MULTIWAVELENGTH SINGLE CAVITY BRILLOUIN ERBIUM FIBER LASER (BEFL)

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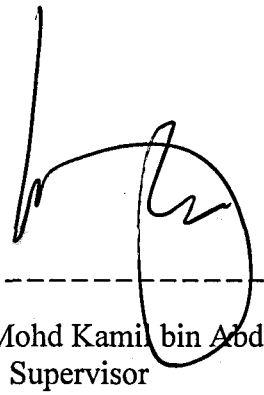

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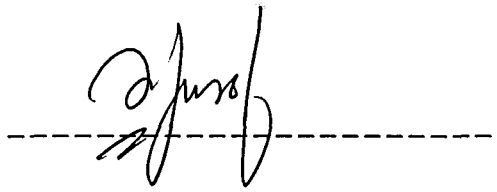

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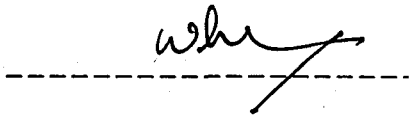

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ABSTRACT

MULTIWAVELENGTH SINGLE CAVITY BRILLOUIN ERBIUM FIBER LASER

This project focuses on how Multiwavelength Single Cavity Brillouin Erbium Fiber Laser (BEFL) can improve Brillouin stokes signal in the system by using 500m of SMF. The objectives of this project are to characterize optical components, design and set up of multiwavelength single cavity BEFL system and also to characterize and test BEFL system. Significance of this project is to increase the Brillouin stokes by using BEFL system. This is because in telecommunication system, Brillouin is a special gain medium that function to increase the number of Brillouin stokes signal. This system also can produce multiple wavelengths simultaneously by using one light source. Scope for these projects covers identifying and characterizes the optical component that will be used in designing multiwavelength single cavity Brillouin Erbium fiber laser, an efficiency of multiwavelength single cavity Brillouin Erbium fiber laser and also the number of Brillouin Stokes signal. The process of understanding of BEFL system and demonstrating this system is very important to achieve the objectives of this project. Maximum of 9 Brillouin stokes was able to achieve by increasing SMF pump power until 3mW. However, when the SMF pump power was increased until its maximum power 9mW, the Brillouin stokes will decrease.

CHAPTER 1

INTRODUCTION

1.1 Background

Communication is the process of establishing a link between two points and passing information between them. The information is transmitted in the form of a signal. In electronics, a signal can be anything from the pulses running through a digital computer to the modulated radio waves of an FM radio broadcast. Such passing of information involves three activities such as encoding, transmission, and decoding. Now, the demand for capacity over the last few years is rapidly growing usage of the Internet and business data transfer [11].

In the growing world of improved communication, fiber optics offers a method of transmission that allows for clearer, faster, more efficient communications than copper. A fiber optics system holds many advantages over a copper wire system. For example, while a simple two strand wire can carry a low speed signal over a long distance, it cannot send high speed signals very far. Coaxial cables can better handle high speed signals but only over a short distance. Fiber optics holds a great advantage over the two transfer media as it can handle high speed signals over extended distances. Other advantages of fiber optics include immunity from Electromagnetic (EM) Radiation and Lightning, lighter weight, higher bandwidth, better signal quality, lower cost, easily upgraded, and also ease of installation and minimize space [18].

Nonlinearities that need special attention when designing state of the art fiber optic include Self Phase Modulation (SPM), Cross Phase Modulation (CPM), Four