NONLINEAR DYNAMICS AND RADIOFREQUENCY INTERFERENCE

Christopher B. Wallace
Northrop Grumman Mission Systems

Wireless technologies are ubiquitous in modern life. As demand grows, the electromagnetic spectrum becomes more crowded thereby stimulating production of new waveforms and information transmission schemes to maximally employ allotted bandwidth, provide basic communication security with reliability, and, hopefully, minimize unwanted interference. Unfortunately, more sophisticated waveforms may come with an unintended price new physical, nonlinear dynamics that can corrupt desired electronic information flow.

The fundamental driven nonlinear element we are concerned with in any particular RF interference phenomena is the semiconductor p/n junction. Associated with it are resistances, inductances, self-capacitance, and external capacitances associated with other elements of the circuit or device of which it is a part. Physical insight comes from understanding effective junction current and voltage behavior and the self-consistent change in boundary conditions associated with the externally imposed RF interaction. Electromagnetic interference response results from voltage sources driving semiconductor devices interacting with complex impedances. The nonlinear semiconductor component response is the basic mechanism by which system level effects are induced.

The purpose of the present paper is to provide an overview, with examples (experimental, computational) of interesting nonlinear behavior introduced by various simple and complex waveforms in electronic components and circuits. This includes periodic, quasiperiodic, and chaotic responses. Measurement and diagnostic capabilities provided by modern commercial instrumentation are exploited to capture both pulsed and continuous induced electronic responses. Data analysis techniques that permit key metrics to be extracted from data will also be described and illustrated, while the robust interplay now possible between theory and numerical simulation provides meaningful explanation of the observed behavior.

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1. (a)
Christopher Wallace
Northrop Grumman Mission Syst
100 Sun Avenue NE
Suite 300
Albuquerque, NM
87109 USA
christopher.wallace@ngc.com
(b) (505) 998-8182
(c) (505) 998-8112

2. E - Electromagnetic Noise and Interference

3. (a)

4. I - Invited Paper, Program chair: Ira Kohlberg

5. No special instructions