Computer-Aided Design and Analysis of Different Configurations of Singly - Balanced Microstrip Diode Mixers Using the Modified MSDES and ADS Packages

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Abstract—**The aim of this paper is to introduce the computer aided design and analysis of different configuration of singly-balanced Microstrip diode mixers using the recent MSDES program developed by the author and the recent ADS package. The design stages of the Microstrip Mixers including the design of hybrid couplers, Design of matching circuit that matches the diode input impedance to the coupler, and design of Lowpass filter that passes the IF output signals are introduced. The Teflon substrate with substrate parameters er = 4.3, H = 1.35 mm and T = 0.035 mm is used for the mixer circuit design and analysis. The ADS layouts and the applications of the designed Microstrip mixers are presented. Key Words: Microwave Circuits and systems, Computational Microstrip Circuit Design, Microwave Circuits analysis**

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I. INTRODUCTION

Recently many works have been performed for the design and fabrications of the individual parts of the microwave transceiver circuit such as amplifiers, oscillators and mixers using Microstrip technique [1-6]. In the beginning of 1990, the works of fabrication of a complete Microstrip transceiver has been started especially for the military applications. Figure 1 shows the block diagram of transceiver. It comprises a 4-GHz Microstrip negative-resistance oscillator (NRO), 4-GHz broadband Microstrip amplifier (BMA), a 7-dB power splitter using Microstrip branch coupler (MBC), singly balanced diode mixer (SBDM) with 4-port/5-port rate-race, Lange coupler or rectangular branch coupler, Microstrip Lowpass filter (LPF) and TRS [1-2].

For Singly-balanced diode mixer The input signals for the rate-race, Lange or branch-line coupler are: 1) the reference LO input signal comes from 2.4 GHz NRO through the coupled port of 9dB MBC and 2) the received RF signal comes from antenna through TRS and 2.4 GHZ BMA [7-15]. The IF output signal is extracted from the mixer output through Microstrip low-pass filter (LPF). The design of the different configuration of single-balanced diode mixer is performed completely with the aid of the full-scale computer simulation program developed by the author [16-18] while the analysis and optimization are performed using the ADS2017 software [19]. The Microstrip substrate parameters with 50-Ω normalized impedance are: relative permittivity (ε_r) = 4.3 , substrate height (H) = 1.58 mm, and conductor thickness (T) = 0.035 mm.

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