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MICROWAVE LOW PASS FILTER FOR WiMAX WIRELESS COMMUNICATION

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ABSTRACT

A microwave low pass filter has been builded. The filter was makes using the step impedance method, with the alternative part's characteristic linear impedance perhaps too high or too low. This filter has been stimulated with the help of HFSS software and relying on full-wave analytical techniques in 3D work page with modifying every lower or higher impedance characteristics such as width and length desired characteristics can be high. It becomes feasible when designed with micro strip technology. In comparison to other filters, this one is simple. The results of the practical measurement and simulation were in fairly good accord.

Keywords: Maked, Filter, Impedance, Ansys.

1. INTRODUCTION

Microwaves are a form of electromagnetic radiation employed in a variety of fields, from heating, cooking etc. Electromagnetic waves having wavelengths ranging from 1cm to 1m are described by the term microwave. For 1cm wavelength waves, the relevant frequency range is 300 MHz to 30 GHz. 1m to 10mm is the variation of electromagnetic waves. In the electromagnetic spectrum, they are placed between infrared and radio waves. Because microwaves, unlike lower frequency radio waves, do not diffract across hills, follow the earth's surface as ground waves, or reflect off the ionosphere, terrestrial microwave communication links are limited to around 40 miles by the visual horizon (64 km). They are absorbed by gases in the air at the high end of the spectrum, limiting practical communication lengths to a few meters. They are absorbed by gases in the atmosphere at the high end of the spectrum, limiting practical communication distances to roughly a kilometer.

2. METHODOLOGY

The line acquires capacitor properties and will close more to properties of the squeezed capacitor boundary used in channel, as well as the other way around; additionally, as line impedance increases, the fine bar becomes more slender, and the line acquires inductor properties and will close more to properties of the squeezed conductor boundary used in channel. Know that the channel recurrence reaction is gotten to the next level whatever the proportion of the line impedance is more hierarchical. Then, as a result of this method, we should use the highest and lowest trademark impedance that is possible. According to several sources, the typical impedance range for tiny strip fabrication might range from 20 to 125 ohm. Nonetheless, low or moderate recurrence can hit to signature impedance under 10 ohms or around 150 ohms. This impedance range arises as the width of the line guide increases, causing cross over reverberation. As the guide line width decreases, streaming becomes more difficult, and creating resilience increases. In order to continue in this section, we must complete the calculations that we have obtained its results charts, which will aid us in determining an impedance range that is appropriate for the perfect plan. It has been demonstrated the effects of line trademark impedance on the width of two tiny strip lines with dielectric coefficients of 9.4 mm and thicknesses of 1.58 and 0.79 mm. The level pivot addresses various impedance characteristics, while the vertical pivot addresses line width. We reasoned that if we need to reduce line width, we should use lines with less thickness, as shown in chart 2.

The line width of impedance in thickness 0.79 mm is close to half of the line width in thickness 1.58 mm, demonstrating impact more underneath impedances. At 0.79 mm and 1.58 mm thickness, the effects of dielectric coefficients strip line guide width for trademark impedance north of 120 ohms are given. The vertical hub represents the line channel width, whereas the level join is the unique dielectric coefficients. The result of this figure indicates that whatever dielectric coefficient of a plan on the miniature strip line is lower and line thickness is high, the width of the line guide is higher, and the trademark impedance is over than 120 ohms. The effects of dielectric coefficients strip line guide width for trademark impedance under 20 ohms are presented for both thicknesses of 1.58mm and 0.79mm. The dielectric coefficients are represented by the flat joint, while the line guide width is represented by the vertical hub. A result of the graph, whatever dielectric coefficient for the plan on the miniature strip line is more notable and line thickness is lower, breadth of the line guide is low, that is more appropriate for the trademark impedance generally under 20 ohms.

3. MODELING AND ANALYSIS

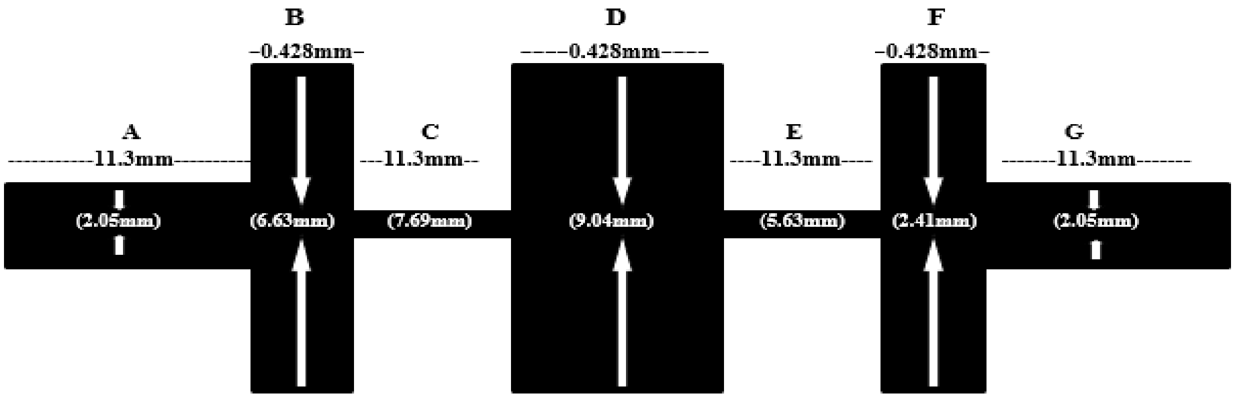

Figure 1: Design

We may choose the constraint contracts and processes that are done for a reasonable strip transmission line structure for channel plan using the correlation between the 2 and 3 outlines. Low pass channels with step impedance can be designed using responses of the type max level or reaction with comparable Swell. Standardized g values are used to configure the system. Inductors and capacitors should be used instead of resistors and capacitors. We provide the design for a microwave low pass channel with a cutting frequency of 2.5GHz and a level highest reaction of more than 20dB in recurrence. Moreover, channel trademark impedance is 50 ohm at 4GHZ. Low pass design with level highest reaction for cutting recurrence indicates the standardized worth of its bounds. We 1 and impedance Z0 1 are shown in the diagram below.

$$q_1 \square 0.517 \square c_{1,}\ q_2 \square 1.414 \square l_2 \quad (1)$$

$$q_3 \square 1.932 \square c_{3,}\ q_4 \square 1.932 \square l_4 \quad (2)$$

$$q_5 \square 1.414 \square c_{5,}\ q_6 \square 0.517 \square l_6 \quad (3)$$

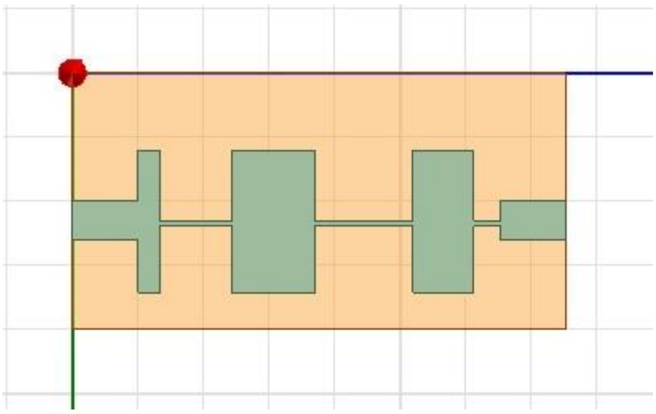

Figure 2: ANSYS Design

The micro strip low pass channel with step impedance is made up on a FR4 substrate with a dielectric coefficient of 4.2 and a thickness of 1.58 mm, with a copper guide of 0.5 mm, with a commonsense characteristic impedance of 120 ohm and a minimum of 15 ohm of 785. Vol. 4, No. 5, October 2012, Worldwide Journal of Computer Theory and Engineering the line. Equations 3 and 4 determine the width of a high impedance line accepting 2hw,as well as the width of a low impedance line accepting 2hw. The real length of inductive and capacitive inductive and capacitive inductive and capacitive inductive and capacitive inductive and capacitive inductive and capacitive in The precision of the presented relationship for calculating the width of the great line impedance and low impedance in condition 3 is greater than 1%, so if more precision is necessary, use the enhancement methods. Table I shows the exact, streamlined advantages of line width and wi, as well as line length Il. Following the acquisition of plan estimations, we examine the intended channel using microwave sensitive products and, if the reproduction results are favorable, we fabricate the channel on a small strip transmission line. HFSS programming is used to investigate the projected channel.

This emulator is based on full wave investigation strategies and uses similar input circles, as well as providing a three-layered workplace, apparatuses, and other ideal microwave instruments, to provide an appealing and optimal climate for planning, as noted and seen taking into account the product pattern, the range goal of an effect in this product should be limited. Because the lattice model scope of pattern structure is still up in the air, we put the perspective on the pattern in a metal or

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radiation holder. Assuming that the product's imitated reaction is nearly identical to the architect's ideal reaction, we can achieve the architect's desired boundaries using the settings segment. The perfect channel was run on a miniature strip transmission line after the re-enactment, and the processes of this illustration of miniature strip channels are clarified in a photo from the generated low pass channel. The organization analyzer compares the re-enacted run to the estimated channel, and the reproduction and manufacturing outcomes are shown separately by red and blue lines. The discrepancy between the consequences of reproduction and development was split rather evenly. It's undeniable that the consequences are extremely similar.

4. RESULTS AND DISCUSSION

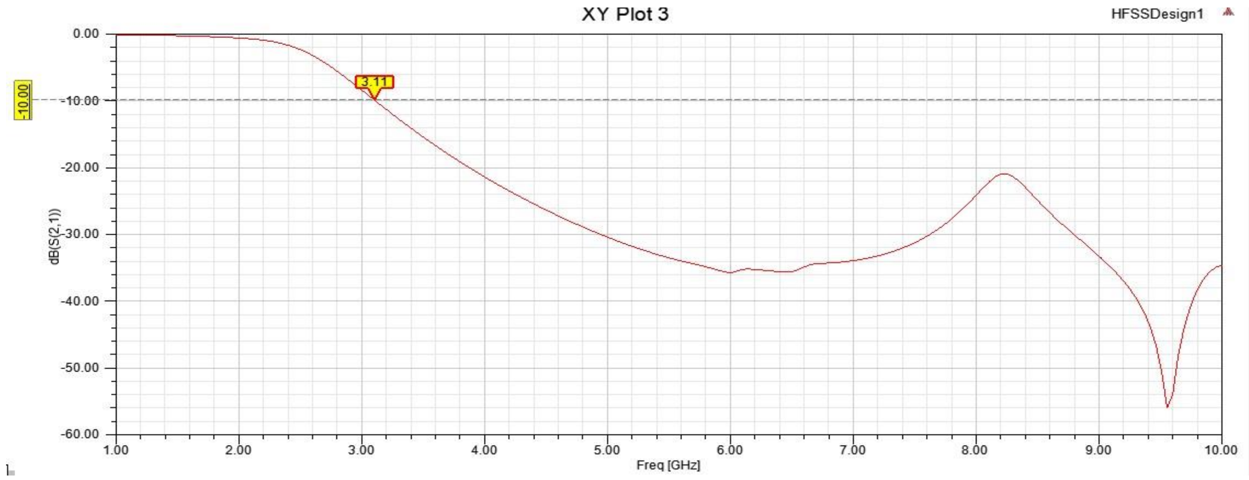

Figure 3: Reflection coefficient

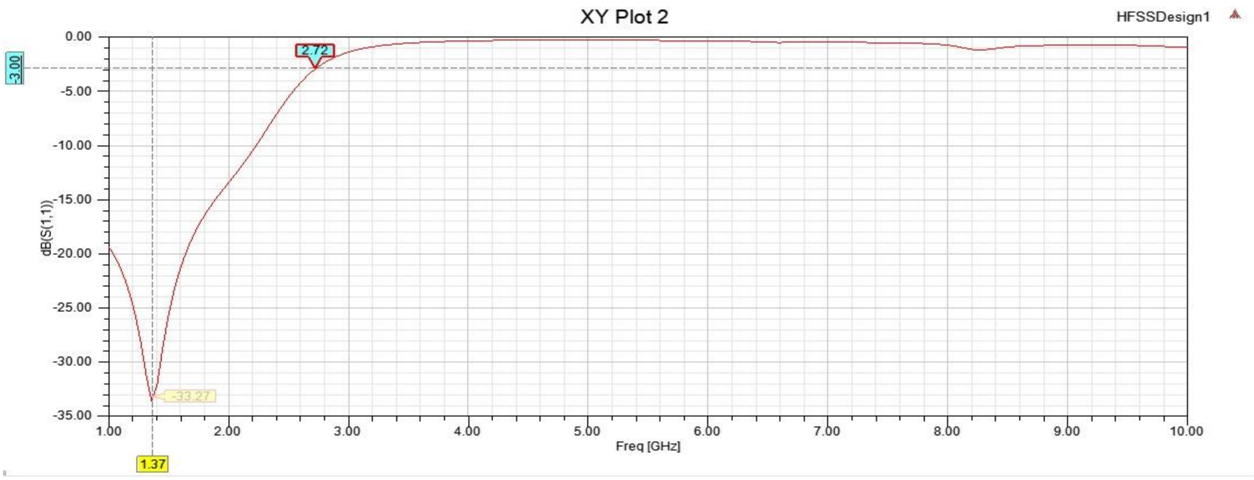

Figure 4: Transmission coefficient

The outputs of the design, simulation, and measurement are provided. The prototype is created and build on FR4 Epoxy microwave dielectric board (_=4.4 and tan = 0.02), with the prototype's middle frequency 'f 0' being 3 GHz, and simulated also measured output of low pass filter is presented in the figure above. After final designing in the software, extra modification and optimization in the HFSS is required to account for open ports and the dissipation effect of micro strip lines. The substrate's physical dimensions are 18mm x 15.5mm x 1.6mm, and the passband of this low pass filter is 0.22 GHz, with a frequency range of 2.5 to 3 GHz, making it suitable for wireless communication in WSN and RFID applications. The rectangular slot is filled with FR4 epoxy substrate in the first case, and another substrate is placed on top. For comparison, the measured S-parameter is shown beside the simulated result using Ansys HFSS. The simulated and measured findings are very similar. 2.5 GHz is the measured 3 dB.

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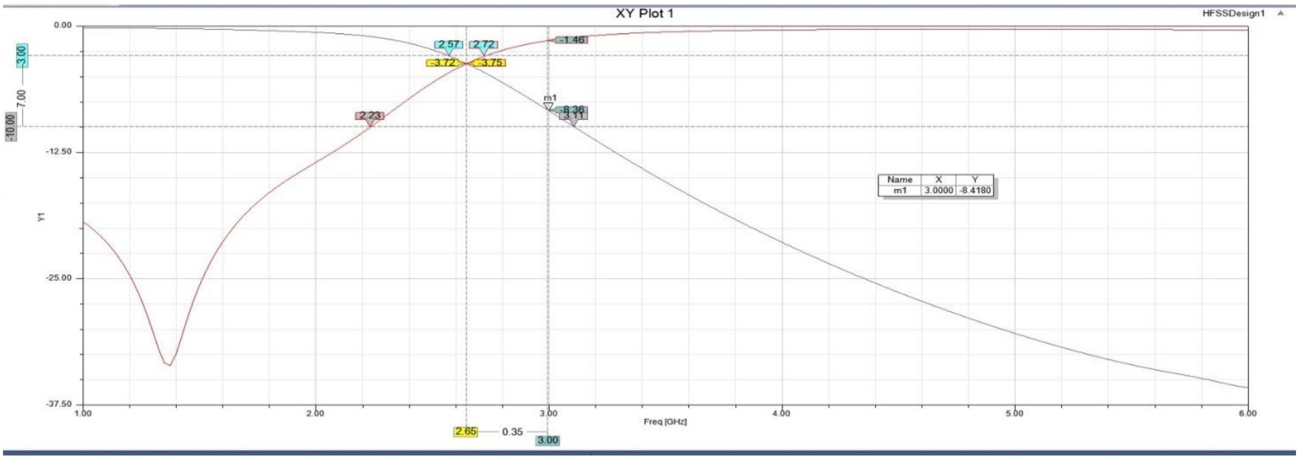

Figure 5: Parameters Analysis

5. CONCLUSION

Micro strip lines having both an extensive and low impedance characteristic were used to build a Low Pass microwaves filter with step impedance. The low limitations we explain when the filter's floor is in the slicing band range from 1 to 0 impedance, despite the same old implementations. Furthermore, obviously it depends on the substrate, those are superior filters with limited length constraints due to the process being concise and dense. This work analyses to be executive steps of micro strip filter out with approach of a step impedance from design to make with the aid of design approach with helping pc and demonstrating methods It increase the capacity of a micro strip filter out with assisting our micro strip technology and frequency reaction and improve the energy return losses with the aid of design method with assisting pc. To improve frequency responsiveness, this design pattern suggests raising the ratio of high to low feature impedance. The strategies to enhance the coefficient dielectric, minimise substrate thickness, and maintain regular widths to achieve this goal and solve difficulties such as higher creating tolerances, width revival, and the avoidance of pass waft. All of these strategies lead to a smaller clean-up area. It should be noted that the methods presented in this study can be used to reduce the length and keep improving the frequency response of a variety of microwave filters for use on micro strip transmission lines.

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