

On the Performance of Ultra Wideband Radio in Stochastic Tapped Delay Line Model of the Ultra Wideband Channel

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Abstract—This paper demonstrates the performance of Ultra Wideband (UWB) systems in the Stochastic Tapped Delay Line (STD L) model of the UWB channel with RAKE receiver. System models are based on Direct Sequence Code Division Multiple Access (DS-CDMA) principle. The system has been studied in presence of multiple user interference and Gaussian noise. During the analysis, various types of narrow, sub-nanosecond pulses with same power were used and extensive simulations were run in 3.1 to 10.6 GHz frequency band. The simulation results show that pulse shape has noticeable impact on the performance of the system. The performance of the pulse waveform based on third derivative of Gaussian pulse has proved to be better than other pulses that were used. With a thorough analytical approach, spectral behavior of higher order Gaussian pulses has been explained. Finally, it is concluded that the third derivative of Gaussian pulse is the most suitable pulse shape for fulfilling the FCC regulated power spectral diagram (PSD) has also been illustrated and in multi-user interference environment.

Index Terms—Ultra wideband, channel model, pulse shape.