

论文

非相干UWB-PPM接收机前置滤波器带宽的优化选择

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摘要

由于硬件实现简单, 基于能量检测的非相干超宽带(Ultra-Wideband, UWB)接收机对一些低速数据应用具有较大的吸引力, 但另一方面也存在误码性能不高的不利之处, 影响其性能的两个主要因素是能量积分时间和前置滤波器带宽选择。该文针对非相干接收机前置滤波器产生的多径分量干扰的影响进行了分析, 并在推导出接收机误码性能闭式表达式的基础上对滤波器带宽的优化选择进行了分析。结果表明, 在信道模型 $CM1 \sim CM4$ 下, 前置滤波器产生的多径分量干扰平均来说对其输出能量的影响很小, 并且一般来说存在一个最佳的滤波器带宽值。此外, 在实际系统设计中采用高斯窄脉冲宽度倒数的2倍, 或者脉冲信号的一3dB或一10dB带宽作为准最佳的滤波器带宽值基本上可以满足设计的优化需求, 相应的误码性能损失约为0.5dB以内。

关键词 [超宽带](#) [非相干接收机](#) [前置滤波器](#) [通带带宽优化](#)

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Optimization of Pre-filter Passband Width for Noncoherent UWB-PPM Receiver

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Abstract

The noncoherent receiver is attractive for UWB system implementation in lower data rate applications due to its simplicity for implementation, which, however, is accompanied with the performance degradation. There are some factors that affect the performance of noncoherent receiver, among which is the selection of the pre-filter passband width. In this paper, the inter-path interference incurred by the pre-filter is analyzed numerically and statistically, and the optimal passband widths are analyzed as well based on the derivation of closed-form BER performance expression. It is shown that, the impact of IPI due to the pre-filter is insignificant to noncoherent receiver, and there exist different optimal pre-filter passband widths for different channels and input SNRs. However, the $\approx 61485; -3\text{dB}/-10\text{dB}$ bandwidth of the Gaussian pulse, as well as 2 times of the pulse width reciprocal, could be treated as a suboptimal filter bandwidth, which would only result in a lightly performance degradation.

Key words [UWB](#) [Noncoherent receiver](#) [Pre-filter](#) [Passband width optimization](#)

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