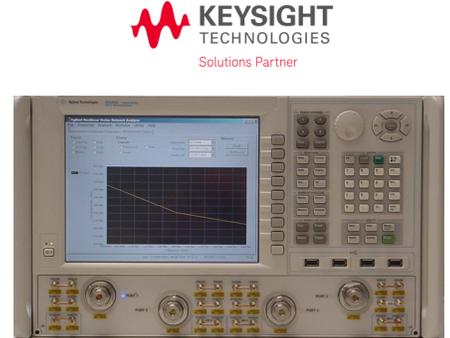


### Modelithics X-Parameter Measurement & Model Service

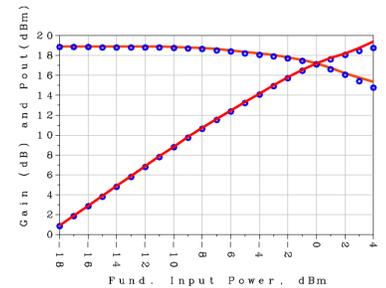
Modelithics, a Keysight Technologies Solutions Partner and provider of precision measurement and modeling services, offers custom non-linear X-Parameter\* measurements and X-parameter model development.

#### Non-Linear X-Parameters:

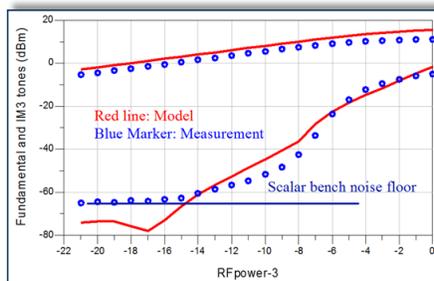
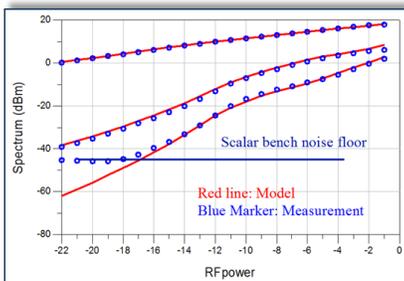
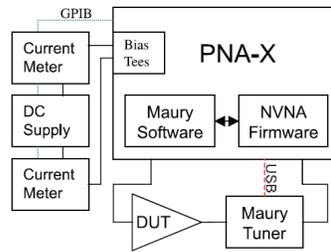
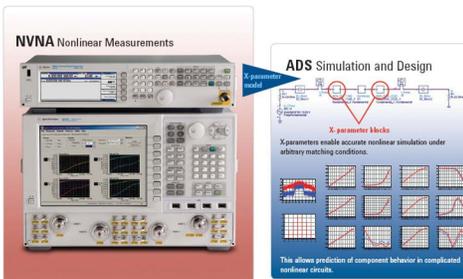
- Provide mathematically correct extensions of S-parameters to large-signal conditions with fully nonlinear framework that provides both the magnitude and phase of the distortion.
- Cover both large-signal and small-signal conditions, and capture complete linear and nonlinear behavior at all loads.
- Characterize the amplitudes and relative phase of harmonics generated by components under large input power levels at all ports.
- Correctly characterize impedance mismatches and frequency mixing behavior to allow accurate simulation of cascaded nonlinear x-parameter blocks, such as amplifiers and mixers in wireless design.
- Apply to individual transistor modeling as an alternative to, supplement to, or validation of traditional compact equivalent circuit modeling.
- Can be measured using a non-linear vector network analyzer, such as a suitably optioned Keysight PNA-X series instrument.
- Can be measured as a function of impedance and bias.
- Can be simulated in multiple circuit simulation tools, such as Keysight ADS and Keysight Genesys software.



Keysight PNA-X Series Non-linear Vector Network Analyzer (NVNA)

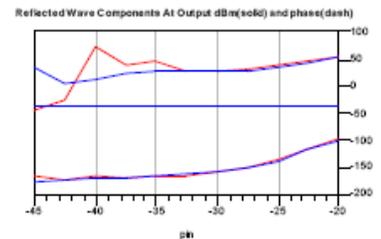
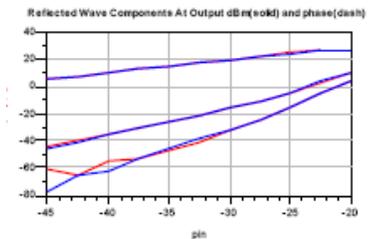


Comparison of X-parameter model simulation to conventional power bench measurement for a surface mount amplifier at 50 ohm source/load conditions.



Comparison of X-parameter model simulation to conventional load-pull measurement for a SMT amplifier for fundamental, 2nd and 3rd harmonic. Source and load-tuned for optimal power.

Comparison of X-parameter model simulation to conventional load-pull measurement results for a surface mount amplifier for fundamental and IM3 tones. Source and load-tuned for optimal IP3



Output (B2) wave amplitudes and phase of two cascaded amplifiers measured directly and predicted from individual amplifier X-parameters.

\*"X-Parameters" is a registered trademark of Keysight Technologies. The X-parameter format and underlying equations are open and documented. For more information on X-parameters, visit <http://www.keysight.com/find/eefof-x-parameters-info>