ERBIUM YTTERBIUM DOPED WAVEGUIDE AMPLIFIER

NOR LAILATUL HANA BT MOHD REDZWAN

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ABSTRACT

ERBIUM YTTERBIUM DOPED WAVEGUIDE AMPLIFIER

In this project, the Erbium Ytterbium doped waveguide amplifier was designed on a piece of compact disc (CD). The CD is an optical component that has refractive index value of 1.55. Fabricating the amplifier involves the process of CD preparation, coating with SU-8 polymer, soft bake, expose with UV, hard bake, cladding removal, splicing, fiber design onto the CD piece and make the PMMA layer onto the fiber. The fiber arrangement also involves in the project. The use of CD, polymer SU-8 and polymer PMMA are for fiber arrangement. The coating of polymer layer was characterized by using prism coupler and optical spectrum analyzer. The thickness and refractive index of SU-8 film on the CD was measured by using prism coupler. The values with smaller standard deviation were considered as appropriate results to choose for its refractive index and thickness. The Gain (G) and Noise Figure (NF) of amplifier were measured by using optical spectrum analyzer. The power pump and corresponding pump current of laser diode were recorded in the table. The Gain and Noise Figure were measured at several different pump powers. At 5, 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100 mW of the pump power, the Gain of amplifier were -18.14, -2.71, 15.73, 21.80, 24.41, 25.94, 26.92, 27.67, 28.27, 28.70 and 29.13 dB respectively. At these pump powers, the Noise Figure of amplifier were 18.34, 5.79, 2.29, 2.08, 2.09, 2.07, 2.08, 2.05, 2.04, 2.07 and 2.04 dB respectively. Lastly, the Gain was measured at fixed pump power at different signal wavelength light. At 1530.336, 1535.618, 1540.978, 1545.266, 1549.584, 1555.040 and 1559.462 nm of signal wavelength, the amplifier Gain were 33.02, 28.14, 25.58, 26.05, 26.05, 22.33 and 24.88 dB respectively. All the measurements were recorded in the appropriate tables. The relevant graphs were plotted based on the records in the tables.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The field of photonics is huge and applications can be found in virtually all technological industries. The long list of photonic applications grows practically by the day. Photonics is the technology which tells about light emission, transmission, deflection, amplification and detection by optical components and instruments. The quantum unit in technology of photonics is photon. Lasers, fiber optic and other light sources also includes in technology of photonics.

The photonics industry is generally subdivided as follows [1]:

- Avionics
- Electronics- Specialize in fiber cables.
- Health- Photonics knowledge is used in Bio-medical sensor and instrumentation, capillary electrophoresis, columns and accessories.
- Industrial process control- Photonics is applied in optical networking components for machine vision and industrial inspection industries.
- Instrumentation, tests and measurements- The example of instrument are digital multimeters, power supplies, function generators and counters.