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Conference Programme

EKC 2019

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Vienna University of Economics and Business
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[D3/D6_8] Future RF and Microwave Technologies

18 Jul (Thu) 16:45 – 18:00

Convener/Chair	DR. CHOI, Heungjae (Ser Cymru Research Fellow, Cardiff University)
Room: 5.18	DR. CHOI, Jung Han (IC-Design Project Manager, Fraunhofer Heinrich Hertz Institute HHI)

16:45 – 17:05 INVITED

Noise reduction techniques for human vital-signal radar sensors

Kawon Han, Songcheol Hong

EE School, KAIST

17:05 – 17:20

Embedded Packaging Technologies for Microwave and mmWave Applications

Dongsu Kim, Jong-Min Yook, Jun-Chul Kim

KETI

17:20 – 17:35

A Return Loss Equalizer Using Non-reciprocal Device for In-band Full-duplex RF Front-end

Junhyung Jeong[1], Girdhari Chaudhary[1], Phanam Pech[1], Dongshin Kim[2], Yongchae Jeong[1]

[1]Chonbuk National University, [2]Korea Electronics Technology Institute

17:35 – 17:45

Portable Microwave Power Excitation System Based on Substrate Integrated Waveguide Resonator for Rapid DNA Extraction

Heungjae CHOI

School of Engineering, Cardiff University

17:45 – 18:00

Ultra low-power high-speed IC and high-frequency packages for optical communication transceivers

Jung Han CHOI

Fraunhofer Heinrich-Hertz Institute

A Return Loss Equalizer Using Non-reciprocal Device for In-band Full-duplex RF Front-end

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Abstract

The full-duplex scheme has high spectral efficiency because it performs transmission and reception simultaneously in the same frequency band. However, as using the same frequency band for the transmitter and the receiver, high isolation characteristics between the transmitter and receiver are required. If isolation characteristics are not sufficient, a relatively high power transmitting signals leak into the receiver and cause unwanted interferes or abnormal operations. The circulator is mainly used to increase the isolation between the transmitter and the receiver. Transmission and reception operations with one antenna using a circulator can cancel out the transmission leakage signals at the receiver by using a cancellation path between the transmitter and the receiver[1]. Typically, the RF front-end requires a 60 dB isolation. However, when the circulator is used, the reflected transmitting signals from the antenna is directly transferred to the receiver according to the return loss characteristic of the antenna. The reflected signals from the antenna are unneglectable, and the broadband isolation characteristic is degraded due to the typical narrowband reflection characteristic of the antenna.

This paper presents a return loss equalizer using a non-reciprocal device to improve the isolation characteristics of full-duplex RF front-end according to the reflection characteristics of antennas. The proposed circuit consists of a 3-dB Wilkinson power divider and two circulators. One terminal of a 3-port circulator is open or short-circuited to implement a 2-ports non-reciprocal circuit. The output of the Wilkinson power divider is delivered to the antenna using the respective open and shorted 2-port non-reciprocal circuits. In this case, the forward transmission characteristics are 180 degrees phase difference with each other, and the reverse transmission has the same transmission characteristic. As a result, the signals reflected from the antenna after forwarding transmission are recombined in the Wilkinson power divider through reverse transmission and canceled out each other. In the receiving process, since only the reverse transmission is performed from the antenna, two received signals are combined in the Wilkinson power combiner. The more than 20 dB return loss bandwidth of patch antenna is 32 MHz at 2.14 GHz. Proposed circuit has 140 MHz broadband return loss characteristics. Therefore, the proposed circuit can be used to improve the broadband cancellation characteristics in full-duplex RF front-end.

Keywords: *full-duplex, non-reciprocal, returnloss equalizer*

References

[1] 1. D. Bharadia, E. Mcmilin, and S. Katti, “Full duplex radios,” in Proc. ACM SIGCOMM 2013 Conf. on SIGCOMM, pp. 375~386, Oct. 2013.

Biography

Junhyung Jeong was born in Seoul, Republic of Korea, in 1987. He received the B.E. degree in electronics & information engineering from the Chonbuk national university, Republic of Korea, in 2012, the M.E. degree in electronics engineering from the Chonbuk National University, Republic of Korea, in 2014. He is currently working toward the Ph.D. degree at Division of Electronics Engineering, Chonbuk National University, Republic of Korea. His research interests in RF filter, high-efficiency PA