# NEW COMPACT DUAL BAND BPF WITH WLAN NOTCH & COMPARISON OF LOSSES WITH UWB FILTER

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**ABSTRACT:** The format of a Dual band Band Pass Filter (BPF) with WLAN notch for Microstrip (3.0 - 3.9GHz). The essential sketch proposed in this assignment are primarily based on the Dual band BPF with WLAN notch, which consists of a easy rectangular body developed on a 1.6mm thick commercially reachable Rogers TMM 10 cloth substrate. The twin band BPF insertion loss is expanded to -1.5dB, to -0.5dB and return loss is lowered to -13.25dB to -25dB at 3.0GHz to 3.9 GHz, in accordance to simulated and experimental results. With the assist of Ansoft HFSS model 14.0 software, this twin band BPF used to be designed and its overall performance used to be evaluated. The simulated outcomes exhibit that the insertion loss and return loss of a twin BPF have dramatically increased. The designed filter-antenna operates at a centre frequency of 2.4 GHz and has a fairly wide-band impedance bandwidth of about 1.22 GHz and a fractional bandwidth (FBW) of about 50%. The outcomes of three one of a kind kinds of substrate material, which are Rogers RT5880, Rogers RO3003, and FR-4, are investigated and presented the use of the equal configuration.

The filter-antenna graph is simulated and optimised the use of pc simulation technological know-how (CST) software program and is fabricated and measured the usage of a Rogers RT5880 substrate with a peak (h) of 0.81 mm, a dielectric consistent of 2.2, and a loss tangent of 0.0009. The shape is printed on a compact measurement of 0.32 λ0 × 0.30 λ0, the place λ0 is the free-space wavelength at the centre frequency. A properly agreement is got between the simulation and size performance. The designed filter-antenna with the performed overall performance can discover one of a kind purposes for 2.4 GHz ISM band and 4G wi-fi communications. Recently, many filter-antenna designs the usage of exclusive kinds of substrate substances have been proposed. In a co-design of a filter-antenna the usage of a multi-layered- substrate is delivered for future wi-fi applications. The layout consists of three-pole open-loop ring transmission strains and a T-shaped microstrip antenna.

The multilayer technological know-how is utilized to acquire a compact measurement structure. A Rogers RT5880 substrate with a relative dielectric consistent of 2.1 and a thickness of 0.5 is used in this structure. The filter-antenna diagram operates on 2.6 GHz with a fractional bandwidth of round 2.8% and has performed a measured reap of 2.1 db. The principal gain of this shape is the compact size, however it lacks simplicity in the development due to the use of a multilayer substrate configuration. The filter-antenna introduced in [25] observed the identical system and executed comparable overall performance with a round polarisation characteristic. However, the proposed configuration utilized some other diagram technique based totally on the substrate built-in waveguide technology. It is recognized that the use of a substrate fabric in the layout of RF/microwave circuits is frequent and has some necessary challenges. One of the diagram fundamentals is to select the excellent substrate fabric kind as properly as the thickness to healthy with a appropriate application. Finding the dielectric substrate for printed circuit board (PCB) substances is a trade-off manner between high-performance designs and the value of these substances at the RF and MW frequencies. This represents a good sized undertaking for the designer.

**Key Words:** Dual Band BPF, WLAN Notch, Ultra Wide Band Filter, Microstrip, Ansoft HFSS, Low Pass Filter, High Pass Filter.

## INTRODUCTION:

Dual band Band Pass Filter (BPF) are used for satellite S-band. This research is important to improve the insertion loss in dual band BPF with WLAN notch. The applications of this research are broadcast radio, wireless communication and television. The Ansoft high frequency structure simulator (HFSS) could be a full wave electromagnetic (EM) software package for calculating the electromagnetic behavior of a 3-D structure. They are used extensively in communications applications to either select frequencies of interest or

reject frequencies which interfere with the communications system. The small upper stop band, on the other hand, is the key downside of this form of arrangement. The former method is resonant in nature and therefore ideal for narrowband processing thanks to SRR technology. The second solution, on the other hand, has larger transmission bands as a function of its combined left and right-handed features. The CPW is a multimodal waveguide capable of propagating two fundamental modes (even and odd) at the same time, which interact at any asymmetry or transformation. The main aim of a wireless communication device is to offer the best services possible by using the least amount of electricity and bandwidth available. The diagram shows the two most important network architectures for elliptic curve low-pass prototype filters. Microstrip processing has been used to incorporate the majority of elliptic-function low-pass filters (LPFs).Microwave Band Pass Filters (BPFs) with high selectivity are important components of microwave wireless communication systems.

The designed filter-antenna operates at a centre frequency of 2.4 GHz and has a rather wide-band impedance bandwidth of about 1.22 GHz and a fractional bandwidth (FBW) of about 50%. The outcomes of three one-of-a-kind sorts of substrate material, which are Rogers RT5880, Rogers RO3003, and FR-4, are investigated and introduced the use of the equal configuration. The filter-antenna format is simulated and optimised the use of laptop simulation science (CST) software program and is fabricated and measured the usage of a Rogers RT5880 substrate with a top (h) of 0.81 mm, a dielectric regular of 2.2, and a loss tangent of 0.0009. The shape is printed on a compact measurement of 0.32 λ0 × 0.30 λ0, the place λ0 is the free-space wavelength at the centre frequency. A correct settlement is bought between the simulation and size performance. The designed filter-antenna with the finished overall performance can locate one of a kind functions for 2.4 GHz ISM band and 4G wi-fi communications.

## LITERATURE SURVEY:

Dong-Sheng La, Hong-Cheng Li, Jing-Wei Guo, and Yu-Ying Li described Design of Broadband Band-Pass Filter with Cross-Coupled Line Structure, Band-pass filters (BPFs) with high frequency selectivity and out-of-band rejection levels are intensively required in the modern wireless communication systems. Resonators are usually proposed to construct wideband BPFs. Wang introduced a cross-shaped resonator with wide pass band. By cascading two cross-shaped resonator structures, a compact ultra-wideband band-pass filter is designed. The performance of the wideband BPF need to be improved. Xu proposed a broadband band-pass filter composed of the coupled lines and a cross-shaped resonator, which improves the frequency selection characteristics of the band-pass filter by introducing a transmission zero point. In a novel band-pass filter with a T-shaped structure is proposed. The position of the transmission zeroes can be adjusted to achieve high selectivity of the band-pass filter. Cheng proposed a broadband band-pass filter based on parallel coupled lines and cross-shaped resonators. The p-i-n diodes are used as the tuning elements, which can implement three reconfigurable bandwidth states. In, the filter is based on the cross-shaped resonator structure with terminal short circuit. The low- frequency band of the first pass band can be adjusted by the capacitance value, while the other three band edges remain unchanged. In, a cross-shaped resonator with an open stub is used to design a band-pass filter and a cross-coupled stub is used to design a microstrip band-stop filter. Most filter structures are complex and difficult to be analysed and discussed. Some filters are difficult to give an equivalent circuit for analysis. In addition, most filters require high manufacturing accuracy.

Mamoon A. Al-Atrakchii, Khalil H. Sayidmarie, & R.A.Abd- Alhameed introduces a Compact Band-stop Microstrip Line Filter Using U-Shaped Slot, A band stop filter is proposed, where the resonant element is a slot that is folded to the shape of the letter U and embedded into the microstrip line so that no extra width is required. Moreover, the folding of the slot reduces its length to ¼ the effective wavelength. This is a considerable size reduction in comparison with the filters using the resonant elements like rings or coupled short-circuited and open-circuited stubs. The designed prototype at the WLAN frequency of 2.45 GHz was investigated using the CST software package and showed low insertion loss at the pass bands and high rejection across the stop band. The folding of the slot offered very low radiation at the stop band. The simulation results are validated by measurements on the fabricated prototypes.

Samaneh Sedighi Maragheh, Massoud Dousti, Mehdi Dolatshahi explained Tunable dual-band band pass filter for multi-standard applications, A new tunable dual-mode Dual Band Pass Filter (DBPF) is presented based on coupled- line resonators structure. The centre

frequency and bandwidth can be individually tuned in each band with varactors, which are loaded at the end and middle of the coupled resonators. Varactor diodes can adjust the lower band from GPS to GSM standards (from 1.57 to 1.85 GHz), and the higher band for GSM, UMTS, WiFi and WLAN applications (from 1.85 to 2.5 GHz). The LC equivalent model of the proposed filter is presented to analyze the resonator at odd- and even-mode frequencies to prove the favorable role of each varactor in tuning the center frequency and bandwidth. To validate the simulation results, the proposed filter is fabricated and measured. Measurement results are in good agreement with LC equivalent model and simulation results.

## EXISTING SYSTEM

The Dual band Pass Filter (BPF) is similar to the UWB dual band filter in this analogy. In the old filter, they used a compact dual band filter, but in the new one, we used a dual band BPF. The original filter has a low insertion loss, while the newly constructed filter has a low return loss. In this case, He is using HFSS (high frequency structure simulator). HFSS is a platform for constructing three- dimensional (three-dimensional) electromagnetic (EM) models. Electronic components include antennas, antenna arrays, RF or microwave elements, IC sets, and circuit boards, which are all examples of high-frequency electronic objects. We will use FEKO and CST to obtain a higher insertion loss than the current research (Osman and Raju 2020).

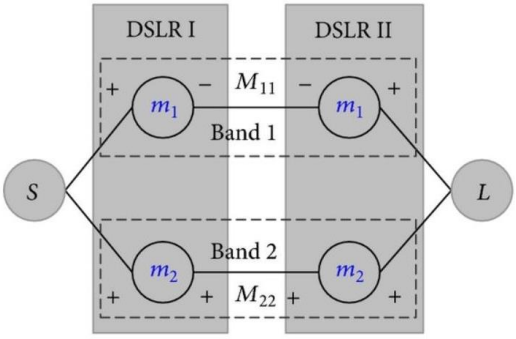


Fig 1: Existing Block Diagram

## PROBLEM IDENTIFICATION

- High return loss
- High insertion loss

## PROPOSED SYSTEM

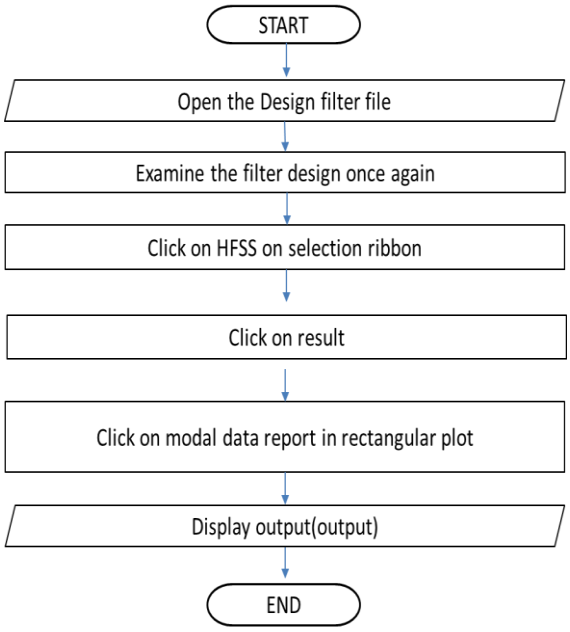


Fig 2: Flowchart for Proposed Scheme

The proposed block diagram consist of four sections. They are: Source, Dual Band BPF with Ansoft, Output of the dual band filter and Comparing of results with UWB filter. At the initial stage of the proposed system, we have to feed the basic requirement to the software designing platform to design a Dual Band pass filter. Later the output characteristics has been obtained by clicking on the report analysis in the Ansoft. The results which are obtained from Ansoft Should be placed in SPSS to compare the output Characteristic graph with existing UWB filter.

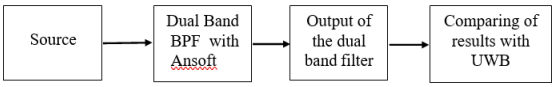


Fig 3: Block Diagram of Proposed design

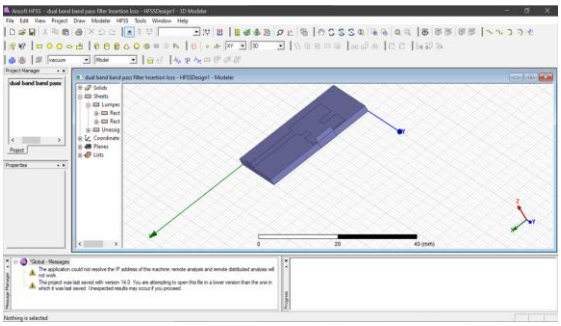

Fig 4: Layout for Proposed Scheme

**HARDWARE AND SOFTWARE REQUIREMENTS:**

- Ansoft HFSS
- SPSS

**METHODOLOGY**

The WLAN notch filter is fashioned with the aid of the aggregate of the each the LPF and HPF with one-of-a-kind cut-off frequencies. Filter designs past 500MHz are challenging to comprehend with discrete elements due to the fact the wavelength will become related with the bodily filter issue dimensions, ensuing in more than a few losses. Band skip filters (BPFs) have an imperative position in distinctive wi-fi conversation structures specifically in microwave structures that are limited with a small occupied place for microwave elements and circuits. This kind of filters must fulfill the following specifications, such as dimension compactness, harmonics suppression, excessive selectivity, and insertion loss discount in the performed band to be like minded with the present day verbal exchange systems. The resonator with open-loop configuration can be performed by means of the use of a half-wavelength microstrip line of the working frequency with coupling structure. The coupling can be electrical, magnetic, or blended coupling to acquire the preferred filtering performance. With the repaid tendencies of the wi-fi verbal exchange systems, designing filters with multi bands is preferable. More research have been performed to acquire the dual-band response of the band pass by filter. Since there are a lot of functions that have to be operated concurrently barring any interference such as WLAN, which runs at 2.45, 5.2, and 5.8 GHz and WiMAX, which additionally runs at 3.5 and 5.2 GHz.

The electric powered discipline distribution consequences of the BSF at the essential and 2nd modes 5.5/14.5 GHz (band cease region) and at 2.5 GHz (pass-band region). The bodily shape of the third-order BPF is decided the use of EM simulation relying on the values of coupling matrix and exterior exceptional factor. The filter is composed of two coupled resonators as preceding second-order filter linked with the input/output ports and the 0.33 resonator is an open-loop resonator with large measurement and coupled with the two resonators. The lumped capacitor enhances the power saved in the resonator which in flip will increase the pleasant thing of the resonator at the fee of the bandwidth. Two electrically coupled OLRs loaded with a stub the use of 0◦feeding technique, two spiral resonators and lumped capacitors have been utilized to acquire the favored 3.5/5.5 GHz and 3.5/6 GHz frequency band to serve in wi-fi applications, mainly WiMAX/WLAN applications.

**RESULTS :**

- With the help of obtained results, we can conclude the characteristics of designed filter has reduced
- There are various types of methods are available to design the filter on that by using WLAN Notch gives better results
- These results are used to compare with UWB filter
- This project gives an idea of all, how to reduce the losses of filters by various approaches

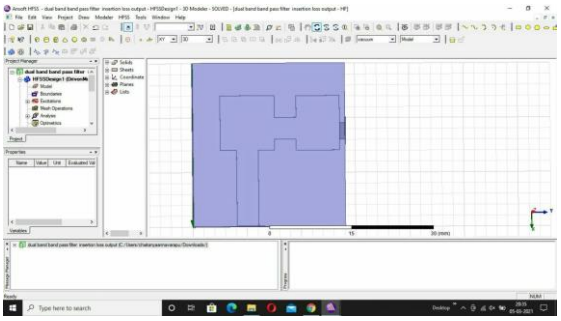

Fig 2: Obtained layout

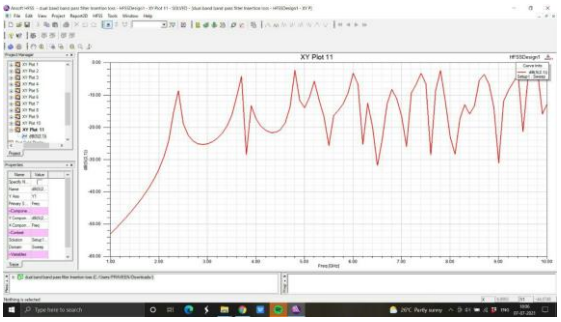

Fig3: Output of Return loss

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| frequency | fr4 epoxy | 10 | 3.4500 | .30277 | .09574 |
| | Rogerus rt/duroid 6010 | 10 | 3.4500 | .30277 | .09574 |
| Return loss | fr4 epoxy | 10 | 7.5358 | 4.98063 | .05750 |
| | rogerous rt/duroid 6010 | 10 | 8.6292 | 6.45135 | .04010 |

Fig X:Group Statistics of return loss

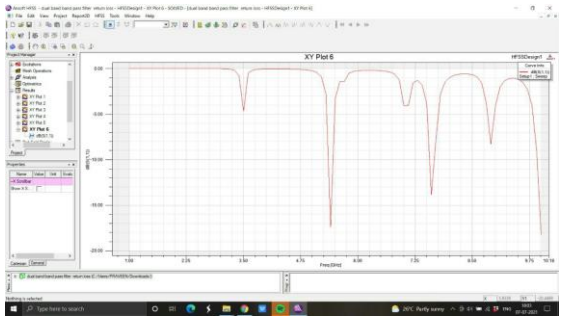

Fig 4: Output of Insertion Loss

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| frequency | silicon | 10 | 3.4500 | .30277 | .09574 |
| | rogerus rt/duroid 6010 | 10 | 3.4500 | .30277 | .09574 |
| Insertion loss | silicon | 10 | 4.1783 | 1.70557 | .05393 |
| | rogerus rt/duroid 6010 | 10 | 4.3903 | 2.65539 | .08397 |

Fig X: Group Statistics of Insertion loss

## CONCLUSION

This project emphasizes on the current scenario of Filter design and the need of the dual band filters is to manage the vast range of applications in our day to day life. There are various types of methods are available to design the filter on that by using WLAN Notch gives better results . After obtaining the results of designed WLAN Notch filter. These results are used to compare with UWB filter. This project gives an idea of all how to reduce the losses of filters by various approaches.

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