available today with e.g. 48-128 channels [18,19], of which 12-32 outputs could be used to receive 12-32 OFDM carriers after spectral magnification.

The proposed scheme relies on magnifying the OFDM spectrum by a factor M (here M = 4), and then using a bandpass filter with a bandwidth comparable to the symbol rate to extract the OFDM signal. This intrinsically implies throwing away about 1-1/M of the signal power (here ¾), with M being the magnification factor. However, this can be compared to O-FFT (DFT) which requires the use of optical gates following a matched filter as in e.g [7,20], where the gate will carve away $1\text{-}T_s/T = 1\text{-}1/N$ of the signal power, where $T_s = T/N$ is the allowed gating window width, T the symbol period, and N the number of samples (outputs of the delay interferometer DFT unit). In e.g [7], N = 8, and hence $1\text{-}T_s/T = 7/8$ of the signal power would be lost. Note, however, that the insertion of a guard interval allows a broader gating window to be used (although the guard interval reduces the spectral efficiency). So the proposed scheme is comparable to previous suggested schemes based on O-DFT as the power loss related to filtering/gating can be of the same order of magnitude. The implication of this on the transmission power budget is under investigation in further studies. As the main idea is to replace the O-DFT receiver, further studies are also under way to more rigorously compare the performance of these two schemes, in terms of OSNR sensitivity and power consumption. The proposed scheme will only use one active magnifier compared to the same number of active gates as number of subcarriers in the O-DFT scheme. On the other hand, the magnifier will require high-power EDFAs, where the gates could be low-power electroabsorption modulators. In [7], 325 sub-carriers were used, though, so a considerable amount of driving power must be expected, whereas a single magnifier could still in principle handle all 325 carriers with only two pump lasers, so the magnification scheme scales favourably. To make a direct meaningful comparison of power consumption, though, is beyond the scope of this paper, as this would require information not readily available in the literature. Another interesting possible limitation of the magnification scheme is that it could result in a lower OSNR sensitivity due to the 1-1/M loss of signal power. All of this is subject to further investigation.

6. Conclusion

We have proposed a new scheme for AO-OFDM demultiplexing based on spectral magnification with time-lenses, enabling significantly reduced ICI after simple optical band-pass filtering. The experimental proof-of-principle demonstration confirms that improved BER performance is obtainable after spectral magnification. This scheme allows for the use of standard DWDM receivers to detect spectrally advanced OFDM signals.

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