Nano Scale Disruptive Silicon-Plasmonic Platform for Chip-to-Chip Interconnection

Design of first generation beam shapers and compact optical filters

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Executive Summary

This milestone report summarizes the results obtained regarding the design of the first generation beam shapers and optical filters.

Change Records

Version	Date	Changes	Author
1.0 (final)	2012-01-26	Start	Dries Van Thourhout

Contents

1. Introduction

The targeted specifications for these components where respectively:

- **Optical filter**: 2/3nm bandwidth[2], >10dB suppression, >30nm FSR
- **Coupler**: 5dB loss, 100um distance

This milestone feeds into milestone MS31 (Fabrication of devices)(M18) and then in deliverable D5.3 (report on first generation filters and beam shapers)(M21).

2. Optical filter:

The aim of this task is to design and fabricate optical filters, which can serve as a noise filter for the receiver stage. Work for this task has progressed faster than foreseen. In the mean time optical filters have not only been designed but also fabricated and characterized. They fulfill the requirements set forward.

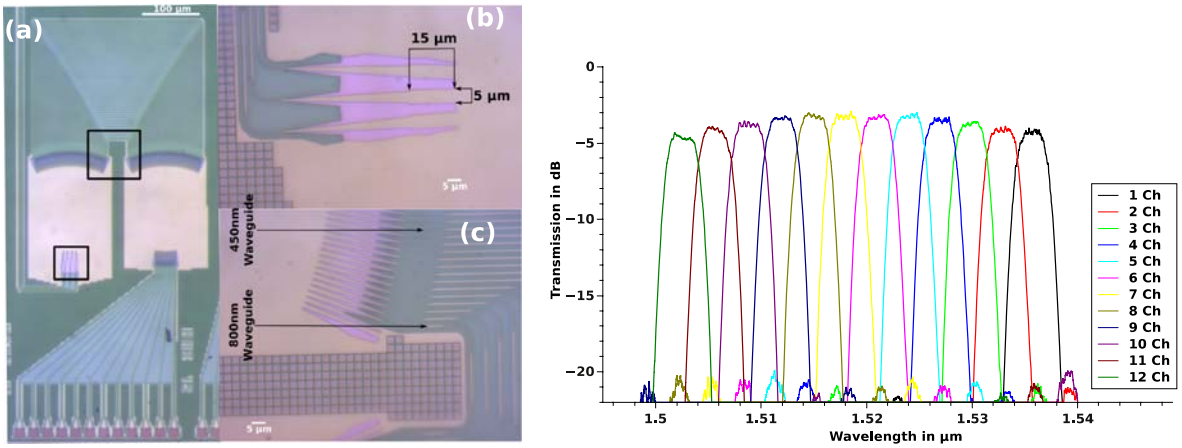

Figure 1 Left: Microscope view of fabricated filter, Right: Measured transmission.

The optical filter was implemented as an MMI-AWG: An MMI at the entrance of the 1st star coupler of an AWG-demultiplexer (Figure 1b) broadens the optical field at the output, resulting in a broadening of the optical response. Figure 1 shows also the measured optical response for a device with 12 channels, having a bandwidth of 3.3nm, suppression >15dB and FSR=12x400GHz (i.e. >30nm). Hence this filter fulfils the requirements. Details will be presented in D5.3

3. Optical coupler

The original aim of this task was to design a focussing grating coupler, showing 5dB loss and 100um coupling distance. However, at the start of the project we decided to initially evaluate a

[2] Note there is an inconsistency in the DoW regarding the specifications of the bandwidth for the filter. The MS27 mentioned 3nm while the resulting deliverable mentions 2nm. We have now designed devices with different bandwidth, demonstrating our design approaches are flexible with respect to the bandwidth. The bandwidth for the final design will be selected on the basis of the system specifications.

completely new type grating couplers, which are electrostatically steerable. Several variations where designed:

1) Grating couplers steerable in angle, driven through parallel plate actuation.
2) Grating couplers steerable in plane, driven through comb actuators.

Several variations for each of these have been implemented in a mask and in the mean time have been fabricated. They are currently under evaluation. The figure below illustrates some variations of the design.

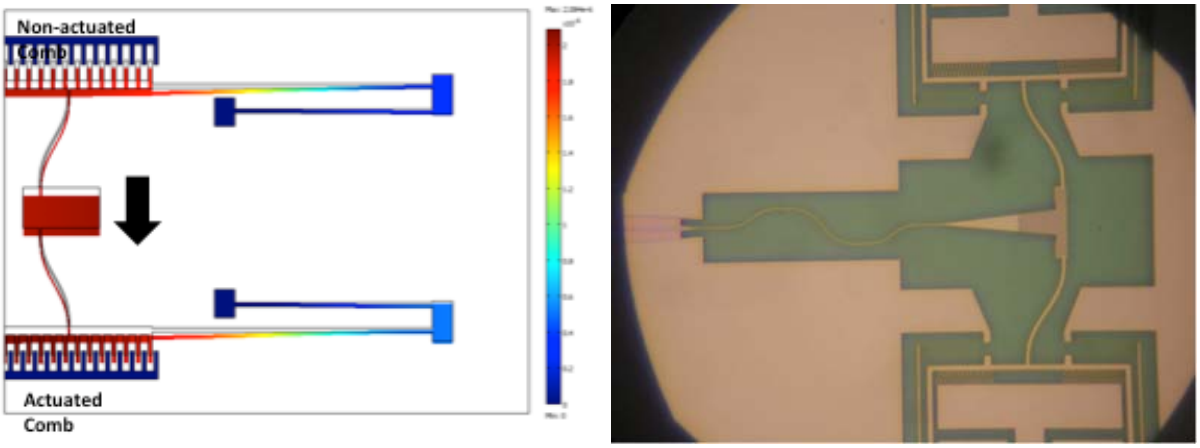

Figure 2 a) Simulation of laterally driven grating coupler. Note that by pushing/pulling both combs simultaneously, also movement in the forward direction is in theory possible. b) Top microscope picture of fabricated structure.

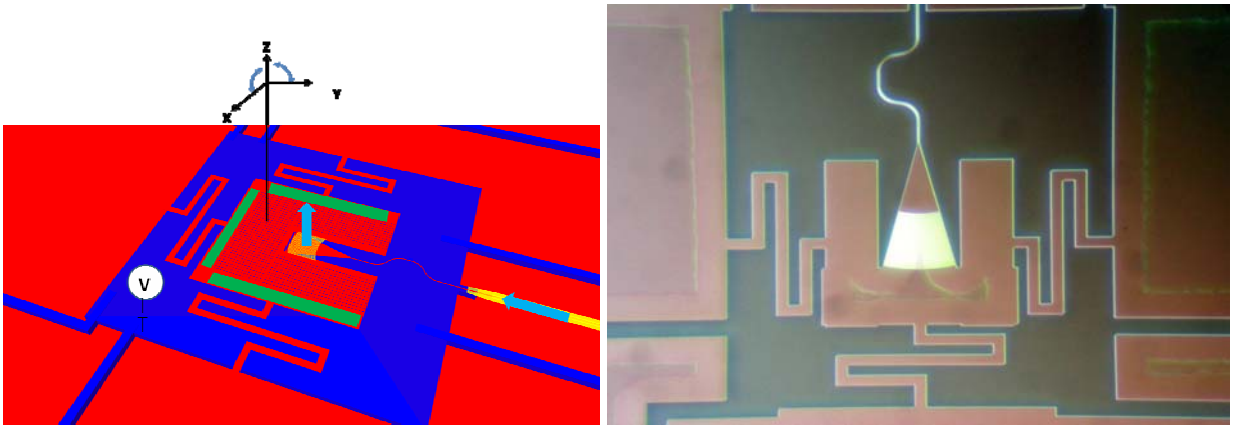

Figure 3 a) Schematic view of grating coupler platform with electrostatically driven actuation. b) Top microscope picture of fabricated structure.

Conclusion

Devices were designed according to plan.