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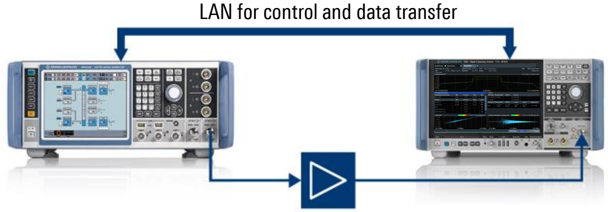
AMPLIFIER MEASUREMENTS WITH ROHDE & SCHWARZ SPECTRUM ANALYZERS (K18 OPTION)

Solution overview

Your benefit	Features
Amplifier characterization (K18)	The K18 option for the R&S®FSW, R&S®FSV(A)3000 and R&S®VSE enables fast and easy amplifier characterization, including AM/AM and AM/PM traces. ACLR, raw EVM, AM/AM, gain compression and many more results can be measured from a single capture using almost any stimulus (input signal) – whether mobile comms, satellite or just a ramp signal.
Assessment of possible optimization with direct digital predistortion (K18D, K18M)	The K18 option generates digital predistortion (DPD) to demonstrate spectral performance and EVM gains when applying a DPD algorithm. K18 takes two algorithmic approaches to DPD: standard polynomial and memory polynomial DPD. The K18D option provides an algorithm-independent method for comparisons, using an iterative, sample based DPD approach.
In-depth view on frequency response and group delay (K18F)	The K18F option provides in-depth analysis of memory effects causing a device's frequency response and group delay.

Amplifier measurement setup



The measurement setup includes an R&S®FSW or R&S®FSV(A)3000 signal and spectrum analyzer or R&S®VSE compliant instruments with an R&S®SMW200A, R&S®SMM100A or R&S®SMBV100A vector signal generator. The closed-loop system enables control of the signal generator and automatic synchronization.

- Users can decide whether to stimulate the amplifier under test using a swept CW or modulated signal
- The generator feeds the selected RF signal to the amplifier
- The test signal waveform information is also directly transmitted to the analyzer via a LAN interface that serves as a reference for amplifier characterization
- Predistortion information derived with the K18/K18D/K18M option can also be transmitted by LAN and a predistorted signal applied to the DUT for further analysis

For more information and related material

Video series: R&S Amplifier Masterclass

App card: Verification of wideband power amplifiers

App note: K18D MATLAB Modeling Toolkit

Introduction video: K18 amplifier measurement option

Webpage: R&S®VSE software

K18: main functions for amplifier characterization

Perfect for: power amplifier measurements, envelope tracking measurements, digital predistortion with polynomial model

Characterize equipment: K18 allows separation of three signal degrading contributors: nonlinearity, frequency response and signal-to-noise ratio. Furthermore, EVM, ACLR, AM/AM and more results can be obtained from a single measurement.

Power amplifier measurements: fast and easy amplifier characterization, including AM/AM and AM/PM traces. Measures and models linear and nonlinear amplifier distortions.

Polynomial based digital predistortion: amplifier modeling and computation of a polynomial model for power amplifiers. The coefficients can be used directly in DPD algorithms for DUTs and by the R&S®SMW-K541 real-time predistortion option.

Envelope tracking measurements: full characterization of power amplifier envelope tracking. Measures envelope tracking impact on power efficiency and signal quality, including instantaneous power added efficiency (PAE).

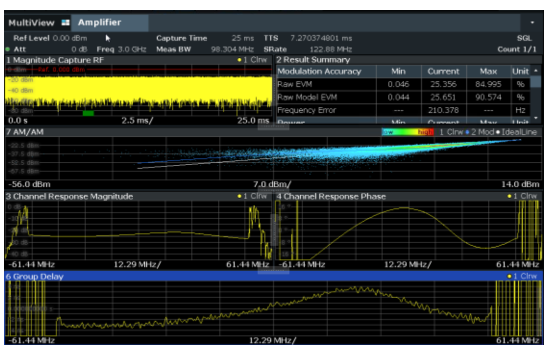
K18D and K18M: assessment of the DUT under digital predistortion conditions

Perfect for: linearizing setups for better spectral performance, compensating for effects such as frequency response

The K18D option provides direct digital predistortion that uses an iterative approach to linearize the DUT. It minimizes EVM and ACLR without being limited to a certain DPD algorithm, making it ideal for comparing PAs under linearization conditions.

- K18D can investigate the extent to which memory DPD algorithms are capable of **compensating nonlinear behavior of amplifiers**.
- In contrast to the DPD in K18 using a polynomial model, -K18D uses a **direct digital predistortion** model to iteratively compensate for further effects such as frequency response.
- K18D can linearize setups using signal generators and power amplifiers **for better spectral performance**.
- The K18M option derives **memory polynomial coefficients** that can be applied to the waveform on a signal generator or exported. Exported coefficients can be used for real-time DPD on the DUT.

K18F: investigation of frequency response and group delay



Perfect for: analysis of frequency response, group delay measurements

The K18F option can investigate the nonlinear dynamics of two-port setups. Visualizing frequency response and group delay allows in-depth analysis of amplifier performance.

- **Frequency response** can be investigated with graphs showing magnitude (i.e. gain or loss) and phase versus frequency. Signal amplitude over time and the phase shift of the output signal relative to the reference signal are displayed.
- **Group delay** generates distorted signals from varying time delays across the bandwidth. This effect can be investigated with the K18F option, which shows the time delay of a signal over frequency.

Note: the K17 option offers robust multicarrier group-delay measurements for in-depth investigations. It is explicitly designed for signal degradations that occur during in-orbit testing, such as the Doppler effect.

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