

# Advanced Spectrum Analysis Tools for Microwave Bench Test

## MS271xB Family

Economy Microwave Spectrum Analyzers, 9 kHz to 7.1, 13, and 20 GHz

### System Description

The Anritsu MS271xB Economy Microwave Spectrum Analyzer Family (MS2717B, MS2718B, and MS2719B) delivers affordable spectrum analysis with exceptional performance, advanced capabilities, and now with thirteen options for wireless measurements from GSM to Mobile WiMAX and TD-SCDMA.

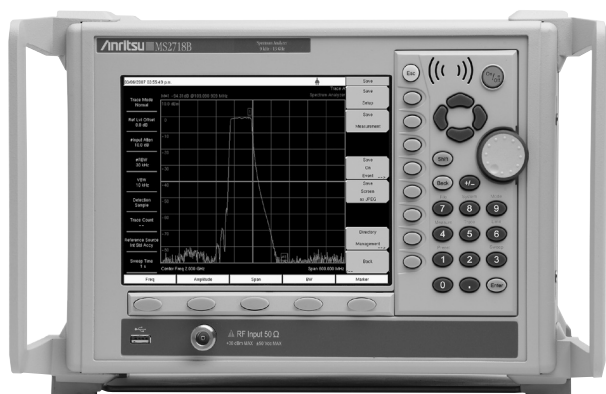


*The MS2717B with Tracking Generator, MS2718B, MS2719B Economy Microwave Spectrum Analyzers, and PSN50 High Accuracy Power Sensor*

## Introduction

Engineers in R&D and manufacturing need advanced tools for spectrum analysis of wireless components in the critical physical layer of modern communication systems. For best value and overall satisfaction, these general purpose tools must deliver performance, capabilities, and the ability to lower the cost of testing. Anritsu's new MS271xB Economy Microwave Spectrum Analyzers offer superior performance and advanced capabilities. Take a closer look and we think you will agree that the MS271xB family redefines the economy class by delivering superior spectrum analyzer performance at a surprisingly affordable price.

Covering the 9 kHz to 7.1, 13 and 20 GHz ranges, the MS271xB family easily handles most RF and microwave spectrum analyzer needs. The hallmark of the MS271xB family is the phase noise performance: typical  $-110$  dBc/Hz SSB phase noise at 10 kHz offsets up to 7.1 GHz (MS2717B) which easily measures most wireless local oscillators and synthesizers. The superior dynamic range of 100 dB means fast and precise testing of wireless components that require exceptional linearity. The wide 10 MHz demodulation bandwidth supports optional GSM, CDMA, W-CDMA, W-CDMA/HSDPA, EVDO, WiMAX and TD-SCDMA measurements. Best of all, the MS271xB family is ergonomically designed so controls are easy-to-learn and easy-to-use for improving productivity in manufacturing, R&D, and general purpose testing.



The new MS271xB family offers tremendous value with excellent performance, attractive wireless options, and economy pricing.

### Typical Performance of the MS271xB family

- 9 kHz to 7.1, 13 and 20 GHz
- Standard Built-in Preamp
- Dynamic Range of 100 dB
- Third Order Intercept of +12 dBm
- DANL (No Preamp) of  $-126$  dBm (RBW = 10 Hz)
- DANL (With Preamp) of  $-150$  dBm (RBW = 10 Hz)
- Phase Noise (800 MHz) of  $-114$  dBc/Hz at 10 kHz Offset
- Amplitude Accuracy of  $\pm 1.0$  dB to 20 GHz
- Sweep Speed of 200 ms in 10 MHz Span (RBW = 30 kHz, VBW = 10 kHz)
- Demodulation Bandwidth of 10 MHz
- Residual ACLR of  $-60$  dB
- Residual EVM of 1.75%
- True RMS Detection
- 65 dB Attenuation Range, 5 dB Steps
- 20 Watt (+43 dBm) Input Protection

### Optional Wireless Capabilities<sup>1</sup>

Wireless Protocol	RF Measurements	Demodulator Measurements
GSM/GPRS/EDGE	Option 40	Option 41
CDMA	Option 42	Option 43
W-CDMA	Option 44	Option 45
W-CDMA/HSDPA	Option 44	Option 65 <sup>2</sup>
EVDO	Option 62	Option 63
Fixed WiMAX	Option 46	Option 47
Mobile WiMAX	Option 66	Option 67
TD-SCDMA	Option 60	Option 61

<sup>1</sup> RF and Demodulator options measurements require Option 009

<sup>2</sup> Option 65 includes Option 45

### Optional Capabilities

- Tracking Generator option (MS2717B only)
- High Accuracy Power Meter Option
- Phase Noise
- Rack Mount Chassis:  
Conveniently place MS271xB in 19 inch racks.

### General

- Easy-to-Learn Operation
- 8.4 inch Color TFT Display (SVGA)
- Eight Built-in Languages (plus Two Custom)
- 512 MB Storage for 4,000 Traces and 4,000 Setups
- Six Markers, Nine Marker Modes
- Built-in AM/FM/SSB Demodulator
- Output Displays in JPEG Formats
- Connectivity: Ethernet, USB 2.0, Compact Flash
- USB 2.0 Host connector for PSN50 High Accuracy Power Meter and USB Flash Drives on Front Panel
- Remote Programming: Ethernet and GPIB
- Compact Size and Weight: 5.6 kg (12 lbs)
- Operational  $-10$  °C to 55 °C, Humidity < 85%
- Improved Zero-Span Operation
- New Advanced Limit Line Capabilities
- LabVIEW<sup>®</sup> Drivers Available
- Master Software Tools: simplifies upgrades & data management in the field
- 1 Year Standard Warranty
- GPIB - Option

LabVIEW<sup>®</sup> is a registered trademark of National Instruments Corporation

## Specifications

### Frequency

#### Frequency Range:

MS2717B: 9 kHz to 7.1 GHz  
 MS2718B: 9 kHz to 13.0 GHz  
 MS2719B: 9 kHz to 20.0 GHz

#### Preamplifier:

MS2717B: 100 kHz to 7.1 GHz  
 MS2718B and MS2719B: 100 kHz to 4.0 GHz

#### Frequency Span:

10 Hz to full frequency range, plus 0 Hz (zero span)

#### Tuning Resolution: 1 Hz

#### Time Base Stability

#### Frequency Reference:

Condition Specification

25 °C ± 25 °C, Aging < ±1 ppm/10 yrs  
 25 °C ± 25 °C, < ±0.3 x 10<sup>-6</sup>/yr or 0.3 ppm/yr + aging

**Span Accuracy:** Same as frequency reference accuracy

#### Dynamic Range

Using the popular dynamic range definition of 2/3 (TOI – DANL), the following specifications show the excellent dynamic range that is available when using the indicated tone spacing for TOI and RBW of 1 Hz.

#### Minimum Dynamic Range

Minimum Dynamic Range using 2/3 (TOI-DANL), -20 dBm tones, 100 kHz spacing, RBW = 1 Hz, 0 dB attenuation, Preamp = OFF

MS2717B: 600 MHz 95 dB, 3.5 GHz 96 dB  
 MS2718B and MS2719B: 2.4 GHz 101 dB

#### Typical Dynamic Range using 2/3 (TOI-DANL)

Frequency	Typical Dynamic Range (-20 dBm tones, 100 kHz spacing, RBW = 1 Hz, 0 dB attenuation, Preamp = OFF)		
	MS2717B	MS2718B	MS2719B
10 MHz to 1.0 GHz	98	98	98
>1.0 GHz to 2.2 GHz	97	100	100
>2.2 GHz to 2.8 GHz	96	101	101
>2.8 GHz to 3.0 GHz	99	101	101
>3.0 GHz to 4.0 GHz	101	101	101
>4.0 GHz to 7.1 GHz	95	100	100
>7.1 GHz to 10 GHz	N/A	100	100
>10 GHz to 13 GHz	N/A	100	100
>13 GHz to 20 GHz	N/A	N/A	100

### Displayed Average Noise Level (DANL)

Using 1 Hz RBW the following tables show maximum DANL performance (not including discrete spurious). Reference level is -20 dBm for preamplifier off and -50 dBm for preamplifier on; RMS detection is used and input attenuation is set to 0 dB.

#### Maximum Displayed Average Noise Level (DANL)

Frequency	Maximum DANL (RBW = 1 Hz)					
	MS2717B		MS2718B		MS2719B	
	Preamp OFF	Preamp ON	Preamp OFF	Preamp ON	Preamp OFF	Preamp ON
10 MHz to 1.0 GHz	-137 dBm	-161 dBm	-139 dBm	-159 dBm	-139 dBm	-159 dBm
>1.0 GHz to 2.2 GHz	-133 dBm	-159 dBm	-139 dBm	-156 dBm	-139 dBm	-156 dBm
>2.2 GHz to 2.8 GHz	-126 dBm	-153 dBm	-139 dBm	-156 dBm	-139 dBm	-156 dBm
>2.8 GHz to 3.0 GHz	-136 dBm	-159 dBm	-139 dBm	-156 dBm	-139 dBm	-156 dBm
>3.0 GHz to 4.0 GHz	-136 dBm	-159 dBm	-139 dBm	-154 dBm	-139 dBm	-154 dBm
>4.0 GHz to 7.1 GHz	-127 dBm	-154 dBm	-136 dBm	N/A	-136 dBm	N/A
>7.1 GHz to 10 GHz	N/A	N/A	-136 dBm	N/A	-136 dBm	N/A
>10 GHz to 11 GHz	N/A	N/A	-130 dBm	N/A	-130 dBm	N/A
>11 GHz to 13 GHz	N/A	N/A	-127 dBm	N/A	-127 dBm	N/A
>13 GHz to 20 GHz	N/A	N/A	N/A	N/A	-136 dBm	N/A

### Noise Figure

The following table shows the calculated noise figure from DANL measurements for 0 dB attenuation at 23° C with preamplifier on.

#### Equivalent Noise Figure, 23° C

Frequency	Equivalent Noise Figure, 23 °C, Preamp = On		
	MS2717B	MS2718B	MS2719B
10 MHz to 1.0 GHz	11 dB	15 dB	15 dB
>1.0 GHz to 2.2 GHz	14 dB	18 dB	18 dB
>2.2 GHz to 2.8 GHz	18 dB	18 dB	18 dB
>2.8 GHz to 3.0 GHz	14 dB	18 dB	18 dB
>3.0 GHz to 4.0 GHz	14 dB	20 dB	20 dB
>4.0 GHz to 7.1 GHz	16 dB	38 dB <sup>1</sup>	38 dB <sup>1</sup>
>7.1 GHz to 10 GHz	N/A	38 dB <sup>1</sup>	38 dB <sup>1</sup>
>10 GHz to 11 GHz	N/A	44 dB <sup>1</sup>	44 dB <sup>1</sup>
>11 GHz to 13 GHz	N/A	47 dB	47 dB
>13 GHz to 20 GHz	N/A	N/A	38 dB <sup>1</sup>

<sup>1</sup> Preamplifier is limited to 4 GHz; equivalent noise figure values for Preamp = Off -174 dBm/Hz (i.e., 1 Hz bandwidth at 23° C), 10 log (BW2/BW1)

### Third Order Intercept (TOI)

Using two -20 dBm tones separated by 100 kHz, the following tables show the minimum and typical TOI performance. Reference level is set to -20 dBm, input attenuation is set to 0 dB, and the preamplifier is off.

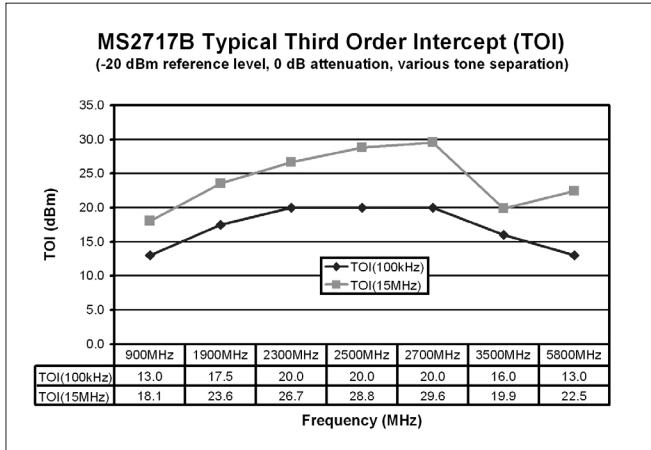
### Minimum Third Order Intercept (TOI)

Minimum Third Order Intercept (TOI), -20 dBm tones, 100 kHz spacing, RBW = 1 Hz, 0 dB attenuation, Preamp = OFF

MS2717B: 600 MHz +7 dBm, 3.5 GHz +9 dBm  
MS2718B and MS2719B: 2.4 GHz 12 dBm

### Typical Third Order Intercept (TOI)

Frequency	Typical TOI (-20 dBm tones, 100 kHz spacing, 0 dB attenuation)		
	MS2717B	MS2718B	MS2719B
50 MHz to 300 MHz	>8	>6	>6
>300 MHz to 500 MHz	>10	>6	>6
>500 MHz to 2.0 GHz	>10	>8	>8
>2.0 GHz to 2.2 GHz	>10	>10	>10
>2.2 GHz to 2.8 GHz	>15	>10	>10
>2.8 GHz to 3.0 GHz	>10	>10	>10
>3.0 GHz to 4.0 GHz	>13	>10	>10
>4.0 GHz to 7.1 GHz	>13	>12	>12
>7.1 GHz to 10 GHz	N/A	>12	>12
>10 GHz to 13 GHz	N/A	>12	>12
>13 GHz to 20 GHz	N/A	N/A	>12



MS2717B family typical Third Order Intercept for popular wireless frequencies.

### Typical TOI (MS2717B)

The following table shows the excellent TOI that is typically available for popular wireless frequencies and tone spacings.

Frequency	Typical TOI (Offset = 100 kHz)	Typical TOI (Offset = 15 MHz)
900 MHz	13 dBm	18 dBm
1900 MHz	17 dBm	24 dBm
2300 MHz	20 dBm	27 dBm
2500 MHz	20 dBm	29 dBm
2700 MHz	20 dBm	30 dBm
3500 MHz	16 dBm	20 dBm
5800 MHz	13 dBm	23 dBm

### Second Harmonic Distortion

(0 dB input attenuation, -30 dBm input):

Input Frequency Range	MS2717B Second Harmonic	MS2718B, MS2719B Second Harmonic
50 MHz to 500 MHz	-60 dBc, -70 dBc Typical	-50 dBc, -60 dBc Typical
>500 MHz to 800 MHz	-60 dBc, -70 dBc Typical	-45 dBc
>800 MHz to 1.4 GHz	-60 dBc, -70 dBc Typical	-60 dBc
>1.4 to 2 GHz	-70 dBc	-60 dBc
>2 GHz to 3 GHz	-80 dBc	-60 dBc
>3 GHz	-80 dBc	-70 dBc

### Amplitude

Maximum Continuous Input: ( $\geq 10$  dB attenuation), +30 dBm Input Damage Level\*:

\*Input protection relay opens at >30 dBm with  $\geq 10$  dB input attenuation and at approximately

Attenuation Setting	Input Damage Level*
$\geq 10$ dB >+43 dBm	$\pm 50$ Vdc
<10 dB >+23 dBm	$\pm 50$ Vdc

10 to 23 dBm with <10 dB attenuation. ESD Damage Level: >10 kV with  $\geq 10$  dB attenuation.

### Amplitude Accuracy

Amplitude accuracy at 50 MHz:  $\pm 0.7$  dB (20 °C to 30 °C)

MS2717B (30 minute warm-up)

Overall Amplitude Accuracy: (-10 °C to 55 °C)

### Power levels:

$\geq -50$  dBm,  $\leq 35$  dB input attenuation

9 kHz to $\leq 10$ MHz	$\pm 1.5$ dB
>10 MHz to 4 GHz	$\pm 1.25$ dB
>4 to 7.1 GHz	$\pm 1.75$ dB

40 to 55 dB input attenuation

9 kHz to $\leq 10$ MHz	$\pm 1.5$ dB
>10 MHz to 4 GHz	$\pm 1.75$ dB
>4 to 6.5 GHz	$\pm 1.75$ dB
>6.5 to 7.1 GHz	$\pm 2$ dB

60 to 65 dB input attenuation

9 kHz to $\leq 10$ MHz	$\pm 1.5$ dB
>10 MHz to 6.5 GHz	$\pm 1.75$ dB
>6.5 to 7.1 GHz	$\pm 3$ dB

Preamplifier on, 0 or 10 dB input attenuation

9 kHz to 4 GHz	$\pm 1.5$ dB
>4 to 7.1 GHz	$\pm 1.75$ dB

MS2718B and MS2719B (30 minute warm-up)

Overall Amplitude Accuracy: (20 °C to 30 °C)  $\pm 1.3$  dB

Frequency Flatness: >4 GHz add  $\pm 1.5$  dB

*Amplitude Settings*

**Attenuator Range:** 0 to 65 dB  
**Attenuator Resolution:** 5 dB steps  
**Measurement Range:** DANL to +30 dBm  
**Display Range:** 1 to 15 dB/div in 1 dB steps  
 Ten divisions displayed

**Amplitude Units**

Modes	Units
Log Scale	dBm

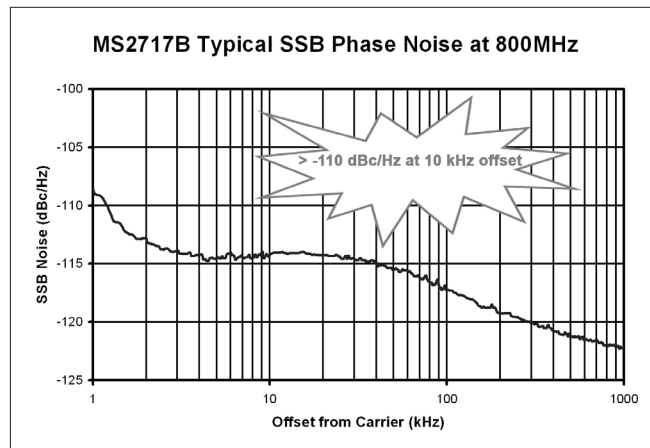
*Resolution and Video Bandwidth (RBW,VBW)*

**Resolution Bandwidth:**  
 (-3 dB) 1 Hz to 3 MHz in 1-3 sequence ±10%,  
 200 Hz, 9 kHz, 120 kHz when quasi-peak detector selected

**Demodulation Bandwidth:** 10 MHz

**Video Bandwidth:** (-3 dB) 1 Hz to 3 MHz in 1-3 sequence

*SSB Phase Noise:*



MS2717B family typical Phase Noise at 800 MHz.

Frequency Range Model(s)	9 kHz to 7.1 GHz MS2717B	9 kHz to 13 GHz MS2718B/19B	>13 GHz to 20 GHz MS2719B
Offset From Carrier	SSB Phase Noise (typical)	SSB Phase Noise (typical)	SSB Phase Noise (typical)
1 kHz (500 MHz)	(-105) dBc/Hz	(-101) dBc/Hz	(-101) dBc/Hz
10, 20 and 30 kHz	-100 (110) dBc/Hz	-95 (102) dBc/Hz	-91 (99) dBc/Hz
100 kHz	-102 (112) dBc/Hz	-97 (104) dBc/Hz	-93 (101) dBc/Hz
1 MHz	-100 (110) dBc/Hz	-105 (112) dBc/Hz	-102 (109) dBc/Hz
10 MHz	-100 (110) dBc/Hz	-120 (126) dBc/Hz	-116 (123) dBc/Hz

*Sweep Times*

**Sweep Time:**

Zero span: 10 us to 600s  
 Spans >0 Hz: Minimum 200 ms, automatically optimized. Can be manually increased

**Sweep Time Accuracy:** ±2% in zero span

**Sweep Trigger:** Free run, Single, Video, External

**Sweep Span:**

Full span, zero span, and span up/span down

### Input-Related Spurious

Spurious Response consists of Input-Related Spurious and Residual Spurious.

#### Input-Related Spurious:<sup>1</sup>

(-30 dBm input, 0 dB input attenuation, Span <1.7 GHz)  
-70 dBc typical -60 dBc max<sup>2</sup>

#### MS2717B Residual Spurious:

(Preamplifier on, RF input terminated, 0 dB input attenuation)  
-100 dBm max

(Preamplifier off, RF input terminated, 0 dB input attenuation)

-90 dBm max\*, 100 kHz to <3200 MHz  
-84 dBm max\*, 3200 to 7100 MHz

#### \*Exceptions:

Frequency	Max Spur Level (Typical)
250, 300, and 350 MHz	-85 dBm
~4010 MHz	-80 dBm (-90 dBm)
~5084 MHz	-70 dBm (-83 dBm)
~5894 MHz	-75 dBm (-87 dBm)
~7028 MHz	-80 dBm (-92 dBm)

#### MS2718/MS2719B Residual Spurious:

(Preampifier on, RF input terminated, 0 dB input attenuation)  
-100 dBm max

(Preamplifier off, RF input terminated, 0 dB input attenuation)

-90 dBm max  
-85 dBm max, >13 GHz

<sup>1</sup> Discrete spurious signals are not included in the measurement of DANL as they are covered by the residual spurious specification.

<sup>2</sup> MS2717B except input frequency 1674 MHz, -38 dBc max.  
MS2718B, MS2719B except input frequency 3275 MHz, -50 dBc max.

## Options Specifications

### Secure Data Operation (Option 7)

Option 007, Secure Data Operation, prevents the user from storing measurement setup information onto the internal file storage location.

### RF and Demodulation Hardware (Option 9)

Needed to run any of the wireless RF and demodulation options.

### GPIB Interface (Option 17)

Complies with IEEE Standard 488.1-1987

### PSN50 High Accuracy Power Meter Functionality (Option 19)

#### PSN50 Sensor:

**Measurement Range:** -30 dBm to +20 dBm

**Frequency Range:** 50 MHz to 6 GHz

**Input Connector:** Type N, male, 50 Ω

**Max Input Without Damage:** +33 dBm, ±25 VDC

#### Input Return Loss:

50 MHz to 2 GHz: ≥26 dB

2 GHz to 6 GHz: ≥20 dB

#### PSN50 Accuracy:

**Total RSS Measurement Uncertainty (0 °C to 50 °C):**

±0.16 dB<sup>1</sup>

**Noise:** 20 nW max

**Zero Set:** 20 nW

**Zero Drift:** 10 nW max<sup>2</sup>

**Sensor Linearity:** ±0.13 dB max

**Instrumentation Accuracy:** 0.00 dB

**Sensor Cal Factor Uncertainty:** ±0.06 dB

**Temperature Compensation:** ±0.06 dB max

**Continuous Digital Modulation Uncertainty:**

±0.06 dB (+17 to +20 dBm)

#### PSN50 System:

**Measurement Resolution:** 0.01 dB

**Offset Range:** ±60 dB

<sup>1</sup> Excludes mismatch errors.

Excludes noise, zero set, zero drift for levels <-20 dBm.

Excludes digital modulation uncertainty between +17 and +20 dBm.

<sup>2</sup> After 30 min warm-up

*Tracking Generator, Option 20 (MS2717B only)*

**Frequency Range:** 100 kHz to 7.1 GHz

**Frequency Resolution:** 1 Hz

**Frequency Accuracy (25 °C ±25 °C):**

Same as spectrum analyzer

**Output Power:** 0 dBm to -40 dBm

**Step Size:** 0.1 dB nominal

**Level Accuracy (15 °C to 35 °C):**

±1.5 dB max, 450 kHz to 7.1 GHz,  
excluding SWR effects

**Zero Span Behavior:** CW Output

**Output Connector:** Type N female, 50 Ω

**Damage Levels:** +23 dBm, ±50V DC, 2 kV ESD

**Phase Noise:** -100 dBm/Hz max at 10 kHz offset.  
(1 GHz, 0 dBm CW output)

*IF Output - Option 89*

This option adds an IF output connector to the MS2718B and MS2719B and used in zero span to see the signals present in the user-selected IF bandwidth.

**IF Frequency:** 37.8 MHz typical for signal at center frequency

**IF bandwidths:** 7 MHz, 10 MHz, 16 MHz, typical.

The RBW settings should not be used during IF Output operation.

**Output Power Level:** -20 to -45 dBm typical, given:

RF Input Level = +30 to -43 dBm with Preamp OFF

-40 to -60 dBm with Preamp ON

Reference Level set at RF Input Level

Auto RF Attenuation

*Phase Noise Measurements (Part number 2300-517)*

Includes CD-ROM, security key, and user guide. This software operates on user computer running Windows 2000 (Service Pack 4 or above), XP (Service Pack 2 or above) or VISTA to provide displays of Single-Sideband Phase Noise versus Frequency Offset with a logarithmic frequency axis.

*Displays types:*

- Multiple phase noise trace plots on the same scale, each in a different color
- Smoothed Traces
- Limit Lines
- Phase Noise vs. time at a user-specified offset
- Integrated noise in seconds, degrees, or Hz

## GSM/GPRS/EDGE Wireless Option Specifications (Options 40, 41)

MS271xB-Family Available Functional Tests by Option		GSM/GPRS/EDGE		Measurement Results
		40	41	
Options		RF	Demod	
RF Measurements	Spectrum	•		
	Power vs. Time	•		
	RF Summary	•		
Demodulation Measurements	I/Q Vector		•	
	Demodulation Summary		•	

**Pass/Fail Mode:** Available for measurements in both options 40 and 41.

**Frequency Range:** 380 to 400 MHz, 410 to 430 MHz, 450 to 468 MHz, 478 to 496 MHz, 698 to 746 MHz, 747 to 792 MHz, 806 to 866 MHz, 824 to 894 MHz, 890 to 960 MHz, 880 to 960 MHz, 876 to 960 MHz, 870 to 921 MHz, 1710 to 1990 MHz

*GSM/GPRS/EDGE RF Measurements (Option 40)*

**Occupied Bandwidth:** Bandwidth within which 99% of the power transmitted on a single channel lies

**Burst Power:** ±1 dB typical for -50 dBm to +20 dBm (±1.5 dB max)

**Frequency Error:** ±10 Hz + time base error, 99% confidence level

*GSM/GPRS/EDGE Demodulator (Option 41)*

**GMSK Modulation Quality**

**RMS Phase Measurement Accuracy:** ±1 deg

**Residual Error (GMSK):** 1 deg

**8PSK Modulation Quality**

**(EVM) Measurement Accuracy:** ±1.5%

**Residual Error (8PSK):** 2.5%

## CDMA Wireless Option Specifications (Options 42, 43)

MS271xB-Family Available Functional Tests by Option		CDMA		Measurement Results
		42	43	
Options		RF	Demod	
RF Measurements	Spectrum	•		
	ACPR	•		
	Spurious Emission	•		
	RF Summary	•		
Demodulation Measurements	Code Domain Power (CDP), CDP Table		•	
	Demodulation Summary		•	

**Pass/Fail Mode:** Available for measurements in both Options 42 and 43.

**Frequency Range:** 1 MHz to 2.7 GHz

*CDMA – RF Measurements (Option 42)*

**Channel Power Accuracy:** ±1 dB typical for RF Input from +20 dBm to -50 dBm (±1.5 dB maximum)

*cdmaOne and CDMA2000 1xRTT Demodulator (Option 43)*

**Residual Rho:** >0.995 typical for RF Input from +20 dBm to -50 dBm (>0.99 dB maximum)

**Rho Accuracy:** ±0.01 for Rho >0.9

**Frequency Error:** ±20 Hz + Time base error, 99% confidence level

**PN Offset:** with 1 x 64 chips

**Pilot Power Accuracy:** ±1 dB typical, relative to Channel Power

**Tau:** ±0.5 μs typical (±1 μs maximum)



## W-CDMA/HSDPA Wireless Option Specifications (Options 44, 45, 65)

MS2717xB-Family Available Functional Tests by Option		W-CDMA/HSDPA			Measurement Results
		44	45	65	
Options		RF	Demod	Demod	
RF Measurements	Spectrum	•			Channel Power, Peak to Avg Pwr, Occupied BW
	ACLR	•			Alternate Left, Adjacent Left, Channel Power, Adjacent Right, Alternate Right
	Spectral Emission Mask	•			Spectral Emission, Mask Type
	RF Summary	•			Channel Power, Carrier Frequency, Frequency Error, Spectral Emission, Occupied BW, Peak to Avg Pwr Alternate Left, Adjacent Left, Adjacent Right, Alternate Right
Demodulation Measurements	Code Domain Power (CDP), CDP Table		•	•	P-CPICH Power, Channel Power, Noise Floor, EVM, Carrier Feed Through, Peak CD Error, Carrier Frequency, Frequency Error, Frequency Error (ppm), CPICH, P-CCPCH, S-CCPCH, PICH, P-SCH, S-SCH
	HSDPA (adds constellation view)			•	
	Codogram		•	•	Set Zoom (16, 32, or 64), Select Start Index
	Demodulation Summary		•	•	Carrier Frequency, Frequency Error, Channel Power, P-CPICH Power, Carrier Feed Through, Peak CD Error, EVM, P CCPCH Power, S CCPCH Power, PICH, PSCH Power, SSCH Power

**Pass/Fail Mode:** Available for measurements in options 44, 45, and 65.

**Frequency Range:** 824 to 894 MHz, 1710 to 2170 MHz, and 2300 to 2700 MHz

*W-CDMA/HSDPA RF Measurements (Option 44)*

**RF Channel Power (Temperature range 15 °C to 35 °C):**  
±0.7 dB typical ±1.25 dB max

**Occupied Bandwidth Accuracy:** ±100 kHz

**Residual Adjacent Channel Leakage Ratio (ACLR)\*\***  
**(824 to 894 MHz, 1710 to 2170):**

**MS2717B:**

- 54 dB typical at 5 MHz offset
- 59 dB typical at 10 MHz offset

**MS2718B, MS2719B:**

- 51 dB typical at 5 MHz offset
- 59 dB typical at 10 MHz offset

**Leakage Ratio (ACLR)\*\* (2300 to 2700 MHz):**

**MS2717B:**

- 54 dB typical at 5 MHz offset
- 57 dB typical at 10 MHz offset

**MS2718B, MS2719B:**

- 51 dB typical at 5 MHz offset
- 57 dB typical at 10 MHz offset

**ACLR Accuracy (Single Channel Active)**

**(824 to 894 MHz, 1710 to 2170 MHz):**

- ±0.8 dB for ACLR ≥ –45 dB at 5 MHz offset
- ±0.8 dB for ACLR ≥ –50 dB at 10 MHz offset

**ACLR Accuracy (Single Channel Active)**

**(2300 to 2700 MHz):**

- ±1.0 dB for ACLR ≥ –45 dB at 5 MHz offset
- ±1.0 dB for ACLR ≥ –50 dB at 10 MHz offset

**Frequency Error:**

- ±10 Hz + time base error, 99% confidence level

*W-CDMA Demodulation and W-CDMA/HSDPA Demodulator (Options 45 and 65)*

**EVM Accuracy\*\*\***

**(824 to 894 MHz, 1710 to 2170 MHz):**

(3GPP Test Model 4) ±2.5%; 6 ≤ EVM ≤ 25%

**EVM Accuracy\*\*\***

**(2300 MHz to 2700 MHz):**

(3GPP Test Model 5) ±2.5%; 6 ≤ EVM ≤ 20%

**Residual EVM:** 2.5% typical

**Code Domain Power:**

- ±0.5 dB for code channel power > –25 dB
- 16, 32, 64 DCPH (test model 1)
- 16, 32 DCPH (test model 2, 3)

**CPICH (dBm) Accuracy:** ±0.8 dB typical

**Scrambling Code:** 3 seconds

\*\*\* Depends on reference level, input signal level and single channel conditions

## EVDO Wireless Option Specifications (Options 62, 63)

MS271xB-Family Available Functional Tests by Option		EVDO		Measurement Results
Options		62	63	
		RF	Demod	
RF Measurements	Spectrum	•		Channel Power, Occupied BW, Channel Power (Watts), Peak To Avg Pwr
	Power vs. Time	•		Pilot & MAC Power, Channel Power, Frequency Error (ppm), Frequency Error, Idle Activity, ON/OFF Ratio
	ACPR	•		Alternate Left, Adjacent Left, Channel Power, Adjacent Right, Alternate Right Selection for Number of Carriers (5 max), Carrier BW
	Spurious Emission	•		Marker 1-8, Pass/Fail
	RF Summary	•		Channel Power, Pilot & MAC Power, Frequency Error, Spurious Emission, Occupied BW, Idle Activity, ON/OFF Ratio, Peak to Avg Pwr
Demodulation Measurements	CDP MAC		•	Pilot & MAC Power, Channel Power, Frequency Error, Frequency Error (ppm), Rho Pilot, Rho Overall1, Data Modulation, Noise Floor Set Zoom (16, 32, or 64), Select Zoom Start, Select Relative/Absolute CDP Units
	CDP Data		•	Active Data Power, Data Modulation, Rho Pilot, Rho Overall1, Max Data CDP, Min Data CDP Select Relative/Absolute CDP Units
	MAC CDP Table		•	Code Utilization
	Demodulation Summary		•	Pilot & MAC Power, Channel Power, Rho Pilot, Rho Mac, Rho Data, Rho Overall1, Rho Overall2, Data Modulation, Noise Floor, RMS Phase Error, Frequency Error, Tau

**Pass/Fail Mode:** Available for measurements in both options 62 and 63.

**Frequency Range:** 1 MHz to 2.7 GHz

*EVDO RF Measurements (Option 62)*

**Channel Power Accuracy:**

±1 dB typical for RF Input from +20 dBm to -50 dBm (±1.5 dB maximum)

*EVDO Demodulator (Option 63)*

EVDO Rev A compatible

**Residual Rho:**

>0.995 typical for RF Input from +20 dBm to -50 dBm (>0.99 dB maximum)

**Rho Accuracy:** ±0.01 for Rho >0.9

**Frequency Error:** ±20 Hz + Time base error, 99% confidence level

**PN Offset:** within 1 x 64 chips

**Pilot Power Accuracy:** ±1 dB typical relative to Channel Power

**Tau:** ±0.5 μs typical (±1 μs maximum)

## Fixed WiMAX Wireless Option Specifications (Options 46, 47)

MS271xB-Family Available Functional Tests by Option		Fixed WiMAX		Measurement Results
Options		46	47	
		RF	Demod	
RF Measurements	Spectrum	•		Channel Power (RSSI), Occupied BW Select Span
	Power vs. Time	•		Channel Power (RSSI), Preamble Power, Data Burst Power, Crest Factor
	ACPR	•		Alternate Left, Adjacent Left, Channel Power, Adjacent Right, Alternate Right
	RF Summary	•		Channel Power (RSSI), Data Burst Power, Preamble Power, Occupied BW, Crest Factor
Demodulation Measurements	I/Q Constellation Select Reference Points Off/On		•	RCE (rms), RCE (pk), EVM (rms), EVM (pk), Frequency Error, Frequency Error (ppm), Carrier Frequency, Base Station ID
	EVM vs Sub Carrier, EVM vs Symbol		•	
	Spectral Flatness		•	Adjacent Subcarrier Flatness (Peak)
	Demodulation Summary		•	RCE (rms), RCE (pk), EVM (rms), EVM (pk), Carrier Frequency, Frequency Error, Frequency Error (ppm), Base Station ID

**Pass/Fail Mode:** Available for measurements in both Options 46 and 47.

**Frequency Range:** 2.3 to 2.7 GHz, 3.3 to 3.8 GHz, 5.25 to 5.875 GHz

*Fixed WiMAX RF Measurements (Option 46)*

**Channel Power Accuracy\*\*\*\*:** ±1 dB Typical for +20 dBm to -50 dBm (±1.5 dB max)

\*\*\*\* Will vary with amount of data burst traffic

*Fixed WiMAX Demodulator (Option 47)*

**Residual EVM (rms):**

3% for +20 dBm to -50 dBm (3.5% max.)

**Frequency Error:** ±0.1 ppm + time base error, 99% confidence level

## Mobile WiMAX Wireless Option Specifications (Options 66, 67)

MS271xB-Family Available Functional Tests by Option		Mobile WiMAX		Measurement Results
Options		66	67	
D/M = Demodulator		RF	Demod	
RF Measurements	Spectrum	•		Channel Power (RSSI), Occupied BW Select Span
	Power vs. Time	•		Channel Power (RSSI), Preamble Power, Downlink Burst Power, Uplink Burst Power
	ACPR	•		Alternate Left, Adjacent Left, Channel Power, Adjacent Right, Alternate Right
	RF Summary	•		Channel Power (RSSI), Downlink Burst Power, Preamble Power, Occupied BW, Uplink Burst Power
Demodulation Measurements	I/Q Constellation Select Reference Points Off/On		•	RCE (rms), RCE (pk), EVM (rms), EVM (pk), Frequency Error, Frequency Error (ppm), Carrier Frequency, Sector ID
	EVM vs Sub Carrier, EVM vs Symbol		•	
	Spectral Flatness		•	Adjacent Subcarrier Flatness (Peak)
	DL-MAP		•	Auto Decode, Number of Zones, Selected Zone, Preamble Index, Segment, ID Cell, Subchannel Bitmaps
	Demodulation Summary		•	RCE (rms), RCE (pk), EVM (rms), EVM (pk), Carrier Frequency, Frequency Error, Frequency Error (ppm), Sector ID

**Pass/Fail Mode:** Available for measurements in both Options 66 and 67.

**Frequency Range:** 2.3 to 2.7 GHz, 3.3 to 3.8 GHz

### Mobile WiMAX Specifications

**Bandwidths:** 5 MHz, 8.75 MHz, 10 MHz

**Frame Length:** 5 ms, 10 ms

**Zone Types:** PUSC

### DL-MAP Auto Decoding:

Convolutional Coding (CC)

and Convolutional Turbo Coding (CTC)

### Mobile WiMAX RF Measurements (Option 66)

#### Channel Power Accuracy:

±1 dB Typical (±1.5 dB max) or +20 dBm to -50 dBm

### Mobile WiMAX Demodulator (Option 67)

#### For +20 dBm to -50 dBm, Residual EVM (rms):

2.5% typical (3% max), at -50 dBm on FCH

#### Frequency Error:

±0.02 ppm + time base error, 99% confidence level  
±0.2 μs (external trigger)

## TD-SCDMA Option Specifications (Options 60, 61)

MS271xB-Family Available Functional Tests by Option		TF-SCDMA		Measurement Results
Options		60	61	
D/M = Demodulator		RF	Demod	
RF Measurements	Spectrum	•		Channel Power, Left Channel Power, Right Channel Power, Occupied BW, Left Ch. Occ BW, Right Ch. Occ. BW
	Power vs. Time	•		Slot 0 - 6 Power, Channel Power (RRC), UpPTS Power, On/Off Ratio, DL-UL Delta Power, DwPTS Power, Slot PAR
Modulation Measurements	CDP Data		•	Slot Power, Freq. Error, EVM, DwPTS Power, Tau, Peak EVM, Noise Floor, Scrambling Codes, Peak CDE

### TD-SCDMA RF Measurements (Option 60)

#### Channel Power (RRC):

±1 dB typical, 1.5 dB max

(slot power from +10 dBm to -40 dBm)

### TD-SCDMA Demodulator (Option 61)

**Residual EVM (rms):** 3% typical (for P-CCPCH slot,  
slot power > -50 dBm)

**Freq Error Accuracy:** ±10 Hz typical + time base error  
(in the presence of a downlink slot)

#### Timing Error (Tau) for dominant SYNC-DL code:

±0.2 μs (external trigger)

**Supported Modulation:** QPSK

**Spreading Factor:** 1, 16

## General

### Markers and Limit Lines

**6 Markers, 9 Modes:** Normal, Delta, Marker to Peak, Marker to Center, Marker to Reference Level, Next Peak Left, Next Peak Right, All Markers Off, Noise Marker, Frequency Counter Marker (1 Hz resolution), Markers Tracking or Fixed, Marker 1 reference for all deltas.

**Multiple Marker:** Display up to six markers on screen. Each marker includes a delta marker, effectively allowing up to 12 markers on screen.

**Marker Table:** Display a table of up to six marker frequency and amplitude values plus delta marker frequency offset and amplitude.

**Limit Lines:** Display upper and lower fixed and segmented limit lines, where each upper and lower limit can be made up of between one and 40 segments.

### Miscellaneous

**Detection:** Peak, Negative, Sample, RMS, Quasi-peak

**Displayed Traces:** Three Traces with trace overlay. Trace A is always the live data; Traces B and C can be stored data, min/max hold data, or traces which have been mathematically manipulated.

**Memory:** Trace and Setup storage is limited only by the capacity of the installed Compact Flash card or USB Flash drive. For a 256 MB card, storage is greater than 13000 spectrum analyzer traces and over 10000 setups.

**Languages:** Built-in English, Spanish, Italian, French, German, Japanese, Korean, and Chinese. The instrument also has the capability to have customized languages and soft key definitions installed from Master Software Tools.

### Display

**Display:** Bright color transmissive LCD, Full SVGA, 8.4 inches

### Connectivity

For convenient connection to PCs and networks, the MS271xB family offers an RJ45 connector for Ethernet 10/100 Base T connections. Alternatively, a 5-pin Mini-B USB 2.0 (full speed) connection is provided for connection to a PC. USB 2.0 Host connector used with PSN50 High Accuracy Power Meter and USB Flash Drives

### Interfaces

**RF Input Connector:** Type N female

**RF Input VSWR (>10 dB attenuation):**

MS2717B, MS2718B; 2.0:1 maximum, 1.5:1 typical

MS2719B; 2.0:1 maximum, 1.5:1 typical <13 GHz, 2:1 typical 13 to 20 GHz

**External Reference Input Connector:** BNC female

**External Reference Frequencies:**

1, 1.2288, 1.544, 2.4576, 4.8, 4.9152, 5, 9.8304, 10, 13 and 19.6608 MHz at -10 to +10 dBm

**External Trigger Connector:** BNC female, TTL Signal

**External Headphone Jack**

**Speaker**

### Remote Programming

SCPI available via Ethernet and GPIB

### Power Requirements

90 to 250 VAC, 47-63 Hz, 35 VA maximum

### Size and Weight

**Size with handles:** 372W x 242H x 339D mm (14.7W x 9.6H x 13.4D in)

**Size with rack mount:** 483W x 242H x 339D mm (19W x 9.6H x 13.4D in)

**Weight:** 5.6 kg (12 lbs)

### Environmental

**MIL-PRF-28800F class 2**

**Operating:** -10 °C to 55 °C, humidity 85% or less

**Storage:** -51 °C to 71 °C

**Altitude:** 4600 meters, operating and non-operating

### Safety

Conforms to EN 61010-1 for Class 1 portable equipment

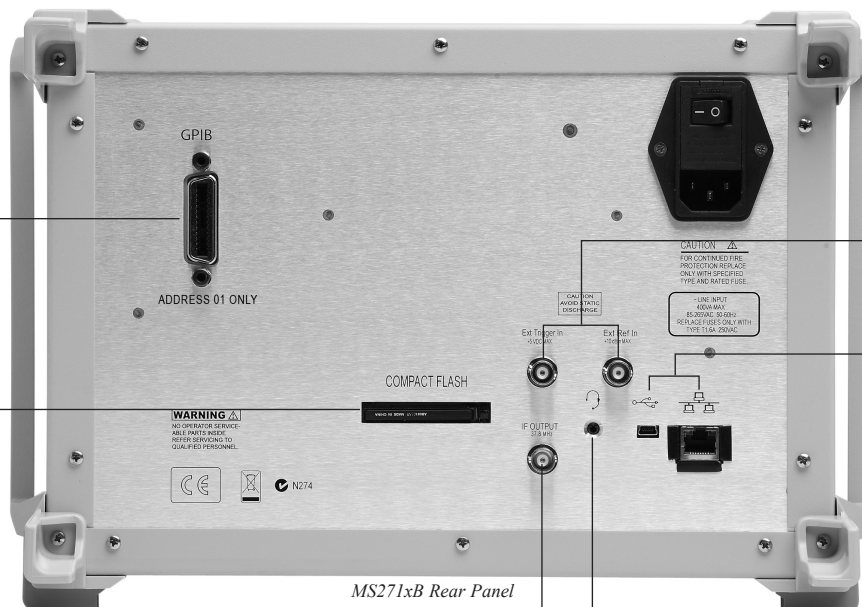
Electromagnetic Compatibility Meets European Community requirements for CE marking.

Light weight: 5.6 kg (12 lbs)

Small footprint:  
372W x 242H x 339D mm  
(14.7W x 9.6H x 13.4D in)

GPIB Interface

Use higher capacity compact flash cards to increase storage capacity for traces and setups.



Rear-panel female BNC connectors for an external reference source and external trigger.

Simple PC and network hookups with five-pin Mini-B USB 2.0 port and an Ethernet 10/100 Base-T local area network (LAN) RJ45 connector.

Popular 2.5 mm 3-wire cellular headset connector for listening to demodulated signals.

## Ordering Information

All models include standard 1 year warranty plus Certificate of Calibration and Conformance

MS2717B	Economy Microwave Spectrum Analyzer 9 kHz – 7.1 GHz, including preamplifier
MS2718B	Economy Microwave Spectrum Analyzer 9 kHz – 13.0 GHz, including preamplifier
MS2719B	Economy Microwave Spectrum Analyzer 9 kHz – 20.0 GHz, including preamplifier

### Options

MS271xB-001	Rack Mount (No Slides)
MS271xB-007	Secure Data Operation
MS271xB-009	RF and Demodulation Hardware
MS271xB-017	GPIO Interface
MS271xB-019	High Accuracy Power Meter Functionality (PSN50 Sensor not included)
MS2717B-020	Tracking Generator (MS2717B only)
MS2718B-089	IF Output
MS2719B-089	IF Output

### Calibration Options

MS271xB/98	Z540/ISO Guide 25 Calibration
MS271xB/99	Premium Calibration

### Standard Accessories

10580-00181	Anritsu User's Guide, Models MS271xB
2300-498	CD ROM containing Master Software Tools
3-2000-1498	USB A-mini B Cable
2000-1371	RJ45 Ethernet Cable
3-2000-1567	512 MB Compact Flash
2000-1520-R	2 GB USB Flash Drive
1091-27	Type-N Male to SMA Female Adapter
1091-172	Type-N Male to BNC Female Adapter

### Optional Transit Case

760-244-R	MS271xB Transit Case (includes wheels)
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### Optional Rack Mount Kit

MS271xB-001	Rack Mount (No Slides)
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### Optional Accessories

PSN50	High Accuracy Power Sensor, 50 MHz – 6 GHz
MA24106A	USB Power Sensor, 50 MHz – 6 GHz
3-2000-1567	512 MB Compact Flash
2000-1520-R	2 GB USB Flash Drive
2000-1209	Cross-over Ethernet Cable
42N50A-30	30 dB, 50 watt, Bi-directional, DC – 18 GHz, N(m) – N(f) Attenuator
34NN50A	Precision Adapter, DC – 18 GHz, 50 $\Omega$ , N(m) – N(m)
34NFN50C	Precision Adapter, DC – 18 GHz, 50 $\Omega$ , N(f) – N(f)
15NNF50-1.5B	Test port cable, armored, 1.5 meter, N(m) – N(f) 18 GHz
15NN50-1.5C	Test port cable armored, 1.5 meter, N(m) – N(m), 6 GHz
15NN50-3.0C	Test port cable armored, 3.0 meter, N(m) – N(m), 6 GHz
15NN50-5.0C	Test port cable armored, 5.0 meter, N(m) – N(m), 6 GHz
15NNF50-1.5C	Test port cable armored, 1.5 meter, N(m) – N(f), 6 GHz
15NNF50-3.5C	Test port cable armored, 3.0 meter, N(m) – N(f), 6 GHz
15NNF50-5.0C	Test port cable armored, 5.0 meter, N(m) – N(f), 6 GHz
15ND50-1.5C	Test port cable armored, 1.5 meter, N(m) – 7/16 DIN(m), 6.0 GHz
15NDF50-1.5C	Test port cable armored, 1.5 meter, N(m) – 7/16 DIN(f), 6.0 GHz
510-90	Adapter, 7/16 DIN(f) – N(m), DC – 7.5 GHz, 50 $\Omega$
510-91	Adapter, 7/16 DIN(f) – N(f), DC – 7.5 GHz, 50 $\Omega$
510-92	Adapter, 7/16 DIN(m) – N(m), DC – 7.5 GHz, 50 $\Omega$
510-93	Adapter, 7/16 DIN(m) – N(f), DC – 7.5 GHz, 50 $\Omega$
510-96	Adapter 7/16 DIN(m) – 7/16 DIN(m), DC – 7.5 GHz, 50 $\Omega$
510-97	Adapter 7/16 DIN(f) – 7/16 DIN(f), 7.5 GHz

### Literature

10580-00181	Anritsu User Guide, Models MS271xB
10580-00182	Anritsu Programming Manual, Models MS271xB
11410-00418	MS271xB Family Brochure

### Software

2300-498	Master Software Tools CD ROM
2300-517	Phase Noise Software CD-ROM and Key



## Overview of Optional Wireless Capabilities

MS271xB-Family Available Functional Tests by Option		Wireless Signal Analysis														
		GSM/GPRS/EDGE		W-CDMA/HSDPA			CDMA		EVDO		Fixed WiMAX		Mobile WiMAX		TD-SCDMA	
		40	41	44	45	65	42	43	62	63	46	47	66	67	60	61
Options		RF	Demod	RF	Demod	Demod	RF	Demod	RF	Demod	RF	Demod	RF	Demod	RF	Demod
RF Measurements	Spectrum	•		•			•		•		•		•		•	
	Power vs. Time	•							•		•		•		•	
	ACLR/ACPR			•			•		•		•		•			
	Spectral Emission Mask			•												
	Spurious Emission						•		•							
	RF Summary	•		•			•		•		•		•		•	
Demodulation Measurements	Code Domain Power (CDP), CDP Table				•	•		•		•						•
	Codogram				•	•										
	I/Q Constellation		•			•						•		•		
	EVM vs Sub Carrier, EVM vs Symbol											•		•		•
	Spectral Flatness											•		•		
	DL-MAP													•		
	Demodulation Summary		•		•	•		•		•		•		•		•
Pass/Fail Mode	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

### Wireless Options (Require Option 009)

MS271xB-040	GSM/GPRS/EDGE RF Measurements
MS271xB-041	GSM/GPRS/EDGE Demodulator
MS271xB-042	CDMA RF Measurements
MS271xB-043	cdmaOne and CDMA2000 1xRTT Demodulator
MS271xB-044	W-CDMA/HSDPA RF Measurements
MS271xB-045	W-CDMA Demodulator
MS271xB-046	Fixed WiMAX RF Measurements
MS271xB-047	Fixed WiMAX Demodulator
MS271xB-060	TD-SCDMA Measurements
MS271xB-061	TD-SCDMA Demodulator
MS271xB-062	EVDO RF Measurements
MS271xB-063	EVDO Demodulator
MS271xB-065	W-CDMA/HSDPA Demodulator <sup>1</sup>
MS271xB-066	Mobile WiMAX RF Measurements
MS271xB-067	Mobile WiMAX Demodulator

<sup>1</sup> Option 065 includes Option 045.

Wireless Protocol	Frequency Range(s)
GSM/GPRS/EDGE Mode	380 – 400 MHz
	410 – 430 MHz
	450 – 468 MHz
	478 – 496 MHz
	698 – 746 MHz
	747 – 792 MHz
	806 – 866 MHz
	824 – 894 MHz
	890 – 960 MHz
	880 – 060 MHz
W-CDMA/HSDPA	876 – 960 MHz
	870 – 921 MHz
	1710 – 1990 MHz
CDMA Mode	824 – 894 MHz
	1710 – 2170 MHz
	2300 – 2700 MHz
EVDO Mode	1 MHz – 2.7 GHz
Fixed WiMAX Mode	1 MHz – 2.7 GHz
	2.3 – 2.7 GHz
	3.3 – 3.8 GHz
Mobile WiMAX Mode	5.25 – 5.875 GHz
	2.3 – 2.7 GHz
TD-SCDMA Mode	3.3 – 3.8 GHz
	1 MHz – 2.7 GHz

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