A Proposal of Waveguide Bragg grating resonator

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Abstract

Fabry-Perot Cavity is an optical interferometer that allows optical waves resonating between the mirrors at the end of the waveguide. In this project, we will build a cavity using Bragg gratings. Our objective is to pursue a higher Quality Factor, thus a high transmission peak.

Layout

The layout is drawn by using Klayout,

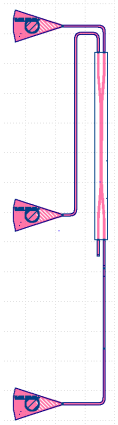

Figure 1

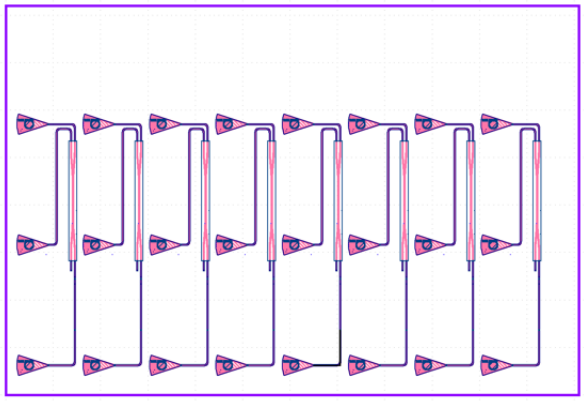

Figure 2

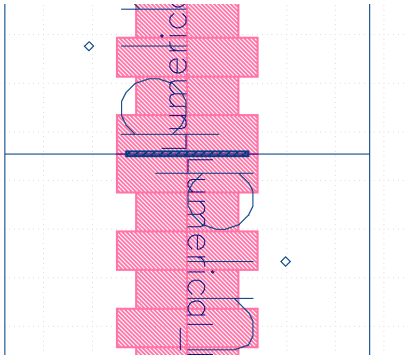

Figure 3

Figure 2 shows the cavity design including 8 same Bragg grating designs, which is shown in Figure 1. The layout for each design has three couplers and is connected to the Bragg gratings through a splitter. The top coupler will measure the reflection and the bottom one will measure the transmission.

Simulations

The Bragg grating period is set to be 318 nm, to get 1550 nm as the central wavelength shown as Figure 5.

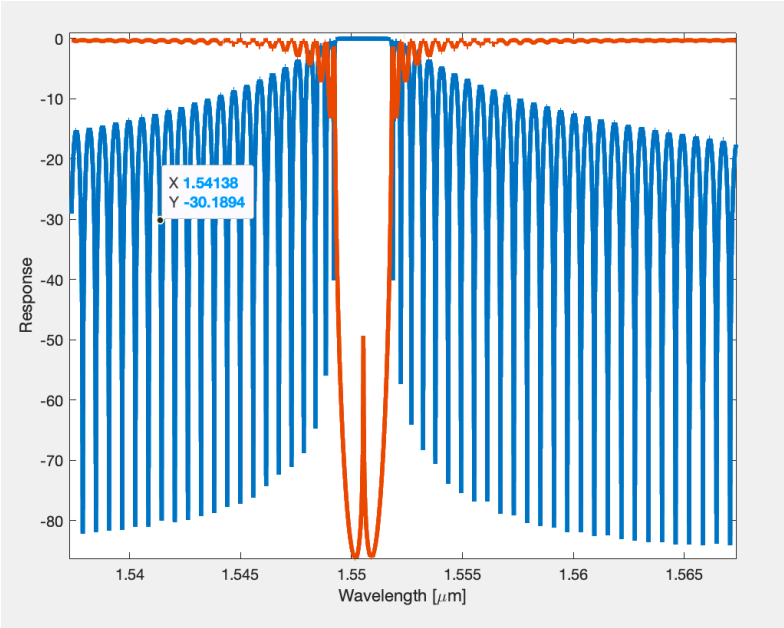

Figure 5

The effective delta n is set as 0.01 and the group index is set as ng = 4.49
uncorrugated waveguide width W = 350e-9 and waveguide corrugation dW = 50e-9.
Since all the above parameters are fixed, the test we perform will only related to the NGs to select the best design to reach the highest Quality factor. So far, I haven't finished all of the test and the current design has a NG1 as 100, NG2 as 140 shown as the green line in Figure 6. I didn't finish calculate the data, but the result looks decent to have a high Q factor.

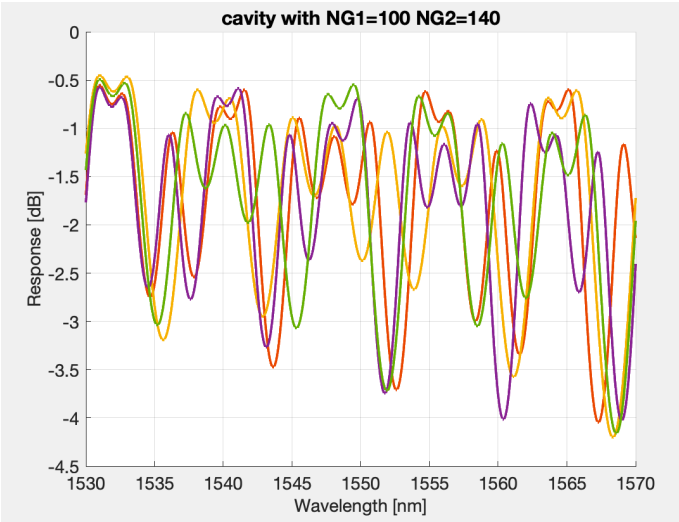

Figure 6

Conclusion

In conclusion, we have designed a Bragg grating cavity having a decent Q factor, and that only depends on the number of grating periods. For now, I am using NG1 =100 and NG2=140.