1928
K N Toosi University of Technology
Faculty of Electrical Engineering
Center of Excellence in Computation and Characterization of Devices and Subsystems

The Second Iranian Conference on Engineering Electromagnetics (ICEEM 2014), Jan. 8-9, 2014

Iranian Scientific Society of Engineering Electromagnetics

Broadband Half Mode Substrate Integrated Waveguide Cruciform Coupler

Z. Mansouri [1*], M. Kishihara [2], F. B. Zarrabi [3], and F. Geran [4]

[1] Department of Electrical engineering, Sciences & Research Branch, Islamic Azad University Hesarak, Tehran, I. R. Iran
[2] Okayama Prefectural University Faculty of Computer Science and System Eng . 111 Kuboki, Soja, Okayama, 719-1197 Japan
[3] University of Tabriz, Faculty of Electrical and Computer Engineering, Tabriz, Iran
[4] Shahid Rajaee Teacher Training University, Faculty of Electrical and Computer Engineering, Tehran, Iran

[*]Corresponding author: zm.mansouri@gmail.com

ABSTRACT— **In this paper, a cruciform coupler with half mode substrate integrated waveguide structure is presented. The prototype coupler consists of four half mode SIW structures crossing each other in right angle and two metallic posts are inserted in free section of junction in order to reach the coupling properties. Compact size and broadband operation are the features of this coupler. The size of coupler is reduced about 24% compared to previous HMSIW cruciform coupler and arround 40% smaller than the SIW cruciform coupler. a fractional bandwidth of about 35 percent is obtained. The coupler has been designed and simulated with HFSS13 and CST microwave studio for full wave simulation. Here, the simulation results have been compared with experimental results.**

KEYWORDS: half mode SIW, substrate integrated waveguide, cruciform coupler, directional coupler, millimeter wave

I. INTRODUCTION

In recent years by development of communication and radar systems at high frequency range, new structures should be designed for wave transfer at these frequencies. Low loss and small size should be considered in millimeter frequency range [1] 90 degree hybrids are used in many applications in telecommunication circuits such as modulators, mixers, feed networks and other microwave devices. Branch line, Lange, Bethe hole, short slot and cruciform coupler are different conventional types for 90 degree hybrids [2]. The cruciform couplers are attractive due to some advantages such as compactness, simplicity, planar structure, right-angled input/output ports, high handling power, flat coupling and broadband quality [3, 4]. So many researches have been done on design and improvement of these couplers. Wide bandwidth and small size are 2 goals in design~~ing~~ of these couplers.

Substrate integrated waveguide is a new structure for using in high frequency applications. It is a new type of rectangular waveguide in which sidewalls are replaced by a row of metallic posts. Low loss, high Q factor, high power quality and easy fabrication are the advantages of SIWs. [5, 6] In the last decade, by developing rectangular waveguide