

# KEYSIGHT TECHNOLOGIES

Solutions Partner



## Non-Linear Measurements using PNA-X

# Hybrid Load Pull & Behavior Modeling with PNA-X

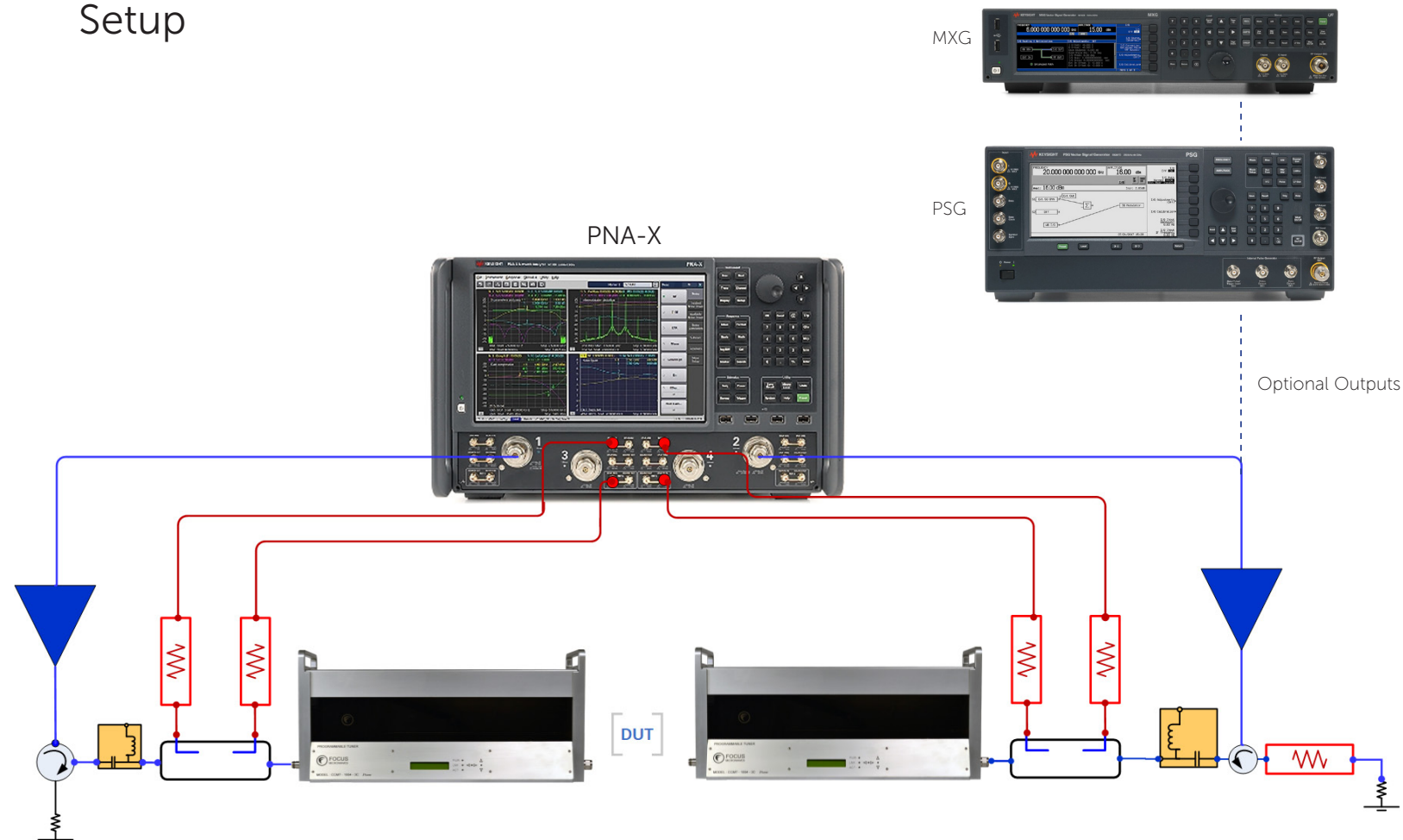
Hybrid active Load Pull combines the benefits of both passive and active Load Pull techniques in one setup. Active Load Pull is the only method that allows reaching the low internal impedance of power transistors, especially on wafer and at very high frequencies. The system relies on the basic concept of using a passive electromechanical tuner as a prematch to get closer to the device's conjugate output impedance, then complementing with active injection, the system can tune impedances anywhere in the Smith chart and beyond ( $\geq 1$ ).

The measurements themselves are "travelling wave" based, performed using a Keysight PNA-X. With the introduction of prematching tuners, the feedback injection signal power

remains close to the DUT output power not only at the fundamental frequency but at the very important harmonic frequencies, whereas in pure active systems, the power amplifier has to produce very high power (up to 20 times the DUT power) to compensate for the strong mismatch between the impedance of the feedback injection amplifier ( $50\Omega$ ) and the DUT internal impedance ( $0.5 - 1\Omega$ ).

The user can also add optional signal generators to drive the load not only at the fundamental but at the harmonic frequencies. Keysight's X-series family of signal generators can be used as well as the high end PSG analog or vector signal generator.

## Setup







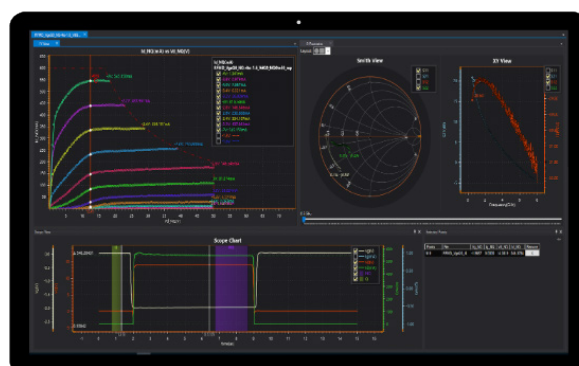
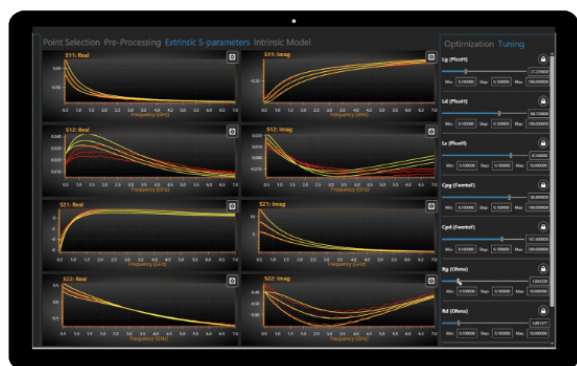
# Pulsed IV and Compact Modeling with PNA-X

The Focus Compact Model (FCM) utility is a streamlined software package designed to be used with Focus' AURIGA high-end pulse system, that is used to generate Compact Models for transistors from their Pulsed-IV and wideband pulsed s-parameter data.

The FCM utilises Keysight's PNA-X platform to measure highly accurate pulsed s-parameters of the device under test. Keysight's PNA-X support both wideband and narrow band detections offering greater flexibility and performance. These techniques

let the user trade dynamic range for speed, with the result almost always yielding faster measurements than those obtained by conventional filtering.

The PNA-X's four internal pulse generators and pulse modulators, two internal sources with a combining network, and active-application options provide fully integrated pulsed active-device characterization.



PNA-X

