

The Large Signal Microwave Characterization and Design Challenge



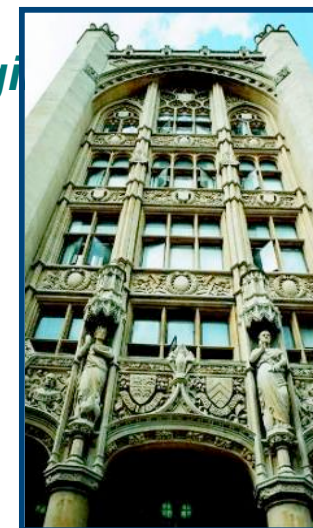
Centre for High Frequency Engi

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*IEEE MTT-S Distinguished
Microwave Lecturer
2008-2010*

- RF I-V Waveform Measurement & Engineering

Centre for High Frequency Engineering

- *Who are we?*

- Founded in 1997
- Significant funding from Government and Industry
- Staff & Students
 - 4 academics
 - 1 professorial fellow
 - 2 research associates
 - 20+ research Students
 - dedicated Technical Support
- Strong industrial links
 - Tektronix, Agilent, Freescale, CREE, RFMD, Nokia, Ericsson, EADS, Astrium, ...
 - Research is 50% funded by industry
- Also EPSRC, DTC, FP7, EUREKA



Prof. P Tasker



Prof. A Belcher



Prof. A Porch



Prof. S Cripps



Dr. J Benedikt



**Cardiff
Team**



Centre for High Frequency Engineering

- *What do we do?*

Mission statement: *to innovate and establish scientifically robust nonlinear characterisation, analysis and design methodologies at high-frequencies*

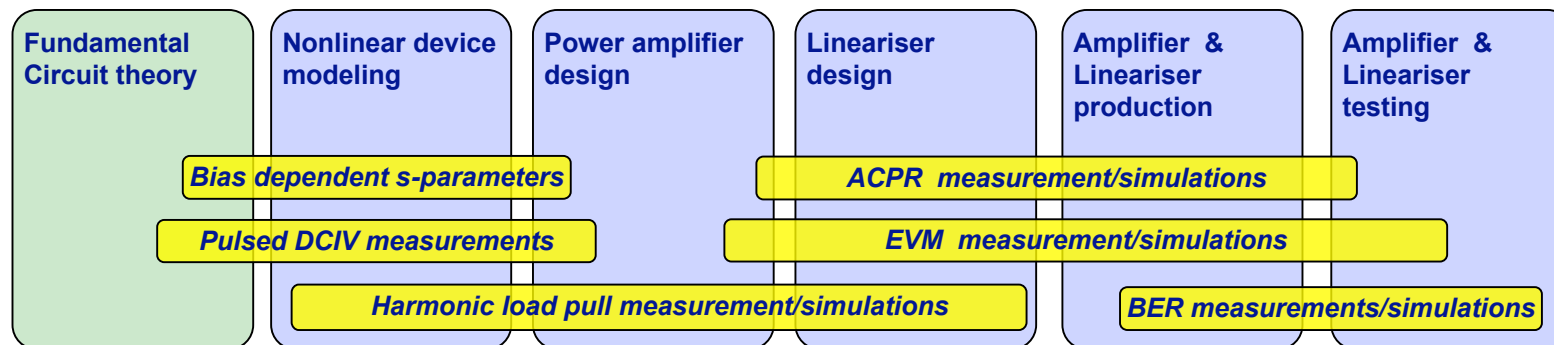
- *Motivation behind lectures*

Core capability and development: *RF Waveform Measurement and Engineering*

- *Topic of the lectures*
- **Measurement:** *The ability to **observe and quantify** the time varying voltage $V_n(t)$ and current $I_n(t)$ present at all terminals of the Device Under Test (DUT): thus involves all frequencies including DC, IF and RF.*
- **Engineering:** *The ability to **modify in a quantified manner** the time varying voltage $V_n(t)$ and current $I_n(t)$ present at the terminals of the Device Under Test (DUT): thus involves all frequencies including DC, IF and RF.*

Motivation and Background

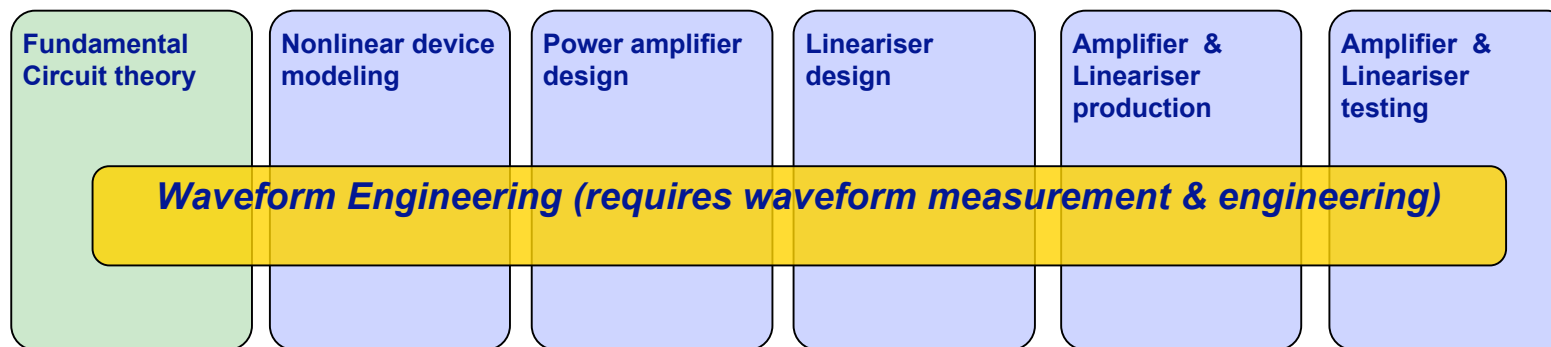
Consider the Design and Optimization of the Highly Efficient Linear RF Power Amplifier



Lack of single measurement techniques that can successfully tackle all relevant technology areas!

In coherent links between the area resulting in significant and relevant loss of information when moving from one area to another

Motivation and Background



Current and voltage waveforms have the potential to interlink the entire design and development chain!

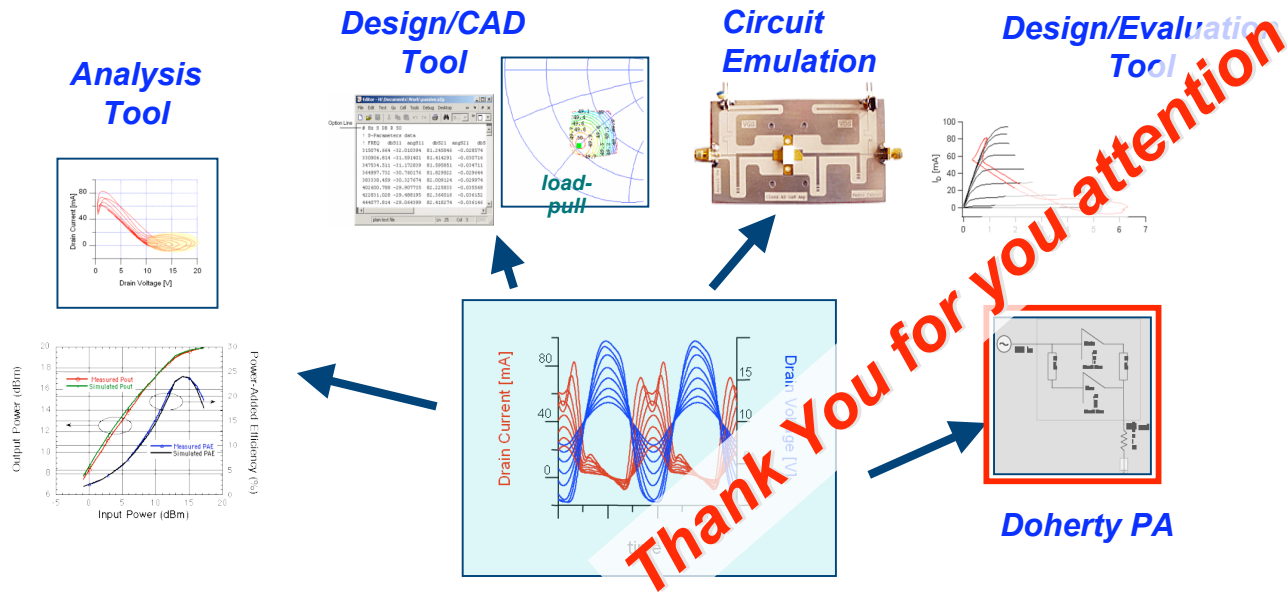
However, it is a new approach and as such requires (1) new measurement systems, (2) new data analysis tools, and (3) design techniques

RF I-V Waveform Measurement & Engineering

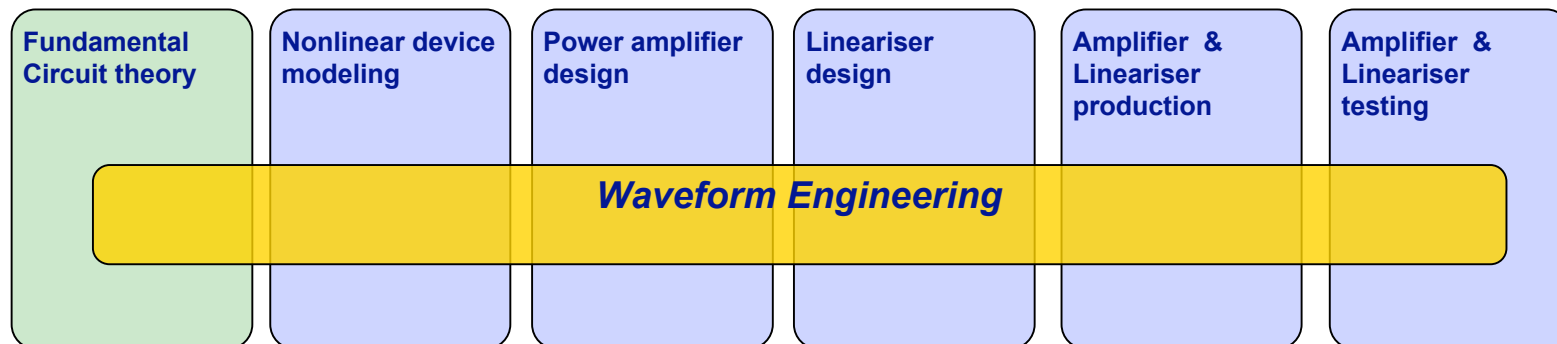
- **Lecture : 10.00am - 11.00am**
 - CW Measurement System Realization
- **Lecture 2: 11.00am - 12.00pm**
 - Role in Supporting Non-Linear CAD Design
- **Lecture 3: 1.00pm - 2.15pm**
 - Role in Transistor Characterization and Amplifier Design
- **Lecture 4: 3.00pm - 4.00pm**
 - Emerging Multi-Tone Systems

RF Waveform Measurements and Engineering

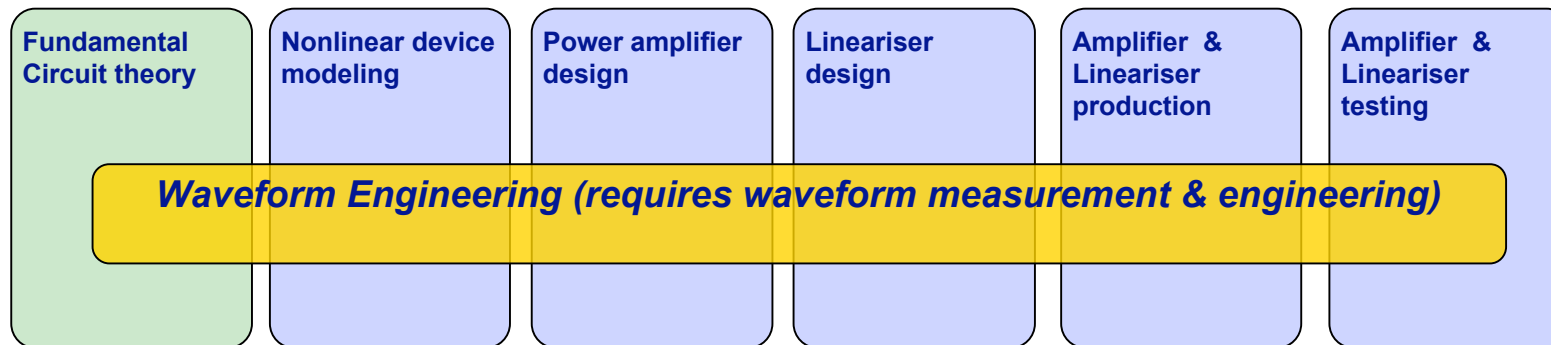
– a powerful tool and concept



unifying link between device technology, circuit design & system performance



Summary



Current and voltage waveforms have the potential to interlink the entire design and development chain!

However, it is a new approach and as such requires (1) new measurement systems, (2) new data analysis tools, and (3) design techniques

Thank You