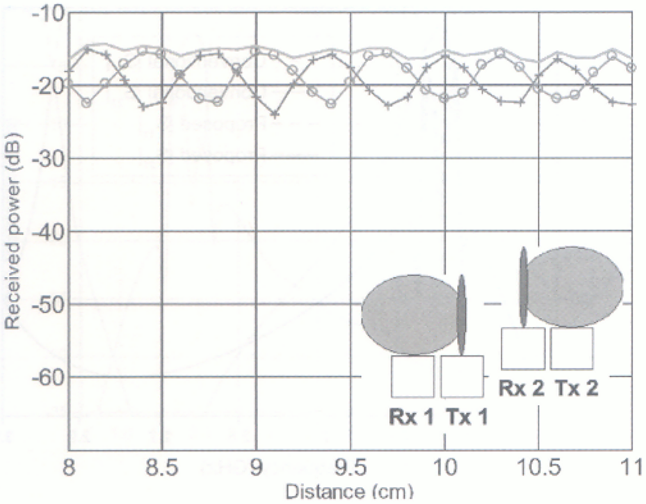

Figure 3 Dual system with offset: 4 × 4 array in Tx and 4 × 1 array in Rx (E-plane association). +–+– system 1 (Rx 1); – ○ –○ – system 2 (Rx 2); ——addition (treatment). [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com]

linearly between 0 and 10 cm and the received signal is lower than the relative coupling level. So, a large beamwidth at reception in the antennas associated plane seems advisable to reduce the oscillations.

Finally, measurements were carried out with large beamwidth arrays in emission (and the same antennas as before in reception). With a 4 × 4 array in emission and a patch in reception, associated in E-plane, results are similar to Figure 1. Other associations gave more important oscillations.

4. REDUCTION OF OSCILLATIONS

So as to limit oscillations, a dual system could be used: the purpose here is to combine two signals. The idea is based on the fact that the oscillations follow a quasi sinusoid pattern versus target antenna distance. Thus, if two identical sinusoid signals can be obtained with 1/4 of a wavelength offset, their addition should give a constant level. Here the meaningful level of the received signals is decreasing as the distance increases, and so will the addition signal. Oscillations are present versus the antenna-target distance. The offset can be obtained by a 3 mm ($\lambda_0/4$) gap between the two systems. On account of the $\lambda_0/4$ offset, one of the two signals has to be delayed by 180° before the addition.

Using 3D simulation, a configuration was found giving oscillations with 1/4 of a wavelength offset in reception of each system; the target was centered on the center line of the two systems. Figure 3 presents simulation results (one calculation point per mm): the magnitude of the oscillations is nearly 9 dB for a single system, and is reduced to 2 dB for the combination. This solution is efficient for limited frequency bandwidth on account of the fixed offset distance between the two systems.

5. CONCLUSION

Short range detection of a metallic square target has highlighted important oscillations of the received relative power when using two side by side antennas. The measurements presented here showed that oscillations are quasi sinusoid versus antenna-target distance with a period of $\lambda_0/2$. The oscillations amplitude is related to the antennas association.

As regards amplitude detection, it is possible to realize it with a threshold but this generates a random detection area. In fact, if a threshold is used, some distances will be detected and for some others, the power level will be varying around the threshold on account of the oscillations.

Detection of precise distances based on amplitude measurement is not valid if near field conditions are not taken into account. A solution has been presented here to reduce oscillations, using a dual system in millimeter wave range.

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SPURIOUS SUPPRESSED MICROSTRIP BANDPASS FILTER WITH TWO TRANSMISSION ZEROS

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ABSTRACT: *A novel microstrip transversal bandpass filter is proposed by replacing the full-wavelength resonator with two shorter resonators; in order to achieve simultaneous spurious response suppression and dual zero implementation. These two zeros can be easily tuned by the above resonators. A prototype filter was designed and tested to validate its performance.* © 2006 Wiley Periodicals, Inc. Microwave Opt Technol Lett 48: 1979–1981, 2006; Published online in Wiley InterScience (www.interscience.wiley.com). DOI 10.1002/mop.21822

Key words: *capacitive stub; spurious suppression; stepped impedance; transmission zeros; transversal filter*

1. INTRODUCTION

The conventional microstrip transversal bandpass structure using full-wavelength and half-wavelength open-loop resonators takes full advantage of the phase cancellation of the split signals in these two resonators to generate a transmission zero in order to improve the filter selectivity [1–4]. Even the bandpass response with dual zeros is preferable in modern telecommunications, the above structure can only place a single zero located in either the lower or upper passband edge. In addition, the full-wavelength open-loop resonator also introduces unwanted spurious located near the bandpass response center frequency f_0. To suppress the above spurious response, the quarter-wavelength short resonator was proposed to replace the above full-wavelength open-loop resonator but the use of via constitutes a drawback [5]. In order to achieve simultaneous spurious response suppression and dual transmission zeros implementation; a novel microwave transversal bandpass filter is proposed and compared with the conventional structure. A simple stepped-impedance resonator (SIR) technique is applied to shorten

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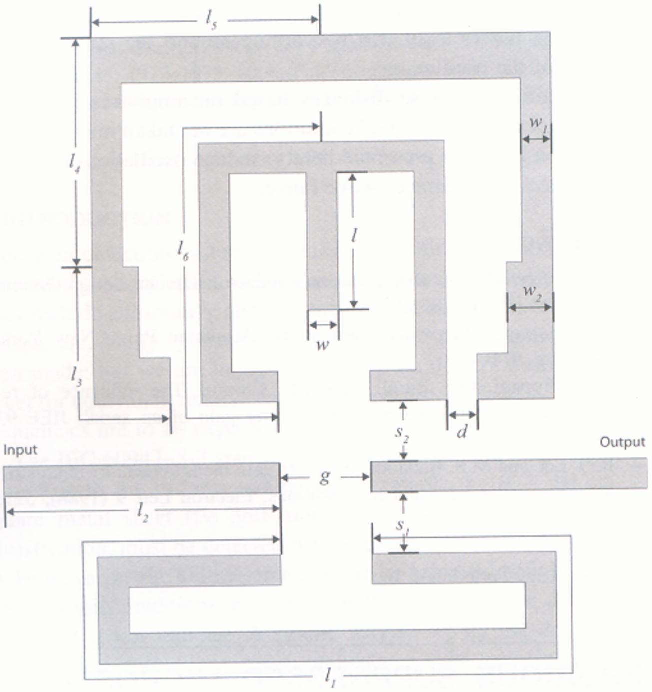

Figure 1 Proposed microstrip transversal bandpass filter

the one wavelength open-loop resonator of the conventional transversal filter whilst a shorter open-loop resonator with capacitive stub is placed inside the above SIR resonator open-loop to introduce an additional zero. Even if additional resonator is used, the size of this new filter is still compact and it offers sharp rejection due to the transmission zeros near the passband edge. Its spurious is also suppressed and thus stopband is extended. The performance of this novel bandpass filter is experimentally characterized and compared with its simulation results which show a good agreement.

2. FILTER DESIGN

Figure 1 shows the proposed microstrip transversal bandpass filter where the conventional full-wavelength resonator is replaced by two reduced-size resonators. These two resonators are the longer outer SIR open-loop resonator and the shorter inside with capacitive stub. Taking full advantage of inner area of outer SIR resonator; an additional resonator is easily introduced. A zero near the lower passband edge is generated from the outer resonator and this zero is easily controlled by the applied SIR effect. The inner resonator introduces an additional zero near upper passband edge and the stub can control the location of this zero. Moreover, the filter spurious responses are relocated to the higher frequency regime [6]. An example filter centered at 2 GHz has been designed on the RO4003 substrate with relative dielectric constant of 3.38 and substrate height 1.52 mm. The dimensions of the proposed bandpass filter are listed in Table 1.

TABLE 1 Dimensions of the Proposed Filter Structure (mm)

d	0.2	l	21
g	2.0	l_1	56.8
s_1	0.45	l_2	17
s_2	0.2	l_3	16.35
w	0.95	l_4	20.2
w_1	1.7	l_5	11.95
w_2	3.8	l_6	33.86

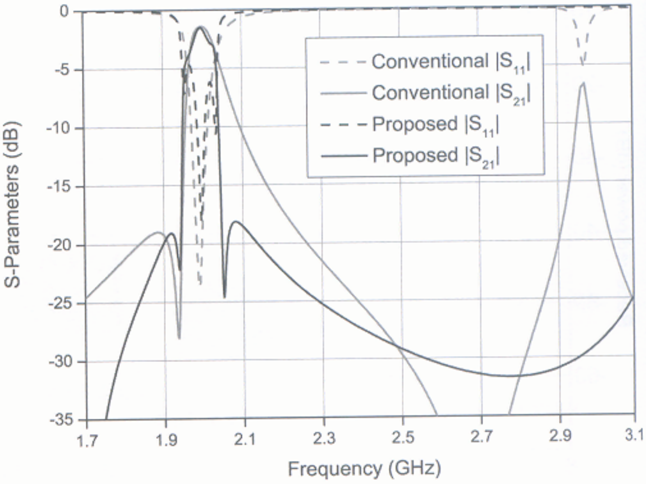

Figure 2 Simulated S-parameters of the proposed and the conventional transversal bandpass filters

On the basis of these dimensions, the impedance ratio R is calculated as 0.64. The simulation results for the proposed filter plotted against the transfer characteristic of a conventional full wavelength resonator transversal bandpass filter with similar specification are shown in Figure 2. This new filter obtains a similar passband transfer characteristic at 2 GHz with BW close to 70 MHz (3.5% FBW) when compared with those of the conventional filter. Two transmission zeros are located at 1.95 and 2.05 GHz, respectively. Obviously, the proposed filter offers much sharper rejection near the passband edges because of the additional zero near the upper passband edge. Around 1.6 dB low passband insertion loss and 19 dB good matching have been simulated. As observed, the conventional microstrip transversal filter suffers from the 1st spurious responses at 2.97 GHz. By using the SIR on the outer resonator, 23 dB spurious response suppressions are obtained. Simultaneously, the filter compactness can be kept even an additional resonator is added to the inner loop of the outer resonator. To investigate the transmission zeros relocation due to the inner/outer resonators; the proposed structure is simulated with impedance ratios R varying from 0.5 to 0.65 and the stub length l from 19 to 21 mm. As illustrated in Figure 3, the lower zero is

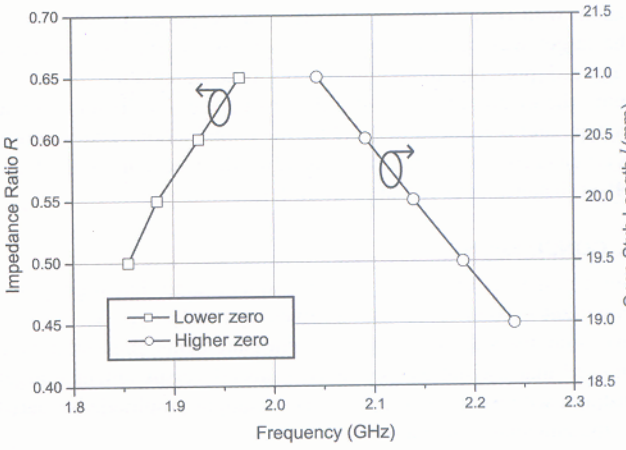

Figure 3 Transmission zeros relocation

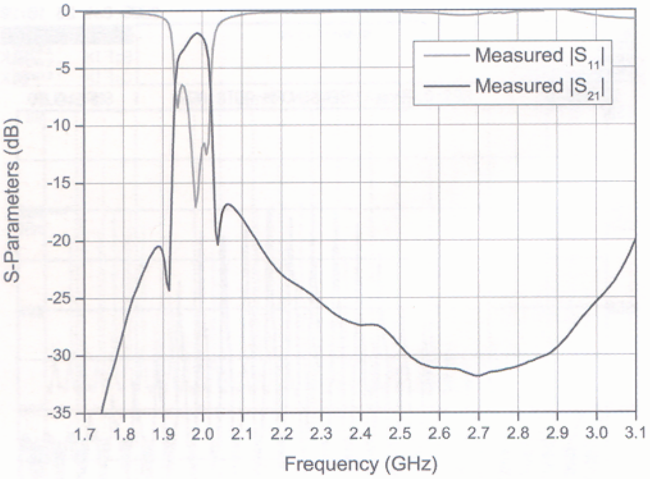

Figure 4 Measured *S*11 and *S*21 of the proposed transversal bandpass filter

relocated from 1.86 to 1.97 GHz whilst the upper zero varies from 2.24 to 2.04 GHz.

3. MEASURED RESULTS

To verify the proposed approach, a filter is designed at $f_0 = 2$ GHz with 3.5% FBW and $R = 0.64$ using the dimensions as reported in the last section. The substrate used is RO4003 with relative dielectric constant of 3.38 and substrate height 1.52 mm. Its measurements have been recorded in Figure 4 and a good agreement with the simulation is observed. Two transmission zeros are reported at 1.91 and 2.04 GHz, respectively. The measured 3 dB BW is around 85 MHz (4.3% FBW) and center frequency is located at 1.99 GHz. About 2 dB passband insertion loss as well as 17 dB matching are also measured at center frequency. The stopband performance of the proposed filter outweighs that of the conventional structure by more than 20 dB suppressions at 2.97 GHz, as shown in Figure 4. This yields spurious free stopband with around 20 dB rejection till 3.1 GHz. The fabricated transversal filter photo is also shown in Figure 5 with circuit size about 36 × 36.3 mm^2, which is similar to that of the conventional ones.

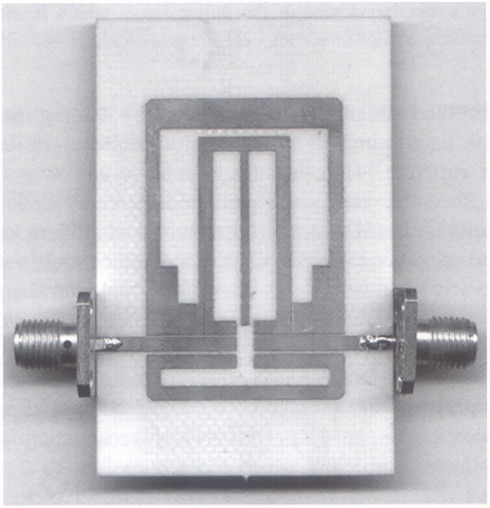

Figure 5 Prototype filter photo

4. CONCLUSIONS

A novel microstrip transversal bandpass filter with spurious response suppression is proposed. An additional transmission zero is introduced to improve the filter selectivity without circuit size increase. Both the simulated and measured results validate the proposed filter performance.

ACKNOWLEDGMENT

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MULTIWAVELENGTH PEAK POWER EQUALIZED LASERS BASED ON SOA USING A SAMPLED CHIRPED FIBER BRAGG GRATING

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ABSTRACT: *A novel multiwavelength SOA ring laser and a linear cavity multiwavelength laser are proposed and demonstrated experimentally. Stable multiwavelength lasing operation with about 100 GHz channel spacing is achieved with both lasers. Up to ten stable lasing wavelengths with an OSNR greater than 40 dB are obtained with an equalized peak power.* © 2006 Wiley Periodicals, Inc. Microwave Opt Technol Lett 48: 1981–1984, 2006; Published online in Wiley InterScience (www.interscience.wiley.com). DOI 10.1002/mop.21821

Key words: *multiwavelength; semiconductor optical amplifier; fiber Bragg grating; fiber laser*

1. INTRODUCTION

Multiwavelength lasers have attracted considerable interest because of their applications in fiber-optic sensors, test, and measurement of wavelength division multiplexing (WDM) components, and optical communication networks. Fiber lasers exploiting the erbium-doped fiber's (EDF's) broad amplification bandwidth