Relevant Projects

- Non-Linear RF device characterization from external EMI/EMC excitations
  - Characterization is necessary for our EMI/EMC MURI
  - Pulsed-RF is of most importance/

- RF-Thermal characterization of MEMS devices

- High power GaN arrays for power beaming

- Reconfigurable Arrays Incorporating High Power Switches
GaN HEMT Low Noise Amplifiers under High Power EMC Induced Effects

3rd order non-linearities are significantly increased

Coherent constructive addition of Induced EMC voltage and input source

Coherent destructive addition of Induced EMC voltage and input source
Solar Power Conversion Using Array of AlGaN/GaN Heterostructure FETs (with Prof. Pavlidis)

- Wireless Power Transmission (WPT) by means of spatial power-combining oscillator arrays
- AlGaN/GaN HFETs for RF Signal Sources
- RF matching networks
- Integrated arrays
High Power Array Concept and Applications

• **Goal is**
  – to design a highly stable, efficient and multimode-free oscillator array that is tolerant to multiple device failures.
  – study fundamental issues associated with injection locking of the large antenna array (phase jitter across arrays, multimodes etc.)

• **Large finite arrays must therefore be analyzed as a single unit rather than in periodic form.**
  – Since the oscillator circuit and radiating element can strongly interact, edge effects of the array are likely to affect oscillator stability.
  – Oscillator circuit and antenna must be modeled as a single unit leading to excessive computational needs involving millions of unknowns.
Power Advantages of III-V Nitrides

• Wide-bandgap (3.4eV) Gallium-Nitride based semiconductors were used for realization of blue diode lasers and demonstration of FETs with record power density >10W/mm at X-band

• Studies of electron transport in GaN suggest v-F characteristics with a region of negative differential mobility, high threshold and critical fields, and reduced energy-relaxation times