25 Gbit/s QPSK Hybrid Fiber-Wireless Transmission in the W-Band (75–110 GHz) With Remote Antenna Unit for In-Building Wireless Networks

In this paper, we demonstrate a photonic up-converted 25 Gbit/s fiber-wireless quadrature phase shift-keying (QPSK) data transmission link at the W-band (75–110 GHz). By launching two free-running lasers spaced at 87.5 GHz into a standard single-mode fiber (SSMF) at the central office, a W-band radio-over-fiber (RoF) signal is generated and distributed to the remote antenna unit (RAU). One laser carries 12.5 Gbaud optical baseband QPSK data, and the other acts as a carrier frequency generating laser. The two signals are heterodyne mixed at a photodetector in the RAU, and the baseband QPSK signal is transparently up-converted to the W-band. After the wireless transmission, the received signal is first down-converted to an intermediate frequency (IF) at 13.5 GHz at an electrical balanced mixer before being sampled and converted to the digital domain. A digital-signal-processing (DSP)-based receiver is employed for offline digital downconversion and signal demodulation. We successfully demonstrate a 25 Gbit/s QPSK wireless data transmission link over a 22.8 km SSMF plus up to 2.13 m air distance with a bit-error-rate performance below the $2 \times 10^{-3}$ forward error correction (FEC) limit. The proposed system may have the potential for the integration of the in-building wireless networks with the fiber access networks, e.g., fiber-to-the-building (FTTB).