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Design of Microstrip Bandpass Filter with Dgs for Wlan Applications

Prof.G.Revathi[1], M.Nivetha[2], K.Roshini[3], T.S.Nishanthi[4]
(Department of ECE,M.A.M College of Engineering, Tamil Nadu, India)

Abstract: *In this paper ' A Micro strip Band Pass Filter with DGS for WLAN applications' with the frequency of 2.4GHz is designed .This filter design is obtained by using stub loaded resonators. The total area of the filter is 13*14.2mm^2 . The design shows the insertion loss as -0.1dB and return loss as -15dB for WLAN with DGS. It has the quality factor of 4 and the bandwidth is 600MHz.The filter design has been modeled, simulated using a method of moment based electromagnetic simulator IE3D and its performance has been evaluated. This structure was fabricated with FR4 substrate using PCB technology. This fabricated structure is tested with network analyzer.*

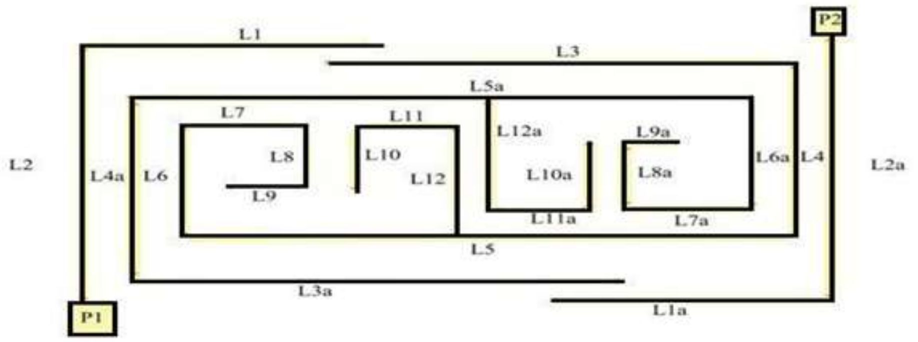
Keywords: *Band pass filter, mobile WLAN (Wireless local area network) , optimum distributed HPF (high pass filter), step impedance LPF (low pass filter).*

I. Introduction

RECENTLY, band pass filters (BPFs) become the key components to satisfy the demand of plural applications of communication devices. In general, multiple resonators are utilized to obtain a multi-band response for the design of BPF . However, most filters exhibits a disadvantage of large circuit size. Some researchers are concentrated on stub-loaded resonators (SLRs) due to the advantages of controllable resonant-modes. In, the adopted asymmetric SLR was constructed by combining an open-circuit terminated stub and a short-circuit terminated stub. The frequencies and bandwidth can be controlled independently by altering the coupling gap and coupling length properly. In this paper stub-loaded resonators (SLRs) were used to form a BPF. A defected ground structure (DGS) loop was adopted to enhance the coupling strength with low insertion loss. In, SLRs and half-wavelength resonators were used to achieve a BPF with the zero-degree feeding structure resulting in the appearance of transmission zeros, thus enhancing pass band selectivity. A novel square ring loaded resonator (SRLR) is used to design a BPF, and all resonant frequencies for the pass bands could be determined based on odd- and even-mode method. A micro strip line with a DGS was used to design a BPF. In this design, the filter was fabricated on an FR4 substrate with a relative dielectric constant of 4.4 and a thickness of 1.6 mm. BPF. A stub-loaded step-impedance resonator (SLSIR) was proposed for use in a BPF, providing multi design freedoms by combining the SLR with the step-impedance resonator (SIR). This letter proposes a simple resonator structure based on asymmetric stub-loaded resonators (ASLRs) to design a BPF. The centered frequencies of ASLR are predicted based on a resonant-mode analysis. The proposed BPF uses proposed resonators set at 2.4GHz for Wireless Local Area Network (WLAN).

II. The Filter Design And Simulation

This filter is constructed by proposed filter is designed using Rectangular loop size of 13mm*14mm for WLAN application. The coupled DGS resonators are considered the main block of proposed band pass filters. The Band pass filter has the operating frequency of 2.4GHZ and the performance is evaluated with the insertion loss of - 0.1 dB and the return loss of -16 dB and the GD of -8◦ . Also we have obtained the band width between 2.2
GHZ to 2.8 GHZ range. The Simulation result shows that the proposed filter offers good insertion loss and return loss response The design filter is simulated using a method based electromagnetic simulator IE3D software .

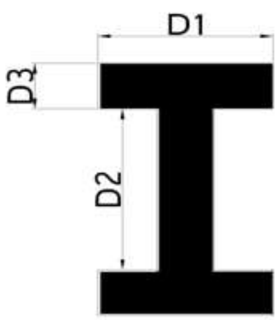


(a)Proposed band pass filter

PARAMETER	DIMENSION
Ɛe	3.02
Z_0	18.8668 Ω
C	$0.7318*10^{-21}$F
L	6.00858H
PARAMETER	DIMENSION
Ɛe	3.02618
Z_0	19.00158 Ω
C	$0.7267*10^{-21}$F
L	6.05149H
PARAMETER	DIMENSION
Ɛe	3.0841
Z_0	21.2446 Ω
C	$0.6499*10^{-21}$F
L	6.7661H

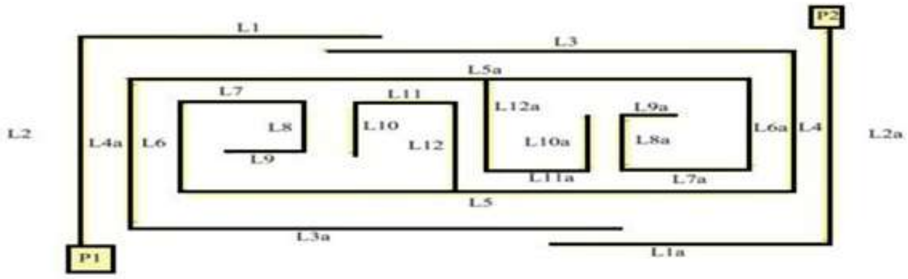
III. Defected Ground Structure

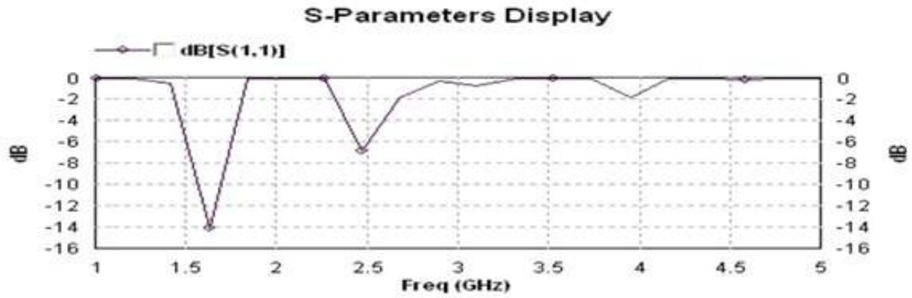
A Defective Ground Structure (DGS) is an *intentionally* designed defect on a ground plan, which creates additional effective inductance and capacitance. This technique can be used to design micro strip lines with desired characteristics such as higher impedance, band rejection and slow-wave characteristics, while significantly reducing the footprint of the micro strip structure. DGS structures are used in RF/microwave components (filters, dividers, amplifiers and high-speed digital designs.



(b)Dumbbell shaped DGS

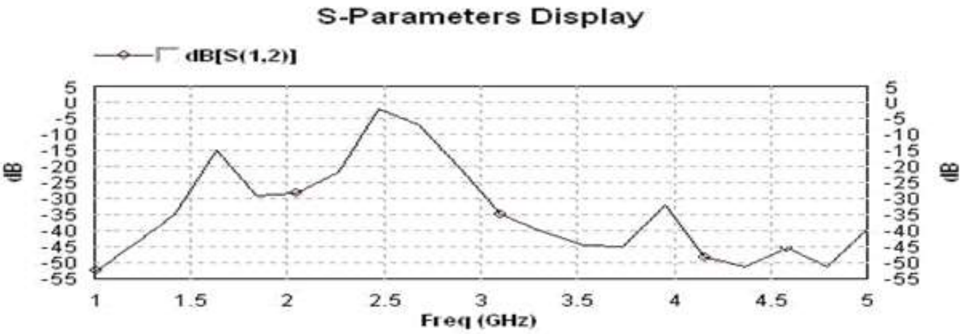
Without DGS





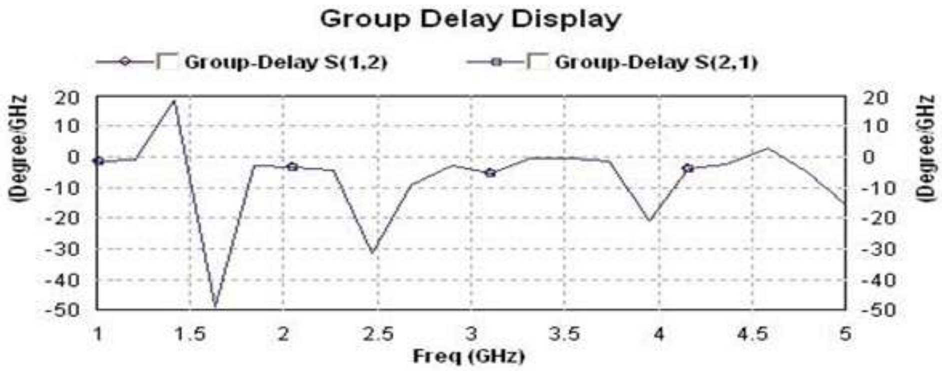
(c)

The simulated return loss of -7dB is shown in fig (c)



(d)

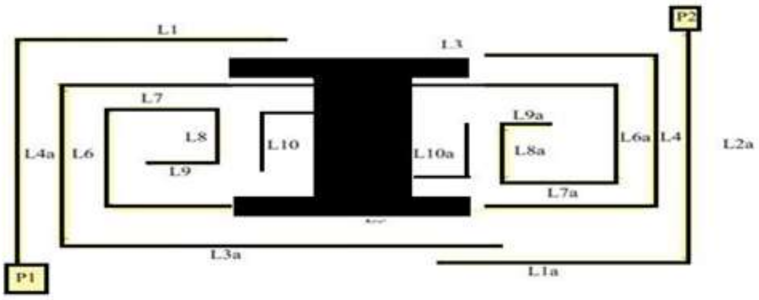
The simulated return loss of -2dB is shown in fig (d)

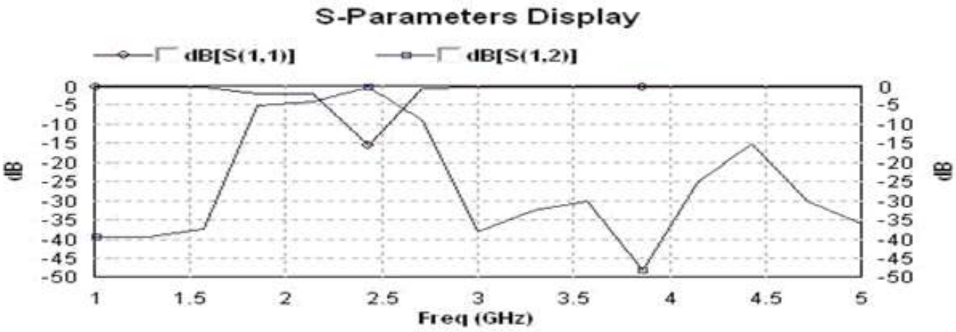


(e)

The simulated group delay of -32 degree are shows in fig(e)

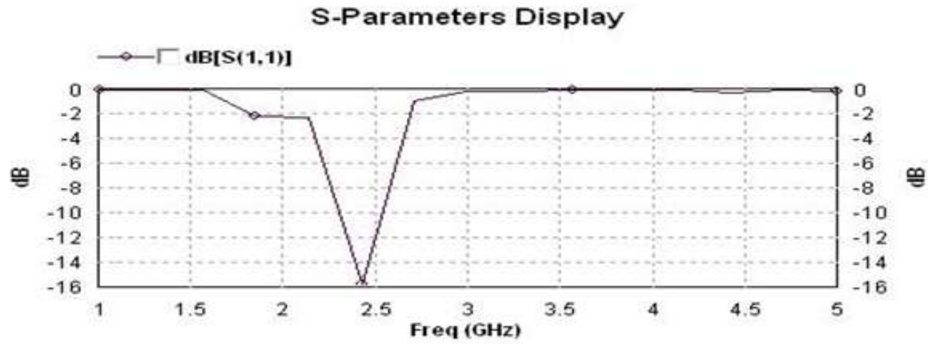
With DGS





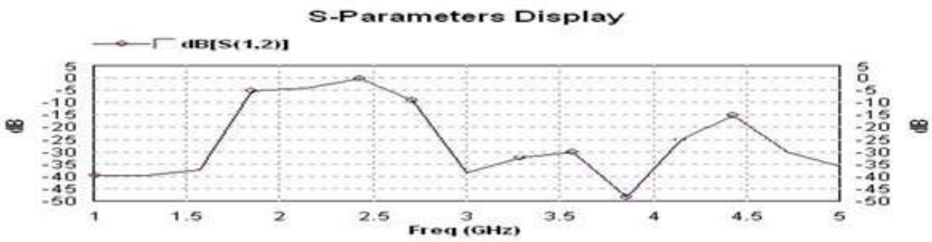
(f)Simulated S-parameter of proposed WLAN band pass filter

The simulated insertion loss and return loss are shows in fig (f) and the band pass filter shows a center frequency of 2.42GHz



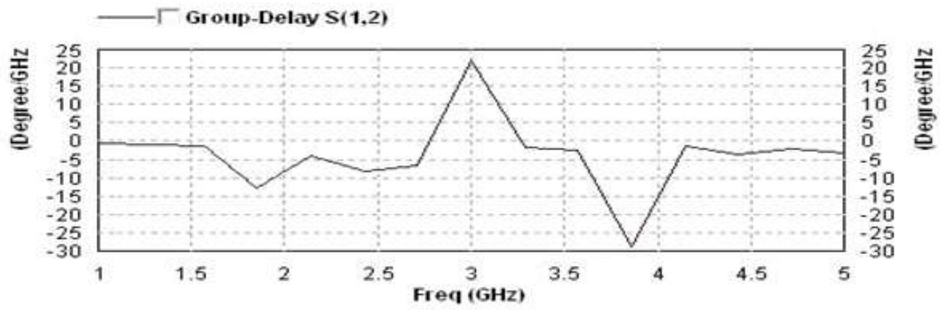
(g)

The simulated return loss of -0.1dB is shown in fig (g)



(h)

The simulated insertion loss of -16dB is shown in fig (h)



(i)

The simulated group delay of -8 degree are shows in fig(i)

Parameter	Dimension(mm)
Width of the stub	0.2

Parameter	Dimension(mm)
D1	3
D2	5.5
D3	1.5

Parameter	Dimension(mm)
L1	5.65
L2	10.65
L3	9.075
L4	7.25
L5	11.875
L6	4.625
L7	2.5
L8	2.725
L9	1.7
L10	2.725
L11	2.1
L12	4.625

Parameter	Dimension(mm)
L1a	5.65
L2a	10.65
L3a	9.075
L4a	7.575
L5a	12.225
L6a	4.475
L7a	2.675
L8a	2.725
L9a	1.025
L10a	2.725
L11a	2.075
L12a	4.475

Table.1 Filter Parameters

IV. Conclusion

Thus we have designed the **Micro strip Band Pass Filter using DGS for WLAN application** in the range of frequency 2.4**GHz**, by reducing the size of the filter to 13 mm* 14mm. The filter is fabricated with FR4 substrate and characterized by measuring insertion loss as -0.1dB and return loss as -16dB. It has the quality factor of 4 and the bandwidth is 600MHz. Simulated results from IE3D software are in good agreement with the measured result.

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