



MERIT
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INSTITUTE FOR RESEARCH IN
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& **APPLIED PHYSICS**

High Powered Microwave Wideband Interference on Electronics

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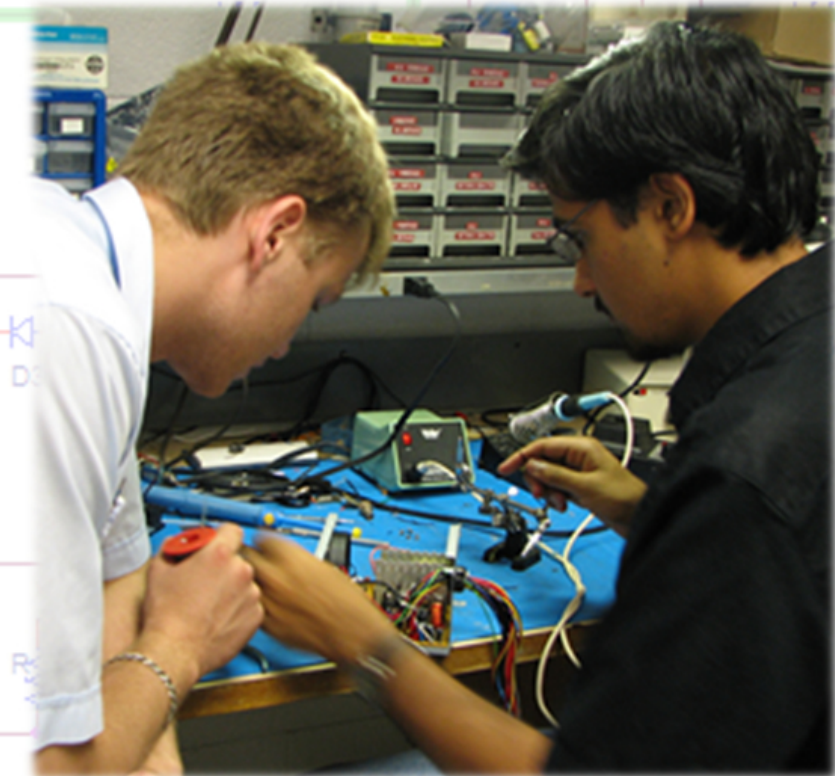
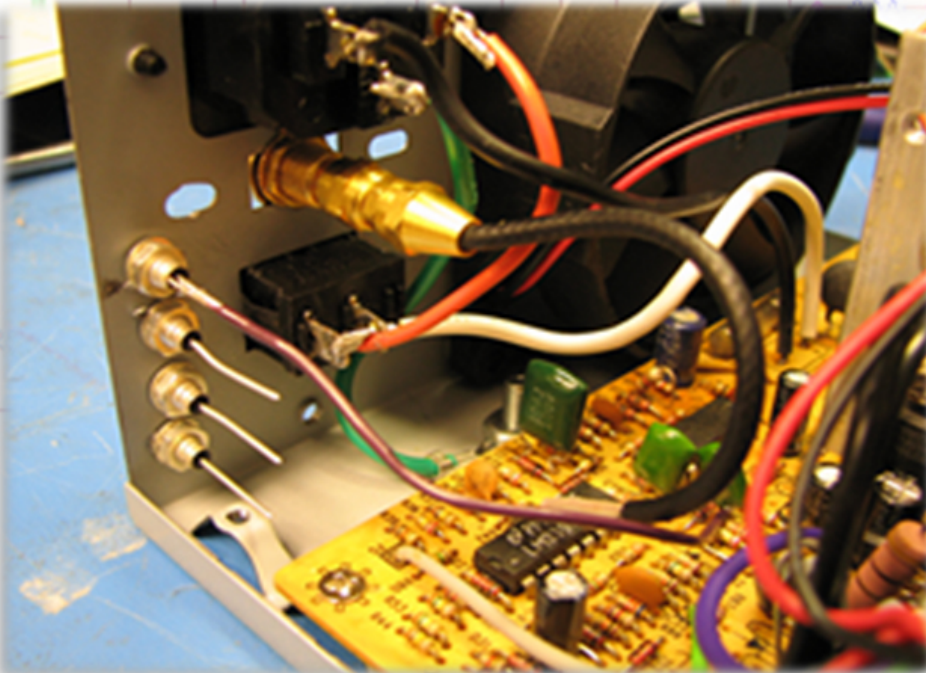
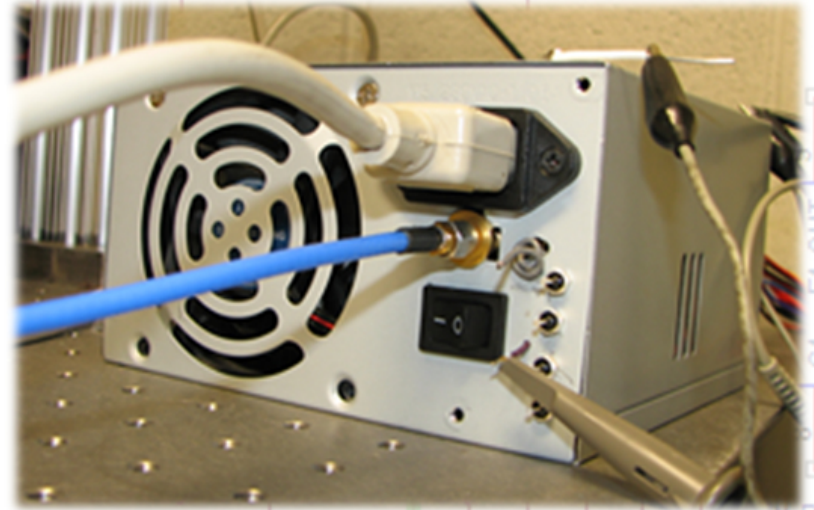
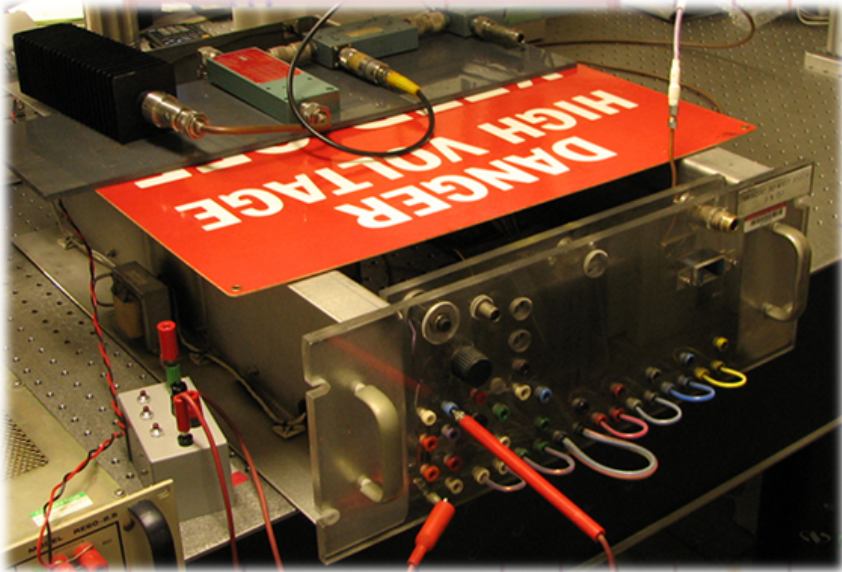
Dr. John Rodgers
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Motivation

- Physical downscaling of integrated circuits lead to lower noise susceptibility
- Proliferation of microwave sources in commercial and military applications
- PN junctions have been shown to rectify coherent RF signals and cause effects in digital electronics
- TWT in a feedback oscillator configuration can produce chaotic wideband signals

Is there a difference between using **chaotic** and **coherent** signals to cause disruptions in electronics?

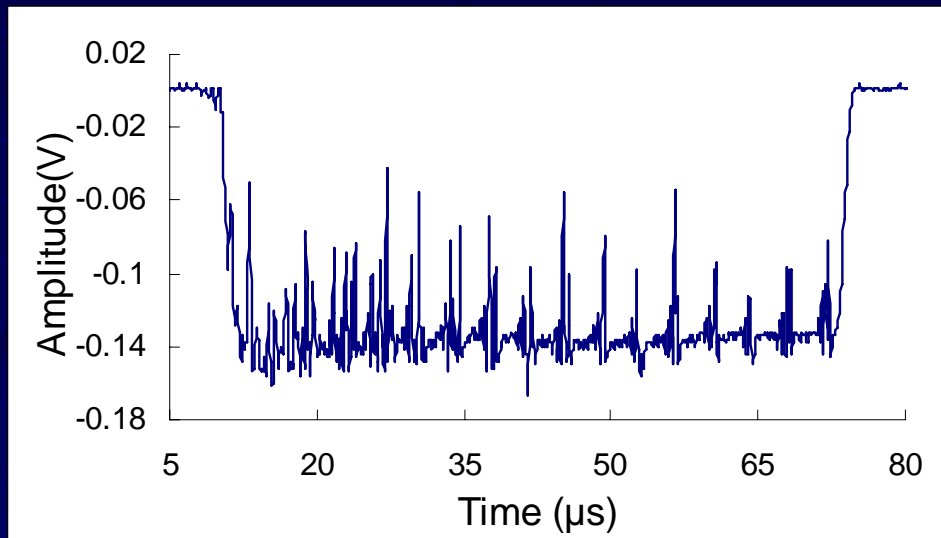
Experiments



Results

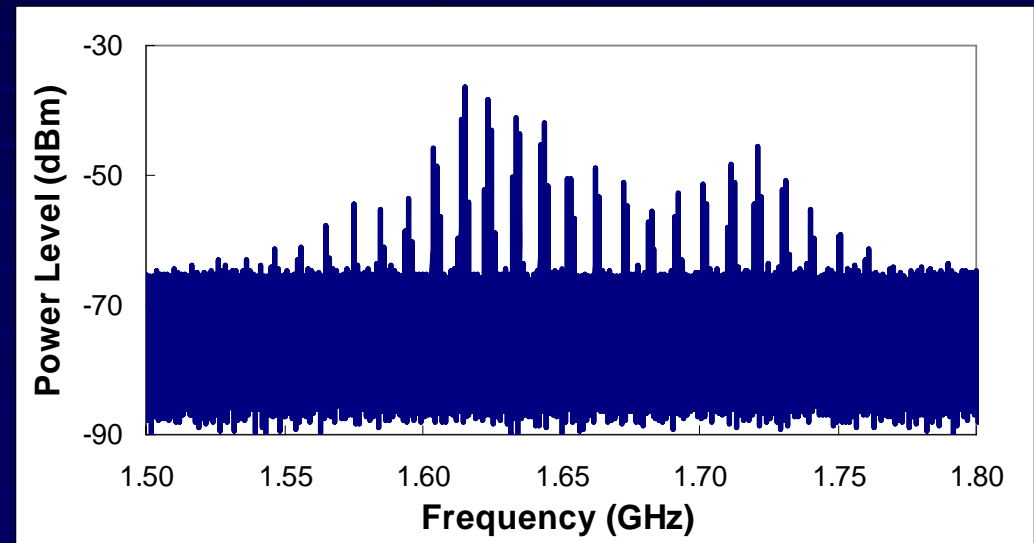
Chaotic Wideband Pulse

Amplitude vs Time



Deep Modulation

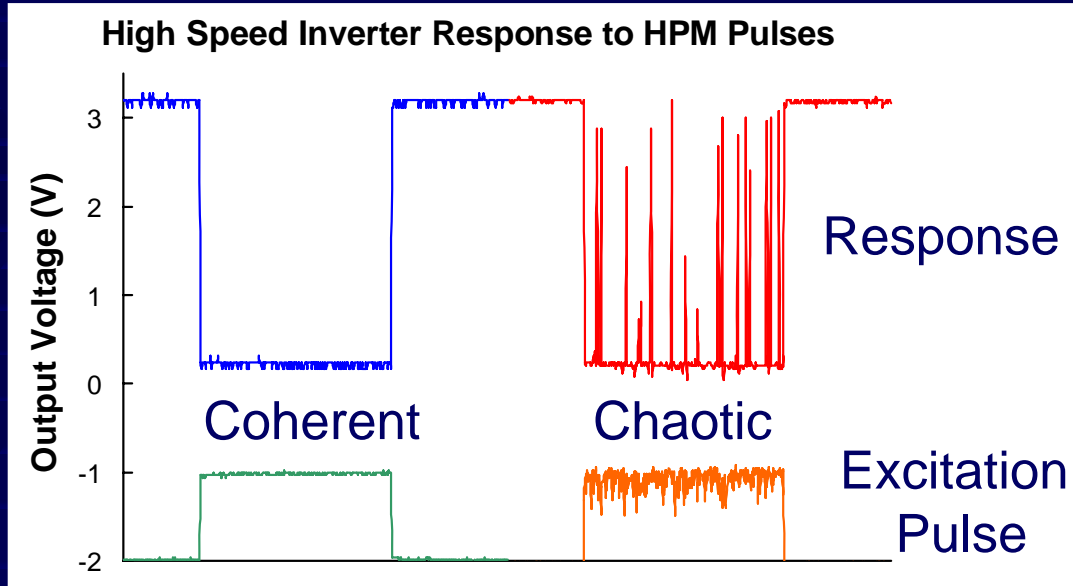
Power vs Frequency



200 MHz Bandwidth

Chaotic signals are **deterministic**, not stochastic

Results

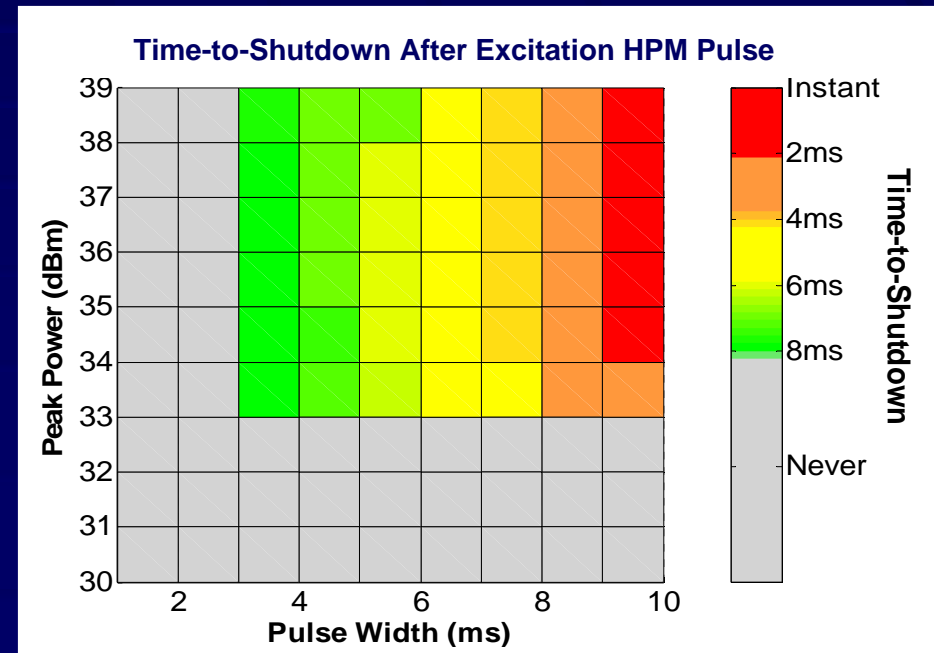


Chaotic modulation
disrupts a high speed
digital inverter



bit errors
data corruption

For the power supply,
distinct thresholds in pulse width
and peak power must be crossed
before **shutdowns** occur.



Findings

- Chaotic HPM pulses are more effective than coherent pulses at disrupting high speed circuits due to wideband modulation
- No difference in rectification between wideband and coherent signals was observed in the power supply tested
- However, HPM pulses can cause shutdown states in power supplies; a catastrophic failure for time and mission critical systems.