Abstracts

Vector modulator for W-band software radar techniques

D.S. McPherson and S. Lucyszyn. "Vector modulator for W-band software radar techniques." 2001 Transactions on Microwave Theory and Techniques 49.8 (Aug. 2001 [T-MTT] (Mini-Special Issue on the 2000 IEEE Radio and Wireless Conference (RAWCON))): 1451-1461.

Direct-carrier modulation is an attractive technique for low-cost high-performance radar transceivers. In this paper, it is shown that, when the technique is applied to a generic homodyne radar architecture, the signaling waveform can be software adapted without requiring any hardware modifications. The key circuit in this novel software radar is a W-band monolithic I-Q vector modulator employing two push-pull (bi-phase) amplitude modulators. To fully exploit this circuit's capacity to generate accurate constellations at millimeter-wave frequencies, a generalized theoretical analysis of the I-Q (push-pull) vector modulator is presented. This is a comprehensive analysis of the topology and does not assume ideal components. As a demonstration of the vector modulator's flexibility, a 76.5-GHz MMIC version has been fabricated and characterized by means of static S-parameter measurements and by several modulation spectra. Based on the theoretical model and the measured results, the I-Q (push-pull) vector modulator promises to be a vital component for the realization of future software radar.

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