Abstracts

Correlation of nonlinear distortion in digital phased arrays: measurement and mitigation

L.C. Howard and D.J. Rabideau. "Correlation of nonlinear distortion in digital phased arrays: measurement and mitigation." 2002 MTT-S International Microwave Symposium Digest 02.1 (2002 Vol. I [MWSYM]): 49-52 vol.1.

In a digital array, each receiver performs analog-to-digital-conversion (ADC), with the resulting digital data later combined via digital beamforming techniques. Since ADC is performed prior to beamforming, it is thus theoretically possible to enhance the dynamic-range (DR) of the individual receivers through post-ADC array integration gain. In practice, however, DR enhancement is limited by correlation of the nonlinearities (from receiver to receiver). Worse still, little published data exists on this subject (i.e. suitable for quantitatively assessing the correlation coefficients). This makes it difficult to predict how much DR enhancement will be achieved on real digital. arrays. This paper describes the results of recent experiments involving a, four-channel digital receiver system. The system was used to measure the correlation (between receivers) of different types of nonlinear distortion. The measurements quantitatively demonstrate that some nonlinearities are highly correlated. Next, the system was used to evaluate a recently proposed method for decorrelating nonlinear distortion in digital arrays. The measurements show that the mitigation technique is successful in decorrelating some nonlinear signal components.

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