系统工程与电子技术 2012, 34(12) 2569-2573 DOI: 10.3969/j.issn.1001-506X.2012.12.29 ISSN: 1001-506X CN: 11-2422/TN

通信与网络

抗干扰扩频接收机中的ADC设计

杨伟君[1],张朝杰[1,2],袁铁山[1],金小军[1,2],金仲和[1,2]

1. 浙江大学信息与电子工程学系， 浙江 杭州 310027;
2. 浙江大学微小卫星研究中心， 浙江 杭州 310027

摘要：

模数转换器（analog-to-digital converter, ADC）量化引入的信噪比(signal-to-noise ratio, SNR)损失是影响数字接收机性能的一个重要因素。根据ADC误差产生的机理，得到了关于量化位数和幅度因子（ADC最大量化电平与ADC输入电平的比值）的噪声表达式，求出了不同量化位数下的最佳幅度因子。针对存在干扰的情况，得出了ADC输出SNR关于输入SNR、量化位数和干信比的计算公式。计算结果表明，当要求输出SNR为-15 dB时，要实现30 dB、 40 dB、 50 dB和60 dB的抗干扰能力（量化损失小于1 dB）所需要的最小量化位数分别为5位、7位、9位和10位。

关键词： 模数转换器 量化噪声 饱和噪声 幅度因子 扩频抗干扰

ADC design in anti-jamming spread spectrum receivers

YANG Wei-jun[1],ZHANG Chao-jie[1,2],Yuan Tie-shan[1],JIN Xiao-jun[1,2],JIN Zhong-he[1,2]

1. Department of Information Science and Electronics Engineering, Zhejiang University, Hangzhou 310027, China;
2. Micro-Satellite Research Center, Zhejiang University, Hangzhou 310027, China

Abstract:

The loss of signal-to-noise ratio (SNR) due to analog-to-digital converter (ADC) is an important issue that impacts the performance of a digital receiver. According to the mechanism of ADC quantization error, a noise expression which depends both on the number of bits and on the amplitude factor (the ratio of the saturation level of the converter and the input level) is derived, and thus optimal amplitude factors are obtained under different numbers of bits. For the situation in the presence of interference, the output SNR is computed as a function of input SNR, number of bits as well as interference-to-noise ratio. Calculation results show that, when an output SNR of -15 dB is demanded, the quantization bits of 5, 7, 9 and 10 are minimally required to achieve 30 dB, 40 dB, 50 dB and 60 dB anti-jamming capability respectively (i.e. less than 1 dB SNR loss due to quantization).

Keywords: analog-to-digital converter (ADC) quantization noise saturation noise amplitude factor spread-spectrum anti-jamming

收稿日期 修回日期 网络版发布日期

DOI: 10.3969/j.issn.1001-506X.2012.12.29

基金项目:

通讯作者:

作者简介:

作者Email:

参考文献：

本刊中的类似文章

1．赵晋,张建秋,尹建君,李阳 .单比特量化软件接收机中的鲁棒数字鉴相器[J]. 系统工程与电子技术, 2011,33(1): 173-0178

2．马仑，廖桂生，卢丹.基于子空间投影的并行交替采样系统误差估计[J]. 系统工程与电子技术, 2012,34(9): 1796-1800