SIMULATION OF INTERFERENCE EFFECTS FROM UWB SIGNALS TO A QPSK DIGITAL NARROWBAND SYSTEM

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This paper reports on the study of the interference effects from Ultra wideband (UWB) sources on QPSK transmission system by simulation. The culprit UWB sources were: multi-band orthogonal frequency-division multiple-access (MB-OFDM), direct-sequence code@division multiple@access (DS-CDMA), DS spread spectrum UWB (DS-SS UWB), and additive white Gaussian noise (AWGN). The MB-OFDM and DS-CDMA were modeled based on the proposal specifications in the IEEE.802.15.3a to standardize high-speed wireless personal area networks. Average bit error rate (BER) degradation of the victim system was evaluated while verifying the desired-to-undesired signal power ratio *(D/U)*, where *D* is the transmission signalfs average power and *U* represents the power of the UWB signalfs average power occupying the same bandwidth. The statistical properties of the culprit UWB signals entering the victim receiver were also investigated by means of amplitude probability distribution (APD).

We proposed a modified equivalent baseband system to accelerate the simulation speed. In the proposed system, the victim system was generated in the passband domain, while the UWB signals were generated at the equivalent baseband domain to lower the sampling rate of the simulation. The simulation was carried while varying the bandwidth of the victim system from 1, 5, to 10 MHz to observed significant relations between the BER and the victimfs bandwidth.

It was found that the DS-CDMA signal at the pulse repetition frequency (PRF) shows non-Gaussian properties, degrading the BER of the victim system 3 dB worse than the AWGN one. The interference effects from the MB-OFDM signal however were nearly 3 dB lower than that of the AWGN one in the D/U= 10 dB region. In a previous report, the authors pointed out that the MB-OFDM signal marked frequency peaks at every 3.2 MHz which would degrade the BER further. However, in this paper, the victim systemfs bandwidth was relatively wide, thus eliminating the difference in power between the spectral peaks. We also concluded that the average BER degradation were gradually improved with increasing bandwidth of the victim system.

Abstract Submission Form

2006 National Radio Science Meeting

Abstract: pasya4768

Date Received: September 28, 2005

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