POLARIZATION BIREFRINGENCE OF SILICA WAVEGUIDE IN PHOTONIC CRYSTAL FIBER

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Final Year Project Report Submitted in Partial Fulfilment of the Requirements for the Degree of Bachelor of Science (Hons.) Industrial Physics in the Faculty of Applied Sciences Universiti Teknologi MARA

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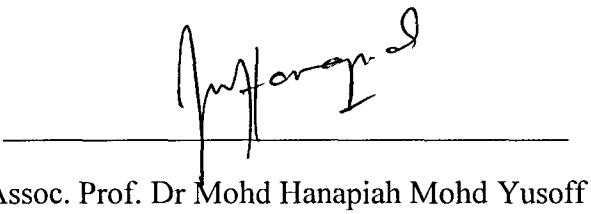
This Final Year Project Report entitled **"POLARIZATION BIREFRINGENCE OF SILICA WAVEGUIDE IN PHOTONIC CRYSTAL FIBRE"** was submitted by Farah Shahida Binti Ismail, in partial fulfillment of the requirements for the Degree of Bachelor of Science (Hons.) Industrial Physics, in the Faculty of Applied Sciences, and was approved by



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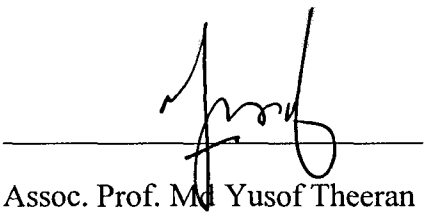

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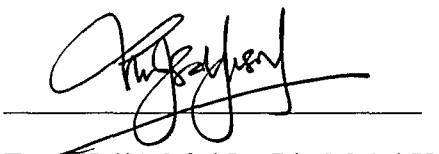

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"May Allah bless and reward them for their generosity"

TABLE OF CONTENTS

ABSTRACT

The demand for increased bandwidth in the next few years is expected to grow at an unprecedented rate. These optical systems will eventually provide the bandwidth that is in such demand. As in long-distance telephone cables, the signal must therefore be amplified and regenerated to continue on its way without losing information but the pulse signal would broaden and tend to overlap with each other. Therefore, the conventional silica optical waveguide devices such as polarization rotator or splitter are important components in optical network. Unfortunately, for low index contrast waveguide, its size would be in centimeter long. In order to realize a compact size, high index contrast waveguide like slotted silica structured is needed which is more compact than conventional ones. However, the mode is no longer in single mode but in multi-mode. In this project, the silica waveguide with photonic crystal glass air cladding is proposed. The silica waveguide is implemented in photonic crystal in the form of glass tubing to provide the mechanical support. Using FIMMWAVE software, the structure is designed and Waveguide Scanner is used to vary width and height until the optimum structure is obtained that gives high polarization birefringence. The final result of this silica waveguide is comparable to size of optical fiber when implemented in an array. The maximum polarization birefringence is obtained for a width of about 0.5μm for silica in photonic crystal waveguide. Maximum birefringence is equal to 0.03823.