

**PERFORMANCE PREDICTION OF FREE SPACE OPTICAL
COMMUNICATIONS UNDER SEVERE HAZE CONDITIONS**

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Dengan segala hormatnya perkara di atas adalah dirujuk.

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ABSTRACT

Rare usage of Free Space Optical (FSO) communication in Malaysia is caused by environmental factors. The FSO technology is also known as unguided beam or ‘optical wireless’ or infrared broadband. FSO can be used in various applications such as LAN to LAN connections, fiber backup, last mile access, metro network extensions and hybrid microwave/laser. An advantage of using FSO is no license is required from Federal Communications Commission (FCC) for the installation and commissioning of FSO system. Apart from that, the cost of installation is primarily economical because there is no extra cost of digging the street for laying the bulky fiber optic cables.

This study offers quick preliminary investigation on possible FSO performance before the final commissioning and installation at site. Preliminary evaluation of system performance is done using readily available local weather data obtained from local government authority. Thus, FSO installers could make quick judgment before giving recommendation of a suitable system to the customers. This project will critically recommend a suitable wavelength and distance for FSO system in hazy conditions.

In the normal practice of FSO, evaluation of FSO performance is conducted by testing the actual system at site. This process requires the FSO hardware to be installed temporarily at site to acquire the system performance. If the attenuation performance of the system is satisfactory, the system is then permanently installed and commissioned. On the other hand, if the system shows poor performance, necessary adjustment of system parameters and/or hardware is done. In this project, a more proactive method to forecast the system performance is proposed without having to physically install the hardware. The alternative method requires only

CHAPTER 1

INTRODUCTION

1.1 An Overview

Transmission through light has been used since the nineteenth century. In 1880, Alexander Graham Bell expanded optical communications with his ‘photophone’ that modulated sunlight for communication. In the early 1960’s, scientists have successfully developed Light Amplification by Stimulated Emission of Radiation (LASER) technology. Finally, optical communication was shortly discovered after the development of LASER technology (FSO, 2003 & Johnson, 2002).

1.2 Background

There are several options for data communication in the existing technology today. The most common mode used is the fiber optic cable technology. It is proven to be the best choice in the telecommunications industry. Fiber is the most reliable for many applications in various areas in communication connectivity. However, using fiber optic can sometimes be extremely uneconomical. This is because the costs of trenching street to lay fibers and other civil works are excessively high.

Another option is radio frequency (RF) technology. RF is a mature technology, but is limited in data rate, requires FCC licensing and is costly relative to other access. RF technology cannot scale to 2.5Gbps. The current RF bandwidth ceiling is 622 Megabits. When compared to Free Space Optical, RF does not make economic sense for service providers looking to extend optical networks (Rockwell, 2001).

The third alternative is wire and copper based technologies. The percentage of copper technology use is higher than fiber, but it does not solve the bottleneck of