DESIGN AND ANALYSIS OF LOW PROFILE MICROSTRIP FILTER FOR 5G WIRELESS APPLICATIONS

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ABSTRACT

In recent decade of years as many research work has been going on with biomedical devices inside and on the human body for wireless communication. With advanced application towards micro strip patch filter comprise their requirements in biomedical area which involves wireless health monitoring, glucose monitoring, self-monitoring, etc. In this scheme a rectangular patch filter with wandered slots and PIN diode is presented. It is designed to operate at dual bands with the help of PIN diode. The filter is fabricated on a flexible substrate, and simulation is carried out on 3D electromagnetic (EM) simulation software. Microstrip Filter is fabricated from the procedure of Step impedance low pass prototype filter.

INTRODUCTION

Microstrip filters design is always well-known due to their easy fabrication, small size, and low cost, light weight in cellular mobile phone industry and in many integrated circuits. The main focuses on active low-pass filter design using operational amplifiers. Low-pass filters are commonly used to execute antialias filters in data-acquisition systems. To illustrate an actual circuit implementation, six circuits, separated into three types of filter are built using a TLV2772 operational amplifier.

It is most familiar method to refer to a circuit as a Butterworth design or a Bessel filter because its transfer function has the same coefficients as the Butterworth or the Bessel polynomial further MFB method also was referred for design or Sallen-Key circuits as filters.

The selection of circuit topology depends on various performance conditions. The MFB is given priority the most because of its sensitivity to component variations and better for high-frequency. The unity-gain Sallen-Key inherently gives good accuracy compared to other methods because of its component values.

In [1] Hong,Lancaster,et al. have done Novel compact microstrip bandpass filterswith stub-loaded multi-mode resonators are proposed. Simulated results indicate that all the filters exhibit insertion losses less than 1.5 dB with passband ripples of 1 dB and sharp attenuations of above 40 dB in their stopbands. [2] Hailin Cao, Wei Guan,et al. have doneCompact Lowpass Filter with High Selectivity Using g -Shaped Defected Microstrip Structure. Compared with the conventional DMS, the proposed G-shaped DMS exhibits lower resonant frequency and wider stopband. A lowpass filter with 3 dB cutoff frequency at 3.17 GHz using four pairs of parallel cascaded G-shaped DMS units is designed and fabricated. [3] Tamasi Moyra, Susanta Kumar Parui,et al. have done Design of a Quasi- elliptic Lowpass Filter using A New Defected Ground Structure and Capacitively Loaded Microstrip Line. A new defected ground structure (DGS) consisting of two square slots connects with a rectangular slot by two thin transverse slots underneath a microstrip line is proposed. DGS unit and corresponding L-C parameters are extracted. [4] Niharika Singh Verma,Pankaj Singh Tomar,et al. have done Design and Analysis of Stepped Impedance Microstrip Fractal Low Pass Filter which describes the design of low cost and low insertion loss microstrip stepped impedance Fractal low pass filter (LPF) by using microstrip layout.[5] Pavan Kumar Sharma,Veerendra Singh Jadaun,,et al. have done Designing Microstrip Low Pass Filter In ISM Band For Rectenna System.which gives an idea on wireless power transmission systems. Transmitted and received signals have to be filtered at a certain frequency with a specific bandwidth..[6]Sheikhi, A., A. Alipour et al. have done stepped impedance resonator hexangular unit is presented. The proposed lowpass filter (LPF) has some appropriate features such as compact size, low insertion loss and wide stopband. The LPF has cut-off frequency at 2.8 GHz and stopband bandwidth from 3.15 up to 25.5 GHz with attenuation level better than −20 dB. In [8] Wang, Zhihao, et al. have done wide stopband planar lowpass filter (LPF) using novel stepped impedance hairpin resonators (SIHRs). To validate the designed approach, a microstrip LPF is implemented and tested. The filter features a dimension of $0.158\ \lambda g \times 0.126\ \lambda g$, where λg denotes the waveguide length at the -3-dB cutoff frequency of 1.9 GHz.

PROPOSED SYSTEM

- It has line filters based on impedance line it does not suffer high voltage and low voltage
- It mainly focused on impedance characteristics so failure case will be less when compared to existing system that is component filters.
- Main advantages of the system Mode of analysis are easily switch over from transfer mode to electric mode and transfer mode to electric mode
- For our existing system if we need to change the components the total circuits will be change but in proposed system the line feeding and its position remain only change it automatically transfer from one mode of filters to another mode.

MODULE DESCRIPTION

The following steps are for proposed filter design

Filter specifications

- Prototype design with its simulation performance analysis
- Scaling and conversion (Optimization)
- Implementation (Fabrication and Testing)

PROCESS FLOW

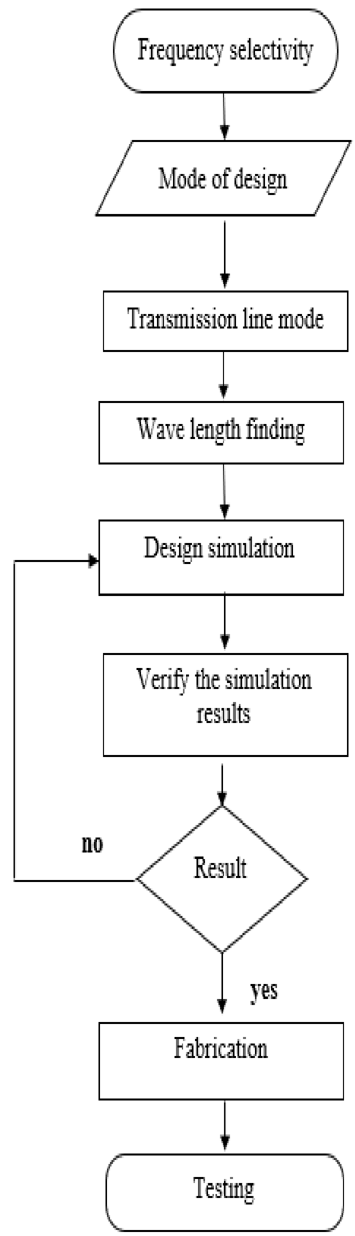


Fig 1 Process Flow Diagram

ASYMMETRICMICROSTRIP PATCH ARRAY FILTER

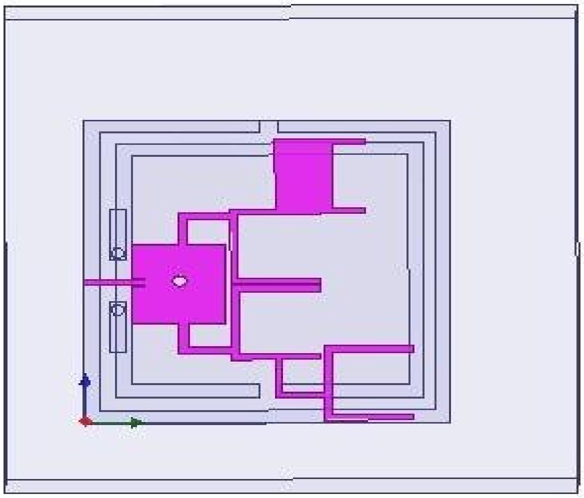


Figure 2 Micro strip patch array filter

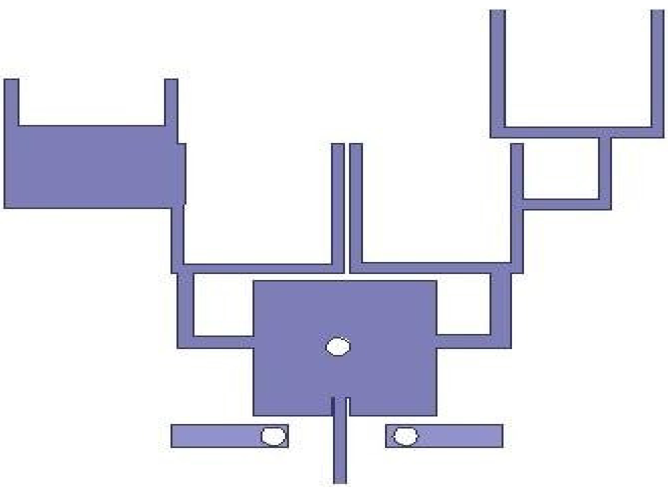


Figure 3 Micro Strip patch array Antenna top

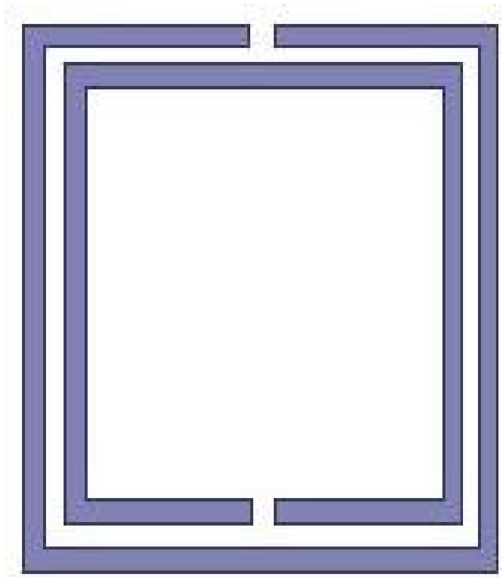


Figure 4 Defected Ground Structure

Table 1 Design Specification of MSPA

SL. No.	Parameters	Values
1	Patch dimension (L*W)	11.5*11.5 mm²
2	Feed length (L)	0.4 mm
3	Feed width (W)	3 mm
4	Relative Permittivity (ε_r)	4.5
5	Substrate Material	FR- 4
6	Loss tangent (tanδ)	0.00018
7	Resonant Frequency (f_o)	30 GHz
8	Wavelength(λ)	10 mm

DESIGN PARAMETERS OF PATCH FILTER ARRAY

- The proposed tri band patch array filter is designed and simulated in HFSS.
- The design structure and parameters are given in the table1
- The proposed micro strip patch array filter is operated over a range of 1 GHz to 5 GHz.
- The resonant frequency is 30 GHz with the application of common wireless communication systems.
- The FR 4 Substrate material is used along with dielectric constant of 4.4 and loss tangent of 0.00018. As like a design procedure the proposed patch array filter is resonate at 30 GHz which gives the maximum desired output. The feed width is 2mm.

RESULTS AND DISCUSSIONS

IMPLEMENTATION

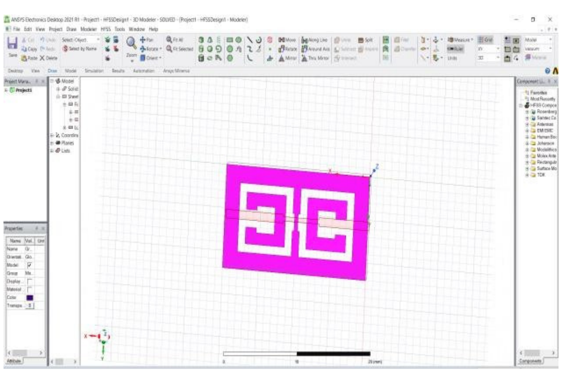
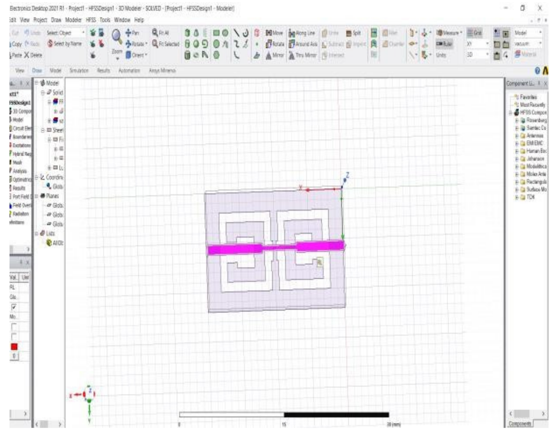


Figure 5 Impedance line

Figure 6 Ground Structure



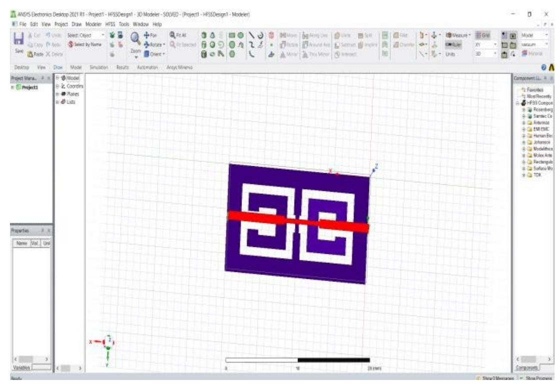


Figure 7 Designed Microstrip Low Profile Filter

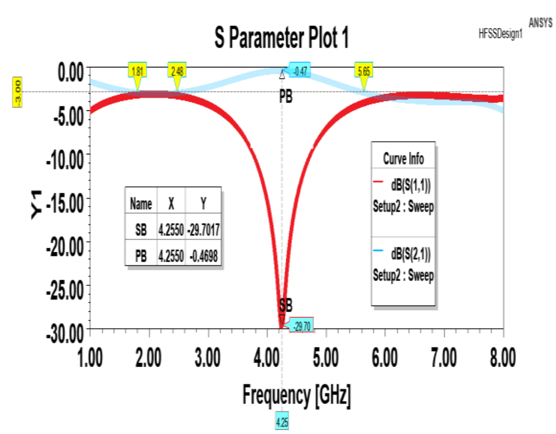
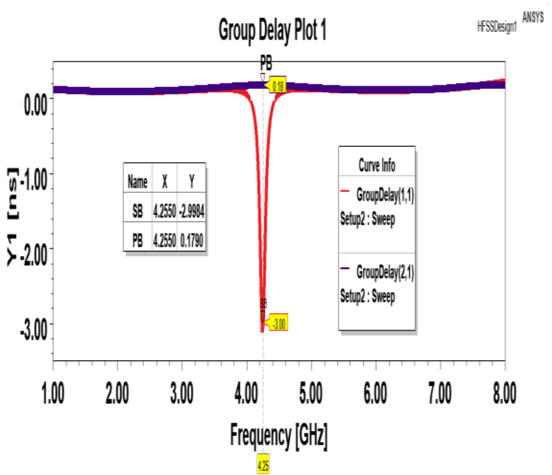


Figure 8 S parameter for low profile filter

Figure 9 Group delay for S parameter



In this Figure 5 has impedance line. Impedance line have property to convert 50 ohms to 75 ohms, so the path will be narrower and the EMF for will be higherand again, giving open slope so signal will return as the spark as released by the ground structure and designs as Cavity resonance generator in Figure 6. So, the result will be highly bandwidth and highly narrower. In figure 7 It shows the design of the microstrip design filter with Low profile. In figure 8 explains the S parameter of the given output and it blocks 2.48 Ghz to 5.65 Ghz and used for 5G and 6G secure communication. In figure 9 explains the group delay plot, It has stop band (-3ns delay) and pass band (0.1ns delay). Transmission delay of the filter is lowest group delay, so stop band delay is lowest as pass band

CONCLUSION AND FUTURE ENHANCEMENTS

For existing work each frequency has block separately, but did not block particular frequency. If we sperate the frequency means the circuit complication will higher. So, we avoid that we locked at the simple lower frequencies in simple circuit at wider bandwidth. Before pervious design there is no simple circuit if we utilize the simple circuit in future, it will be more optimized for wireless applications.

It has line filters based on impedance line it does not suffer high voltage and low voltage. It mainly focused on impedance characteristics so failure case will be less when compared to existing system that is component filters. Main advantages of the system Mode of analysis are easily switch over from transfer mode to electric mode and transfer mode to electric mode. It's purely optimized to 5G and 6G mobile communications

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