

空间应用光纤陀螺随机游走误差在线监测方法

作者: 李敏, 张春熹, 宋凝芳, 金靖, 林松
单位: 北京航空航天大学光电技术研究所
基金项目: 高科技计划(863)

摘要:
随机游走误差是光纤陀螺空间应用中最受影响的误差之一。在分析陀螺器件在辐照环境下的失效模式以及陀螺模型的基础上, 得到了前向通道增益是随机游走误差性能劣化的特征量的结论。依据相关辨识理论, 提出了前向通道增益的在线监测方法, 并在FPGA中得到了实现。通过将伪随机二进制码叠加在阶梯波中, 并与方波调制伪随机二进制码解调得到前向通道增益; 计算伪随机辨识信号与方波信号的相关性, 该方法不会影响陀螺的正常工作。通过光纤陀螺辐照模拟实验验证了该方法的有效性, 结果表明辐照过程中辨识得到的前向通道增益能够反映出随机游走误差75%的劣化。

关键词: 光纤陀螺; 随机游走误差; 前向通道增益; 互相关

Online RWE monitoring based on cross-correlation method for IFOGs in space applications

Author's Name:

Institution:

Abstract:

Random Walk Error(RWE) is one of the most sensitive errors in IFOGs for space applications. Based on the optical component parameters that degrade in space irradiation environment and the IFOG physical model, forward path gain (FPG) is confirmed as the feature characterizes deterioration of RWE. According to the cross-correlation identification theory, we propose an online FPG extraction method with pseudo random binary signals (PRBS) injection. The correlativity between the forward path output, square-wave reference signal and square-wave modulated PRBS are analyzed, and the results show that the extraction process can identify the FPG effectively without disturbing IFOGs' normal working cycles. The prerequisite of the method is discussed and the hardware realization in IFOG is introduced. An IFOG gamma ray radiation experiment was carried out to verify the method and the results shows that the FPG identification process can reveal 75% deterioration of RWE.

Keywords: IFOG, RWE, forward path gain, cross-correlation

投稿时间: 2009-09-16

[查看pdf文件](#)