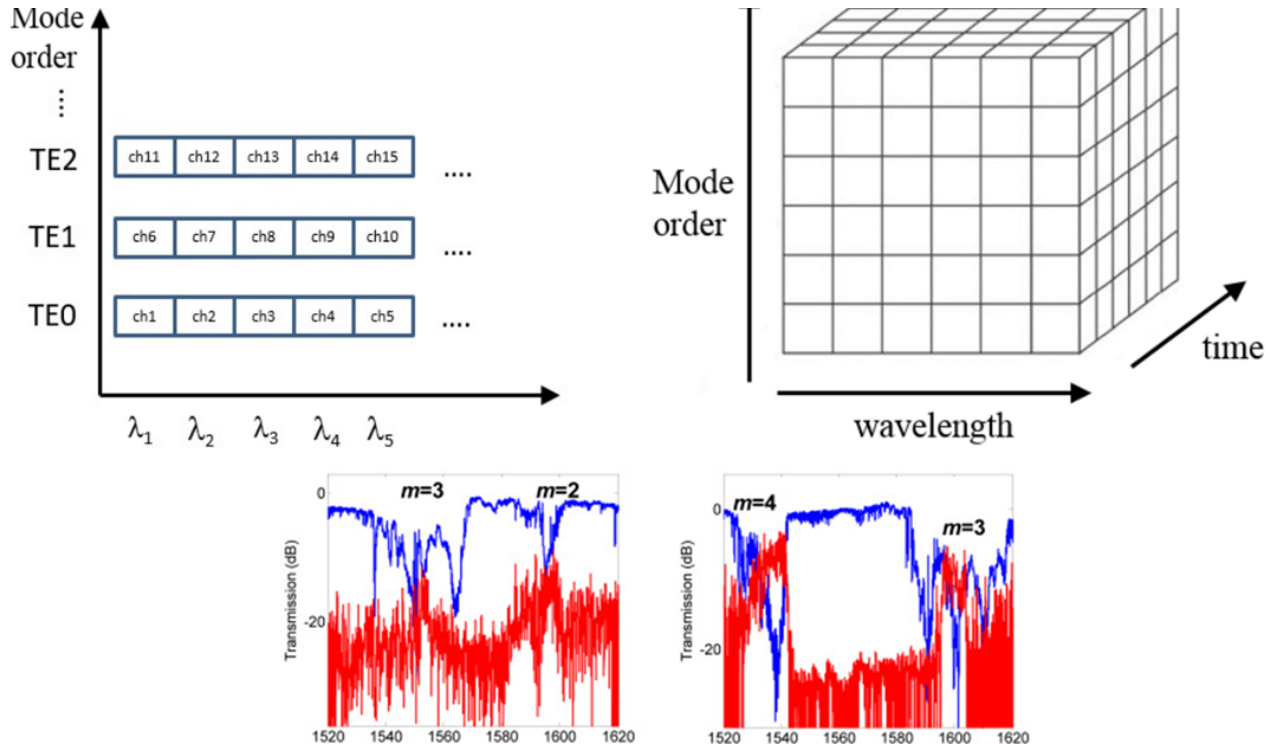
TECH OFFER

Photonic Device With Integrated Coupled Gratings



KEY INFORMATION

TECHNOLOGY CATEGORY:

Energy - Sensor, Network, Power Conversion, Power Quality & Energy Management

Electronics - Memory & Storage

Electronics - Lasers, Optics & Photonics

TECHNOLOGY READINESS LEVEL (TRL): TRL4

COUNTRY: SINGAPORE

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OVERVIEW

The silicon photonics market is projected to grow at a compound annual growth rate of 23.4% from USD 1.0 billion in 2020 to USD 3.0 billion by 2025. The increasing demand for high bandwidth and high data transfer capabilities is the major propelling factor. The data carrying capacity of a transmission medium may be increased using multiplexing, which involves combining a plurality of signals into one signal over a shared transmission medium. Examples of multiplexing techniques may include time division multiplexing (TDM), wavelength division multiplexing (WDM), frequency division multiplexing (FDM), orbital angular momentum multiplexing, polarization division multiplexing and modal divisional multiplexing (MDM).

Transmission of digital binary information, in basic terms, can be encoded in any optical signal's amplitude, wavelength, phase and space. Most technologies in the market can perform either wavelength or mode division multiplexing at any one time but not both at the same time. In the aforementioned technology, the technology owner unleashed a new technology by utilising

waveguide modes to increase the amount data transmission capacity. This enhances network resources utilization and optimizing network performance.

TECHNOLOGY FEATURES & SPECIFICATIONS

This technology offer utilizes coupled gratings which are designed to be sensitive at specific wavelengths using specific mode orders. This allows the separation or combination of optical data transmitted at different wavelengths or using different modes into their different components, such that they can be separately detected and processed. As the optical structures are also wavelength selective, the mode division multiplexing functionality is easily combined with wavelength division multiplexing, such that more than 500 times the original data capacity can be supported within the telecommunications band, compared to a single waveguide without any multiplexing strategies.

POTENTIAL APPLICATIONS

The potential applications of this technology are:

- Silicon Photonics area, particularly in the data centers application.
- Transceiver products
- High performance servers
- Supercomputers.

MARKET TRENDS & OPPORTUNITIES

There is a vast environmental benefit of this technology offer. In 2017, US based data centers alone used up more than 90 billion kilowatt-hours of electricity. To give some perspective on how much energy that amounts to, it would take 34 massive coal-powered plants generating 500 megawatts each to equal the power demands of those data centers.

This is because transceivers, network equipments, servers still require electrical to optical and optical to electrical conversions. Processing of signals electrically will consume and dissipate large amount of heat. Hence, this gives the reason why coolants and refrigeration are an important and consumes a majority portion of electrical consumptions in data centres. On the other hand, processing of optical signals generate very negligible heat and hence does not require refrigeration.

In the aforementioned technology, signals are multiplexed all-optically. There is no need to convert optical signals to electrical signals, and back to optical signals again, hence avoiding the need for large energy consumption. This technology is environmentally friendly while being able to improve network transmission speed at the same time.

UNIQUE VALUE PROPOSITION

The state of the art uses a conventional directional coupling method to accomplish mode division multiplexing. It is difficult to use conventional methods to accomplish more than 2 modes multiplexing. In this technology offer, the improvements over the state of the art are:

1. Able to choose the mode number;

2. Able to multiplex to 3 and 5 modes with considerable coupling coefficient by utilising ‘coupled vertical gratings’;

3 . Able to allow a wavelength selectivity feature; and

4. Able to choose the wavelength to multiplex the information on. For example, data can be encoded onto channel8 (ch8) ie λ3 at TE1.

The technology owner is keen to out-license this technology and do further development with technology collaborators to integrate with their existing hardware/circuits, and tailor the required wavelength/bandwidth. The ideal technology collaborators are photonics IC design houses.