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DESIGN AND ANALYSIS OF LOW PROFILE MICROSTRIP FILTERFOR5G WIRELESS APPLICATIONS

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ABSTRACT

In recent decade of years as manyresearchworkhasbeengoingonwithbio medicaldevicesinsideandonthehuman body for wireless communication.With advanced application towards microstrippatchfiltercomprisetheirrequirementsinbiomedicalareawhichinvolveswirelesshealthmonitoring,glucosemonitoring,self-monitoring,etc.In thisscheme a rectangular patch filterwithwanderedslotsandPINdiodeispresented. It is designed to operate at dualbandswiththehelpofPINdiode.Thefilter is fabricated on a flexible substrate,andsimulationiscarriedouton3Delectromagnetic (EM) simulation software.MicrostripFilterisfabricatedfromtheprocedureofStepimpedancelowpassprototype filter.

INTRODUCTION

Microstrip filters design is always well-known due to their easy fabrication, smallsize, and low cost, light weight in cellularmobilephoneindustryandinmany integratedcircuits.Themainfocusesonactive low-passfilterdesignusingoperational amplifiers. Low-pass filters arecommonly used to execute antialias filtersindata-acquisitionsystems.Toillustrateanactualcircuitimplementation,sixcircuits, separated into three types of filterarebuiltusingaTLV2772operationalamplifier.

Itismostfamiliarmethodtorefertoacircuit as a Butterworth design or a Besselfilter because its transfer function has thesame coefficients as the Butterworth or theBesselpolynomialfurtherMFBmethodalso was referred for design or Sallen-Keycircuitsas filters.

Theselectionofcircuittopologydependsonvariousperformanceconditions. The MFB is given priority themostbecauseofitssensitivitytocomponent variations and better for high-frequency.Theunity-gainSallen-Keyinherently gives good accuracy comparedto other methods because of its componentvalues.

In[1]Hong,Lancaster,etal.havedone Novel compact microstripbandpassfilterswithstub-loadedmulti-moderesonators are proposed. Simulated resultsindicate that all the filters exhibit insertionlosseslessthan1.5dBwithpassband ripples of 1 dB and sharp attenuations ofabove 40 dB in their stopbands. [2] HailinCao, Wei Guan,et al. have doneCompactLowpassFilterwithHighSelectivityUsingg-ShapedDefectedMicrostripStructure. Compared with the conventionalDMS,theproposedG-shapedDMSexhibitslowerresonantfrequencyandwider stopband. A lowpass filter with 3 dBcutoff frequency at 3.17 GHz using fourpairs of parallel cascaded G-shaped DMSunitsisdesignedandfabricated.[3]TamasiMoyra, Susanta Kumar Parui,et al.havedoneDesignofaQuasi-ellipticLowpassFilterusingANewDefected Ground Structure and Capacitively LoadedMicrostrip Line. A new defected groundstructure (DGS) consisting of two squareslots connects with a rectangular slot bytwothintransverseslotsunderneathamicrostrip line is proposed. DGS unit andcorrespondingL-Cparametersareextracted.[4]NiharikaSingh Verma,PankajSinghTomar,etal.havedoneDesignandAnalysisofStepped

ImpedanceMicrostripFractalLowPass Filter which describes the design of lowcostandlowinsertionlossmicrostrip stepped impedance Fractal low pass filter(LPF)byusingmicrostriplayout.[5]PavanKumarSharma,VeerendraSinghJadaun,,etal.havedoneDesigningMicrostrip Low Pass Filter In ISM BandFor RectennaSystem.which gives an ideaonwirelesspowertransmissionsystems.Transmitted and received signals have tobe filtered at a certain frequency with aspecificbandwidth..[6]Sheikhi,A.,A. Alipouretal.havedonesteppedimpedanceresonatorhexangularunitispresented.Theproposedlowpassfilter(LPF) has some appropriate features suchascompactsize,lowinsertionlossandwidestopband.TheLPFhascut-offfrequencyat2.8 GHzandstopbandbandwidth from 3.15 up to 25.5 GHz withattenuation level better than −20 dB.In [8]Wang,Zhihao,etal.havedonewidestopband planar lowpass filter (LPF) usingnovelsteppedimpedancehairpinresonators(SIHRs).Tovalidatethedesignedapproach,amicrostripLPFisimplemented and tested. The filter featuresadimensionof0.158 λ g × 0.126 λg,where λg denotes the waveguide length atthe-3-dB cutoff frequencyof1.9GHz.

PROPOSEDSYSTEM

- Ithaslinefiltersbasedonimpedance line it does not sufferhighvoltageandlow voltage
- Itmainlyfocusedonimpedancecharacteristics so failure case willbe less when compared to existingsystemthatiscomponentfilters.
- MainadvantagesofthesystemMode of analysis are easily switchover from transfer mode to electricmode and transfer mode to electricmode
- For our existing system if we needto change the components the totalcircuitswillbechangebutinproposedsystemthelinefeedingand its position remain only changeit automatically transfer from onemodeoffilters toanother mode.

MODULEDESCRIPTION

Thefollowingstepsareforproposedfilterdesign

Filterspecifications

- ➢ Prototypedesignwithitssimulationperformanceanalysis
- ➢ Scalingandconversion(Optimization)
- ➢ Implementation(FabricationandTesting)

PROCESSFLOW

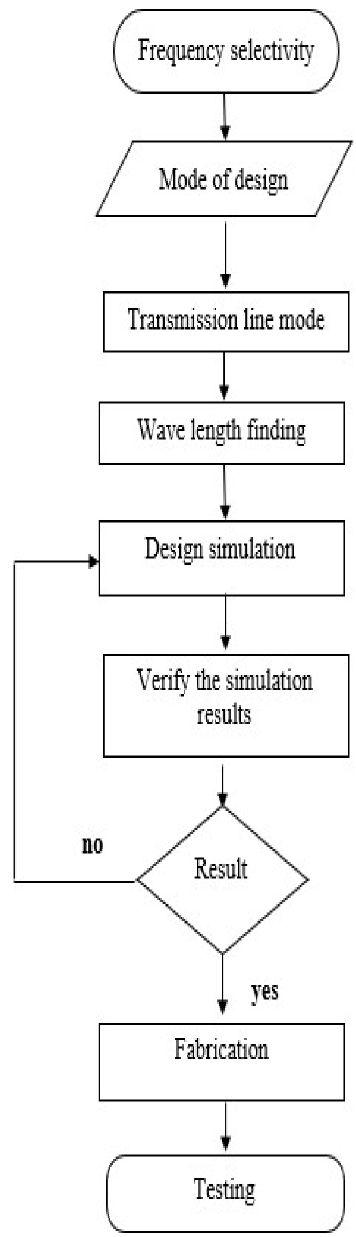


Fig1 Process FlowDiagram

ASYMMETRICMICROSTRIP PATCHARRAYFILTER

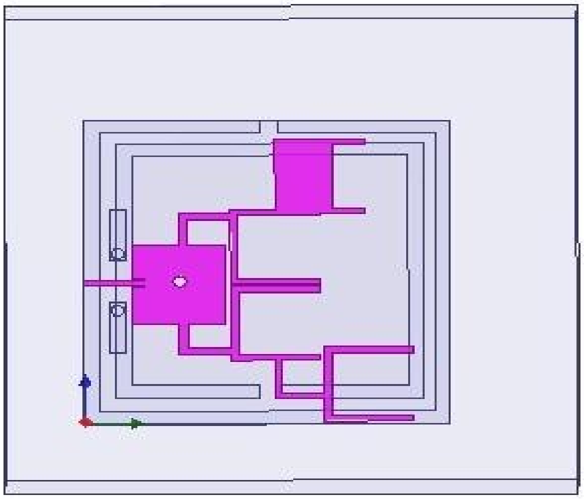


Figure2 Microstrippatcharrayfilter

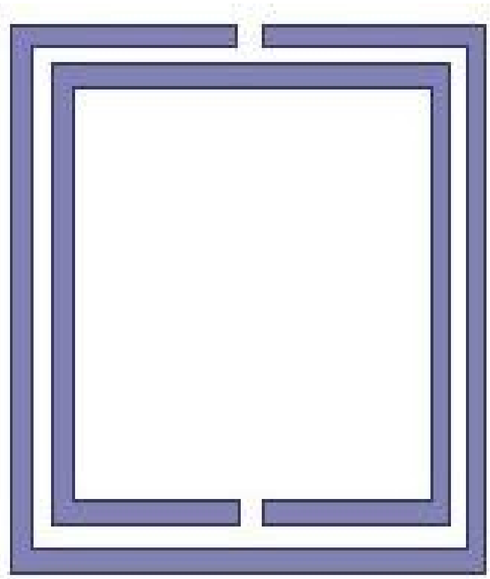


Figure4 DefectedGroundStructure

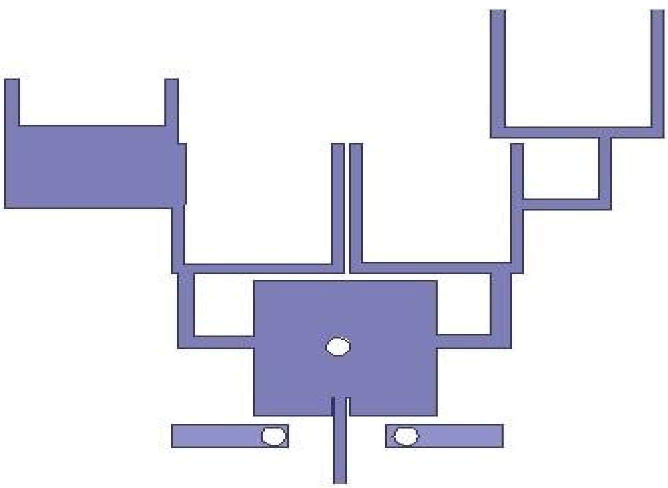


Figure 3 Micro Strip patch arrayAntennatop

Table1Design SpecificationofMSPA

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

DESIGNPARAMETERSOFPATCHFILTERARRAY

- The proposed tri band patch arrayfilter is designed and simulated inHFSS.
- Thedesignstructureandparametersaregiveninthetable1
- Theproposedmicrostrippatcharray filter is operated over a rangeof1 GHzto 5 GHz.
- The resonant frequency is 30 GHzwiththeapplicationofcommon wirelesscommunication systems.
- TheFR4Substratematerialisused along with dielectric constantof 4.4 and loss tangent of 0.00018.Aslikeadesignproceduretheproposedpatcharrayfilterisresonate at 30 GHz which gives themaximum desired output. The feedwidth is 2mm.

RESULTSANDDISCUSSIONS

IMPLEMENTATION

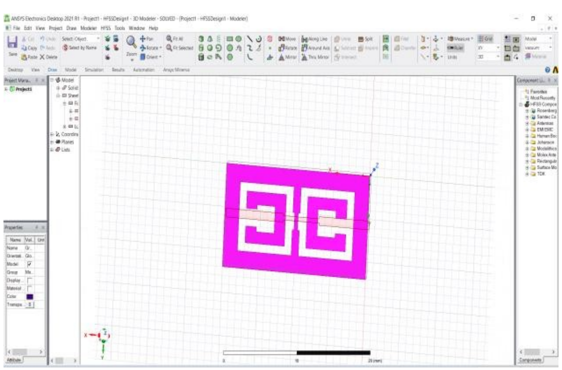
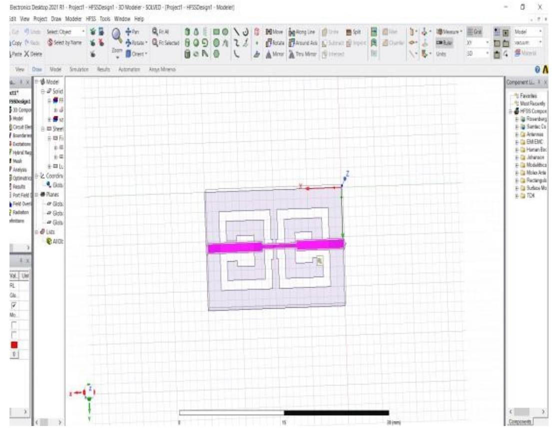


Figure 5 Impedance lineFigure6GroundStructure



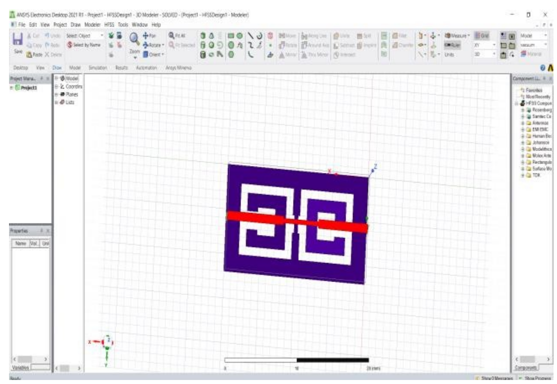


Figure 7 Designed Microstrip LowProfileFilter

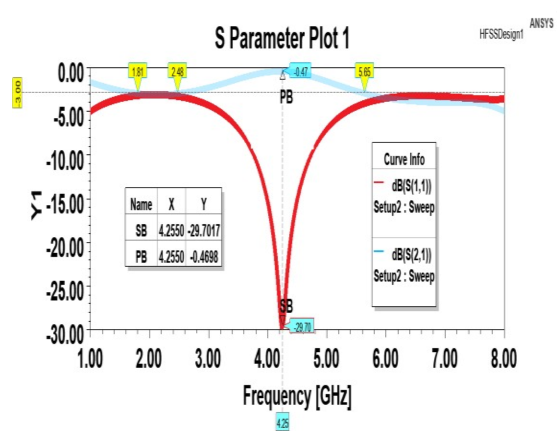
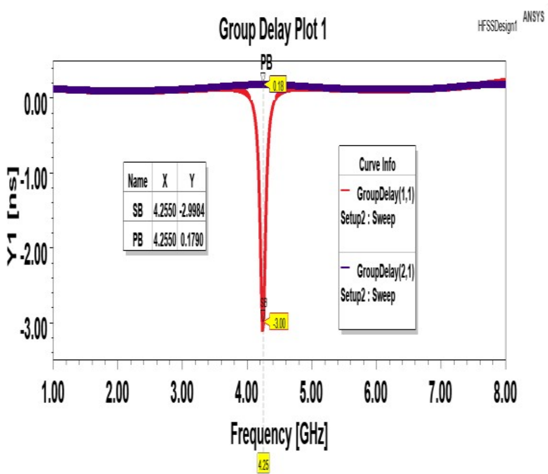


Figure8Sparameterforlowprofilefilter

Figure9Group delayforSparameter



InthisFigure5hasimpedanceline.Impedance linehaveproperty toconvert50 ohms to 75 ohms, so the path will benarrowerandtheEMFforwillbehigherand again,givingopenslopesosignal will return as the spark as releasedbythegroundstructureanddesignsas CavityresonancegeneratorinFigure6.So, the result will be highly bandwidth andhighly narrower. In figure 7It shows thedesign of the microstrip design filter withLowprofile.Infigure8explainstheSparameterofthegivenoutput and itblocks 2.48 Ghz to 5.65 Ghz and used for 5G and6Gsecurecommunication.Infigure9explains the group delay plot, It has stopband(-3nsdelay)andpassband(0.1nsdelay). Transmission delay of the filter islowest group delay, so stop band delay islowestas pass band

CONCLUSION AND FUTUREENHANCEMENTS

For existing work each frequencyhasblockseparately,butdidnotblockparticularfrequency.Ifwesperatethefrequency means the circuit complicationwill higher. So, we avoid that we locked atthesimplelowerfrequenciesinsimplecircuitatwiderbandwidth.Beforepervious design there isno simplecircuitif we utilize the simple circuit in future, itwillbemoreoptimizedforwirelessapplications.

Ithas line filters based on impedance lineitdoesnotsufferhighvoltageandlowvoltage. It mainly focused on impedancecharacteristics so failure case will be lesswhen compared to existing system that iscomponent filters. Main advantages of thesystem Mode of analysis are easily switchover from transfer mode to electric modeandtransfermodetoelectricmode.It'spurelyoptimizedto5Gand6Gmobilecommunications

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