

IF to IF Simulation of Wireless Links Using Commercial CAD Software

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Abstract

This work explores, by way of example, the application of modern CAD software to the simulation of RF communication system hardware. We restrict attention to the front-end analog portions of a typical communication link; that is, our coverage is from IF-to-IF. A 915 MHz breadboard system is used in a case study that compares measurements and simulations of various receiver and transmitter sub-system scenarios; the IF frequency is 70 MHz for both sub-systems. Performance parameters examined for the transmitter and receiver sub-systems include small signal frequency response, 1 dB gain compression power levels, and third-order-intercept (TOI). In addition, simulated and measurements for the receiver noise figure are compared. Finally, the transmitter and receiver are connected together with a variable attenuator to examine overall link performance, while leaving free-space propagation and channel modeling issues for future work. It is shown that after "calibrating" the system CAD representations of the transmitter and receiver sub-systems using component behavior, good predictions of in-band performance can be achieved for all parameters examined. The differences between CAD library (ideal) filters and measured filters can cause significant out-band discrepancies between simulated and measured sub-system behavior.

Biography of Presenter

Lawrence P. Dunleavy received the B.S.E.E. degree from Michigan Technological University in 1982, and the M.S.E.E. and Ph.D. degrees in 1984 and 1988, respectively, from the University of Michigan. He has worked in industry for ESystems and Hughes Aircraft Company and was a Howard Hughes Doctoral Fellow. In 1990 he joined the Electrical Engineering Department at the University of South Florida, where he now holds the title of Associate Professor. From August 1997 to to August 1998 he enjoyed a 1 year sabbatical research appointment with the Microwave Metrology Group of the National Institute of Standards and Technology (NIST) in Boulder, CO. His current research interests are in the area of accurate microwave and millimeter-wave measurements, measurement-based active and passive component modeling, MMIC design, and wireless systems characterization and CAD. Dr. Dunleavy is a Senior Member of IEEE, is very active in the IEEE MTT Society, and has been an Automatic RF Techniques (ARFTG) member since 1986.