Simulation Tools for Silicon Photonics Arrayed Waveguide Gratings.

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I. Introduction

An Arrayed Waveguide Grating(AWG) is one of the vital components in Wavelength Division Multiplexing (WDM) systems. They are used to separate the many wavelength channels in to different waveguides (or vice versa, merge them). It consists of two free propagation regions (star coupler) and an array of waveguides with a linear increment of length. Figure I shows schematic diagram of an 8X200 GHz AWG. A light beam enters into the input star coupler and is distributed over the array waveguides. The different wavelengths reaches the second star coupler with different phase shift. Because of this, wavelengths emerging from the array waveguides interfere in the output star coupler to focus at different output position.

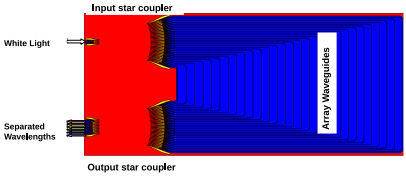

Figure 1. Schematic diagram of an 8X400 GHz AWG.

For WDM systems, a flat passband for the different wavelength channels is desirable. This can be achieved by placing a Multi Mode Interference(MMI) at end of the input aperture. The length and width of the MMI are chosen such a way that it produce a flattop pattern at the output of the AWG[1].

II. Result

We have developed a simulation framework which is fully integrated with our design framework. All the components in this library are parametrized cells (P Cells) enriched by mixins. Our approach is to calculate the transmission matrices(T matrix) of all the parts of the AWG and multiply to get the T matrix of the entire AWG. We compare the simulation result(Figure 2(a)) with our measurement result (Figure 2(b)), for an MMI-input AWG with identical designs.

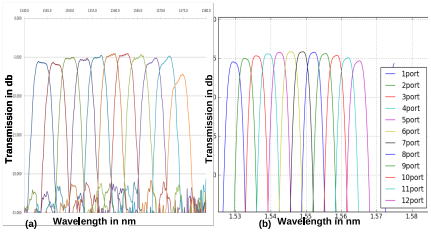

Figure 2. (a) Measurement result and (b)Simulation result of a MMI-input AWG.

III. Conclusions

The results of our semi-analytical model are very similar to the experimental results. This allows us to use a cyclic work flow between design, simulation and fabrication for improved the AWG.

References

[1] M. K. Smit,et al, IEEE Journal of Selected Topics in Quantum Electronics, 2(2), June 1996.

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