AT-PIC

Automated Testing of Integrated Photonics Chips

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**Project Summary:**

Silicon photonics is a rapidly growing field in microelectronics, especially in computing power. A main bottleneck in computing power is the limited bandwidth of the interconnects between various subsystems in a microprocessor. Silicon photonics inherently has a larger bandwidth due to its use of photons rather than electrons. In our project, we want to create a fully automated silicon photonics testing station that will allow for the testing of various issues within photonic circuits, i.e., thermal cross-talk, accuracy of bits, power dissipation, etc. The testing bench uses a 90-mm camera and servo motors to achieve optical fiber connections in 3D space. It also has a vacuum to hold the chip in place. The most extensive part of this project will be the coding that will run this machine. There does need to be a user interface that will allow one person to command the testing station fully and set various attributes for the specific test. All of the parts used in the project have been purchased and received by the ECSyD lab run by Professor Mahdi Nikdast.

**Why is it important?**

This project will provide the ECSyD lab with new hardware and software directly tailored to their needs, allowing the testing of silicon photonic chips to be done automatically. This is important because silicon photonics is a rapidly growing field with many use cases in telecommunications, optical computing, neural networks, etc. Silicon photonics could also lower the power use of various circuits, as general photonic circuits use less power than their traditional silicon counterparts.

**Types of IP:**

| **Type of IP** | **Brief description** |
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| Patent | Patents are a grant of property rights of an invention. To receive a patent, one must file for it and get approved by the U.S. Patent Office. A patent gives the right to exclude others from selling, making, and using an invention for 20 years. |
| Trademark | A trademark is a mark that indicates the difference between a specific good and another. Often used for logos and slogans, trademarks protect against fraud and counterfeits. They last for ten years but can be renewed. |
| Copyright | Copyright is protection given to authors of original works; it only protects specific ideas and properties. Copyright is generally used for literary, musical, video, and computer programming. It lasts the author's life plus 70 years, after which the work or idea becomes part of the public domain. |
| Trade secret | Commercially valuable information that only a limited group knows. It protects processes, practices, design, and other things. A trade secret can last forever and does not require any filing. |

**Intellectual property related to our project:**

While the actual testing station being built for senior design does not have any intellectual property rights due to the use of open-source libraries and techniques, the devices that are going to be tested on the station do have IP. Some of the devices have or are seeking patents, and some of the techniques used for the devices could be considered trade secrets.