60-GHz Ultra-WideBand Radio-Over-Fiber System Employing Modulation and Coding

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***Abstract*—We firstly propose a duplex 60-GHz Ultra-WideBand (UWB) Radio-Over-Fiber (ROF) System to extend the coverage for UWB communication systems. The novel Optical Frequency Multiplication (OFM) Modulation of 15 GHz lower RF is more cost-effective with much lower RF requirement and dispersion-tolerant even up to a 50 km optical transmission distance in the standard Single-Mode Fiber (SMF), compared with Optical Double-Sideband (DSB) Modulation of 30 GHz higher RF. Moreover, we also investigate the novel Punctured Convolutional Encoding for the system, indicating a trade-off between throughput and Bit Error Ratio (BER). The maximum 1120 Mbits/s throughput per band can be achieved at the expense of 6 dB Eb/No penalty, in contrast to the maximum 480 Mbits/s per band of the current standard Orthogonal-Frequency-Division Multiplexing (OFDM)-UWB (WiMedia specification v1.2). In the future, in order to figure out the bottleneck due to the aggregation of multi-BSs, we also will give a detailed analysis about the system network, employing the Optical Code Division Multiple Access (OCDMA). This study provides a guideline for the modulation, coding and network design of a practical UWB-ROF system.**

***Keyword*—Radio-Over-Fiber (ROF), Ultra-WideBand (UWB), Orthogonal-Frequency-Division Multiplexing (OFDM), Optical Frequency Multiplication (OFM), Punctured Convolutional Coding.**

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