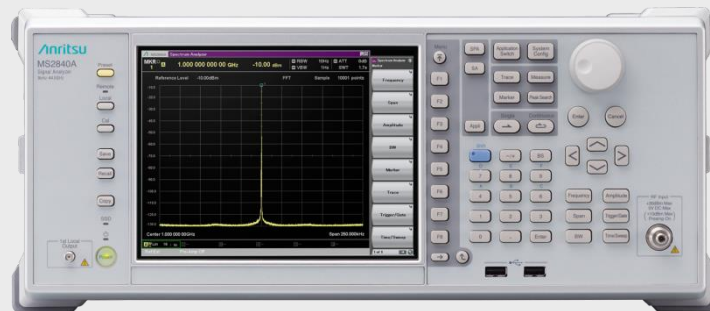




Spectrum Analyzer/Signal Analyzer with Excellent Phase Noise Performance

Signal Analyzer
MS2840A

9 kHz to 3.6 GHz/6 GHz/26.5 GHz/44.5 GHz



Signal Analyzer MS2840A

With its unbelievable and unbeatable high cost-performance The MS2840A is IDEAL for R&D and manufacturing of wireless communications equipment, radar, sensors and signal source using the shortwave to mm-Wave bands.

- **Phase Noise Performance supporting high-performance wireless terminals**
 - ✓ -140 dBc/Hz @ 10 kHz Offset, CF = 150 MHz, with Opt-066 (meas.)
 - ✓ -138 dBc/Hz @ 10 kHz Offset, CF = 1 GHz, with Opt-066 (meas.)
 - ✓ -123 dBc/Hz @ 10 kHz Offset, CF = 1 GHz (spec)
 - ✓ -108 dBc/Hz @ 10 kHz Offset, CF = 40 GHz (meas.)
 - ✓ -100 dBc/Hz @ 10 kHz Offset, CF = 80 GHz, with MA2808A (meas.)
- **Displayed Average Noise Level (DANL) for low-level signal detection**
 - ✓ -165 dBm/Hz @ CF = 1 GHz, Preamplifier On (spec)
 - ✓ -157 dBm/Hz @ CF = 40 GHz, Preamplifier On (spec)
 - ✓ -150 dBm/Hz @ CF = 75 GHz, with MA2808A (meas.)
- **Improved measurement and test efficiency: Faster CPU, SSD, more RAM**
 - ✓ Faster display drawing and file read/write

Outstanding Close-in Phase Noise Performance

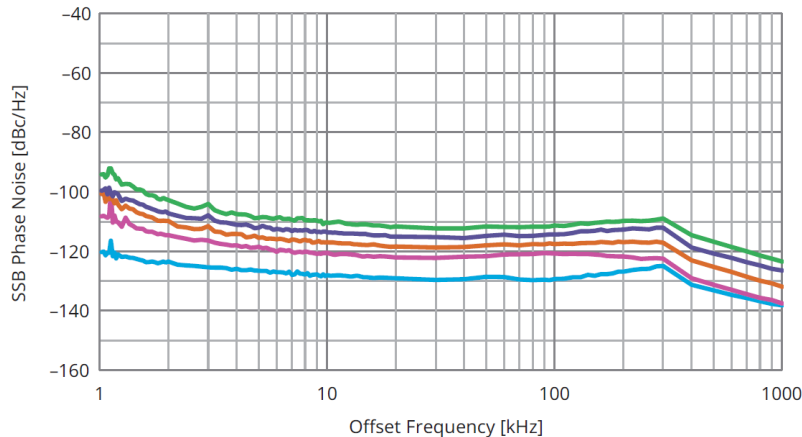
The MS2840A with superior close-in phase noise performance is ideal for accurate measurements aimed at improving the performance of wireless equipment and signal sources as well as for improving phase noise, which is the key to upgrading the measurement resolution of microwave and mm-Wave radar and sensors.

Installing the **Low Phase Noise Performance MS2840A-066** option in the 3.6 GHz and 6GHz models takes the MS2840A phase noise performance to even higher levels.

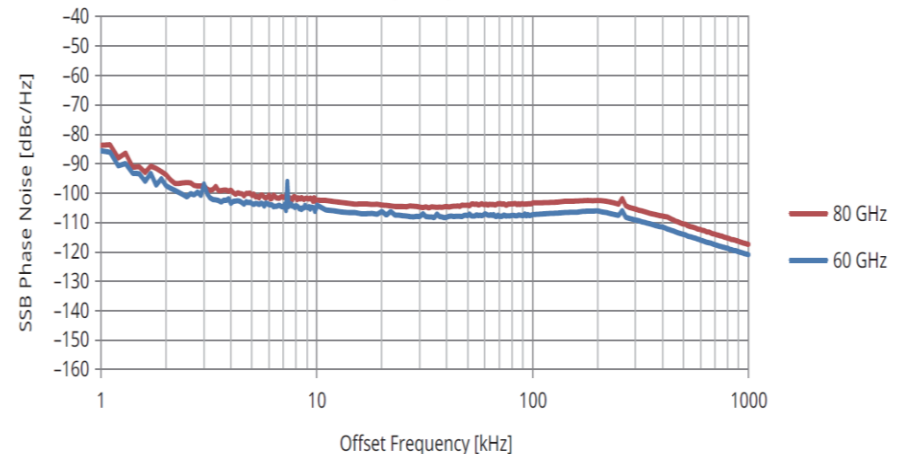
Using the phase noise measurement function makes it easy to measure phase noise components at typical frequency offsets.

Standard Phase Noise Performance of MS2840A (without MS2840A-066)

SSB Phase Noise (meas.)

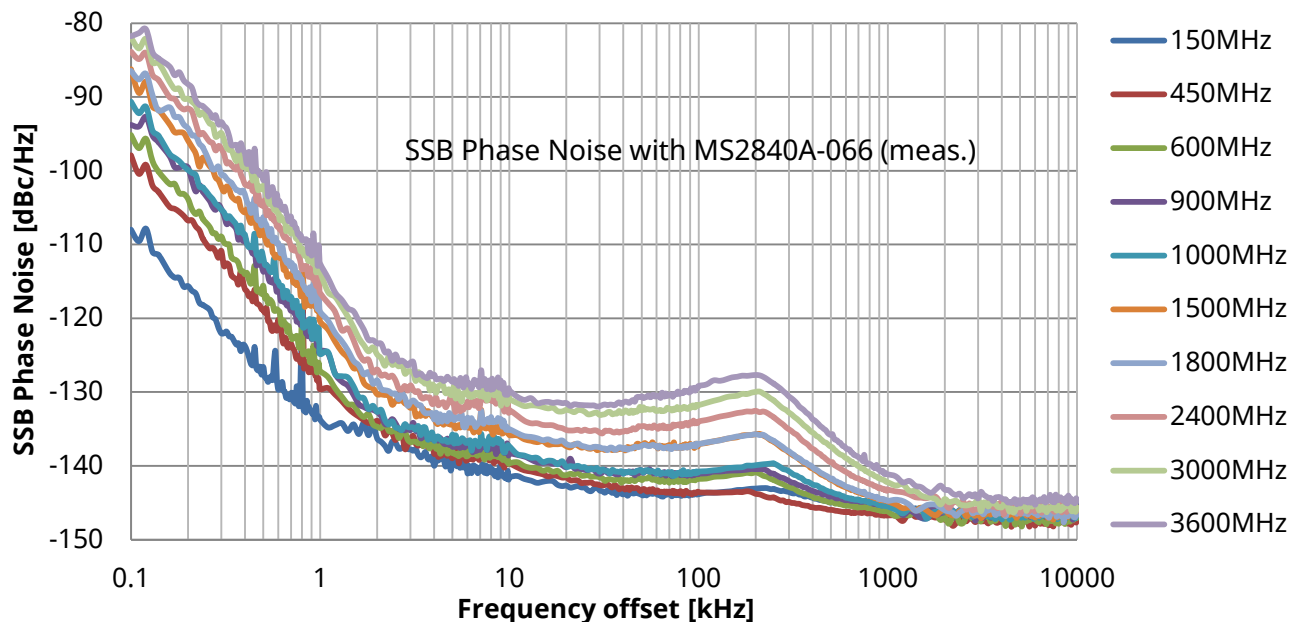


SSB Phase Noise with High Performance Waveguide Mixer
(meas.)

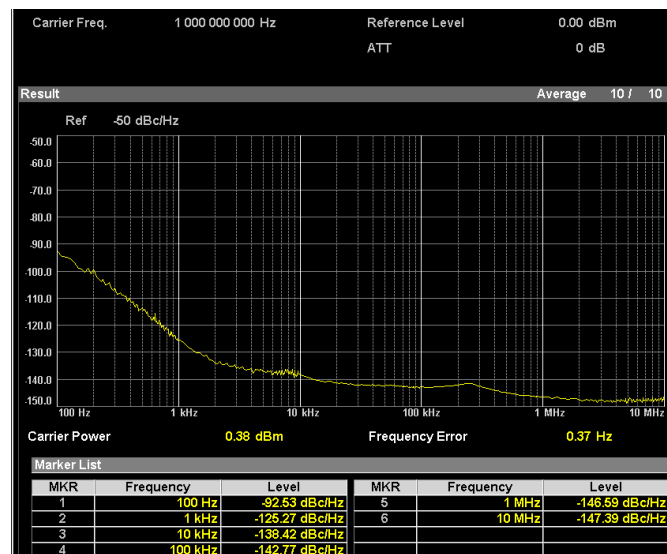
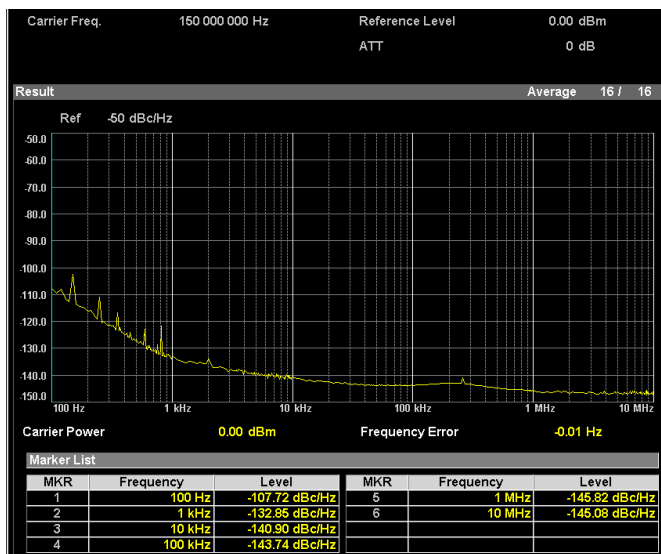


Low Phase Noise Performance MS2840A-066

The Low Phase Noise Performance MS2840A-066 option in the 3.6GHz and 6GHz models greatly increases phase noise performance for RF input signals of 3.7 GHz or less at frequency offsets of 1 kHz to 1 MHz from the main carrier wave. Setting the span to a range of either 300 Hz to 1 MHz (spectrum analyzer function) or 1 kHz to 31.25 MHz (signal analyzer function) enables the function.



Actual Phase Noise Measurement Function Results



Wide Application Range using Versatile Functions

Versatile Measurement Functions

Frequency Error

Channel Power

Occupied Bandwidth

Adjacent Channel Leakage Power

Spectrum Emission Mask

Spurious Emission

Noise Figure Measurement

Phase Noise Measurement

Vector Modulation Analysis (EVM, etc.)

Analog Modulation Analysis (AM/FM/ Φ M)

RF Signal Save/Replay

Others



Main Applications

Parts/Module Function Evaluation

Measurement of basic functions such as spectrum and phase noise

Final Product General Quality Inspection

Inspection of TRx characteristics based on system standards

Legal Compliance Inspection

Measurement of frequency error, unwanted spurious, etc.

Production Line Inspection

Automated testing under remote-control

Maintenance Work

Saving/replay of problem signal waveforms

Application Example: Wireless Backhaul

More technologies are using multi-dimension modulation and the wideband mmWave technology. The phase noise performance of the local signal generator in the transmitter plays a key role in determining system performance and cost.

Combining the Signal Analyzer MS2840A with the High Performance Waveguide Mixer MA2806A/MA2808A covers frequencies from sub-6 GHz to 43 GHz, and the V-band (60 GHz) and E-band (80 GHz).

■ Solution

- **Excellent Phase Noise Performance**

- 112 dBc/Hz @ 10 kHz Offset, CF = 20 GHz (meas.)
-113 dBc/Hz @ 100 kHz Offset, CF = 20 GHz (meas.)

- **Low Noise Floor for Detecting Low-level Spurious**

- DANL -157 dBm/Hz @ CF = 40 GHz, Preamp On (spec)
DANL -150 dBm/Hz @ 75 GHz, with MA2808A (meas.)

- **Spectrum Emission Mask in Wide V-band and E-band with No Image Response Effects**

[7.5 – Signal Bandwidth] GHz (IF = 1.875 GHz, with PS function)

Application Example: Automotive Radar/Sensors

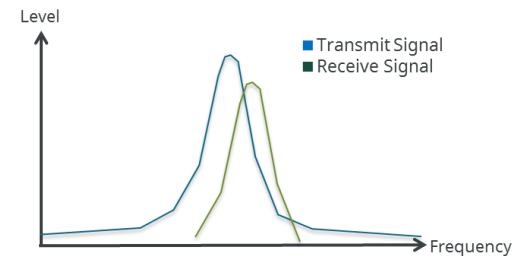
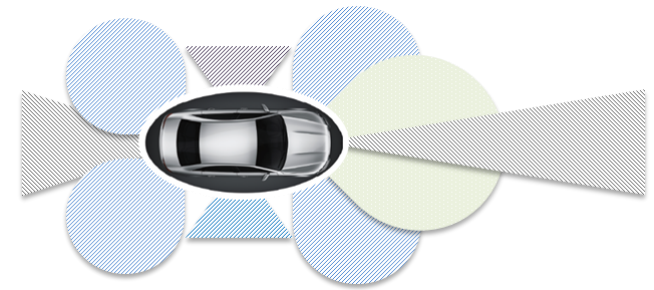
The resolution of radar and sensors is improved by using wideband mm-Wave signals. Traditional measurement methods using Image Shift or Image Suppress with a spectrum analyzer cannot measure the spectrum correctly at bandwidths above 4 GHz.

The distance and directional resolution of radar and sensors is determined by the phase noise performance and devices with poor phase noise performance might not receive radar reflections.

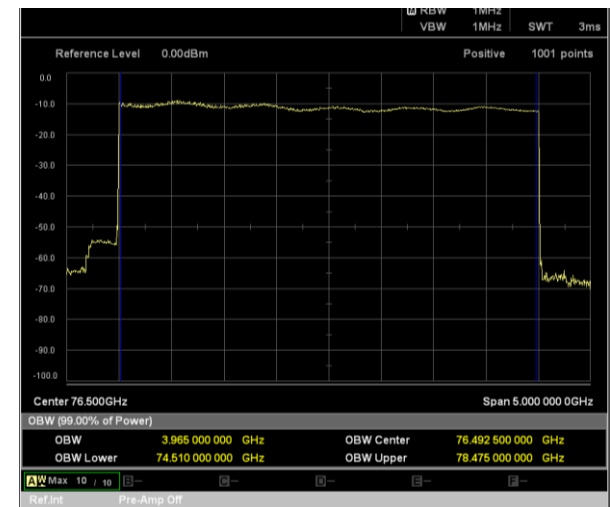
Combining the Signal Analyzer MS2840A and High Performance Waveguide Mixer MA2808A supports the best mmWave radar measurement solution.

■ Solution

- **Accurate Wideband mmWave Signal Spectrum Measurement**
 - High MS2840A IF
 - Low spurious at MA2808A fundamental mixing
 - Unique PS function eliminates image response
- **Excellent Phase Noise Performance**



At Short Range



Spectrum at 4 GHz FM CW

Application Example: Signal Source Evaluation

Wireless functions are being built into a wider range of products, such as household equipment and automobiles.

The signal source performing frequency conversion is a key element in wireless transceivers.

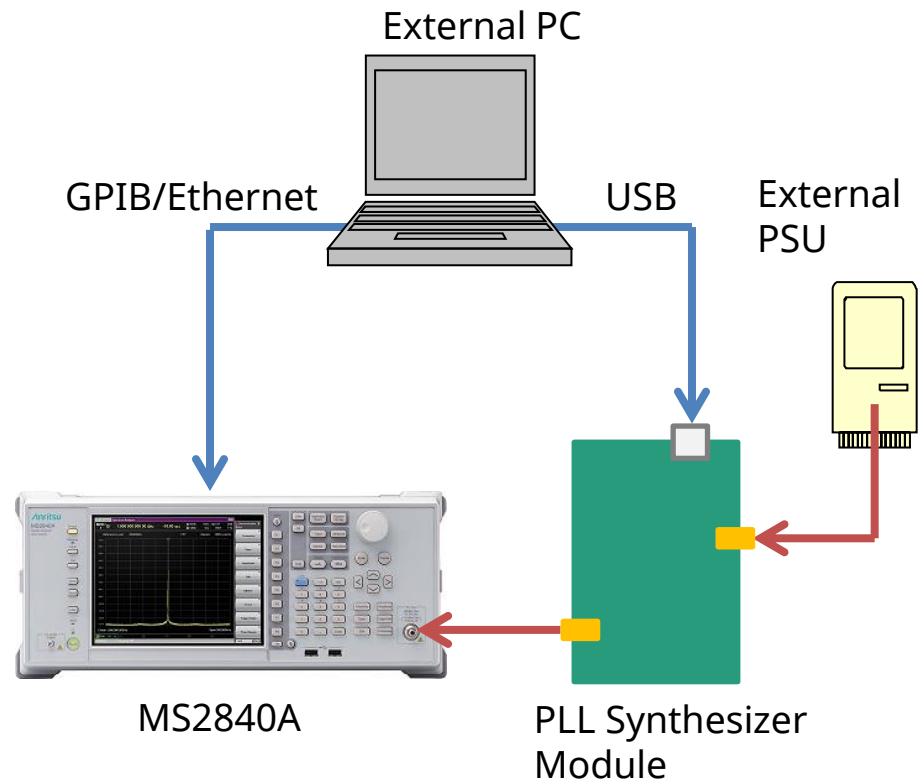
PLL synthesizer ICs are now commonly used as low-cost, high-performance signal sources.

The Signal Analyzer/Spectrum Analyzer MS2840A has the phase noise performance needed to support wide-ranging evaluation of signal sources, especially PLL synthesizer ICs.

It offers all-in-one support for measurements ranging from the purity of unmodulated CW signals generated by signal sources to the modulation accuracy of modulated signals, spectrum, and out-of-band spurious measurements.

Key Measurement Items

- ✓ Phase Noise
- ✓ Frequency
- ✓ Frequency Switching Time



Measurement Example

Mixers Expand Frequency Range

Expand frequency range by connecting to MA2840A LO/IF port

- **High Performance Waveguide Mixer MA2806A/MA2808A**

- MA2806A 50 GHz to 70 GHz: WiGig/IEEE11ad, wireless backhaul, etc.
- MA2808A 60 GHz to 90 GHz: Automobile radar, wireless backhaul, etc.
- Image-response-free measurement up to 7.5 GHz

DANL	-150 dBm/Hz @ 75 GHz (meas.)
P1dB	>0 dBm (typ.)
Conversion Loss	<15 dB (typ.)



- **External Mixer MA2740C/MA2750C Series**

- MA2747C 90 GHz to 140 GHz
- MA2749C 140 GHz to 220 GHz
- MA2751C 220 GHz to 325 GHz



Accessories Expand Measurement Functions

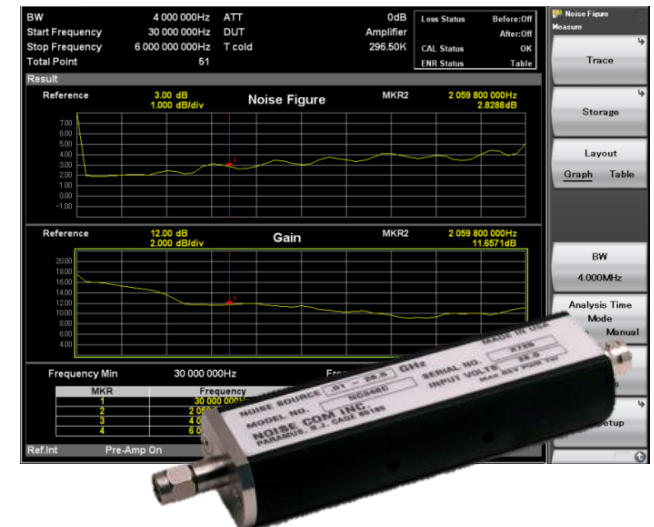
- **USB Power Sensor MA241xx Series**

- Connect to USB port of MA2840A for power meter function
- MA24106A 50 MHz to 6 GHz
- MA24118A 10 MHz to 18 GHz



- **Noise Sources**

- Measure NF of receivers, amplifiers, converters using Y-factor method
- Supported noise source: Noisecom NC346 series
- NC346C 0.01 GHz to 26.5 GHz
- NC346Ka 0.10 GHz to 40.0 GHz



Main Configuration

Type	Name	Notes
MS2840A	Signal Analyzer	Opt-040: 9 kHz to 3.6 GHz Opt-041: 9 kHz to 6 GHz Opt-044: 9 kHz to 26.5 GHz Opt-046: 9 kHz to 44.5 GHz
MS2840A-001	Rubidium Reference Oscillator	
MS2840A-008	Preamplifier	Opt-008: For all frequency models Opt-069: For 26.5 GHz model Opt-068: For 44.6 GHz model
MS2840A-010	Phase Noise Measurement Function	
MS2840A-017	Noise Figure Measurement Function	
MS2840A-021	6 GHz Vector Signal Generator	For 3.6/6 GHz models
MS2840A-066	Low Phase Noise Performance	For 3.6/6 GHz models
MS2840A-067	Microwave Preselector Bypass	For 26.5/44.5 GHz models
MS2840A-078	Analysis Bandwidth Extension to 125 MHz	
MX269017A	Vector Modulation Analysis Software	
MX269018A	Analog Measurement Software	

Main Features and Configurations

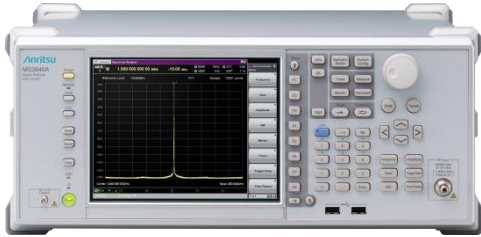
	Standard	Option	Accessories
Spectrum Analyzer	✓	–	–
Signal Analyzer (Analysis BW 31.25 MHz)	✓	–	–
Frequency Counter	✓	–	–
Channel Power (Frequency Domain)	✓	–	–
Burst Average Power (Time Domain)	✓	–	–
Occupied Bandwidth	✓	–	–
ACLR/ACP	✓	–	–
Spectrum Emission Mask	✓	–	–
Spurious Emissions	✓	–	–
AM Modulation • FM Deviation	✓	–	–
Digitize and Replay	✓		
Phase Noise Measurement	–	✓ MS2840A-010	–
Noise Figure Measurement	–	✓ MS2840A-017	Noise Source
Vector Signal Modulation Analysis	–	✓ MX269017A	–
Analog Signal Modulation Analysis	–	✓ MA269018A	–
Power Meter	✓	–	USB Power Sensor

Anritsu Bench-top Signal Analyzers

Anritsu Bench-top Signal Analyzers

NEW

MS2840A



9 kHz to 44.5 GHz

Analysis BW 125 MHz (max.)

**R&D/Mfg.
for
shortwave to mm-Wave
band wireless equipment/
radar/sensors/Local
Oscillator/Signal Source**

**Excellent phase noise
performance and DANL**

Faster CPU/SSD/
more memory
Built-in Vector/Analog SG

MS2830A



9 kHz to 43 GHz

Analysis BW 125 MHz (max.)

**R&D/Mfg./maintenance
for
cellular/WLAN/
narrow-band digital and
analog terminals**

**Wide-coverage
measurement software**

Cost effective
Built-in Audio Analyzer
Built-in Vector/Analog SG

MS2690A Series



9 kHz to 26.5 GHz

Analysis BW 125 MHz (max.)

**R&D/Mfg.
for
cellular/WLAN/wideb
and digital terminals**

**Excellent dynamic
range and deviation
resistant**

Built-in Vector SG

Anritsu Signal Analyzer Comparison

	MS2840A	MS2830A	MS2690A series
Frequency Range	-040: 9 kHz to 3.6 GHz -041: 9 kHz to 6 GHz -044: 9 kHz to 26.5 GHz -046: 9 kHz to 44.5 GHz	-040: 9 kHz to 3.6 GHz -041: 9 kHz to 6 GHz -043: 9 kHz to 13.5 GHz -044: 9 kHz to 26.5 GHz -045: 9 kHz to 43 GHz	MS2690A: 50 Hz to 6 GHz MS2691A: 50 Hz to 13.5 GHz MS2692A: 50 Hz to 26.5 GHz
SSB Phase Noise	<u>CF=500 MHz, w/ Opt-066</u> @10 kHz -133 dBc/Hz <u>CF=1 GHz, w/ Opt-066</u> @10 kHz -138 dBc/Hz (meas.) <u>CF=1 GHz</u> @10 kHz -123 dBc/Hz @100 kHz -123 dBc/Hz @1 MHz -135 dBc/Hz	<u>CF=500 MHz, w/ Opt-066</u> @10 kHz -118 dBc/Hz <u>CF=500 MHz</u> @100 kHz -115 dBc/Hz @1 MHz -133 dBc/Hz	No Opt-066 <u>CF=2 GHz</u> @100 kHz -116 dBc/Hz @1 MHz -137 dBc/Hz
DANL	w/o Preamp 30 MHz $\leq f < 1$ GHz -153 dBm/Hz	w/o Preamp 30 MHz $\leq f < 1$ GHz -153 dBm/Hz	w/o Preamp 30 MHz $\leq f < 2.4$ GHz -155 dBm/Hz
TOI	300 MHz $\leq f < 3.5$ GHz +16 dBm	300 MHz $\leq f < 3.5$ GHz +15 dBm	700 MHz $\leq f < 4$ GHz +22 dBm
Total Level Accuracy	Preamp Off 300 MHz $\leq f < 4$ GHz ± 0.5 dB	Preamp Off 300 MHz $\leq f < 4$ GHz ± 0.5 dB	Preamp Off 300 MHz $\leq f < 6$ GHz ± 0.5 dB

Measured (meas.)

Performance not warranted. Data actually measured from randomly selected measuring instruments.

Typical (typ.)

Performance not warranted. Most products meet typical performance.

Nominal (nom.)

Values not warranted. Included to facilitate application of product.

Anritsu Signal Analyzer Configuration Comparison

	MS2840A	MS2830A	MS2690A series
Rubidium Ref. Oscillator	✓ MS2840A-001	✓ MS2830A-001	✓ MS269xA-001
High-Stability Ref. Oscillator	✓ MS2840A-002 For 3.6/6 GHz models	✓ MS2830A-002 For 3.6/6/13.5 GHz models	-
Analysis Bandwidth 10 MHz	✓ Standard	✓ MS2830A-006	✓ Standard
Analysis Bandwidth 31.25 MHz	✓ Standard	✓ MS2830A-005/009	✓ Standard
Analysis Bandwidth 62.5 MHz	✓ MS2840A-077	✓ MS2830A-077	✓ MS269xA-077
Analysis Bandwidth 125 MHz	✓ MS2840A-078	✓ MS2830A-078	✓ MS269xA-078
Built-in Vector/Analog Signal Generator	✓ MS2840A-020/021/088 For 3.6/6 GHz models	✓ MS2830A-020/021/088 For 3.6/6/13.5 GHz models	✓ MS269xA-020
Low Phase Noise Performance	✓ MS2840A-066	✓ MS2830A-066	-
BER Measurement Function	✓ MS2840A-026	✓ MS2830A-026	✓ included in MS269xA-020
6 GHz Preamplifier	✓ MS2840A-008	✓ MS2830A-008	✓ MS269xA-008
Microwave Preamplifier	✓ MS2840A-068 ✓ MS2840A-069	✓ MS2830A-068	-
Microwave Preselector Bypass	✓ MS2840A-067	✓ MS2830A-067	✓ MS2692A-067
Preselector Extended Lower Limit	-	-	✓ MS2691A/MS2692A-003
Phase Noise Measurement	✓ MS2840A-010	✓ MS2830A-010	✓ Standard
Noise Figure Measurement	✓ MS2840A-017	✓ MS2830A-017	✓ MS269xA-017
Built-in Audio Analyzer	-	✓ MS2830A-018	-
External Mixer	✓	✓	-
Power Meter (connected to USB Power Sensor)	✓	✓	✓

