *multi-channel* performance). We use the ultra-short recirculating loop [3] to emulate cascading multiple HNLF-PGDD sections by passing the signal through one 500-m-long section many times.

In Fig. 1 left, the input and output eyes are shown for 10 Gb/s pulses without artificial degradations (top), with bad extinction ratio ER ~7 dB (middle), and with ±25% amplitude jitter (bottom), for +5 ps/nm residual dispersion per section. Regeneration improves eye-opening by 1.5 dB for the amplitude-jitter-impaired signal and by 2.5 dB for poor-ER signal (Fig. 1 middle). It is robust with respect to moderate change in filter detuning (Fig. 1 right, lowest eye), but has some sensitivity to change in residual dispersion per section (Fig. 1 right, top two eyes). This sensitivity is due to the spectral tilt (Fig. 2right) related to some asymmetry of 1-nm-wide ASE-filter inside our loop.

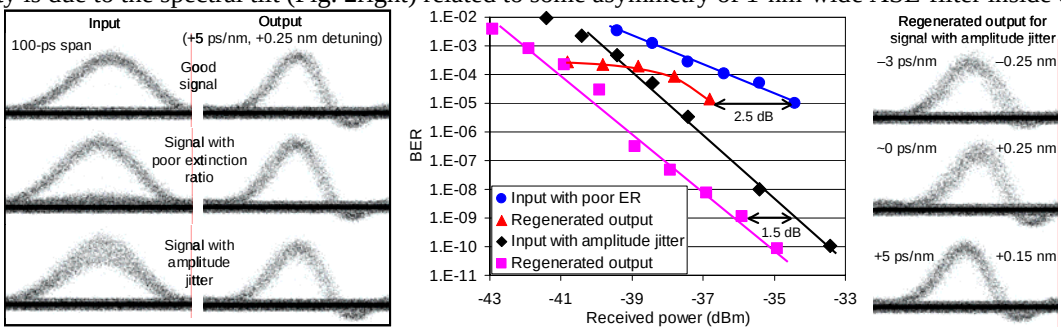

Fig. 1. Left: eyes for signal input (after 0 circulations, no filter detuning) and output (after 15 circulations). Middle: BER vs received power. Right: effect of change in filter detuning (lower eye) or in residual dispersion per section (top two eyes).

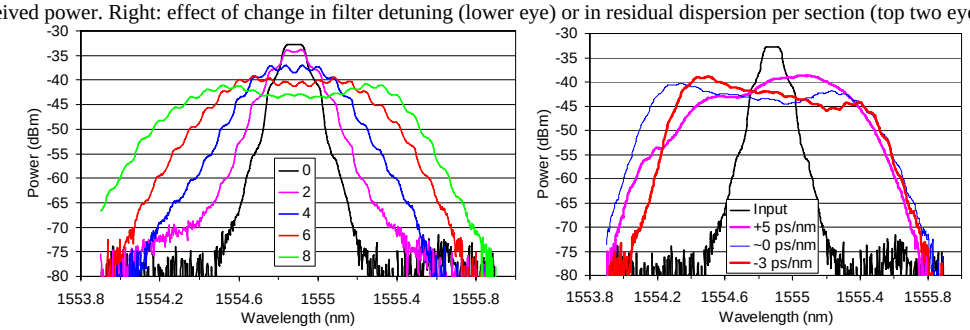

Fig. 2. Left: signal spectra after various numbers of circulations, residual dispersion +5 ps/nm. Right: signal spectra after 15 circulations (total 7.5 km of fiber) for 3 values of residual dispersion. OSA resolution bandwidth is 0.1 nm.

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[3] P. G. Patki, V. Stelmakh, M. Annamalai, T. I. Lakoba, and M. Vasilyev, CLEO 2007, paper CMZ3.