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Design Of Wide Band Microstrip Power Divider Using Advance Design System

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***Abstract*— The design of micro-strip power divider is constructed by dividing Quarter wavelength transmission line into two. The simulation platform which we are going to use is Advanced Design System (ADS). Complex isolation component provides physical separation and electrical isolation between two output ports. In the proposed method, good impedance matching at all the three ports and perfect isolation between two output ports are obtained over the specified 2-12 GHz WB range coupled line section. It can also be used as power combiner when used in reverse. This microstrip circuit with FR-4 substrate with suitable length, width, permittivity is analysed using ADS software. Here the power dividers are implemented in microstrip transmission medium. The proposed model of power divider operates in wide bandwidth with good isolation factor. Finally, the performance of equal split power dividers are examined and the simulated results are compared with measured results.**

I. Introduction

A 3-dB power divider is build using this 50-25Ω impedance transformer as its two arms in parallel.The design parameters of the proposed power divider are examined and initially determined based on its equivalent ideal transmission-line model[2]. Finally, a 3-dB power divider is designed and fabricated. The aim of this paper to design, build, analyze and better understand an equal split power divider. A compact equal power divider is designed, and it is demonstrated that 3 db powers divide from one input port to two output ports is achieved. In addition, good impedance matching at all the three ports and better isolation between two output ports are obtained over the specified 2-12 GHz WB range with suitable length, width, permittivity of dielectric material(FR-4)(Er).

II. Wideband Microstrip Power Divider Design

In this paper, The divider is established by introducing variable width of microstrip line between input lines to output line of different impedance to achieve the ultra-wideband performance. Good insertion/return losses are achieved as illustrated in simulation and measurement. In the following, the design results shows that the proposed WB power divider has more advantages, such as wide bandwidth, large one input and two output ports, excellent input impedance matching, small insertion loss, good balance of amplitude and phase at output ports, and flat group delay within the WB[2]. It can be utilized to a wideband active power-combining system and can include large numbers of active power devices to provide high power.

A. Structure And Design Of Two-Way Power Divider

Fig.1 shows the layout of proposed two-section Wilkinson power divider with matched port. For better coupling and impedance matching, as can be seen in Fig.1.The proposed WB power divider is simulated with commercial software

ADS and measured by Agilent network analyzer. The size of a power divider with relative good performance were determined. The isolating resistor R=100Ω. Basically the structure is based on the method of microstrip variable width and to improve the large bandwidth using variable width technology which is shown in Fig.1 shown the width and length of substrate. The wideband power divider has simulated and measured on the FR-4 substrate with a dielectric constant of 4.6 and a thickness of 1.0 mm.

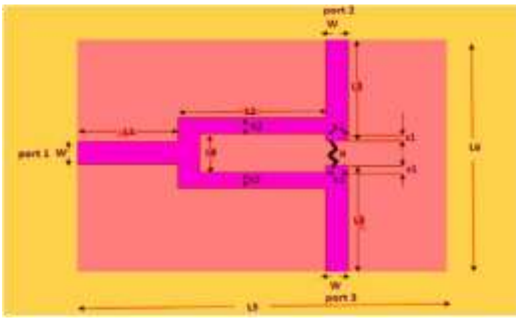

Fig.1. Model layout of the proposed power divider

TABLE I. DIMENSIONS OF THE PROPOSED POWER DIVIDER(IN MM)

(Dimensions 15mm x 10mm)

Dimension	L1	L2	L3	L4	L5
Calculated value	4.1	6.0	4.2	1.7	15
Dimension	L6	X1	X2	W	S1
Calculated value	10.3	0.9	0.7	1.0	0.3

III. Layout Of Design

The layout of the design is designed using ADS software. Advance Design System is an electronic design automation software system produced by Keysight EEs of EDA, a division of Keysight Technologies. It extends an integrated design environment to designers of radio frequency electronic products such as mobile phones, pagers, wireless networks, satellite communications, radar system, and high-speed data links.

Keysight ADS supports each step of the design process-schematic capture, layout, design rule checking, frequency and time-domain circuit simulation, and

electromagnetic field simulation-allowing the engineer to fully characterize and optimize an radio frequency design without changing tools.

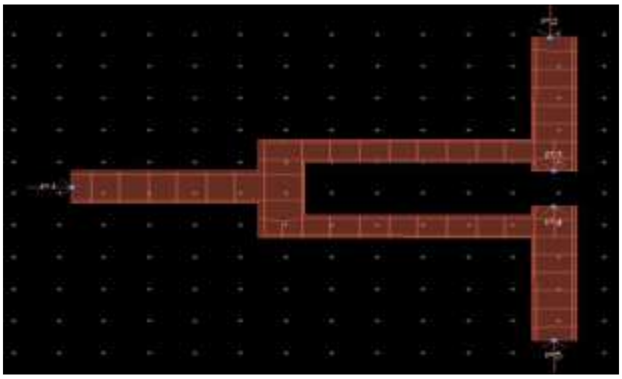

Fig 2. Layout of equal power divider

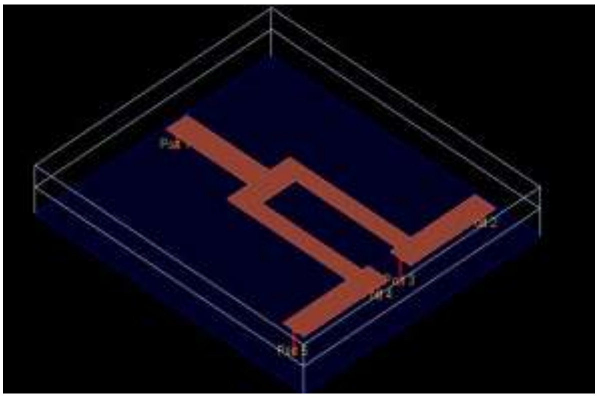

Fig 3. 3 D view of equal power divider

IV. RESULT

The simulated result of return loss for equal power divider is about -15.669dB at the frequency of 5.570 GHz is shown in the fig.4.

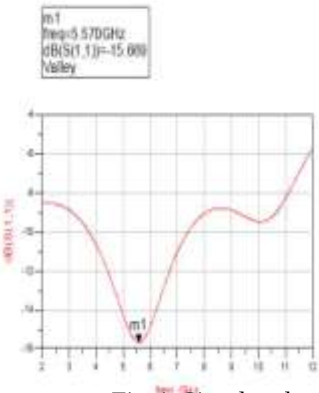

Fig 4. Simulated result

Return loss is a scalar measure of how near the actual input impedance of the network is to the nominal system impedance value and, expressed in logarithmic magnitude.

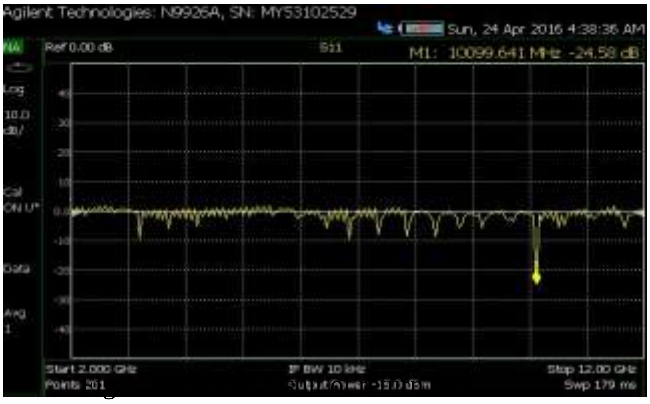

Fig 5. Measured result of return loss

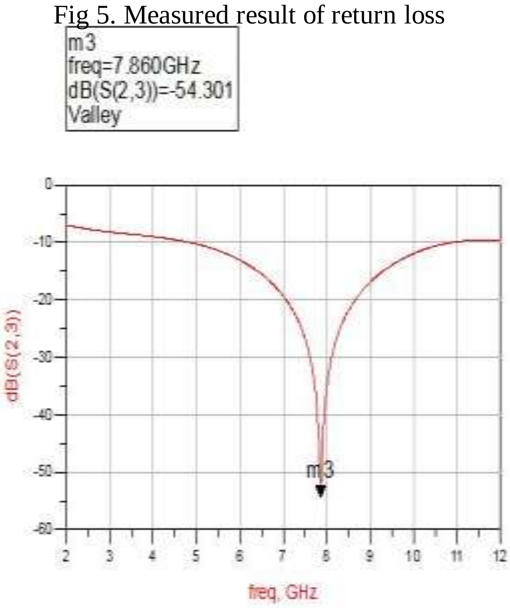

Fig 6. Simulated result of Insertion losses

Fig.6 shows the simulated insertion loss is -3.723dB at 2.440GHz.

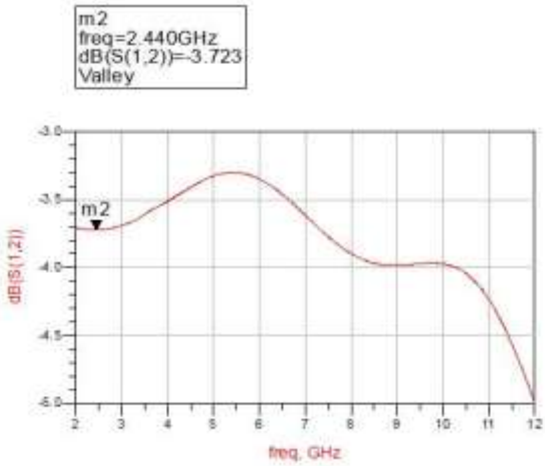

Fig 7. Simulated Isolation Results

Fig.7 shows the simulated isolation value is -54.301 at 7.860GHz.

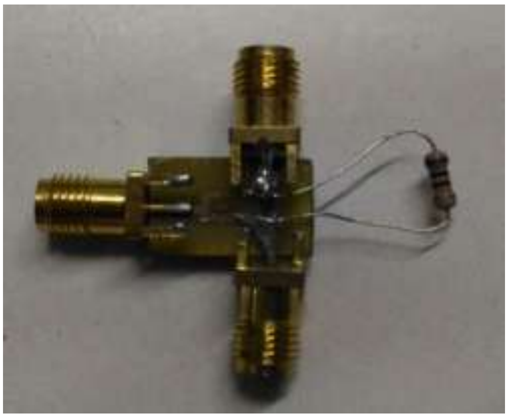

Fig.8. Fabricated structure of power divider

V. CONCLUSION

A compact power divider is designed, and it shows that 3dB powers splitting from one input port to two output ports is achieved. Through the simulation, good power splitting and impedance matching can be obtained. The structure occupies an area of 15mm x 10mm.The circuit integration is upgraded because of the special placement of the isolation elements. Simulated and measured results show that it makes the 3dB power divider work preferably in a wide bandwidth. The simulated and measured input return loss is approximately 24 dB. The simulated insertion loss is approximately about 3.723 at 2.440 GHz. The isolation achieved here is of higher value of about 54.301 at 7.860 GHz. Thus, a very high isolated output is obtained at wideband which is the main aim of the proposed model. Comparing the simulation and measurement return loss and isolation of the power divider also shows that they are in good agreement, except some frequency shift which may result from the fabrication tolerances. The simulation and measurement results of the designed power divider indicated the effectiveness of the proposed method.

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