photonics

MDPI

Letter

Silicon Photonic Mode-Division Reconfigurable Optical Add/Drop Multiplexers with Mode-Selective Integrated MEMS Switches: Supplementary Materials

Vinh Huu Nguyen, In Ki Kim, and Tae Joon Seok*

School of Electrical Engineering and Computer Science, Gwangju Institute of Science and Technology, Buk-gu, Gwangju 61005, Republic of Korea; vinhnguyen@gist.ac.kr (V.H.N); inkikim94@gist.ac.kr (I.K.K.)

* Correspondence: tjseok@gist.ac.kr

Received: date; Accepted: date; Published: date

This document provides supplementary information to "Silicon Photonic Mode-Division Reconfigurable Optical Add/Drop Multiplexers with Mode-Selective Integrated MEMS Switches," including the designs for TE_1 mode coupler and TE_2 mode coupler based on mode-overlap-method calculations.

As required from spatial mode overlapping, a lateral offset was required for the TE_1 mode coupler. The result of the mode overlap integrals of the lateral offset versus gap is shown in Figure S1. It was done at the effective-index-matched coupler width of 450 nm, at which maximum overlap between the TE_1 mode in multimode bus waveguide and $TE_{0\text{-}C}$ mode in coupler waveguide occurred. The optimized offset was chosen to be 600 nm.

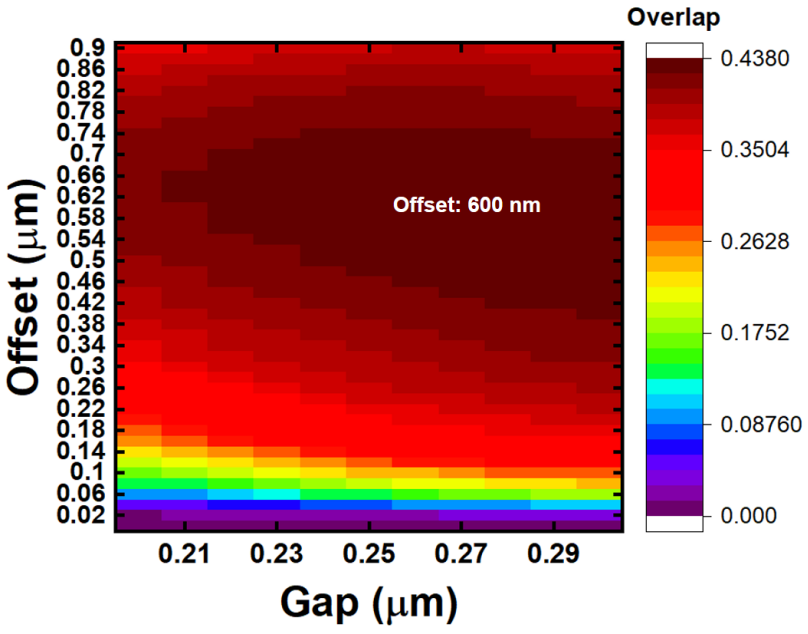

Figure S1. Mode overlap integral result of the lateral offset versus gap spacings for TE_1 mode coupler.

The results of the mode overlap integrals of the taper initial and final widths for the TE_1 mode coupler are shown in Figure S2. With the overlap integrals below 0.05 and the chosen gap of 250 nm, the initial width and final width were 400 nm and 500 nm for TE_1 mode coupler, respectively. Similarly, from Figure S3, the initial width and final width for TE_2 mode coupler were chosen to be 310 nm and 360 nm, respectively.

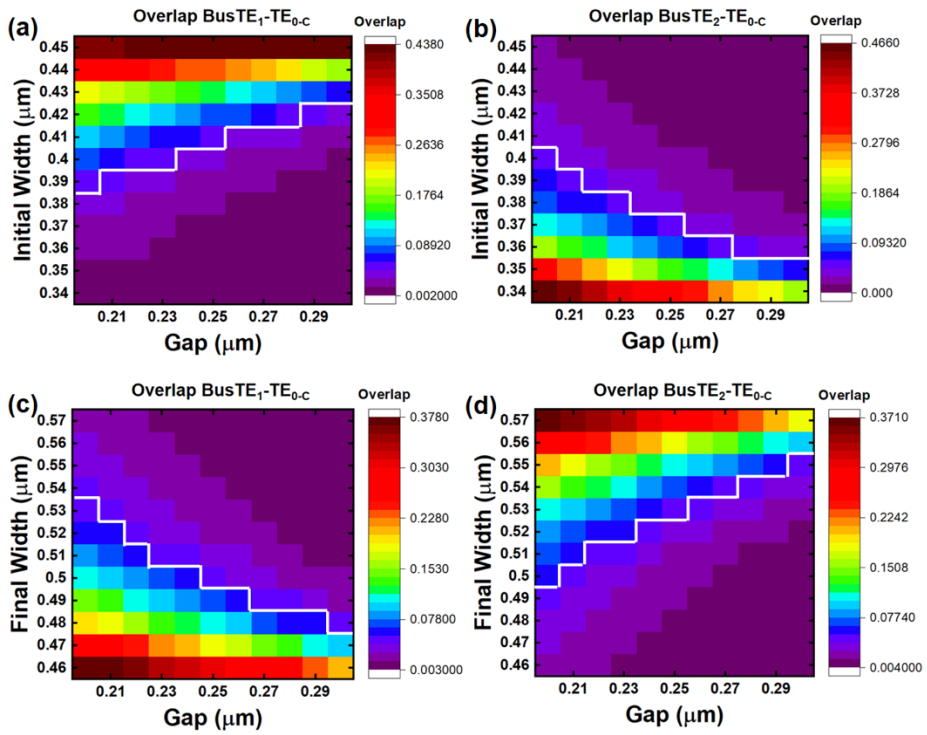

Figure S2. Mode overlap integral results of the initial and final widths of the tapered waveguide for the TE_1 mode coupler. **(a)** Overlap integral between the TE_1 mode of the bus waveguide and the TE_0 mode of the coupler waveguide for the initial width of the tapered coupler. **(b)** Overlap integral between the TE_2 mode of the bus waveguide and the TE_0 mode of the coupler waveguide for the initial width of the tapered coupler. **(c)** Overlap integral between the TE_1 mode of the bus waveguide and the TE_0 mode of the coupler waveguide for the final width of the tapered coupler. **(d)** Overlap integral between the TE_2 mode of the bus waveguide and the TE_0 mode of the coupler waveguide for the final width of the tapered coupler. The white lines show the boundaries of overlap integrals of 0.05.

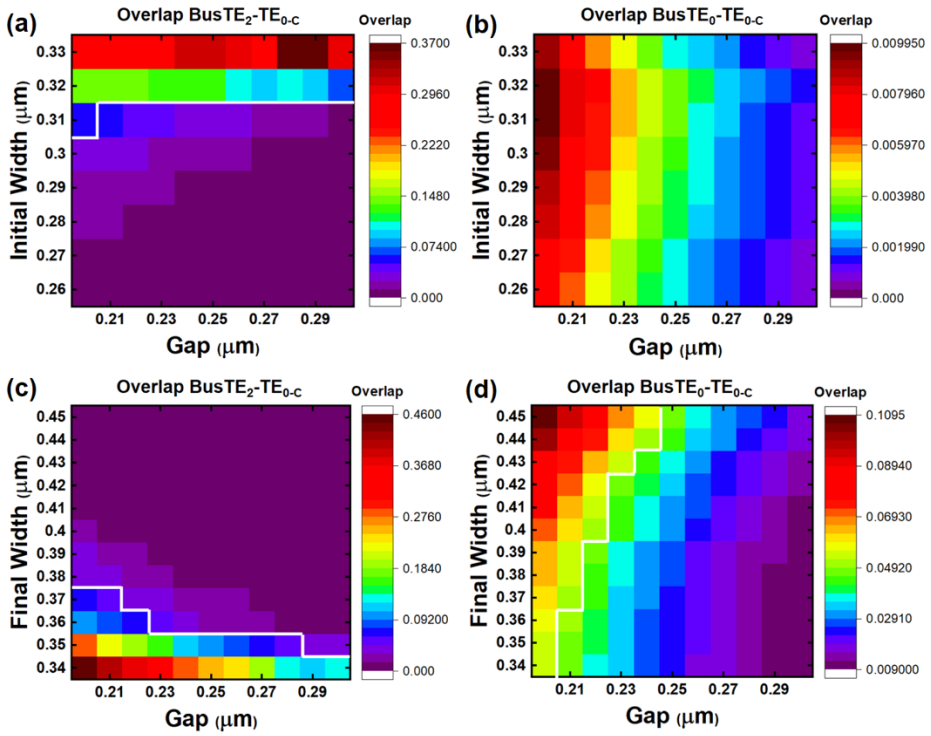

Figure S3. Mode overlap integral results of the initial and final widths of the tapered waveguide for the TE_2 mode coupler. **(a)** Overlap integral between the TE_2 mode of the bus waveguide and the TE_0 mode of the coupler waveguide for the initial width of the tapered coupler. **(b)** Overlap integral between the TE_0 mode of the bus waveguide and the TE_0 mode of the coupler waveguide for the initial width of the tapered coupler. **(c)** Overlap integral between the TE_2 mode of the bus waveguide and the TE_0 mode of the coupler waveguide for the final width of the tapered coupler. **(d)** Overlap integral between the TE_0 mode of the bus waveguide and the TE_0 mode of the coupler waveguide for the final width of the tapered coupler. The white lines show the boundaries of overlap integrals of 0.05.