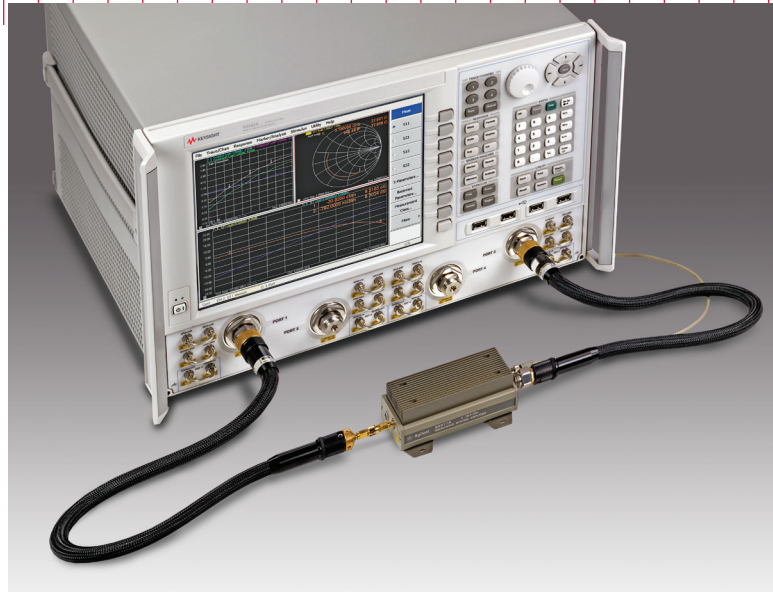


Keysight Technologies

Gain Compression Application for Amplifier Test

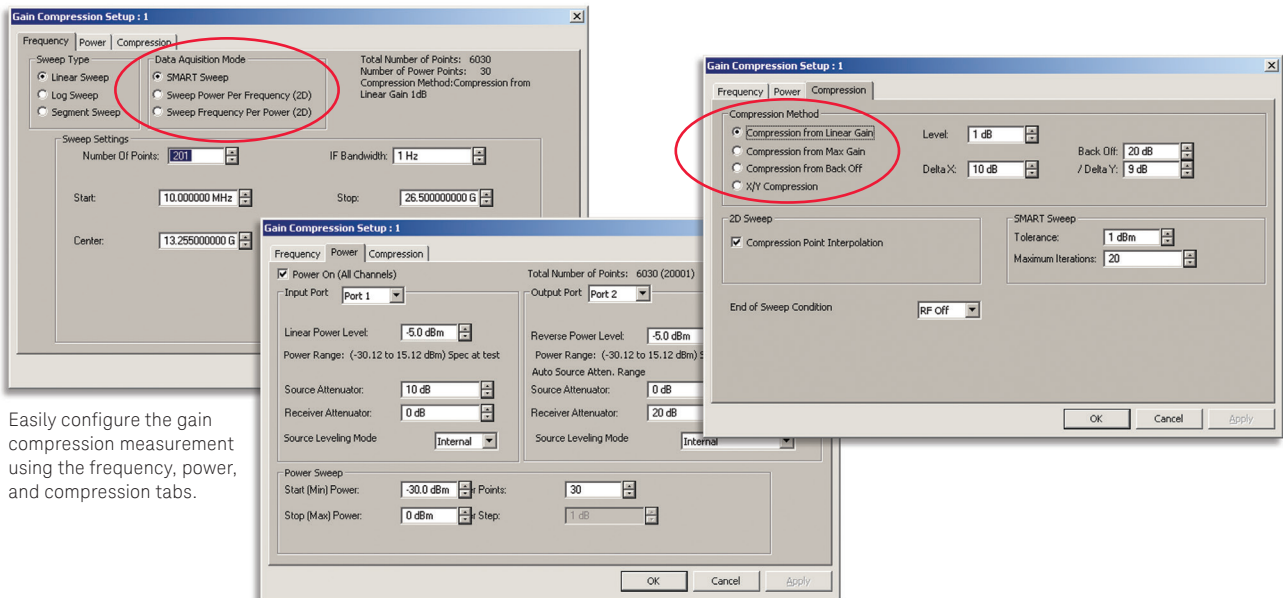
Technical Overview



PNA-X Network Analyzer N5242A Option 086 10 MHz to 26.5 GHz

Keysight Technologies, Inc. Gain Compression Application (GCA) builds upon the PNA-X network analyzer's strength in single-connection active-device measurements, providing compression data fast and accurately, at multiple frequencies, with a simple setup.

- Fast and convenient measurements with GCA's SMART Sweep
- Highly accurate results with a guided calibration – power and mismatch correction
- Complete device characterization with SMART Sweep or 2-dimensional (2D) sweeps, choice of sweep frequency per power, or sweep power per frequency
- Flexibility with a variety of compression algorithms – compression from linear gain, maximum gain, X/Y compression, or compression from backoff



Easily configure the gain compression measurement using the frequency, power, and compression tabs.

Amplifiers are one of the most common and essential building blocks of RF and microwave systems. Amplifier designers and manufacturers characterize the compression level of amplifiers so the performance of RF chains or RF subsystems can be determined and optimized. Gain compression (AM-AM) and phase compression (AM-PM), over an amplifier's specified frequency range, are measured during development, and often tested in manufacturing.

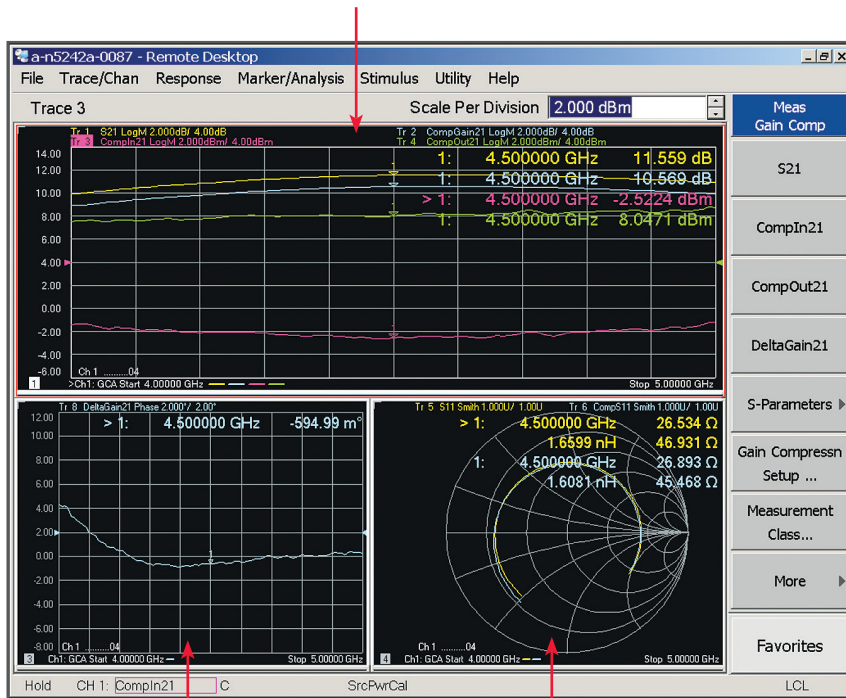
Today, various methods are used to characterize the compression of amplifiers. A common method is to use a network analyzer, using the power sweep capability, at a CW frequency, to find the compression point, both in amplitude and phase. This method has some inaccuracies, one of which is mismatch errors in the absolute power measurements. In addition, there are errors due to dependence on S-parameters, which are inherently linear

parameters, and under some conditions cannot be used in gain compression measurements, which are inherently nonlinear measurements. Furthermore, if many frequency points need to be characterized, the traditional network analyzer solution is slow and inconvenient.

In 2006, Keysight introduced the PNA-X, the premier-performance network analyzer designed for active device test. In this Technical Overview, we introduce Keysight's new Gain Compression Application. GCA builds upon PNA-X's strength in single-connection active-device measurements, providing fast and accurate gain compression data, at multiple frequencies, with a simple setup.

The PNA-X network analyzer with GCA eliminates the problems of lengthy test times and inconvenient setups by providing a single connection solution with a SMART Sweep that is easy-to-use, fast and accurate.

Measure linear gain, compression gain, input and output power at compression, over the specified range.

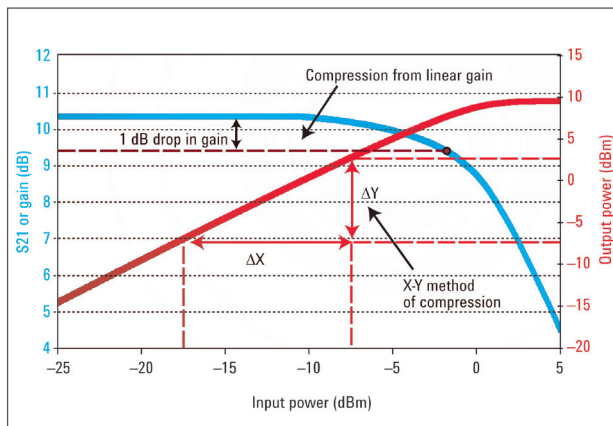


Measure the deviation from linear phase.

Compare linear input match and compression input match.

Sweep Types

GCA's SMART Sweep uses an optimized algorithm to find the desired compression point. SMART Sweep measures fewer data points, but points that are selected based on a proprietary algorithm, which yields a very accurate characterization of the DUT over the desired range. It is therefore much faster than measuring all the finely spaced points on the power curve that are normally needed for the same level of accuracy. SMART Sweep can significantly reduce the overall test time and improves manufacturing throughput.



Another benefit of GCA is that it optimizes accuracy and speed by varying the IF bandwidth. It applies wider bandwidths to higher power levels, which tend to have less noise, and narrower bandwidths to lower power levels, which tend to be noisier.

In addition to SMART Sweep, GCA offers a 2D sweep, where users can specify the frequency range, power range, and number of frequency and power points. GCA gathers the data for the entire range and finds the specified compression point. Additionally, in the 2D sweep mode, GCA offers a choice of sweeping the frequency range for each power point or sweeping the power range for each frequency point. There are cases where the compression performance of the device depends on which type of sweep is taken. For example, some amplifiers have memory effects and are sensitive to power changes. These amplifiers benefit from the sweep frequency per power mode, where the entire frequency range is swept at each power level. Other amplifiers benefit from the faster screen update rate of the sweep power per frequency mode.

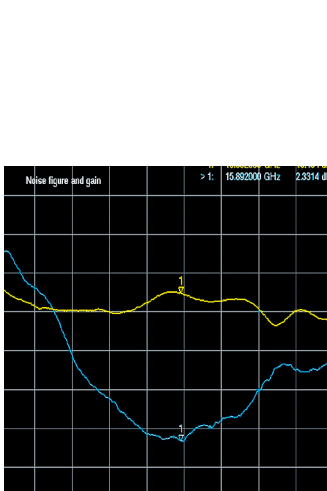
To find the compression point, GCA offers the choice of an X/Y compression method or **compression from linear or maximum gain**. Additionally, various parameters can be measured at the compression point such as input power, output power, gain and phase.

Calibration and Accuracy

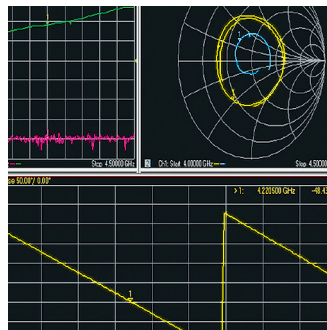
GCA's intuitive guided calibration corrects for absolute power levels by using a power meter and receiver calibration, and corrects for mismatch errors by taking advantage of the vector error correction capabilities of the network analyzer. In traditional power sweep measurements, errors are introduced into the measurement because the compression portion of the measurement is nonlinear, and S-parameter calculations make a linearity assumption. GCA's correction algorithm avoids these errors by measuring both the linear and nonlinear data, and applying the appropriate factors in the error correction equation. GCA's accuracy surpasses the accuracy provided by today's gain compression measurement techniques.

PNA-X...The Premier-Performance Network Analyzer for Amplifier Test

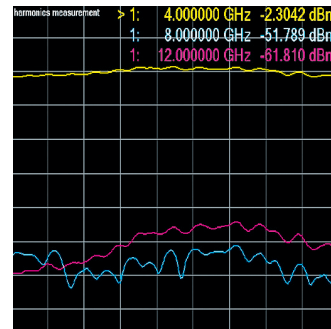
The Keysight PNA-X is the industry standard for microwave network analysis from 10 MHz to 26.5 GHz. With an integrated second source and internal combiner for two-tone test, internal pulse generators and modulators, built-in noise figure capability, built-in DC measurement capability, and now gain compression characterization, the PNA-X is truly the best solution for single-connection active device measurements.



Noise Figure

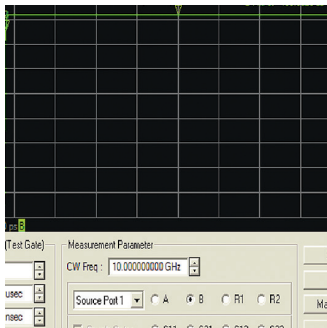


S-parameters

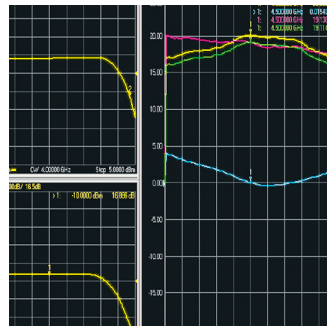


Harmonics

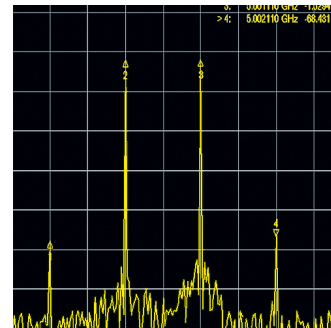
S-PARAMETERS
AND
BEYOND...



Pulsed-RF



Gain Compression



IMD

Ordering Information

For new instruments	N5242A	PNA-X Network Analyzer, 10 MHz to 26.5 GHz
	N5242A-086	Gain Compression Application
For current instruments, upgrade kits	N5242AU-086	Gain Compression Application Upgrade Kit

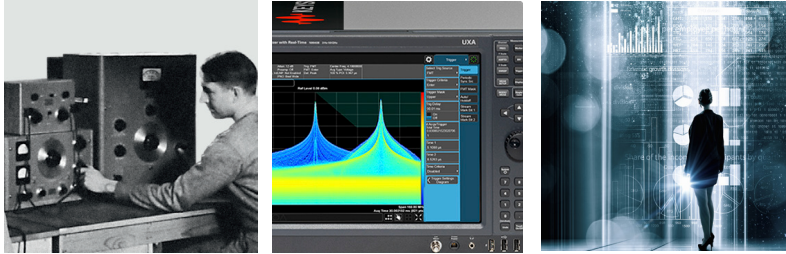
GCA will also be available for the PNA and PNA-L network analyzers in the future. Frequency converters will be supported with a future revision of GCA, which will be available free of charge for customers who purchase GCA today.

A one-time, 14-day, free trial license for the GCA option 086 is available for PNA-X N5242A network analyzers. The license runs for 14 days and enables the full functionality of the gain compression application. To request the license key for the free trial run, visit our website at: www.keysight.com/find/gca

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