ABSTRACT

Wireless communications is ubiquitous nowadays. Global information exchange between users and/or machines becomes very common. Mobile devices such as smart phones, iPAD and laptops are used for these purposes. With the increasing demand for high speed wireless communication system to support consumers's needs for real time streaming of high definition (HD) video and fast file transfers, high data rate is required in the radio systems. In addition, the radio system must be compact, low cost and low power for especially for commercial wireless application.

Six-port receivers have been attracting attention at the mm-wave frequencies. They offered many advantages as compared to the conventional receiver architecture at the mm-wave frequencies in terms of bandwidth, size and power consumption. Six-port receiver consists of three building blocks namely six-port correlator, power detection and baseband recovery. The six-port correlator is the fundamental building block of a six-port receiver. However, it suffers from non-ideal effects such as amplitude imbalance and phase imbalance contribute by its building blocks.

In this thesis, analysis had been done on non-ideal effects such as the amplitude and phase imbalance of the two of the literature six-port correlators. Through the analysis, two novel six-port correlators were designed and sent for fabrication. Eventually, the two proposed six-port correlators were simulated together with the power detectors and amplifiers to demonstrate its intended operation as six-pot receivers.

List of Publications

Journal

P. S. Chew, K. Ma, Z. H. Kong, and K. S. Yeo, "Miniaturized Wideband Coupler for 60-GHz Band in 65-nm CMOS Technology," *IEEE Microwave and Wireless Components Letters,* vol. 28, pp. 1089-1091, 2018.

P. S. Chew, Z. H. Kong, B. Liu, C. C. Boon, "A Compact Rat-race Coupler for 60-GHz Band in 40-nm CMOS Technology," *IEEE Microwave and Wireless Components Letters (To be submitted)*

P. S. Chew, Z. H. Kong, B. Liu, C. C. Boon, " Two Six Port Correlators Utilizing Multi-layer Hybrid Coupler, Rat Race Coupler and Wilkinson Power Divider with Complete Coverage of 60GHz Band," *IEEE Transactions on Microwave Theory and Techniques (To be submitted)*

Conference

P. S. Chew, K. S. Yeo, K. Ma, and Z. H. Kong, "A 57 to 66 GHz novel six-port correlator," in *2015 IEEE 11th International Conference on ASIC (ASICON)*, 2015, pp. 1-4.