Data for the paper

# Losses in the chip assembly

Data for the 3 chip assembly (consisting of chips A, B and C) :

Straight waveguide losses:

* V-groove to V-groove transmission for individual chips was measured at approx. 60% in all cases.
* Propagation losses for the straight waveguides, estimated using the Bragg gratings, are as follows:

|  |  |  |
| --- | --- | --- |
| Chip A (dB/cm) | Chip B (dB/cm) | Chip C (dB/cm) |
| 0.37 pm 0.17 | ? | 0.47 pm 0.17 |
| 0.24 pm 0.12 | 0.43 pm 0.13 | 0.44 pm 0.14 |
| 0.32 pm 0.07 | ? | ? |
| 0.73 pm 0.13 | ? | ? |

The question marks correspond to data that was too noisy to be conclusive. Based on this data, the average loss is 0.43 dB/cm.

* These two sets of data indicate that the average V-groove to chip loss is 0.9 dB.
* The average chip-to-chip coupling had been measured by Ben back in 2013 at 0.3 dB, using the Bragg gratings.
* Based on all this, the expected loss for a 3-chip assembly is 0.9\*2+0.3\*2+0.43\*3 = 3.69 dB. This corresponds to an expected transmission of about 43%. Experimentally, we find 39% and 38% for the two straight paths through the chip. The difference mostly comes from one of the chips shifting during the curing process.

MZI Losses

* The average V-groove to V-groove transmission through the MZIs in a single chip was measured at 23%. Compared to the 60% transmission for straight waveguides, this implies that we have an excess loss of 2.1 dB loss per beam splitter (4.2 total per MZI).
* The expected value for the total loss through the chip assembly is therefore 0.9\*2+0.3\*2+0.43\*3 +3\*4.2 = 16.3 dB, corresponding to 2.3%. This compares to an average measured value through the chip assembly of 4.3%. It seems that the measurements of the transmission through the MZIs were a bit off.

Note: In previous generations of chips, the V-groove to V-groove transmissions through the MZIs could be as high as 40%.

The raw data for total final transmissions through the chip assembly is in “AssemblyTransmission.mat.”

# Beam splitter reflectivities

The average reflectivity through the beam splitters was 56.6%, with a standard deviation of 3.7%. This was calculated using the back-reflections from the Bragg gratings.

**ALL THE FOLLOWING IS DATA TAKEN FROM A PREVIOUS GENERATION OF CHIPS**

# Phase shifters

Data for modulation of the phase shifters is in “MZIIn1Out1.mat”, “MZIIn1Out2.mat”, “MZIIn2Out1.mat”, “MZIIn2Out2.mat”. These files correspond to the outputs of a given MZI (labelled outputs 1 and 2) with light entering first in input 1, then in input 2.

# Crosstalk

Data for crosstalk is in “Crosstalk1.mat” and “Crosstalk2.mat”. These files correspond to the two outputs of a given MZI set to the most sensitive part of its intensity vs PWM curve, while a neighbouring MZI was tuned through its PWM range.

# Stability

Data for stability is in “Stability.mat”. This corresponds to the ratio of the two outputs of an MZI set to the most sensitive part of its intensity vs PWM curve, measured over 1800 seconds with one data point every 0.1 second. The relative variation (defined as std/mean) is 4.1445e-04 during this time.

# Three chip reconfigurability data

Data for reconfigurability of the three chip assembly is in “threeChipReconfigurationData.mat”. This file contains one field for the output labels (waveguides numbered 7 to 12), and one “Data” field containing a 6x2 array of measured powers (in uW) at these outputs. In the “Data” field, the first column corresponds to an attempt to use the MZIs to skew the light towards the lower-numbered outputs, and the second column corresponds to an attempt to skew the light towards the higher-numbered outputs. In both cases, light entered the device via input number 9.