

Charles P. Baylis II*Characterization and Measurement of Nonlinear Power Amplifiers*

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Nonlinear measurements in the microwave frequency range (200 MHz – 30 GHz) are very important for the accurate characterization of high frequency analog devices to be used in communication and radar systems. The focus of this project will be to investigate the novel use of different high-frequency nonlinear measurement techniques in (1) improving large-signal amplifier designs, and (2) improving characterization and modeling techniques to support designs. Two types of nonlinear measurements that will serve as the focus of this test will be (1) measurements of nonlinear network parameters and (2) performing faster load-and source-pull measurements. In layman's terms, the undergraduate students supported by this proposal will be performing measurements that will be useful in determining the impedances shown to the device to optimize its performance under large inputs that force the device into nonlinear operations. The results of this project will be significant in their application to the design of commercial and military sustainable C4I systems (command, control, communications, computing, and intelligence). These include communication and radar systems.

The proposed project is a Summer-Fall-Spring project. It may be noted that this project, while related to our simultaneous submission of a Faculty Research Investment Program (FRIP) proposal, "Nonlinear Network Parameters for Large-Signal Amplifier Design and Spectral Prediction," is significantly different in the following ways: (1) The FRIP proposal is focused on the development of multiple facets and applications of X-parameters, one of which is in the measurement area. (2) The URSA proposal focuses on nonlinear measurements, one of which is X-parameters. Thus, while the URSA and FRIP proposals have an overlap in the area of X-parameter measurements, the FRIP proposal focuses on innovating a new power-amplifier design paradigm using X-parameters (measurements are an enabling part of this), while the URSA proposal focuses on nonlinear measurement techniques that include but go beyond X-parameters.