Silicon Quadruple Series-Coupled Vernier Racetrack Resonators: Experimental Signal Quality

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Abstract

A tunable silicon quadruple Vernier racetrack resonator filter has been experimentally demonstrated. Data was sent through our filter at 12.5 Gbps which resulted in open eye diagrams, even at a suppressed through port notch.

Quadraple series-coupled Vernier racetrack resonators

One of the main benefits of Vernier ring resonator filters (resonators, with different optical path lengths, that are coupled together) is that the Vernier effect can extend the free spectral range (FSR) as compared to single ring resonator filters and coupled ring resonator (each ring having the same optical path lengths) filters [1–13]. One of the issues with using series-coupled Vernier ring resonators is that large dispersion can occur in the region of the suppressed notches of the through port [13–15].

Signal quality

To determine if data can pass through our filter without significant distortion, we performed eye diagram measurements at 12.5 Gbps using a set-up that is similar to the one shown in [19]. Our results show that there is degradation of the signal quality through our filter in the region of a suppressed notch, however, the eye remained open.

Summary

We have presented experimental results on a thermally tunable silicon quadruple series-coupled Vernier racetrack resonator filter. We have determined the group delay and dispersion of our filter and have shown successful data transmission at 12.5 Gbps, with open eyes, at a through port suppressed notch. Also, we have shown that the signal quality depends on where within the suppressed notch the data is transmitted.

Acknowledgment

We acknowledge the Natural Sciences and Engineering Research Council of Canada, CMC Microsystems, the SiEPIC program, Mentor Graphics, and Numerical Solutions, Inc. We thank Dr. Andy Knights at McMaster University for process specification. Also, we thank Jonas Flueckiger, Yun Wang, and Dr. Alina Kulpa for their help.

References