slicer, which leads to some DSP resources savings compared to the work in [12]. There is a tradeoff between receiver sensitivity and overload, which can be observed in Fig. 6(b) (22 km transmission), where a reduction of 1 dB in sensitivity leads to a 5 dB improvement in overload switching from COPU optimization case A to B.

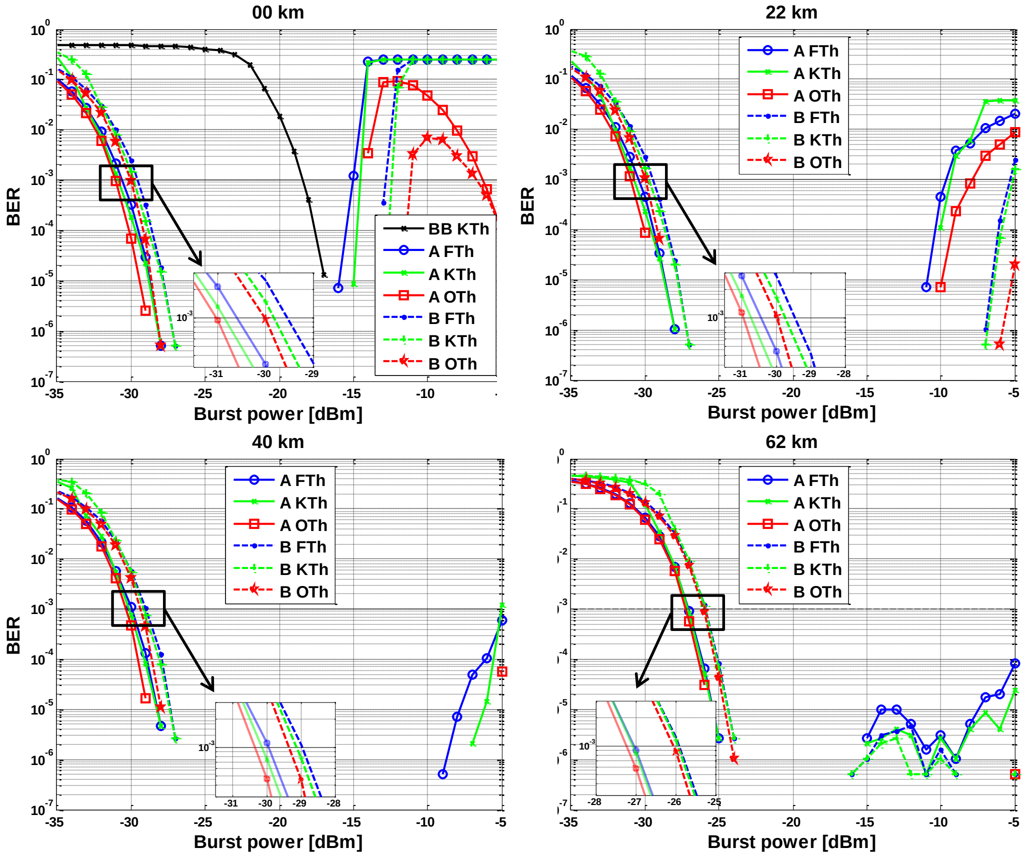

Fig. 6. Experimental BER characterization of the COPU for (FTh) fixed null threshold slicer, (KTh) Kawai variable-threshold slicer, and (OTh) optimum slicer for cases A and B for backhaul distances of (a) 00 km (COPU and no fiber), (b) 22 km, (c) 40 km, and (d) 62 km. The black line represent the back-to-back (neither COPU nor backhaul fiber) case.

5. Conclusions

In this paper, we have characterized a centralized optical processing unit for integrating multiple 10 Gb/s CWDM PONs segments into a long-reach DWDM backhaul. The COPU consists of a power equaliser combined with a WC and is shown to provide both burst equalization and wavelength conversion.

It was shown that there is a tradeoff between the maximum sensitivity of the receiver and the overload point which can be optimized by varying the operating point of the WC. The BER performance using a PIN-based DC-coupled digital burst-mode receiver at 22, 40, and 62 km of unamplified backhaul distances were compared and sensitivities of –30.94, –30.17, and –27.26 dBm with overload points of –9.3, –5, and >-5 dBm were found, respectively. Also, in this application a fixed null threshold slicer performs similarly to a more complex variable-threshold scheme, which could lead to significant receiver DSP resource savings.

Acknowledgments

This work was supported by EPRSC under grant number EP/D074088/1.