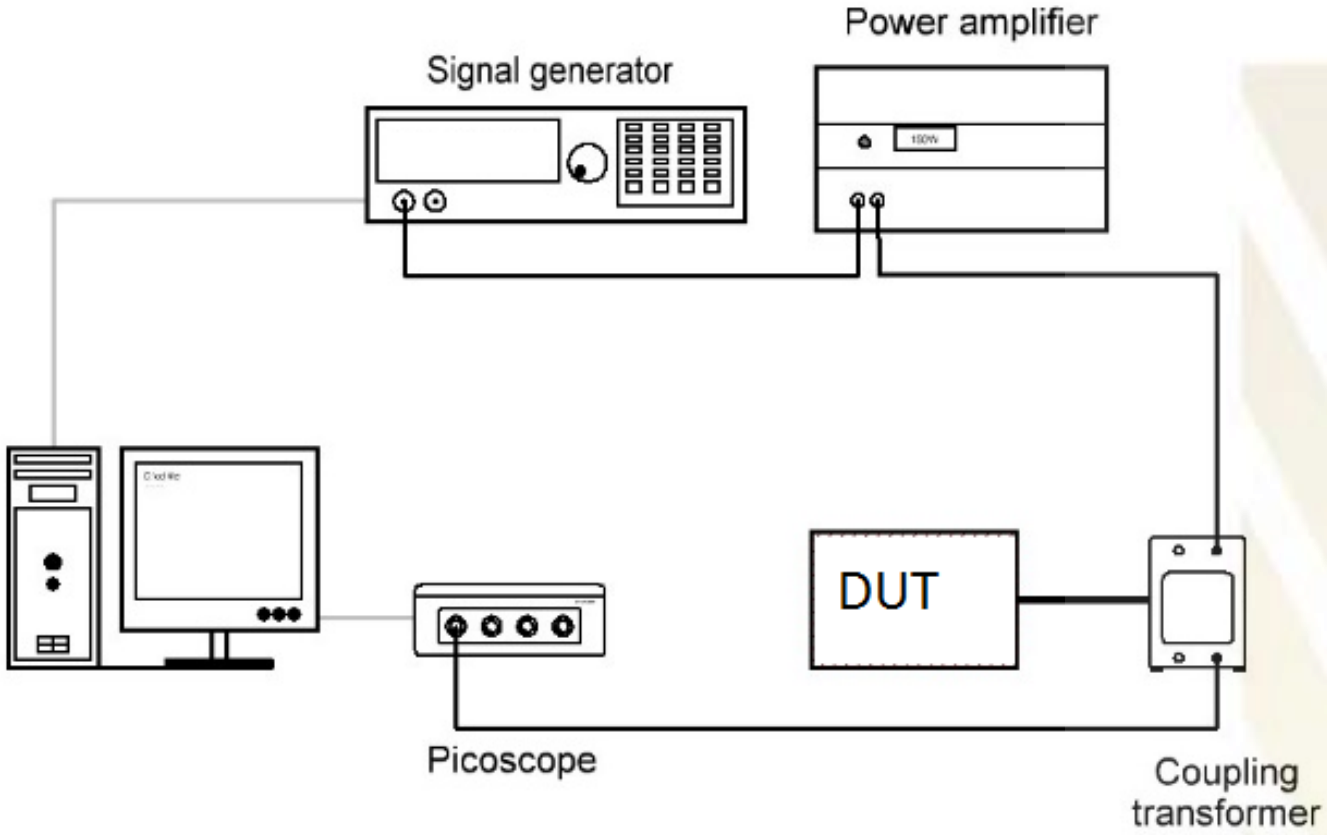


RF Components and Basic Concepts

1.21 - RF Measurement Devices

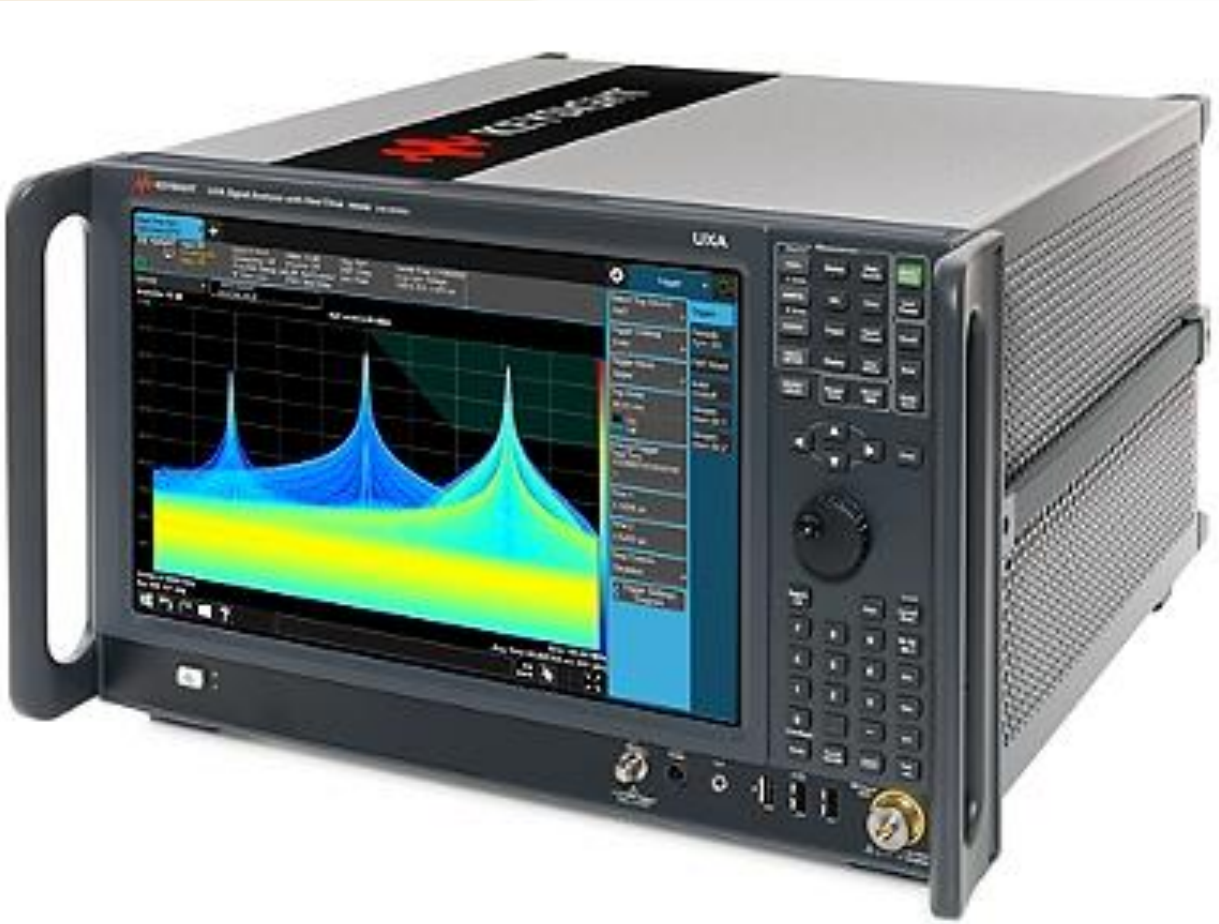
Main Radio Frequency Test Equipment Manufacturers

Main RF Test Equipment

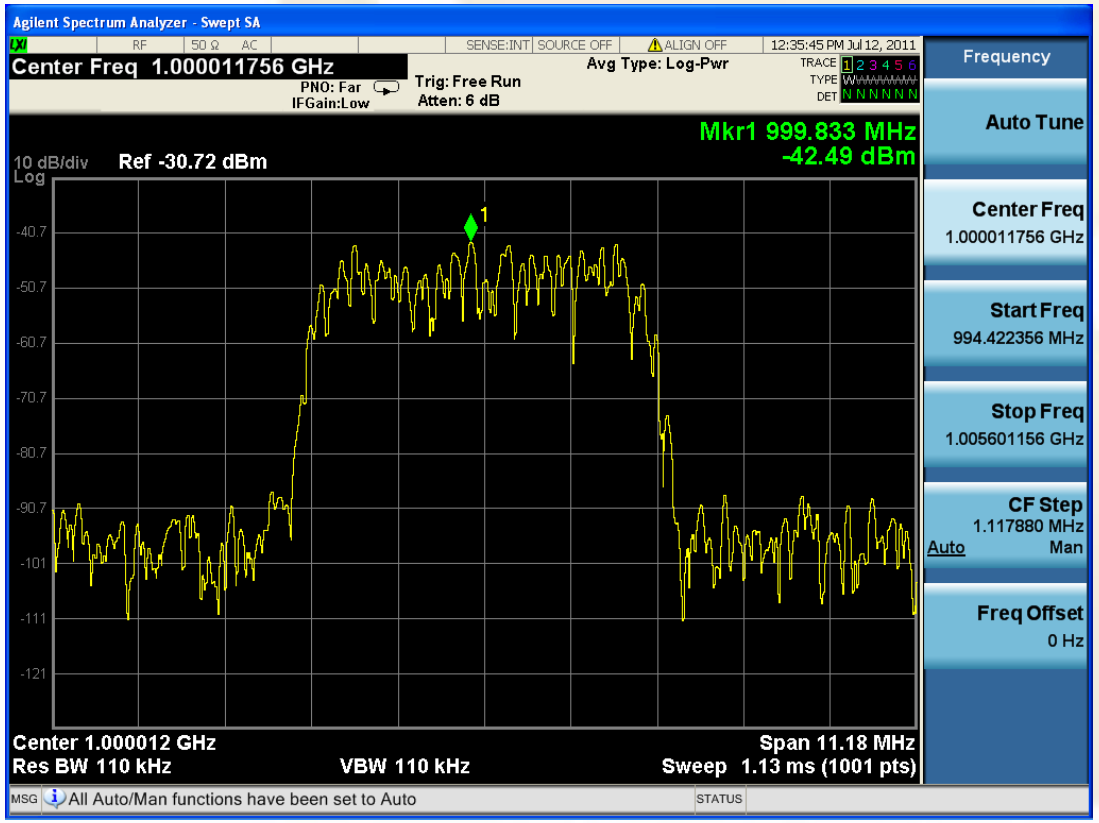
- Spectrum Analyzer
- Signal Analyzer
- Network Analyzer
- Power Meter
- Signal Generator

Spectrum Analyzer

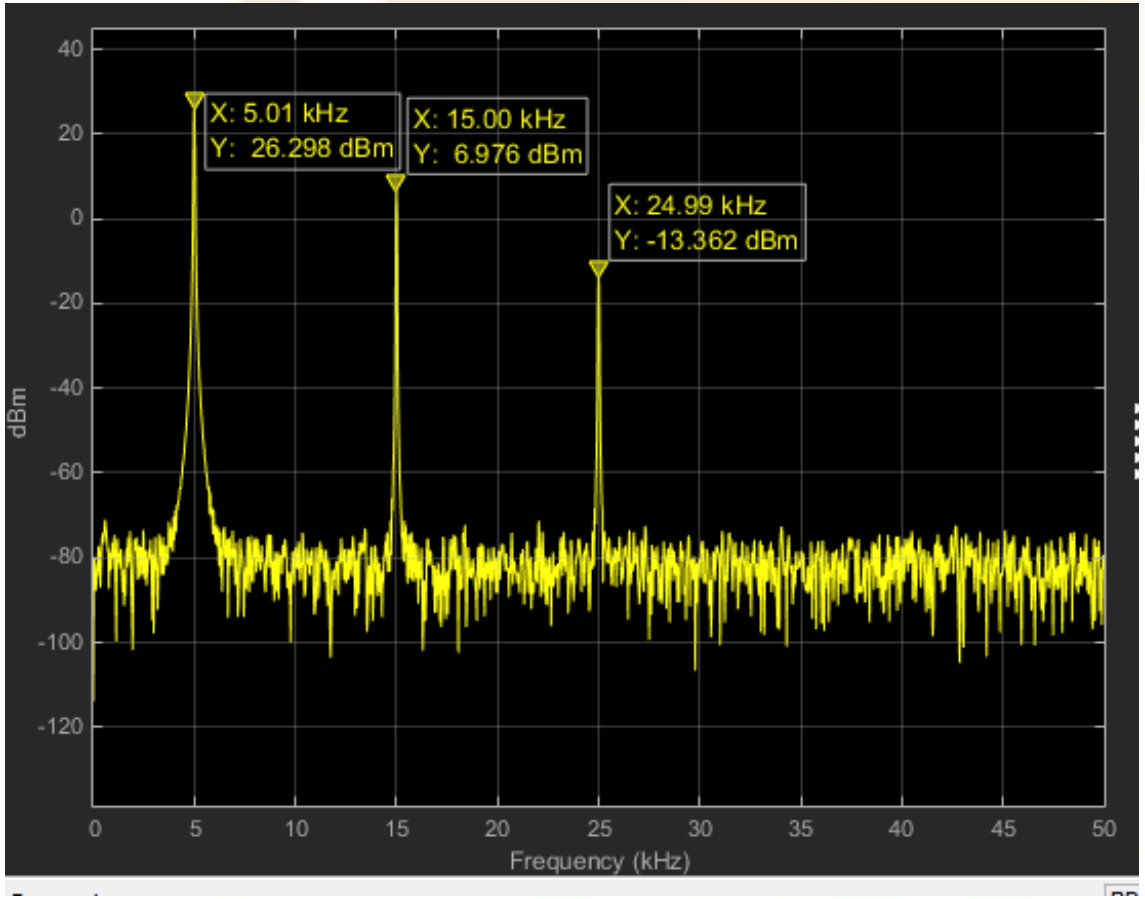
- measures the magnitude of signal versus frequency within the full frequency range of the instrument.
- useful in the characterization of electronic devices, such as power amplifies, switches and transceivers .
- frequency, power, distortion, harmonics, bandwidth, and other spectral components of a signal can be observed that are not easily detectable in time domain waveforms.



Spectrum Analyzer



Spectrum Analyzer



Signal Analyzer

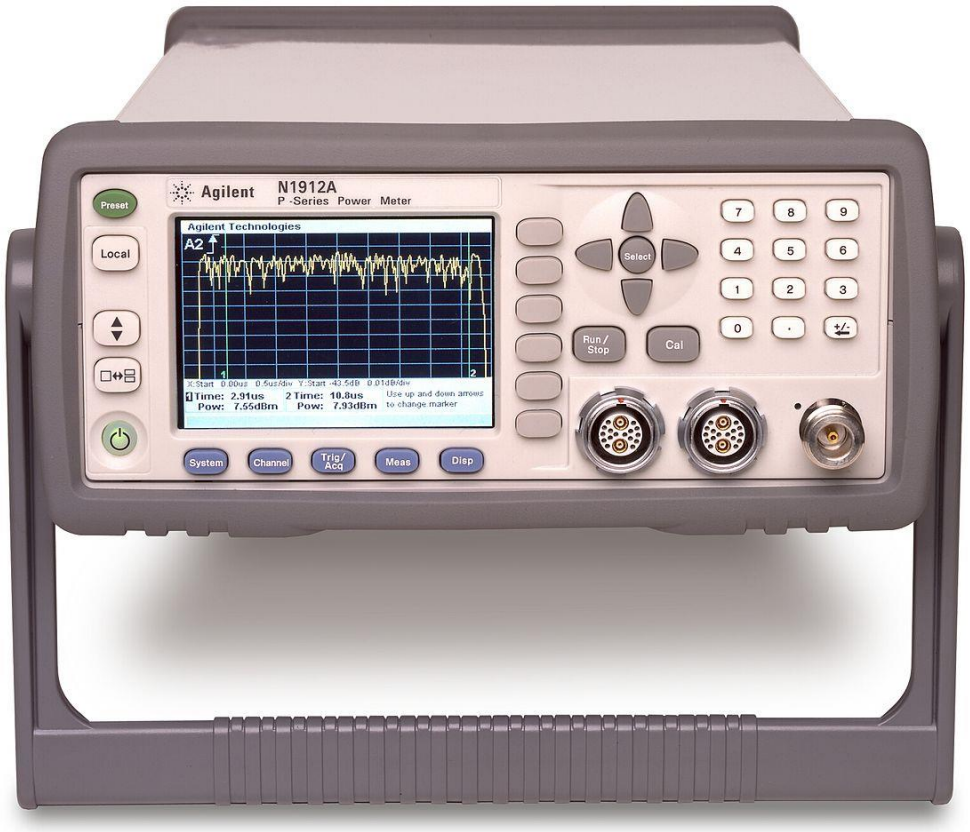
- Measures the magnitude and phase of the input signal at a single frequency within the IF bandwidth of the instrument.
- While spectrum analyzers measure the amplitude or magnitude of signals, a signal analyzer with appropriate software or programming can measure any aspect of the signal such as modulation.
- A signal analyzer has the ability to demodulate RF signals either with internal DSP processing, digitizing the I and Q data and providing that for external processing on a laptop.

Network Analyzer

- Network analyzers commonly measure s–parameters.
- Test setup calibration, board level and chip level matching.
- scalar network analyzer (SNA)—measures amplitude properties only
- vector network analyzer (VNA)—measures both amplitude and phase properties
- Three prominent VNA manufacturers are Keysight, Anritsu, and Rohde & Schwarz.

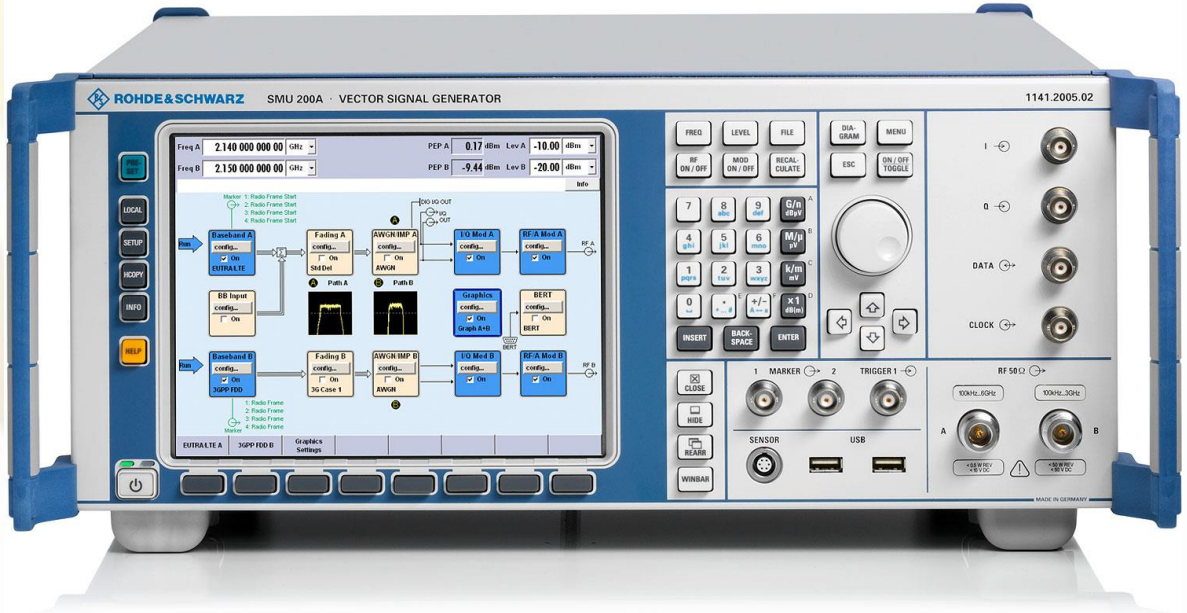
Microwave power meter

- measures the power at microwave frequencies typically in the range 100 MHz to 40 GHz.
- To be sure that you only measure a desired signal, you must use filters and include their losses.
- At spectrum analyzer If there are other components like harmonics or other linearity, you can separate their power from the power of your desired signal.Such operation is done in spectrum analyzers, so if they are calibrated, they are better - they also cost much more for being better.



Signal Generator

- Generates repeating or non-repeating electronic signals in either the analog or the digital domain.
- function generators, RF and microwave signal generators, pitch generators, arbitrary waveform generators, digital pattern generators and frequency generator.
- RF signal generators are capable of producing CW (continuous wave) tones.
- Many models offer analog modulation. This could include AM, FM, ΦM (phase modulation) and pulse modulation.
- Built-in attenuator which makes it possible to vary the signal's output power.
- Depending on the manufacturer and model, output powers can range from -135 to +30 dBm.



Software Used for Automation

- LabView
- Python
- Perl
- MATLAB
- C++