

光子学报 2011, 40(9) 1428-1432 DOI: 10.3788/gzxb20114009.1428 ISSN: 1004-4213 CN: 61-1235/O4

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论文

光纤移频分布式布里渊光纤传感技术

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摘要:

提出了一种利用布里渊光纤环形腔移频技术实现分布式光纤布里渊传感的方法.该方法基于布里渊光时域分析法原理,将一束单纵模运转激光器输出的激光分为两束|一束光入射布里渊光纤环形腔中产生窄线宽的受激布里渊散射光作为斯托克斯光,另一束光经过低频相位调制后作为泵浦光|斯托克斯光和泵浦光分别相向入射进入传感光纤,通过测量布里渊谱得到光纤温度或应变.利用该方法可将十几GHz的微波频率转化为兆赫信号频率进行探测处理,仅需一台激光器,因此系统结构简单、成本低,还可减小激光器频率波动对测量准确度的影响.实验验证了该方法的可行性.

关键词: 分布式光纤传感器 布里渊散射 光纤环形腔 布里渊光时域分析法

Distributed Fiber Optic Brillouin Sensing Technique with Frequency Shifting

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Abstract:

A novel method to implement distributed fiber optic Brillouin sensing was proposed,using the frequency shifting technique via a Brillouin fiber optic ring cavity.The method is based on the Brillouin optical time-domain analysis (BOTDA) principle that a laser beam from single-longitudinal model lasing is divided into two beams|one beam is launched into the Brillouin fiber optic ring cavity to generate the stimulated Brillouin scattering wave of narrow bandwidth as the Stokes wave,the other one is taken as the pump wave through phase modulation at a low frequency|the Stokes and the pump waves counter-propagate along the sensing fiber optic and the Brillouin frequency spectrum is measured to get the temperature or strain in fiber optic.The proposed method translates a microwave frequency signal into a MHz frequency signal for detection and processing with only one laser.The system is simple in structure with low cost and can eliminate the impact of the laser frequency fluctuation on the measurement precision.Experiments show that the method is feasible.

Keywords: Distributed fiber optic sensor Brillouin scattering Fiber optic ring cavity Brillouin Optical Time-Domain Analysis(BOTDA)

收稿日期 2011-03-14 修回日期 2011-05-29 网络版发布日期 2011-09-25

DOI: 10.3788/gzxb20114009.1428

基金项目:

北京市自然科学基金 (No.4073032) 资助

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