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论文

密集波分复用条件下的光轨网络串扰分析与仿真

张蕾蕾, 付明磊, 乐孜纯

浙江工业大学 理学院, 杭州 310023

摘要：

光轨网络是一种能够利用成熟的光学器件实现带宽灵活分配和信息交换的新型网络.串扰是限制光轨网络的物理层性能及其扩展性的重要因素.本文讨论了典型的光轨网络节点中异频串扰和同频串扰的产生原因,理论分析了两者对光轨网络的物理层传输性能的影响.给出了3种串扰性能的评价方法.以密集波分复用技术为应用背景,分别搭建了器件隔离度为20 dB和30 dB的、具有3个节点5个波长且单波长速率为2.5 Gbps的光轨网络,仿真了串扰在光轨网络中的传播过程,并计算了光轨网络的误码率、功率代价和相对串扰.理论分析和仿真结果表明:光滤波器、解复用器和复用器是光轨网络中串扰产生的关键器件,且提高器件的隔离度等性能对于提高光轨网络的传输性能会有较显著的效果;在密集波分复用条件下,串扰对单波长速率为2.5 Gbps的光轨网络的误码率和功率代价具有显著的影响,从而限制了光轨网络实际可用的节点数目.

关键词： 光轨 串扰 密集波分复用 仿真

Crosstalk Analysis and Simulation of the DWDM Based Light-trail Networks

ZHANG Lei-lei, FU Ming-lei, LE Zi-chun

College of Science, Zhejiang University of Technology, Hangzhou 310023, China

Abstract:

Light-trail network is a novel optical network which takes advantage of mature optical devices to assign the bandwidth and switch the packets flexibly. Crosstalk is an important factor to restrict the performance at the physical layer as well as the extensibility of the light-trail network. Firstly, the causes of both interband crosstalk and intraband crosstalk in the typical light-trail nodes are discussed. In addition, the influence of the two kind’s crosstalk on the transmission performance at the physical layer is theoretically analyzed. Secondly, three methods to evaluate the crosstalk are introduced. On the basis of DWDM technique, a simulation platform with 3 nodes and 5 wavelengths is built, in which the optical devices are assigned optical depth as 20 dB and 30 dB. And the basic transmission rate of the wavelength is 2.5 Gbps. At last, the propagation process of the crosstalk is traced in the whole light-trail network. And the BER, the power penalty and the relative crosstalk are calculated accordingly. Both analytical and simulation results show that optical filter, demultiplexer and multiplexer are the key optical devices which cause crosstalks. Hence, the transmission performance of light-trail network can be enhanced obviously by improving the depth of the above optical devices. Moreover, both BER and power penalty are observed to be affected deeply by the crosstalk when the basic transmission rate of single wavelength is up to 2.5 Gbps. Therefore, the number of optical node available is limited at the scenario of DWDM.

Keywords: Light trail Crosstalk Dense Wavelength Division Multiplexing(DWDM) Simulation

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通讯作者: 乐孜纯(1965-),女,教授,主要研究方向为微结构光电子器件.Email:lzc@zjut.edu.cn

作者简介:

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