MICROSTRIP DUAL BANDPASS FILTER

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Introduction

- Modern wireless communication systems usually operate at more than a single band and that is the reason why we today have dual and multiband bandpass filters.

- Bandpass filters have important role in wireless communication systems. Signals that are received and transmitted have to be filtered on certain center frequency

Introduction

- A high-performance filter in wireless communication systems is required to have a small size, low insertion loss, sharp roll-off, and high suppression level in the stopband.

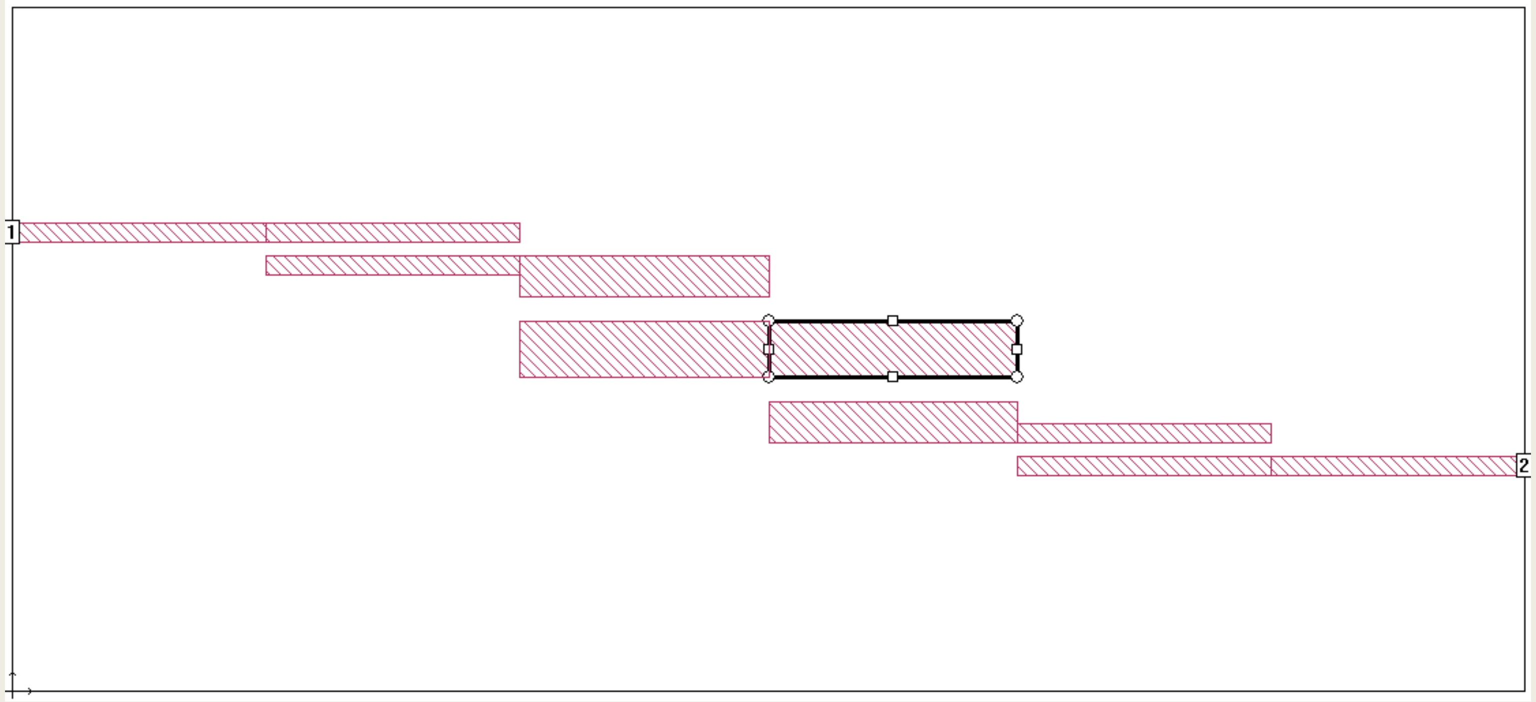
- This paper deals with microstrip dual bandpass filter with center frequencies 3.2 GHz and 5.6 GHz with S-parameters of S_{11} = -33.92 dB and S_{21} = -0.56 dB for frequency of 3.2GHz and S_{11} = -9.49 dB and S_{21} = -0.51 dB for frequency of 5.6 GHz

Design

- Our geometry is a modified version of geometry used in the paper we took as reference. - Khani S, Makki SVAL-D, Mousavi SMH, Danaie M, Rezaei P. Adjustable compact dual-band microstrip bandpass filter using Tshaped resonators. Microw Opt Technol Lett. 2017;59:2970–2975.
- Dielectric thickness is 0.76 mm and air width above that layer is 5.76 mm.
- Start and stop frequency was set at 2 GHz and 6 GHz respectively.

Design

- The change we made is increasing width of middle layer from 0.78 mm to 2 mm.



Results

- We simulated the project in Sonnet software to obtain the values of S11 and S21. For frequency of 3.2 GHz S11 = -3.44 dB and S21 = -2.61 dB, and for frequency of 5.6 GHz S11 = -1.52 dB and S21 = -5.27 dB.

- These results are not suitable because S11 needs to be lower and S21 needs to be higher and at frequency of 5.6 GHz value of S21 is lower than value of S11 which cannot be the case.

- In order to get better results parametric study was done. Geometry was changed so the better response could be obtained.

Results

TABLE I. CHANGE OF WIDTH 3.2 GHz

Length = 9.1 mm (3.2 GHz)		
Width	S11	S21
2.1	-12	-0.07
2.2	-11	-0.07
2.3	-11	-0.07
2.4	-10.3	-0.08
2.5	-9.7	-0.09

TABLE II. CHANGE OF WIDTH 5.6 GHz

Length = 9.1 mm (5.6 GHz)		
Width	S11	S21
2.1	-4.23	-2.07
2.2	-13.62	-0.19
2.3	-7.27	-0.90
2.4	-4.12	-2.16
2.5	-26.55	$-9.605E^{-3}$

Results

Width = 2.4 (3.2 GHz)		
Length	S11	S21
8.80	-3.32	-0.16
8.90	-4.94	-0.422
9.05	-8.91	-0.13
9.15	-12.23	-0.039
9.20	-14.59	-0.013
9.25	-17.83	$-1.27E^{-3}$
9.30	-33.92	-0.56
9.40	-28.13	-0.035

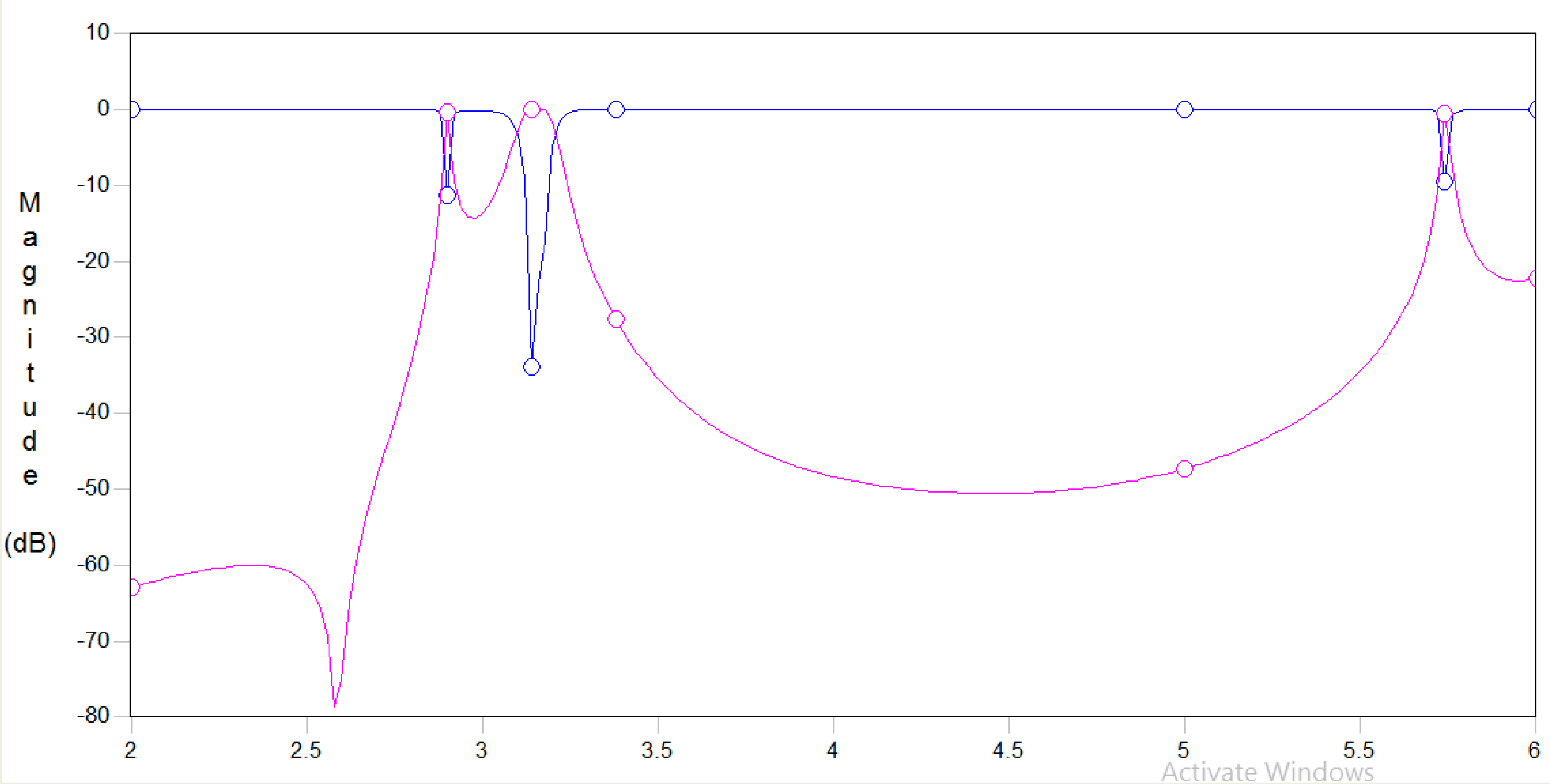
Width = 2.4 (5.6 GHz)		
Length	S11	S21
8.80	-6.16	-1.21
8.90	-8.01	-0.76
9.05	-5.63	-1.41
9.15	-2.82	-3.23
9.20	-2.90	-2.90
9.25	-4.81	-1.73

Results

- Best results are obtained with width of 2.4 mm and length of 9.30 mm. This dimension is chosen for our final geometry.

Results

- Magnitude vs frequency for S11 vs S21 (final geometry)



Conclusion

- This paper dealt with designing of microstrip dual bandpass filter at center frequencies of 3.2 GHz and 5.6 GHz.
- After choosing the initial geometry parametric study was performed in order to meet the design specifications. Geometry in which width of the middle layer is set to be 2.4 mm and length is 9.30 mm is the best among all other variations performed when we consider both frequencies and was chosen for our filter.
- At 3.2 GHz frequency values of S-parameters are: S11 = -33.92 dB and S21 = -0.56 dB, and at 5.6 GHz frequency: S11 = -9.49 dB and S21 = -0.51 dB.

References

- R. Taoufik, N. A. Touhami and M. Agoutane, “Designing a Microstrip coupled line bandpass filter”, International Journal of Engineering and Technology, 2 (4) (2013) 266-269
- M. Alaydrus, “Designing Microstrip Bandpass Filter at 3.2 GHz”, International Journal on Electrical Engineering and Informatics - Volume 2, Number 2, 2010
- Khani S, Makki SVAL-D, Mousavi SMH, Danaie M, Rezaei P. Adjustable compact dual-band microstrip bandpass filter using Tshaped resonators. Microw Opt Technol Lett. 2017;59:2970–2975.
- Sonnet Suites, ver. 17.52, Syracuse, New York.

Thank you