

MS2781B Spectrum Analysis and Vector Signal Analysis with Bandwidths to 50 MHz

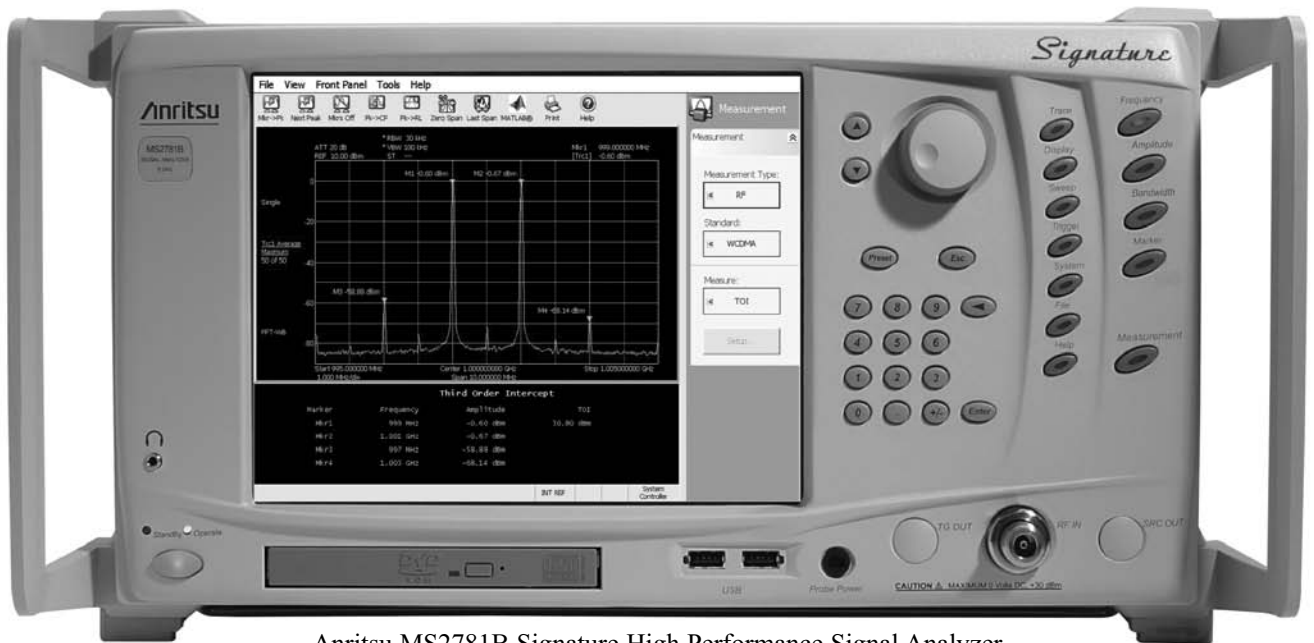
MS2781B

Signature™

100 Hz to 8 GHz

System Description

The Anritsu Signature™ High Performance Signal Analyzer is designed to provide exceptional spectrum analyzer performance and integrated vector signal analysis over the 100 Hz to 8 GHz frequency range.



Anritsu MS2781B Signature High Performance Signal Analyzer

Exceptional performance to 8 GHz without the need for a preselector or bandswitching

The Signature RF block diagram illustrates how a Signature uses a 9.5 to 17.5 GHz synthesized first local oscillator and 9.5 GHz first IF (see Figure 1). This fundamental mixing approach allows the 100 Hz to 8 GHz range to be covered without bandswitching. Also, a preselector is not needed to eliminate image responses of the first LO. Preselectors can degrade the overall amplitude accuracy as well as the modulation analysis bandwidth and accuracy. Fundamental mixing to 8 GHz improves the sensitivity, high signal level performance (TOI) and dynamic range.

This combination of high sensitivity and high TOI provides exceptional dynamic range, which is key for making spurious and on/off ratio measurements.

8 MHz Spectrum Analyzer resolution bandwidths

Signature offers standard resolution bandwidths from 0.1 Hz to 8 MHz. Three conversions are used to achieve a typical displayed dynamic range of 130 dB.

30 MHz Demodulation Bandwidth (Option 22)

Option 22, 30 MHz IF Bandwidth, extends single FFT spectrum and I-Q vector measurements to 30 MHz. Baseband differential I & Q inputs are also added. The ability to turn off the anti-alias filter extends the capture bandwidth to 50 MHz.

Comprehensive WCDMA/HSDPA/HSUPA Measurements (Option 30)

Option 30, WCDMA/HSDPA/HSUPA Measurements, allows a wide variety of Modulation Quality measurements on Handsets, Base Station (Node B) transmitters and related components. Combined with the standard RF measurements in Signature, these provide a complete suite of measurements for Engineering use, both in R&D and Manufacturing.

Fully integrated vector signal analysis (Option 38)

Option 38, QAM/PSK Modulation Analysis, allows you to select the symbol rate, modulation type, and filtering to demodulate captured signals. Measurements include EVM, carrier leakage, and I-Q imbalance. Symbol table, constellation and vector diagrams enhance viewing of measurement results.

Advanced connectivity

Signature can be remotely controlled via GPIB and Ethernet interfaces with SCPI commands that provide familiar spectrum analyzer function calls. IVI drivers simplify test system integration.

Open Windows® XP operating system

Signature's Windows XP Professional environment and built-in PC provide a new level of connectivity, ease-of-use, and remote operation.

Integrated compatibility with MATLAB (Option 40)

Signature expands the ability to analyze RF signals with simulation and analysis tools from the industry leader, The MathWorks. Signature provides an interface to easily transfer captured trace data and I-Q Vectors into MATLAB® and Simulink® for further analysis. DSP demodulator models created in MATLAB and Simulink can be applied to Signature data to evaluate new or proprietary modulation formats.

WiMAX measurements (Option 41)

Mobile and Fixed WiMAX Modulation Measurements provides all the key measurements for your WiMAX device, including Relative Constellation Error (RCE), Carrier Frequency Offset, I/Q Offset, Constellation Diagrams, RCE versus Symbol, and RCE versus sub-carrier.

Phase Noise Measurements (Option 52)

Measure the frequency stability of oscillators, with a log plot of phase noise versus offset or phase noise versus time at one offset. Advanced capabilities include instrument noise & phase noise compensation, selectable FFT or swept operation by decade, and multiple measurements with color differentiation.

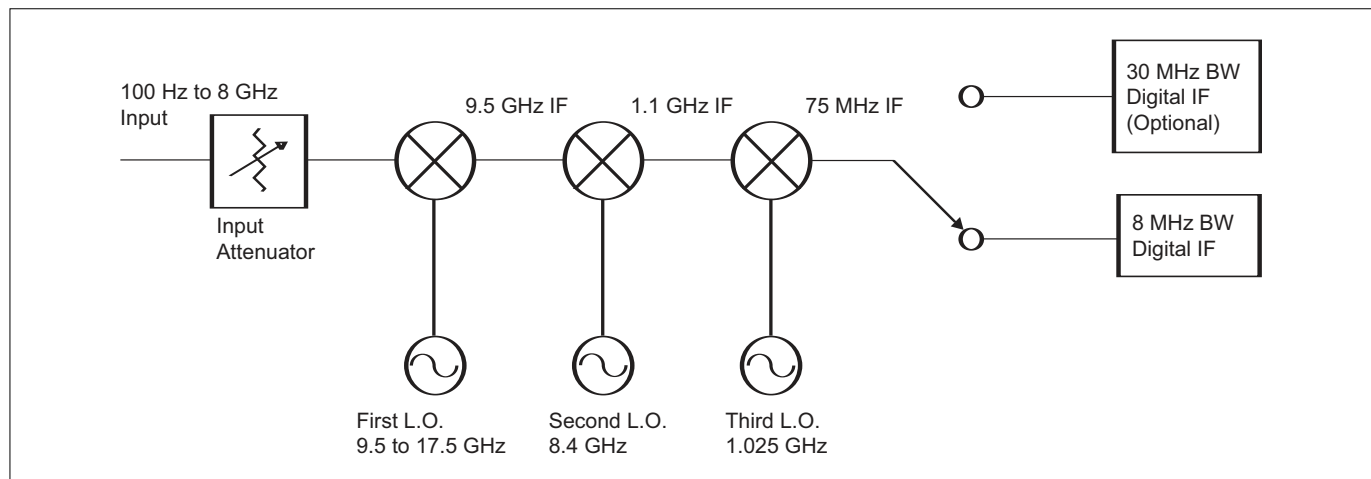


Figure 1, Signature RF block diagram (L.O. frequencies are nominal values)

Frequency Related Specifications

Frequency Range: 100 Hz to 8 GHz

Bands (Architecture): Single-band, fundamentally mixed, image free

Frequency Resolution: 1 Hz

Frequency Span Range: 10 Hz to 8 GHz, 0 Hz

Frequency Span Accuracy:

Span ≤ 33 MHz: 0.3% of span

33 MHz < Span ≤ 80 MHz: 1.4%

Span > 80 MHz: 1.0 % of span

Frequency Readout Accuracy: \pm marker freq * reference accuracy + span accuracy + RBW accuracy * RBW + 0.5 * last digit

Swept Resolution Bandwidth (RBW):

RBW Range: 10 Hz to 8 MHz (1/2/3/5)

RBW Shape Factor (60 dB/3 dB), nominal: 4.6

RBW Accuracy: 10 Hz to 2 MHz: 5%
3 MHz and 5 MHz: 10%

Modulation Analysis Bandwidth:

Standard: 8 MHz

With Option 22: 30 MHz

With Option 22 and anti-alias filter turned off: 50 MHz

FFT

FFT RBWs: 0.1 Hz to 100 kHz (1,2,3,5)

Wideband FFT (requires Option 22): 100 Hz to 3 MHz (1, 2, 3, 5)

FFT Span:

Standard: 10 Hz to 1 MHz

Wideband FFT (requires Option 22): 1 MHz to 30 MHz

FFT Span/RBW: $\leq 30,000$

Wideband FFT (requires Option 22): No restriction

Video Bandwidth (VBW): 1 Hz to 10 MHz (1/2/3/5)

SSB Phase Noise (dBc/Hz @ 1 GHz):

10 Hz Offset: < -90

100 Hz Offset: < -90

1 kHz Offset: < -109

10 kHz Offset: < -116

100 kHz Offset: < -116

1 MHz Offset: < -139

5 MHz Offset: < -142

10 MHz Offset: < -142

Residual FM: < 1 Hz in 1 second, nominal

Reference Oscillator Aging Rate: 5×10^{-10} /day; 1×10^{-7} /year

Reference Oscillator Temperature Drift: 5×10^{-9} over 0 to 50°C

Amplitude Related Specifications

Intermodulation Distortion (20°C to 30°C)

Third-Order Intercept (TOI):

< 100 MHz: > 19 dBm

≥ 100 MHz: > 22 dBm, +25 dBm typical

Second Harmonic Intercept: > 38 dBm

1 dB Compression Point: > 10 dBm

Noise

Displayed Average Noise Level (DANL) (note 5):

10 MHz to 1 GHz: < -167 dBm

> 1 GHz to 2.5 GHz: < -166 dBm

> 2.5 GHz to 5.5 GHz: < -165 dBm

> 5.5 GHz to 8 GHz: < -163 dBm

Noise Figure (0 dB input attenuation, < -20 dBm reference level):

< 16 dB typical @ 1 GHz

Amplitude Uncertainty (20° to 30°C)

Amplitude Uncertainty at 50 MHz (note 2): < 0.1 dB

Frequency Response at 10 dB Attenuation: < 0.4 dB

Frequency Response from Attenuator Switching: < 0.2 dB (note 8)

Additional Frequency Response in FFT Mode: < 0.1 dB

Reference Level Switching Uncertainty:

Without Attenuator Changes: < 0.2 dB

With Attenuator Changes: < 0.25 dB

RBW Switching Uncertainty (RBW ≤ 3 MHz): < 0.15 dB

Log Fidelity (< -10 dBm mixer level [note 4],

0 to 80 dB below reference level, signal to noise > 25 dB): < 0.07 dB

Power Bandwidth Uncertainty (RBW 10 Hz to 1 MHz): 0.1 dB

VSWR (≥ 10 dB attenuation):

≤ 3 GHz: < 1.3

> 3 GHz: < 1.5

Combined Amplitude Accuracy (95% confidence, note 3): < 0.65 dB

Ranges

Reference Level Range: -150 to $+30$ dBm in 0.01 dB steps

Scale Type: Log or Linear

Log Scale per Division: 0.1 to 20 dB

Max Average Power (10 dB attn.) w/o Damage: $+30$ dBm

Input Attenuator Range: 0 to 62 dB, 2 dB steps nominal

Displayed Dynamic Range: 130 dB typical

Spurious

Spurious Responses (-10 dBm mixer level, span ≤ 3 MHz [note 6]):

f < 300 kHz from carrier, -70 dBc

f ≥ 300 kHz from carrier, -80 dBc

Residual Responses (≥ 10 MHz): < -95 dBm

Image Rejection: < -90 dBc, < -105 dBc typical

IF Rejection: < -80 dBc, < -100 dBc typical

Other Amplitude Related

Calibrator Frequency: 50 MHz, internal connection

Amplitude Axis Units: dBm, dBmV, dB μ V, W, and A

Sweep Related Characteristics

Trigger Source(s): Free Run, Line, External ($\pm 10V @ 10 k\Omega$), Video, IF Power (Wide BW)

Frequency Domain Sweep Time:

Span ≤ 4 GHz: 5 ms to 10,000 seconds

Span > 4 GHz: 16 ms to 10,000 seconds

Time Domain (Zero Span) Sweep Time:

200 μ sec to 10,000 seconds

Sweep Time Accuracy:

Span = 0 Hz: 0.1%

Span > 0 Hz (Swept): 1%

Pre/Post Trigger: –Sweep Time to 65 ms

Display Related Characteristics

Detector Modes: Auto, Normal, Max Peak, Min Peak, RMS, Average, Sample (available simultaneously)

Trace Functions: Normal, View, Max Hold, Min Hold, Average, Blank

Traces per Graph: Up to 5

Waveform Math: User can export trace data in CSV format for external processing. Additional math available using MATLAB from The Mathworks. See Connectivity to MATLAB (Option 40) for more details.

Marker Related Characteristics

Markers: Normal, Delta, Display Line, Noise, Phase Noise (Delta CW to Noise)

Marker Frequency Resolution: 0.2% of span

Marker Amplitude Resolution: 0.01 dB

Marker Functions: Marker to peak, marker to next peak, marker to min., marker to reference level, marker to center frequency

Peak Functions: Peak to center, peak to reference level

“Smart” Signal Analyzer Measurements

Channel Power:

Standards Measured: WCDMA (UMTS), user defined

Channel Power Uncertainty: 0.67 dB (Note 10)

Adjacent Channel Power Ratio (ACPR):

Standards Measured: WCDMA (UMTS), user defined

Offsets Measured: Up to 6

ACPR Uncertainty: 0.5 dB (Note 11)

Multi-Carrier Channel Power:

Standards Measured: WCDMA (UMTS), user defined

Number of Carriers: 1 to 12, plus adjacent and 2 alternate channels

Channel Power Uncertainty: 0.67 dB (Note 10)

Occupied Bandwidth:

Frequency Accuracy: \pm Span/500 Nominal

Third-Order Intercept (TOI): Measure third order products and intercept from two tones

Internal PC Functionality

Interfaces: USB, Ethernet, VGA, Parallel printer

USB Functionality: USB access to printers, CDs, disks, cameras, memory devices

Internal Hard Disk Drive: ≥ 40 GB

“Restore” partition on internal Hard Disk Drive

Removable Media Drive: CD R/W + DVD-ROM

Processor: Pentium 4 or greater

Options

GPIB Interface (Option 3)

SH1, AH1, T6, SR1, RL1, PP0, DC1, C0 or C1

Note: Programming for options 41 and 52 are not supported via GPIB.

External Hard Disk Drive (Option 4)

Internal disk drive removed, rear panel Serial-ATA connector provides connection to external hard drives. Includes two external disk drives with complete Signature software.

30 MHz Demodulation Bandwidth (Option 22)

Complex modulated signals with up to 50 MHz bandwidth can be captured and analyzed. Also includes baseband differential I & Q inputs. Option 22 must be factory installed and calibrated.

Max Single-FFT Span: 30 MHz (Note 9)

Modulation Analysis BW: 30 MHz, 50 MHz with anti-alias filter turned off

I-Q Inputs: 30 MHz combined BW

Additional Frequency Response Error in Wideband FFT mode:
1 dB (nominal)

WCDMA and HSDPA/HSUPA Modulation Analysis (Option 30)

Link Direction: Downlink and Uplink

Inputs: RF

Measurements Functions: See page 7

Specifications: See page 7

QAM/PSK Modulation Analysis (Option 38)

Modulation Analysis BW: 8 MHz

With Option 22: 30 MHz, 50 MHz with anti-alias filter turned off

Symbol Rate Range: 10 kHz to 4 MHz

With Option 22: 10 kHz to 20 MHz, 30 MHz with anti-alias filter turned off

Modulation Formats: BPSK, QPSK, $\pi/4$ DQPSK, 8 PSK, $3\pi/8$ - 8PSK, 16 QAM, 32 QAM, 64 QAM, 128 QAM, 256 QAM

Filtering: Root-raised-cosine, $\alpha=0.1$ to 1

Analysis Length: 100 to 10k symbols

EVM: (20°C to 30°C) Test Conditions >-20 dBm, QPSK and 64 QAM modulation, $\alpha = 0.22$, reference level optimized

For Carrier Frequency <3 GHz (Note 7): 1.25% 0.1 to 6 MHz, 2% 6 to 15 MHz, 2.5% 15 to 20 MHz

For Carrier Frequency from 3 GHz to 6 GHz: Error due to frequency response = 1%

Connectivity to MATLAB (Option 40)

Allows seamless transfer of Signature measurements and setup information into the MATLAB workspace. Supports MATLAB 7 (revision 14 or R2007a). Simulink can access this information via the “To Workspace” and “From Workspace” blocks.

Allows viewing of MATLAB computed results, superimposed on the Signature measurement display. MATLAB computed results may be set to automatically update with current measurements. Handshake between Signature and MATLAB ensures synchronization, such as for averaging. MATLAB must be purchased from The MathWorks (www.mathworks.com).

Signature Measurements Transferred to MATLAB:

Traces (in dBm)

IQ vectors (in Volts)

IQ Vector Parameters:

Sample rate: 428 kHz to 21.4 MHz (9 settings)

With Option 22: 100 kHz to 50 MHz (21 settings)

Capture Length:

2 million samples (>4.5 seconds for the minimum sample rate)

With Option 22: 10 million samples (1.28 sec max for some sample rates)

Bandwidth:

Varies with sample rate; 8 MHz max

With Option 22: 30 MHz max, 50 MHz with anti-alias filter off

Handshake: On/Off

WiMAX Modulation Analysis (Option 41)

Supports IEEE 802.16d/e with compliance to WiBro (requires Option 22)

Conformance: 802.16 OFDMA (Mobile WiMAX/WiBro), 802.16 OFDM (Fixed WiMAX)

Link Type: Uplink, Downlink

Duplexing Mode: TDD, FDD (Burst transmission required on both Uplink and Downlink)

Max. Capture Duration: 200 ms to 1.28s, depending on bandwidth

Bandwidths: All WiMAX permissible values (1.25, 1.5, 1.75, 2.5, 3, 3.5, 5, 6, 7, 8.75, 10, 12, 14, 15, 17.5, 20, 24, and 28 MHz)

Cyclic Prefix Values: 1/4, 1/8, 1/16, 1/32

Auto Cyclic Prefix detection: OFDMA: Yes, OFDM: No

FFT sizes: OFDMA: 128, 512, 1024, 2048, OFDM: 256

Modulation Formats: BPSK (pilots) QPSK, 16QAM, 64QAM (auto detection (OFDM only) or manual)

Preamble Detection

OFDM: Auto Detection

OFDMA: Manually Set

Analysis Configuration

OFDMA:

Zone selection within RF burst

Number of Zones that can be analyzed simultaneously: 1

Zone types supported:

Downlink: PUSC, FUSC, and OFUSC

Uplink: PUSC and OPUSC

Number of Bursts in measurements: up to 8

OFDM:

Number of Bursts in measurements: 1

Selective analysis by symbol range and carrier number

Pilot Tracking

OFDMA Downlink, OFDM: Amplitude, Phase, or Timing (user selectable)

OFDMA Uplink: Timing

Equalizer Training

OFDM: Channel Estimation Sequence, with or without Pilots

OFDMA Downlink: Channel Estimation Sequence, with or without Pilots and Data Symbols

OFDMA Uplink: Pilots, with or without Data Symbols

RF Measurements

Power (RSSI), Burst Carrier to Interference and Noise Ratio (CINR), Power vs. Time, Spectrum (FFT), Spectral Flatness (absolute and Delta between Adjacent Channels), Complementary Cumulative Distribution Function (CCDF), Crest Factor

Modulation Measurements

EVM (RCE) including Peak and Peak Position, EVM vs. Carrier and vs. Symbol, IQ Offset, IQ Gain Imbalance, Quadrature Error, Carrier Frequency Error, Symbol Clock Error, Data Symbols (not decoded), FCH information fields, MAP information fields

Residual EVM (RCE): <0.5% (46 dB, see note 12)

Phase Noise Measurements (Option 52)

Plot of Single-Sideband Phase Noise versus Offset

Displays:

Multiple phase noise trace plots on the same scale, each in a different color

Smoothed Traces

Instrument Phase Noise Specification

Limit Lines

Phase Noise vs. time at a user-specified offset

Integrated noise in seconds, degrees, or Hz

Instrument Noise Compensation:

Phase Noise (requires low-phase-noise reference signal at the test frequency)

Sweep Mode: FFT and Swept, controllable by decade

Averaging (specifiable by decade):

Trace averaging for FFT

VBW for swept

Minimum Offset: 10 Hz

Maximum Offset: 100 MHz

	QPSK	Composite	Single-Code	Single-Code Compressed Mode
Modulation Measurements				
EVM (RMS, Peak, and Peak Position)	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
Magnitude and Phase Error	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
IQ Offset	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
Frequency Error	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
Scramble Code (automatically determined)	Not Applicable	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
Channel Power (with or without RRC filtering)	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
Primary, Secondary, and Total Sync Channel (SCH) Power	Not Applicable	Downlink only	Downlink only	Downlink only
Peak Code-Domain Error (PCDE)	Not Applicable	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
Bitstream	Not Applicable	Not Applicable	Downlink and Uplink	Downlink and Uplink
Modulation Graphs				
Constellation	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
Vector Diagrams	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
Power vs. Time	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
EVM versus Time	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
Magnitude Error versus Time	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
Phase Error versus Time	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
Eye Diagrams	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink
Code-Domain Graphs				
	Graph	Zoom	Table	
Code-Domain Power	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	
Code-Domain Error	Downlink and Uplink	Downlink and Uplink	Downlink and Uplink	

RF Measurements

- Channel Power
- ACLR
- Multi-Carrier Power
- Occupied Bandwidth
- CCDF
- Spectrum Masks

Specifications	3GPP TS 25.141 Clause	Instrument Tolerance Interval	3GPP Required Test Instrument Tolerance ¹	Conditions 95% confidence, 20-30°C, Frequency 500 MHz to 3 GHz, Mixer Level -10 to -25 dBm, sufficient averaging.
Power Uncertainty	6.2.1	<0.67 dB	<0.7 dB	Note 10
CPICH Power Uncertainty	6.2.2	<0.65 dB	<0.8 dB	
Frequency Error	6.3	<10 Hz	<12 Hz	Frequency References Locked
Power Control Step Uncertainty	6.4.2	<0.1 dB	<0.1 dB	
Power Control Dynamic Range Uncertainty	6.4.3	<0.3 dB	<1.1 dB	
Total Power Dynamic Range Uncertainty	6.4.4	<0.2 dB	<0.3 dB	
Occupied Bandwidth Uncertainty	6.5.1	<38 kHz	100 kHz	
Code Domain Power Floor	-	<-50 dB	-	
ACLR	6.5.2.2			Nominal, optimum mixer level and reference level
Floor (1 Carrier) Uncertainty		>75 dB <0.5 dB	- <0.8 dB	ACLR= 45 to 55 dB
EVM	6.7.1			Composite, Single-Code, or QPSK Optimal Reference Level and Attenuation EVM 15 to 20%
Floor Uncertainty		<1% <1%	- 2.5%	
Peak Code-Domain Error (PCDE)	6.7.2			
Floor Uncertainty		<-50 dB <1.0 dB	- <1.0 dB	PCDE -30 to -36 dB
Transmitted Code Power Absolute Uncertainty	H.3	<0.64 dB	<0.9 dB	Note 3
Transmitted Code Power Relative Uncertainty	H.3	<0.2 dB	<0.2 dB	
Transmitted Carrier Power Uncertainty	H.4	<0.07 dB	<0.3 dB	

1: 3GPP TS 25.141 version 6.12.0 December 2005, subclause 4.1 and Annex G

General Specifications

Power Requirements

AC: 85-264 VAC, 47-63 Hz

Power Consumption:

Operating: 400 VA

Standby: 30 VA

Display: 26.6 cm (10.4 inches) XGA Color with touch screen

Weight: <28 kg (62 lbs)

Dimensions: 242 H x 432 W x 508 D mm
(9.5 H x 17 W x 20 D in.)

Warranty: 3 years

Calibration Interval: 1 year

Temperature Range:

Operating Temperature Range: 0 to +50°C

Storage Temperature Range: -40 to +75°C

EMI Compatibility: Meets the emission and immunity requirements of:

EN61326: 1998
EN55011: 1998 / CISPR 11: 1997 Group 1 Class A
EN61000-3-2: 1995 + A14
EN61000-3-3: 1995
EN61000-4-2: 1995 – 4 kV CD, 8 kV AD
EN61000-4-3: 1997 – 3 V/m
EN61000-4-4: 1995 – 0.5 kV SL, 1 kV PL
EN61000-4-5: 1995 – 0.5 kV DM, 1 kV CM
EN61000-4-6: 1996 – 3V
EN61000-4-11: 1994 – 100%/1 cycle

Safety: Meets safety requirements of Low Voltage/Safety Standard 72/73/EEC – EN61010-1: 2001

Notes to Specifications

Note 1

For swept spectrum measurements

Note 2

50 MHz, 0 dBm input, Source VSWR <1.1, 10 dB input attenuation, 500 kHz RBW, 0 dBm reference level

Note 3

95% Confidence Amplitude Error Calculation, (CW Signals, 20 to 30°C) 95% confidence level is determined by RSS combination of the individual standard errors. Uniform distribution is used for all contributors except VSWR error.

U-shaped distribution is used for VSWR error.

	Error Specification (dB)	σ
Amplitude Uncertainty at 50 MHz [dB]	0.1	0.06
Frequency Response at 10 dB Attenuation [dB]	0.4	0.23
Frequency Response from Attenuator Switching [dB]	0.2	0.12
Reference Level Switching Uncertainty with Attenuator Changes [dB]	0.25	0.14
RBW Switching Uncertainty [dB]	0.15	0.09
Log Fidelity [dB]	0.07	0.04
VSWR 1.5 Error (DUT VSWR 1.2)	0.15	0.11
RSS Combined Error		0.33
95% Confidence Level for Combined Errors (Combined Errors * 1.96)		0.65

Note 4

Mixer level = signal level minus attenuation

Note 5

RBW = 0.1 Hz, FFT mode, 0 dB attenuation, average detector

Note 6

Specifications apply to mixer level ≤ -30 dBm for signals near 3186 MHz and ≤ -50 dBm for signals near 4780 MHz

Note 7

For symbol rates ≥ 10 MHz, the carrier frequency must be >500 MHz

Note 8

Compared to 10 dB attenuator setting, for 20, 30, and 40 dB attenuator settings. For other attenuator settings:

≤ 3 GHz: <0.4 dB

>3 GHz: <0.65 dB

Note 9

Spurious performance for 30 MHz FFT span may be degraded when attenuation is set manually

Note 10

95% Confidence Amplitude Error Calculation, similar to note 3. However Power Bandwidth Uncertainty is included. Uses RMS detection and sufficient averaging to reduce the measurement variance (Swept Method only).

Note 11

The most significant contribution to ACPR uncertainty is the instruments measurement floor.

Note 12

0 dBm signal level, optimum reference level and attenuation settings. For OFDMA, Residual EVM measured over a 100 symbol 64 QAM, 1024 FFT, 10 MHz bandwidth, fully loaded PUSC segment with PN sequence data. For OFDM, Residual EVM measured over a 100 symbol 64 QAM PN packet.

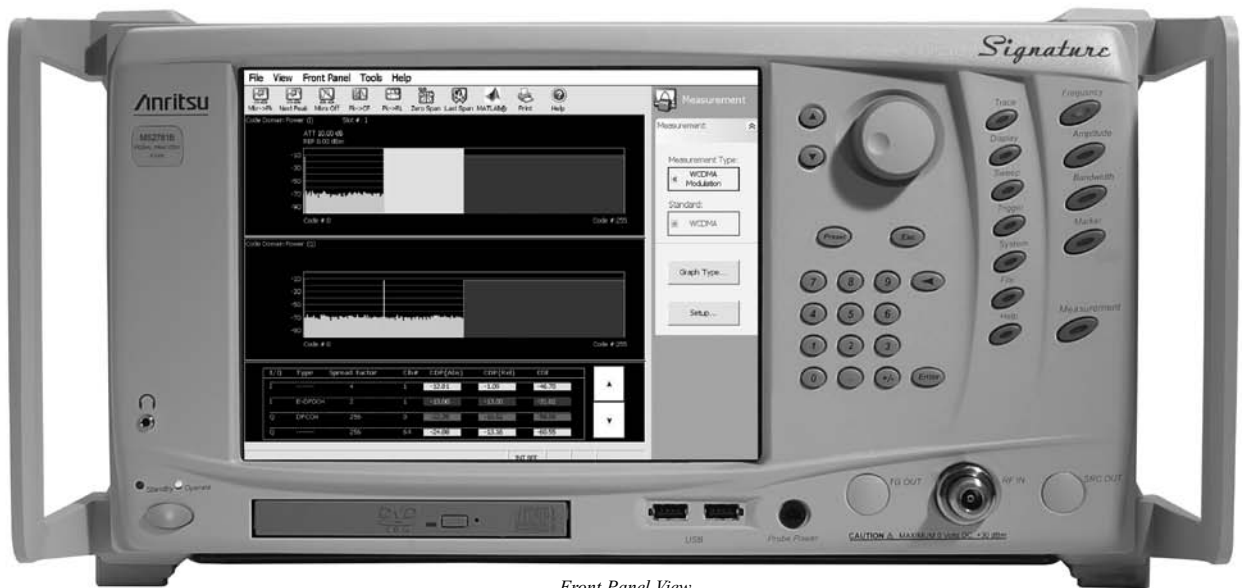
Specification Conditions

The specifications presented are covered by the product warranty unless indicated as typical or nominal.

Specifications apply under the following conditions unless otherwise noted:

- The analyzer has been calibrated within the specified Calibration Interval
- No error or warning messages
- Over the 0° C to 50° C operating range
- After a 30 minute warm up at ambient temperature
- At least 2 hours of storage or operation at the operating temperature
- Sweep Time Coupling = Accy for amplitude and frequency specifications Typical specifications describe expected performance beyond the warranted values.

Characteristics or nominal specifications describe expected product performance as designed or performance that may not be measured in the manufacturing process.



Front Panel View

Front Panel Inputs and Outputs

RF Input: Type-N Female, 50Ω , DC coupled

Probe Power: +15V ±7%/130 mA, -12.6V ±10%/45 mA

Touch Screen Display: Contact sensitive

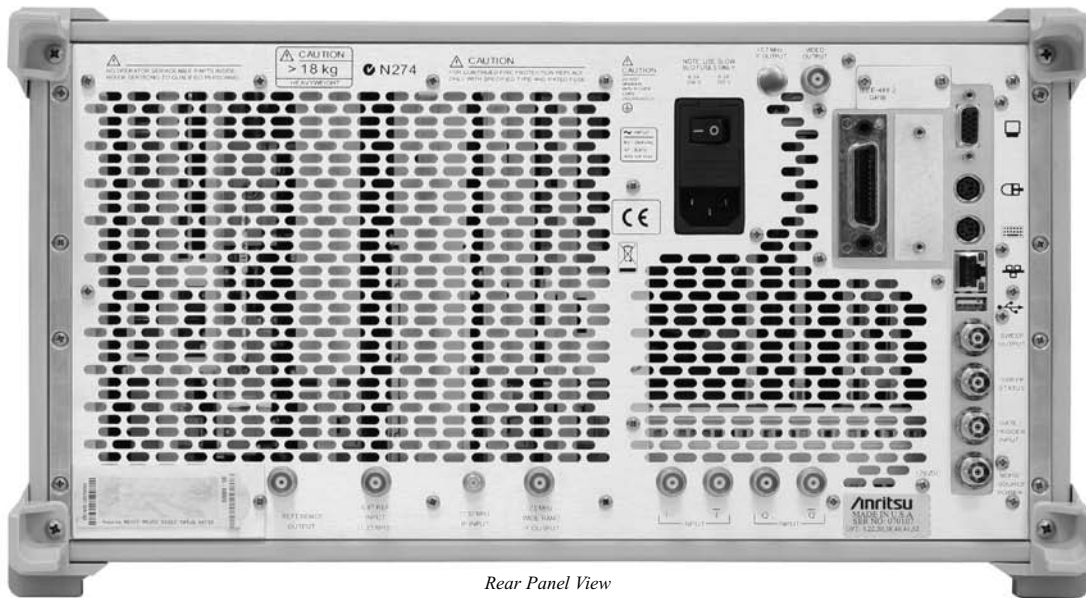
Front Panel Keypad: Preset, Menu keys, Help key, Measurement key, Numerical entry pad, Entry/Knob, Increment/Decrement keys

Operate/Standby

CD R/W + DVD-ROM

USB: 2 ports Type A, Version 1.1

Headphone Jack: CD audio



Rear Panel View

Rear Panel Inputs and Outputs

Power Supply Input Voltage: 85-264 VAC; 47 to 63 Hz

AC Power Switch: Mains power switch

Wide Bandwidth Log Video Output: 2.5V nominal, full scale into 50Ω

75 MHz Wide Band IF Output:

Frequency: 75 MHz nominal

Level (-10 dBm @ 1st mixer): -11.5 dBm ±3 dB

Bandwidth: >40 MHz

IF Input: Not Used

Reference Frequency (EXT REF) Input:

Input Level: -6 dBm < Input signal < +10 dBm

Frequency: Any frequency from 1 to 25 MHz with 1 MHz resolution and 1.544 or 2.048 MHz.
(Derate SSB Phase Noise by 3 dB w/Ext Ref of 1.544 MHz)

Reference Frequency Output:

Output Level: 8 dBm ±3 dB

Frequency:

If external reference not used: 10 MHz

If external reference used: Same as external reference frequency

Sweep Output: Not used

Sweep Status Output: TTL, active low when sweeping

External Trigger Input: BNC (±10 V nominal, into 10 kΩ)

Noise Source Power: 28 VDC (switchable), >60 mA available current

GPIO: See Option 3 description

Ethernet: 10BASE-T, 100BASE-TX, 1000BASE-T

VGA Monitor Output: Matches instrument front panel display resolution

I and Q Inputs (Option 22): 50Ω or 1 MΩ, switchable unbalanced or differential, ±2.5V max (signal to ground or between differential inputs)

USB: Type A Port, Version 2.0

Keyboard: PS/2

Mouse: PS/2

Ordering Information

Models

MS2781B High Performance Signal Analyzer (100 Hz to 8 GHz)

Options

MS2780/1	Rack Mount Adapter, with slides
MS2780/1A	Rack Mount Adapter, no slides
MS2780/3	GPIB Interface
MS2780/4	External Hard Disk Drive
MS2780/22	30 MHz Demodulation Bandwidth (includes baseband differential I & Q inputs)
MS2780/30	WCDMA and HSDPA/HSUPA Modulation Analysis
MS2780/38	QAM/PSK Modulation Analysis
MS2780/40	Connectivity to MATLAB
MS2780/41	WiMAX Modulation Analysis supports 802.16d/e with compliance to WiBro (requires Option 22)
MS2780/52	Phase Noise Measurements
Es50MMD	Extends warranty to 5 years
MS2780/98	Z540/ISO Guide 25 Calibration
MS2780/99	Premium Calibration

Included Accessories

Power Cord, Operating and Programming Manual (printed and CD-ROM),
Restore software CD set, USB Optical Mouse, Blank CD R/W disc, Spare
Fuse

Option Requirements

Option 1	Not Option 1A
Option 1A	Not Option 1
Option 3	None
Option 4	None
Option 22	None
Option 30	None
Option 38	None
Option 40	None
Option 41	Option 22 (30 MHz Demodulation Bandwidth)
Option 52	None
Option 98	Not Option 99 (Option 99 includes Option 98)
Option 99	Not Option 98 (Option 99 includes Option 98)

Optional Accessories

10410-00273	Additional printed Operation Manual
10410-00274	Additional printed Programming Manual
10410-00275	Signature Maintenance Manual
1N50B	Limiter/DC Block, N(m), to N(f), 50Ω, 1 MHz to 3 GHz.
1N50C	Limiter, N(m) to N(f), 50Ω, 10 MHz to 18 GHz
42N50A-30	30 dB Attenuator, 50 Watt N(m) to N(f)
12N50-75B	75W Matching Pad, DC to 3 GHz, 50Ω N(m) to 75Ω N(f)
11N50B	Power Divider, 1 MHz to 3 GHz, 50Ω, N(f) input, N(f) output
2100-1	GPIB Cable 1M
2100-2	GPIB Cable 2M



ANRITSU Corporation

5-1-1 Onna, Atsugi-shi, Kanagawa, 243-8555 Japan
Phone: +81-46-223-1111
Fax: +81-46-296-1264

- U.S.A.

ANRITSU Company

1155 East Collins Boulevard, Suite 100,
Richardson, Texas 75081
Toll Free: 1-800-ANRITSU (267-4878)
Phone: +1-972-644-1777
Fax: +1-972-671-1877

- Canada

ANRITSU Electronics Ltd.

700 Silver Seven Road, Suite 120, Kanata,
Ontario K2V 1C3, Canada
Phone: +1-613-591-2003
Fax: +1-613-591-1006

- Brazil

ANRITSU Eletrônica Ltda.

Praca Amadeu Amaral, 27-1 andar
01327-010 - Paraiso, São Paulo, Brazil
Phone: +55-11-3283-2511
Fax: +55-11-3886940

- U.K.

ANRITSU EMEA Ltd.

200 Capability Green, Luton, Bedfordshire LU1 3LU, U.K.
Phone: +44-1582-433280
Fax: +44-1582-731303

- France

ANRITSU S.A.

9, Avenue du Québec Z.A. de Courtaboeuf
91951 Les Ulis Cedex, France
Phone: +33-1-60-92-15-50
Fax: +33-1-64-46-10-65

- Germany

ANRITSU GmbH

Nemetschek Haus, Konrad-Zuse-Platz 1
81829 München, Germany
Phone: +49 (0) 89 442308-0
Fax: +49 (0) 89 442308-55

- Italy

ANRITSU S.p.A.

Via Elio Vittorini, 129, 00144 Roma, Italy
Phone: +39-06-509-9711
Fax: +39-06-502-2425

- Sweden

ANRITSU AB

Borgafjordsgatan 13, 164 40 Kista, Sweden
Phone: +46-8-534-707-00
Fax: +46-8-534-707-30

- Finland

ANRITSU AB

Teknobulevardi 3-5, FI-01530 Vantaa, Finland
Phone: +358-20-741-8100
Fax: +358-20-741-8111

- Denmark

ANRITSU A/S

Kirkebjerg Allé 90 DK-2605 Brøndby, Denmark
Phone: +45-72112200
Fax: +45-72112210

- Spain

Anritsu EMEA Ltd.

Oficina de Representación en España

Edificio Veganova
Avda de la Vega, nº 1 (edf 8, pl1, of 8)
28108 ALCOBENDAS - Madrid, Spain
Phone: +34-914905761
Fax: +34-914905762

- United Arab Emirates

ANRITSU EMEA Ltd.

Dubai Liaison Office

P O Box 500413 - Dubai Internet City
Al Thuraya Building, Tower 1, Suite 701, 7th Floor
Dubai, United Arab Emirates
Phone: +971-4-3670352
Fax: +971-4-3688460

- Singapore

ANRITSU Pte. Ltd.

60 Alexandra Terrace, #02-08, The Comtech (Lobby A)
Singapore 118502
Phone: +65-6282-2400
Fax: +65-6282-2533

- India

ANRITSU Pte. Ltd.

India Liaison Office

Unit No.S-3, Second Floor, Esteem Red Cross Bhavan,
No.26, Race Course Road, Bangalore 560 001 India
Phone: +91-80-32944707
Fax: +91-80-22356648

- P. R. China (Hong Kong)

ANRITSU Company Ltd.

Units 4 & 5, 28th Floor, Greenfield Tower, Concordia Plaza,
No. 1 Science Museum Road, Tsim Sha Tsui East,
Kowloon, Hong Kong, P.R. China
Phone: +852-2301-4980
Fax: +852-2301-3545

- P. R. China (Beijing)

ANRITSU Company Ltd.

Beijing Representative Office

Room 1515, Beijing Fortune Building,
No. 5, Dong-San-Huan Bei Road,
Chao-Yang District, Beijing 100004, P.R. China
Phone: +86-10-6590-9230
Fax: +82-10-6590-9235

- Korea

ANRITSU Corporation, Ltd.

8F Hyunjuk Bldg, 832-41, Yeoksam-Dong,
Kangnam-ku, Seoul, 135-080, Korea
Phone: +82-2-553-6603
Fax: +82-2-553-6604

- Australia

ANRITSU Pty Ltd.

Unit 21/270 Ferntree Gully Road, Notting Hill
Victoria, 3168, Australia
Phone: +61-3-9558-8177
Fax: +61-3-9558-8255

- Taiwan

ANRITSU Company Inc.

7F, No. 316, Sec. 1, Neihu Rd., Taipei 114, Taiwan
Phone: +886-2-8751-1816
Fax: +886-2-8751-1817

