DESIGN OF DUAL BAND ANTENNA FOR KA BAND AND KU BAND AND COMPARISION OF THE RETURN LOSS AND VSWR WITH CIRCULAR PATCH ANTENNA

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ABSTRACT

To design of dual band antenna for ka band and comparision of the return loss, VSWR for low band (4–8 GHz) of circular patch antenna is presented. The triple bandpass filter insertion loss is increased -3.63dB,-3.12dB at 6.2GHz, 8GHz, according to simulated and experimental results. With the assistance of Ansoft HFSS adaptation 14.0 programming, this dual-band antenna channel was planned and its exhibition was assessed.

Keywords: Circular Patch, Return Loss, VSWR, Insertion Loss, Dual Band, Ansoft HFSS.

I. INTRODUCTION

The research is about the design of a dual-band for ka band Using Inverted S-shape Resonator. This research is important to reduce return loss in circular patch antenna with CPW dual-band bandpass filter. A unit or structure that displays resonance or resonant activity is referred to as a resonator. Resonators may be used to create specific frequency waves or to pick certain frequencies from a signal. The applications of this research are Broadcast radio, wireless communication and television.

The growing demand for wireless services, as well as the rapid advancement in wireless networking technologies, necessitates miniaturization and multiband services, making multiband filters a very appealing option. As a result, multi-band bandpass filters with low insertion loss, small scale, and ease of integration are very appealing. In this article, we present a novel multiband BSF architecture concept based on a meandered DMS (MDMS) system with a small footprint. A resonator is formed by a meander line with a rectangular stub that is connected digitally to produce series capacitance. A multi-set of resonators is a popular method for developing quad-band BPFs. The authors suggest two sets of stepped-impedance resonators (SIRs) or stub-loaded resonators (SLRs) with standard input and output ports (2016). High stability, high reliability, and high integrity are all benefits of multi band communication systems. Compact microwave instruments capable of operating in more than one frequency band have been widely developed in advanced wireless communication systems. Metamaterials are artificially built periodic systems with peculiar electromagnetic wave propagation characteristics dual-band bandpass filters (BPFs) are an essential component of a tri-band transceiver. Traditional stepped-impedance resonators (SIRs), such as the ones suggested, can be used to create tri-band BPFs. Multi-mode resonators, such as the stepped impedance resonator (SIR) and the stub loaded resonator (SLR), are commonly used in the construction of multi-band filters.

II. METHODOLOGY

Circular Microstrip

In sample preparation group 1, the proposed filter is printed on a 1.6 mm thick FR-4 epoxy glass layer. At core frequencies of 2.0 GHz, 4.25 GHz, and 5.6 GHz, the 3-dB estimated fractional bandwidths are 40 percent (1.6–2.4 GHz), 16.5 percent (3.9–4.6 GHz), and 14.3 percent (5.2–6.0 GHz), respectively. The electrical circuit size of this filter is 0.22g 0.16g, where g is the directed wavelength at the middle frequency of the first passband 2.0 GHz. Fractional bandwidth, entry loss; dielectric constant, return loss, circuit duration, and group delay are the output parameters of the built filter. The proposed filter is validated using both simulated and calculated data. The dual-band for ka band is similar to the circular patch antenna triple band filter in this analogy. In the old filter, they used a Metamaterial Inspired band filter, but in the new one, we used a CPW dual-band bandpass filter
Ka Vs Ku Band

Ku-band uses roughly 12-18GHz, and Ka band administrations utilizes the 26.5-40GHz fragment of the electromagnetic range. "Ku" means "Kurz unten" – German for the band just under the "short" or K-band. Of course "Ka" means "Kurz above". This is on the grounds that Ku is the lower part of the first NATO K band, which was parted into three groups (Ku, K, and Ka) in light of the presence of the environmental water fume reverberation top at 22.24 GHz, (1.35 cm), which made the middle unusable for long-range transmission.

Insertion Loss

CPW dual-band bandpass channel gives off an impression of being emanated at higher addition misfortune contrasted with microstrip dual band channel. When contrasted with a roundabout fix, the dual band pass channel has a recognizable improvement in inclusion misfortune.

III. MODELING AND ANALYSIS

![Figure 1: Experiment Setup](image1)

![Figure 2: Project Model](image2)

IV. RESULTS AND DISCUSSION

Performances of dual-band for ka band and Microstrip dual-band filter are analysed. The return loss and VSWR results have been simulated for CPW dual-band bandpass filter. The proposed design of CPW triple band bandpass filter has an insertion loss of -3.63dB, -3.12dB at the frequency of 6.2GHz, 8GHz which is shown in Fig 3. After analysing the simulation curves, it has been observed that the CPW band pass filter has better insertion loss than the Microstrip dual band filter. The comparison of insertion loss for CPW dual-band band-pass filter with Microstrip dual-band filter is tabulated in Table 3. Statistical Analysis is done by using SPSS software. From the Statistical analysis there is a statistically significant difference between the groups.

<table>
<thead>
<tr>
<th>Type of band pass filter</th>
<th>Frequencies(GHz)</th>
<th>Insertion loss(db)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual band for ka band(proposed)</td>
<td>6.2GHz, 8GHz</td>
<td>-3.7db, -3.6db</td>
</tr>
<tr>
<td>Circular Patch(existing)</td>
<td>6.9GHz, 8.2GHz</td>
<td>-3.2db, -1.1db</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR4 Epoxy</td>
<td>10</td>
<td>11.3660</td>
<td>8.51950</td>
<td>.35896</td>
</tr>
<tr>
<td>Rogers10 TMM</td>
<td>10</td>
<td>14.7040</td>
<td>9.09366</td>
<td>.25897</td>
</tr>
</tbody>
</table>
Figure 3: Insertion loss of dual band for ka bandpass filter at 5.8GHz, 6.2GHz, 8GHz are -2.54dB, -3.63dB, -3.12dB. The x-axis is Frequency and the Y-axis is S (2, 1).

V. CONCLUSION

A comparison between the enhancement of return loss and VSWR of three band pass filters shows that there is significant difference between the two groups performed in this work. CPW dual-band bandpass filter appears to be radiated at higher insertion loss compared to microstrip triple band filter. When compared to a circular patch, the triple bandpass filter has a noticeable improvement in insertion loss. The triple band pass filter return loss, VSWR is improved to -3.63dB, 3.12dB at the frequency of 6.2GHz and 8GHz, according to simulated and experimental findings in Ansoft HFSS 14.0 version software. By modifying the type of filter, this work can be expanded to increase the insertion loss.

VI. REFERENCES


