

Waveform Measurement & Engineering

- need for multi-tone capability



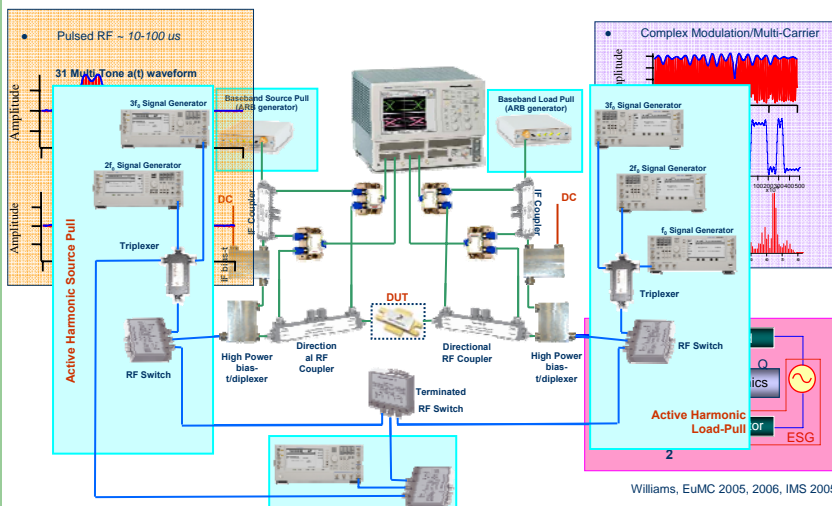
Prof. Paul J Tasker
Dr J. Benedikt
Centre for High Frequency Engineering
School of Engineering
Cardiff University

Contributors: Dr R. Gaddi, Dr D.J. Williams, Dr J. Lees, Dr. D.G. Morgan, T. Williams, Z. Aboush, A. Sheikh, P. McGovern, C. Roff, A. Alghanim, H. Qi

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The Multi-Tone Challenge

Multi-Tone Waveform Measurement



Williams, EuMC 2005, 2006, IMS 2005

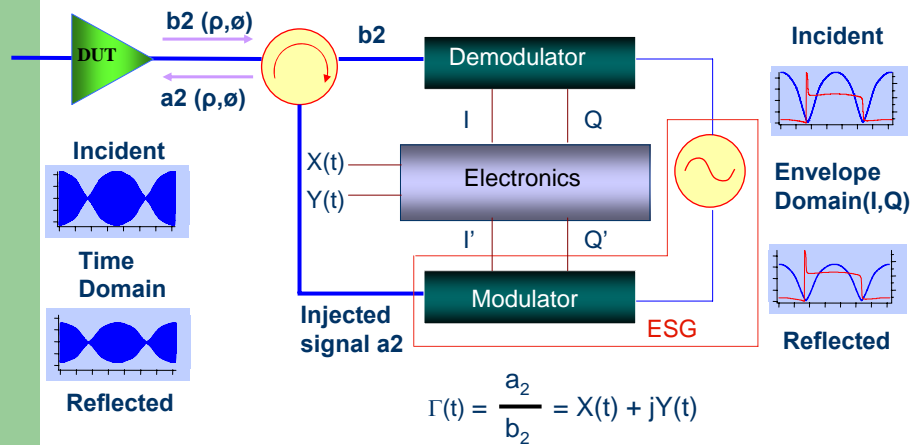
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What about Waveform Engineering?

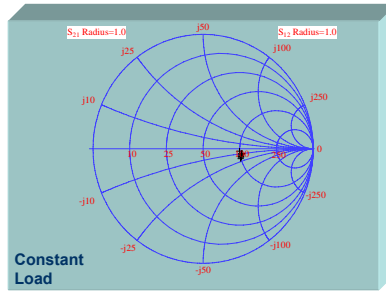
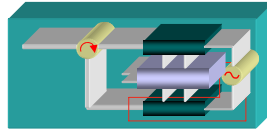
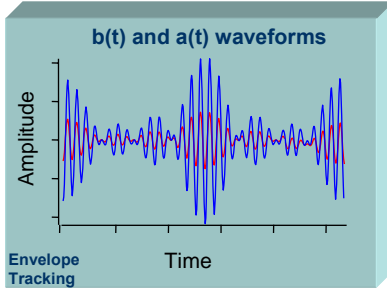
Why Envelop Load-Pull

- Open-Loop Active System Problem
 - Output is Spectrally Rich: *Periodic time varying amplitude and phase envelope*
 - Need a source for each tone
- Passive System Problem
 - Variation of impedance across a given bandwidth, at least five times the modulated bandwidth
- Envelope Active Load-Pull Concept
 - Track time varying amplitude and phase
 - Avoid oscillation by incorporating only base-band feedback
 - Allows for engineering of impedance across a given bandwidth

Active Source- and Load-Pull based on RF Carrier Envelope Feedback

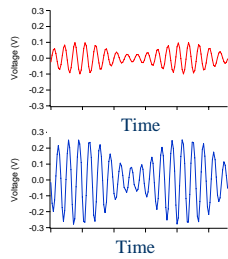


RF Carrier Envelope Tracking

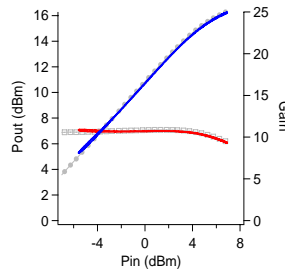


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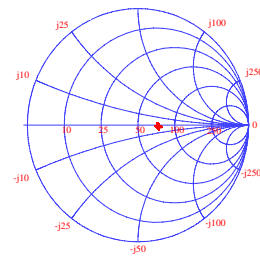
'Real-time' power sweeps



Capture input (red) and output (blue) waveforms modulated with 200Hz

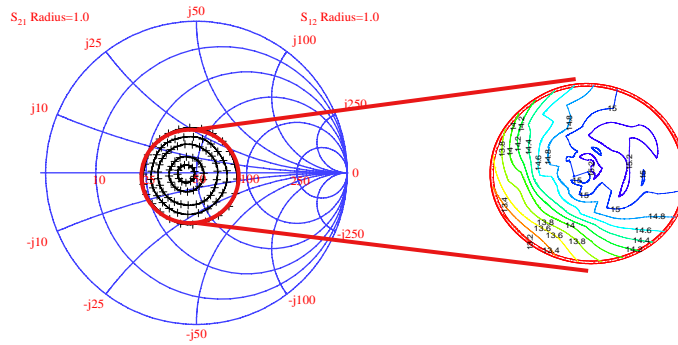


Comparison between 'real time' and CW power sweep



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'Real-time' load pull contours



Sinusoidal stimulus (90° out of phase) are applied to X & Y

- Circles of loads are mapped onto the smith chart
- Rapid generation of load pull contours

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Developing Concept

- Envelope Load-pull
 - Increase bandwidth of electronic loop
 - Analogue solutions
 - Digital solutions
 - In-band circuit impedance synthesis

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