

Demonstration of Bidirectional Wired and Wireless Services in Integrated Optical and Wireless System Carried by Single Wavelength Lightwave

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Abstract: We propose and demonstrate a novel RSOA-based WDM-PON architecture for converging Gb/s-NZR and 16QAM-OFDM ROF signals by employing wavelength reuse techniques. The bidirectional wired and wireless services can successfully be delivered over 25 km fiber by using one single lightwave.

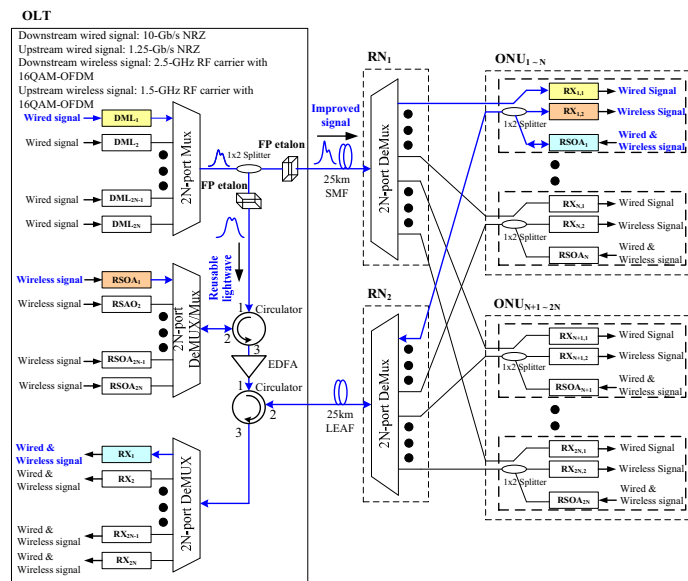
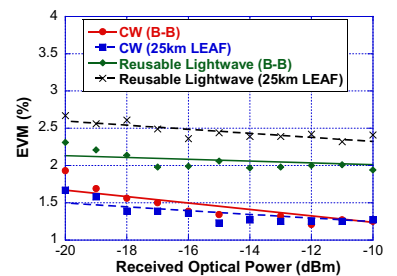
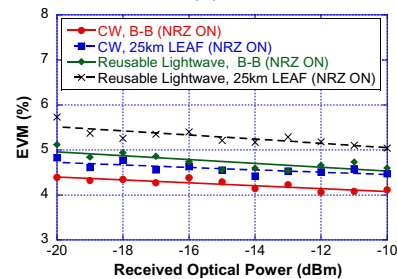


Fig. 1 The proposed optical wireless integration RSOA-based WDM-PON architecture. DML: directly modulated distributed feedback laser, RSOA: reflective semiconductor optical amplifier, SMF: single mode fiber, LEAF: large effective area fiber.



(a)



(b)

Fig. 2 The measured EVM results of (a) downstream and (b) upstream 16QAM-OFDM (code rate: 1/2) signals.

Our proposed architecture is shown in Fig. 1. In this paper, we experimentally demonstrate the bidirectional wired and wireless service delivery. The 10Gb/s-NRZ signal at the optical line terminal (OLT) is transmitted by a DML, and then the output signal of the DML is split into two light paths that one goes through a Fabry-Perot (FP) etalon to enhance its signal quality for downstream wired optical signal and the other through another FP etalon as a reusable seed light whose data is erased by detuned spectral filtering scheme. This reusable seed is re-modulated by an RSOA at OLT with 2.5-GHz 16QAM-OFDM wireless signal for delivering radio-over-fiber (ROF) service to optical network unit (ONU); meanwhile, half the downstream ROF optical signal is re-modulated again by an RSOA at ONU with combined 1.25Gb/s-NRZ and 1.5-GHz 16QAM-OFDM signals for delivering simultaneous wired and wireless services to OLT. At a BER of 10^{-10} , the 10Gb/s- and 1.25Gb/s-NRZ signals can successfully transmit over 25km SMF with 1dB improvement in power penalty and over 25km LEAF with < 0.5 dB power penalty as compared with the remodulation using a continuous wave (CW) seed, respectively. In Fig. 2 the bidirectional 16QAM-OFDM signals entirely meet the error vector magnitude (EVM) requirement for IEEE 802.16-2004 standard, less than 8.413%.

Acknowledgments: This work was supported in part by the National Science Council, Taiwan, under Grant NSC 98-3114-P-011-001-Y.