Spectrum Master™

High Performance Handheld Spectrum Analyzer

MS2722C

9 kHz to 9 GHz

Introduction

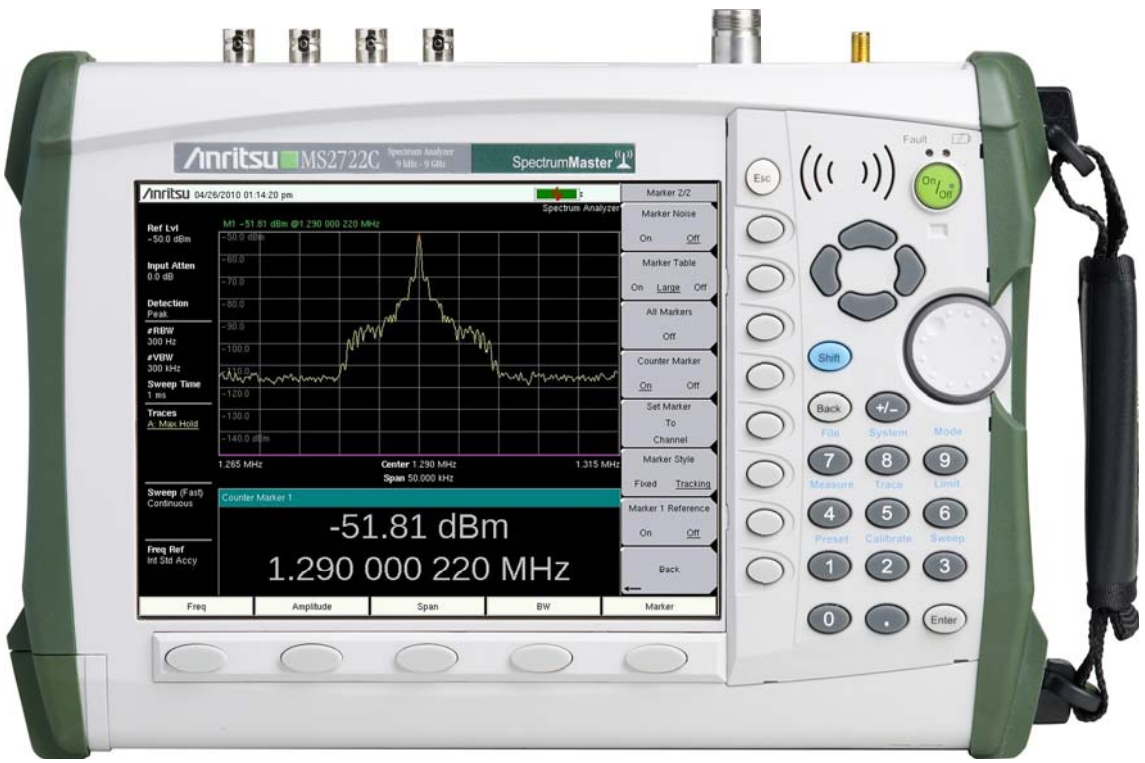
Anritsu's high performance handheld spectrum analyzer provides the wireless professional the performance needed for the most demanding measurements in harsh RF and physical environments. Whether it is for spectrum monitoring, broadcast proofing, interference analysis, RF and microwave measurements, regulatory compliance, or Wi-Fi and wireless network measurements, the Spectrum Master is the ideal instrument for making fast and reliable measurements.

Spectrum and Interference Analyzer Highlights

- Measure: Occupied Bandwidth, Channel Power, ACPR, C/I
- Interference Analyzer: Spectrogram, Signal Strength, RSSI
- Dynamic Range: > 104 dB in 1 Hz RBW
- DANL: –160 dBm in 1 Hz RBW
- Phase Noise: –100 dBc/Hz @ 10 kHz offset at 1 GHz
- Frequency Accuracy: ±25 ppb with GPS On
- 1 Hz to 10 MHz Resolution Bandwidth (RBW)
- Traces: Normal, Max Hold, Min Hold, Average, # of Averages
- Detectors: Peak, Negative, Sample, Quasi-peak, and true RMS
- Markers: 6, each with a Delta Marker, or 1 Reference with 6 Deltas
- Limit Lines: up to 40 segments with one-button envelope creation
- Trace Save-on-Event: crossing limit line or sweep complete

Capabilities and Functional Highlights

- LTE, TD-LTE
- GSM/EDGE
- W-CDMA/HSPA+
- TD-SCDMA/HSPA+
- CDMA, EV-DO
- Fixed, Mobile WiMAX
- AM/FM/SSB Demodulator
- Zero-span IF Output
- Gated Sweep
- GPS tagging of stored traces
- Internal Preamplifier standard
- High Accuracy Power Meter
- 4, 6, 8, 18, 26 GHz USB Sensors
- Channel Scanner
- 8.4 inch Display
- Burst Detect
- < 5 minute warm-up time
- 2.5 hour battery operation time
- Ethernet/USB Data Transfer
- MST Remote Access Tool



Spectrum Master™ MS2722C Spectrum Analyzer
Handheld Size: 315 mm x 211 mm x 77 mm (12.4 in x 8.3 in x 3.0 in), Lightweight: 3.5 kg (7.8 lb)

Spectrum Analyzer

All specifications and characteristics apply to instruments under the following conditions, unless otherwise stated: 1) Instrument within its recommended calibration cycle, 2) After 5 minutes of warm-up time, where the instrument has completely stabilized to the ambient temperature, 3) Internal frequency reference used, 4) Cable analyzer and VNA measurements applicable after standard OSL calibration is performed using Anritsu calibration components, 5) Typical data does not include guard band for measurement uncertainty and temperature variation and is not warranted, 6) All specifications subject to change without notice, 7) Recommended calibration cycle is 12 months.

Measurements

Smart Measurements	Field Strength (uses antenna calibration tables to measure dBm/m^2, dBW/m^2, V/m, A/m, Watt/m^2, Watt/cm^2, or dBmV/m) Occupied Bandwidth (measures 99 % to 1 % power channel of a signal) Channel Power (measures the total power in a specified bandwidth) ACPR (adjacent channel power ratio) AM/FM/SSB Demodulation (wide/narrow FM, upper/lower SSB), (audio out only) C/I (carrier-to-interference ratio) Emission Mask (recall limit lines as emission mask) Coverage Mapping (requires Option 431)

Setup Parameters

Frequency	Center/Start/Stop, Span, Frequency Step, Signal Standard, Channel #
Amplitude	Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Pre-Amp On/Off, Detection
Span	Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span
Bandwidth	RBW, Auto RBW, VBW, Auto VBW, RBW/VBW, Span/RBW
File	Save, Recall, Delete, Directory Management
Save/Recall	Setups, Measurements, Limit Lines, Screen Shots JPEG (save only), Save-on-Event
Save-on-Event	Crossing Limit Line, Sweep Complete, Save-then-Stop, Clear All
Delete	Selected File, All Measurements, All Mode Files, All Content
Directory Management	Sort Method (Name/Type/Date), Ascend/Descend, Internal/USB, Copy
Application Options	Impedance (50 Ω, 75 Ω, Other)

Sweep Functions

Sweep	Single/Continuous, Manual Trigger, Reset, Detection, Minimum Sweep Time, Trigger Type
Sweep Mode	Fast, Performance, No FFT, Burst Detect
Detection	Peak, RMS/Avg, Negative, Sample, Quasi-peak
Triggers	Free Run, External, Video, Delay, Level, Slope, Hysteresis, Holdoff, Force Trigger Once

Trace Functions

Traces	Up to three Traces (A, B, C), View/Blank, Write/Hold, Trace A/B/C Operations
Trace A Operations	Normal, Max Hold, Min Hold, Average, # of Averages, (always the live trace)
Trace B Operations	A –> B, B <–> C, Max Hold, Min Hold
Trace C Operations	A –> C, B <–> C, Max Hold, Min Hold, A – B –> C, B – A –> C, Relative Reference (dB), Scale

Marker Functions

Markers	Markers 1-6 each with a Delta Marker, or Marker 1 Reference with Six Delta Markers, Marker Table (On/Off/Large), All Markers Off
Marker Types	Style (Fixed/Tracking), Noise Marker, Frequency Counter Marker
Marker Auto-Position	Peak Search, Next Peak (Right/Left), Peak Threshold %, Set Marker to Channel, Marker Frequency to Center, Delta Marker to Span, Marker to Reference Level
Marker Table	1-6 markers frequency and amplitude, plus delta markers frequency offset and amplitude

Limit Line Functions

Limit Lines	Upper/Lower, On/Off, Edit, Move, Envelope, Advanced, Limit Alarm, Default Limit
Limit Line Edit	Frequency, Amplitude, Add Point, Add Vertical, Delete Point, Next Point Left/Right
Limit Line Move	To Current Center Frequency, By dB or Hz, To Marker 1, Offset from Marker 1
Limit Line Envelope	Create Envelope, Update Amplitude, Number of Points (41), Offset, Shape Square/Slope
Limit Line Advanced	Type (Absolute/Relative), Mirror, Save/Recall

Frequency

Frequency Range	9 kHz to 9 GHz (tunable to 0 Hz), Preamp 100 kHz to 9 GHz
Tuning Resolution	1 Hz
Frequency Reference	Aging: ±1.0 ppm/10 years Accuracy: ±0.3 ppm (25 °C ±25 °C) + aging
Auto-sensing External Frequency Reference	1, 1.2288, 1.544, 2.048, 2.4576, 4.8, 4.9152, 5, 9.8304, 10, 13, 19.6608 MHz
Frequency Span	10 Hz to 9 GHz including zero span
Sweep Time	10 µs to 600 seconds in zero span
Sweep Time Accuracy	±2 % in zero span

Bandwidth (Performance Sweep Mode)

Resolution Bandwidth (RBW)	1 Hz to 10 MHz in 1–3 sequence ±10 % (–3 dB bandwidth)
Video Bandwidth (VBW)	1 Hz to 10 MHz in 1–3 sequence (–3 dB bandwidth)
RBW with Quasi-Peak Detection	200 Hz, 9 kHz, 120 kHz (–6 dB bandwidth)
VBW with Quasi-Peak Detection	Auto VBW is On, RBW/VBW = 1

Spectrum Analyzer (continued)

Spectral Purity

SSB Phase Noise at 1 GHz	−100 dBc/Hz @ 10 kHz offset from carrier (−104 dBc/Hz typical) −102 dBc/Hz @ 100 kHz offset from carrier (−107 dBc/Hz typical) −107 dBc/Hz @ 1 MHz offset from carrier (−114 dBc/Hz typical) −120 dBc/Hz @ 10 MHz offset from carrier (−129 dBc/Hz typical)

Amplitude Ranges

Dynamic Range	> 104 dB @ 2.4 GHz, 2/3 (TOI-DANL) in 1 Hz RBW
Measurement Range	DANL to +30 dBm
Display Range	1 to 15 dB/div in 1 dB steps, ten divisions displayed
Reference Level Range	−150 dBm to +30 dBm
Attenuator Resolution	0 to 65 dB, 5 dB steps
Amplitude Units	Log Scale Modes: dBm, dBV, dBmv, dBµV Linear Scale Modes: nV, µV, mV, V, kV, nW, µW, mW, W, kW
Maximum Continuous Input	+30 dBm Peak, ±50 VDC (≥ 10 dB Attn) +23 dBm Peak, ±50 VDC (< 10 dB Attn) +13 dBm Peak, ±50 VDC (Preamp On)

Amplitude Accuracy (single sine wave input < Ref level, and > DANL, auto attenuation, Performance Sweep Mode)

20 °C to 30 °C after 30 minute warm-up	Typical: ±0.5 dB, 100 kHz to 9 GHz Maximum: ±1.3 dB, 100 kHz to 9 GHz
−10 °C to 50 °C after 60 minute warm-up	Add ±1.0 dB, 100 kHz to 9 GHz

Displayed Average Noise Level (DANL) (RMS detection, VBW/Avg type = Log., Ref Level = −20 dBm for Preamp Off and −50 dBm for Preamp On, Performance Sweep Mode)

DANL in 1 Hz RBW, 0 dB attenuation	Preamp Off	Preamp On
10 MHz to 4 GHz	−141 dBm	−160 dBm
> 4 GHz to 9 GHz	−134 dBm	−156 dBm

Spurs (0 dB input attenuation, Performance Sweep Mode)

Residual Spurs	Preamp Off (RF input terminated)	−90 dBm 9 kHz to 9 GHz
	Preamp On (RF input terminated)	−100 dBm 1 MHz to 9 GHz
Input-Related Spurs	(−30 dBm input, span < 1.7 GHz)	−60 dBc, −70 dBc typical

Third-Order Intercept (TOI) (−20 dBm tones 100 kHz apart, −20 dBm Ref level, 0 dB input attenuation, Preamp Off)

2.4 GHz	+15 dBm
50 MHz to 9 GHz	+20 dBm typical

P1dB

< 4 GHz	+5 dBm typical
4 GHz to 9 GHz	+12 dBm typical

Second Harmonic Distortion

50 MHz	−54 dBc
< 4 GHz	−60 dBc typical
> 4 GHz	−75 dBc typical

VSWR

	(> 10 dB input attenuation)
< 9 GHz	1:5:1 typical

Spectrum Analyzer (continued)

Secure Data Option (Option 7)

For highly secure data handling requirements, this software Option prevents the storing of measurement setup or data information onto any internal file storage location. Instead, setup and measurement information is stored ONLY to the external USB memory location. A simple factory default reset prepares the Spectrum Master for transportation while the USB memory remains behind in the secure environment. The Spectrum Master cannot be switched between secure and non-secure operation by the user once configured for secure data operation.

AM/FM/PM Demodulation Analyzer Option (Option 509)

Spectrum Master comes with AM/FM/SSB audio demodulation standard. By adding Option 509, the instrument becomes capable of measuring, analyzing, and displaying key modulation parameters of RF Spectrum, Audio Spectrum, Audio Waveform, and Demodulation Summary. The RF Spectrum View displays the spectrum analyzer with carrier power, frequency, and occupied BW. Audio Spectrum shows the demodulated audio spectrum along with the Rate, RMS deviation, Pk-Pk/2 deviation, SINAD, Total Harmonic Distortion (THD), and Distortion/Total. Each demodulation also includes an Audio Waveform oscilloscope display that shows the time-domain demodulated waveform. A summary display provides a list of all the RF and demodulation parameters.

GPS Receiver Option (Option 31)

Setup	On/Off, Antenna Voltage 3.3/5.0 V, GPS Info **Note:** Anritsu GPS antennas (2000-1528-R and 2000-1652-R) require 5 VDC
GPS Time/Location Indicator	Time, Latitude, Longitude, and Altitude on display Time, Latitude, Longitude, and Altitude with trace storage
High Frequency Accuracy	Spectrum Analyzer, Interference Analyzer, Signal Analyzers
when GPS Antenna is connected	< ±25 ppb with GPS On, 3 minutes after satellite lock in selected mode
GPS Lock – after antenna is disconnected	< ±50 ppb for 3 days, 0 °C to 50 °C ambient temperature
Connector	SMA, female

High Accuracy Power Meter (Option 19, Requires external USB Power Sensor)

Setup Parameters

Amplitude	Maximum, Minimum, Offset, Relative On/Off, Units, Auto Scale
Average	# of Running Averages, Max Hold
Zero/Cal	Zero On/Off, Cal Factor (Center Frequency, Signal Standard)
Limits	Limit On/Off, Limit Upper/Lower

Power Sensor Model	PSN50	MA24104A/105A	MA24106A	MA24108/18/26A
Description	High Accuracy RF Power Sensor	Inline High/Peak Power Sensor	High Accuracy RF Power Sensor	Microwave USB Power Sensor
Frequency Range	50 MHz to 6 GHz	600 MHz to 4 GHz (**MA24104A**) 350 MHz to 4 GHz (**MA24105A**)	50 MHz to 6 GHz	10 MHz to 8 GHz (**MA24108A**) 10 MHz to 18 GHz (**MA24118A**) 10 MHz to 26 GHz (**MA24126A**)
Connector	Type N(m), 50 Ω	Type N(f), 50 Ω (**MA24104A**) Type N(f), 50 Ω (**MA24105A**)	Type N(m), 50 Ω	Type N(m), 50 Ω (**MA24108/18A**) Type K(m), 50 Ω (**MA24126A**)
Dynamic Range	−30 dBm to +20 dBm (0.001 mW to 100 mW)	+3 dBm to +51.76 dBm (2 mW to 150 W)	−40 dBm to +23 dBm (0.1 µW to 200 mW)	−40 dBm to +20 dBm (0.1 µW to 100 mW)
VBW	100 Hz	100 Hz	100 Hz	50 kHz
Measurands	True-RMS	True-RMS	True-RMS	True-RMS, Slot Power, Burst Average Power
Measurement Uncertainty	±0.16 dB[1]	±0.17 dB[2]	±0.16 dB[1]	±0.18 dB[3]
Datasheet (for complete specifications)	11410-00414	11410-00483 (**MA24104A**) 11410-00621 (**MA24105A**)	11410-00424	11410-00504

Notes:

1. Total RSS measurement uncertainty (0 °C to 50 °C) for power measurements of a CW signal greater than −20 dBm with zero mismatch errors.

2. Expanded uncertainty with K=2 for power measurements of a CW signal greater than +20 dBm with a matched load. Measurement results referenced to the input side of the sensor.

3. Expanded uncertainty with K=2 for power measurements of a CW signal greater than −20 dBm with zero mismatch errors.

Coverage Mapping (Option 431)

Measurements

Indoor Mapping	RSSI, ACPR
Outdoor Mapping	RSSI, ACPR

Setup Parameters

Frequency	Center/Start/Stop, Span, Freq Step, Signal Standard, Channel #, Channel Increment
Amplitude	Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Pre-Amp On/Off, Detection
Span	Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span
BW	RBW, Auto RBW, VBW, Auto VBW, RBW/VBW, Span/VBW
Measurement Setup	ACPR, RSSI
Point Distance / Time Setup	Repeat Type Time Distance
Save Points Map	Save KML, JPEG, Tab Delimited
Recall Points Map	Recall Map, Recall KML Points only, Recall KML Points with Map, Recall Default Grid

I/Q Waveform Capture (Option 24, Requires Option 9)

General

Mode	Spectrum Analyzer
Capture Mode	Single or Continuous
Trigger	Free Run, External (Rising/Falling), Delay
Maximum Capture Length	800 ms
Maximum Sample Rate	40 MHz
Maximum Signal Bandwidth	32 MHz

Interference Analyzer (Option 25)

Measurements

Spectrum	Field Strength Occupied Bandwidth Channel Power Adjacent Channel Power (ACPR) AM/FM/SSB Demodulation (Wide/Narrow FM, Upper/Lower SSB), (audio out only) Carrier-to-Interference ratio (C/I)
Spectrogram	Collect data up to 72 hours
Signal Strength	Gives visual and aural indication of signal strength
Received Signal Strength Indicator (RSSI)	collect data up to one week Gives visual and aural indication of signal strength
Signal ID	up to 12 signals Center Frequency Bandwidth Signal Type (FM, GSM, W-CDMA, CDMA, Wi-Fi only) Closest Channel Number Number of Carriers Signal-to-Nose Ratio (SNR) > 10 dB
Interference Mapping	Save current point location and direction Save/Recall points/map Delete last saved point Delete all points Speaker on/off Volume Reset Max/Min hold
Application Options	Impedance (50 Ω, 75 Ω, Other)

Channel Scanner (Option 27)

General

Number of Channels	1 to 20 Channels (Power Levels)
Measurements	Graph/Table, Max Hold (On/5 sec/Off), Frequency/Channel, Current/Maximum, Dual Color
Scanner	Scan Channels, Scan Frequencies, Scan Custom List, Scan Script Master™
Amplitude	Reference Level, Scale
Custom Scan	Signal Standard, Channel, # of Channels, Channel Step Size, Custom Scan
Frequency Range	9 kHz to 9 GHz
Frequency Accuracy	±10 Hz + Time base error
Measurement Range	−110 dBm to +30 dBm
Application Options	Impedance (50 Ω, 75 Ω, Other)

Gated Sweep (Option 90)

General

Mode	Spectrum Analyzer, Sweep
Trigger	External TTL
Setup	Gated Sweep (On/Off) Gate Polarity (Rising, Falling) Gate Delay (0 ms to 65 ms typical) Gate Length (1 µs to 65 ms typical) Zero Span Time

Zero Span IF Output (Option 89)

General

Mode	Spectrum Analyzer/Span/Zero Span
IF Frequency	140 MHz
Output Level	−40 dBm to −20 dBm typical
Reference Level	−43 dBm to +30 dBm (Preamp Off) −60 dBm to −40 dBm (Preamp On)
IF Bandwidths	Up to 30 MHz (3 dB bandwidth)
RF Attenuation	Auto
Connector	BNC female

GSM/EDGE Signal Analyzers (Options 40, 41)

Measurements

RF (Option 40)	Demodulation (Option 41)	Over-the-Air (OTA)	Pass/Fail (User Editable)
Channel Spectrum -Channel Power -Occupied Bandwidth -Burst Power -Average Burst Power -Frequency Error -Modulation Type -BSIC (NCC, BCC) Multi-channel Spectrum Power vs. Time (Frame/Slot) -Channel Power -Occupied Bandwidth -Burst Power -Average Burst Power -Frequency Error -Modulation Type -BSIC (NCC, BCC)	Phase Error EVM Origin Offset C/I Modulation Type Magnitude Error BSIC (NCC, BCC)	RF Measurements and Demodulation can be made OTA. There are no additional OTA Measurements.	Measurements -Channel Power -Occupied Bandwidth -Burst Power -Average Burst power -Frequency Error -Phase Error -EVM -Origin Offset -C/I -Magnitude Error Script Master™

Setup Parameters

GSM/EDGE Select	Auto, GSM, EDGE
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screen	Overall Measurements

RF Measurements (Option 40)

Frequency Error	±10 Hz + time base error, 99% confidence level
Occupied Bandwidth	Bandwidth within which 99% of the power transmitted on a single channel lies
Burst Power Error	±1.5 dB, ±1 dB typical, (−50 dBm to +20 dBm)

Demodulation (Option 41)

GSMK Modulation Quality (RMS Phase) Measurement Accuracy	±1 deg
Residual Error (GSMK)	1 deg
8 PSK Modulation Quality (EVM) Measurement Accuracy	±1.5%
Residual Error (8 PSK)	2.5%

W-CDMA/HSPA+ Signal Analyzers (Options 44, 65, 35)

Measurements

RF (Option 44)	Demodulation (Option 65)	Over-the-Air (OTA) (Option 35)	Pass/Fail (User Editable)
Band Spectrum Channel Spectrum -Channel Power -Occupied Bandwidth -Peak-to-Average Power Spectral Emission Mask Single carrier ACLR Multi-carrier ACLR RF Summary	Code Domain Power Graph -P-CPICH Power -Channel Power -Noise Floor -EVM -Carrier Feed Through -Peak Code Domain Error -Carrier Frequency -Frequency Error -Control Channel Power -Abs/Rel/Delta Power –CPICH, P-CCPCH –S-CCPCH, PICH –P-SCH, S-SCH HSPA+ -Power vs. Time -Constellation Code Domain Power Table -Code, Status -EVM, Modulation Type -Power, Code Utilization -Power Amplifier Capacity Codogram Modulation Summary	Scrambling Code Scanner (Six) -Scrambling Codes -CPICH -Ec/Io -Ec -Pilot Dominance -OTA Total Power Multipath Scanner (Six) -Six Multipaths -Tau -Distance -RSCP -Relative Power -Multipath Power	Measurements Max Output Power Frequency Error EVM CPICH Occupied Bandwidth Spectral Mask ACLR PCDE P-CCPCH S-CCPCH Code Spread 3 PICH Code 128 Script Master™ Test Models -1 (16), (32), (64) -2 -3 (16), (32) -4 (+CPICH), (-CIPCH) -5 (2 HS), (4 HS), (8 HS)

Setup Parameters	
Scrambling Code, Threshold	Auto, Manual
User Selectable	Scrambling Code, S-CCPCH Spread, S-CCPCH Code, PICH Code, Threshold, Max Amp Power, CPICH Power, Frequency Error Average
Maximum Spreading Factor	256, 512
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)
Marker	Six Markers, Table On/Off
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements
RF Measurements	(Option 44)
RF Channel Power Accuracy	±1.25 dB, ±0.7 dB typical, (temperature range 15 °C to 35 °C)
Occupied Bandwidth Accuracy	±100 kHz
Adjacent Channel Leakage Ratio (ACLR)	−54 dB/−59 dB ±0.8 dB @ 5 MHz/10 MHz offset, typical, Bands I to VI, VIII to XIV, XVII −54 dB/−57 dB ±1.0 dB @ 5 MHz/10 MHz offset, typical, Band VII
Demodulation	(Option 65)
W-CDMA Modulations	QPSK, QPSK-DTX (Codecs: AMR 4.75, 5.9, 7.4, 12.2 kbps, DTX 7.4, 12.2 kbps)
HSPA+ Modulations	QPSK, 16 QAM, 64 QAM
EVM Accuracy	±2.5%, 6% ≤ EVM ≤ 25%
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
Over-the-Air (OTA) Measurements (Option 35)	
Scrambling Code Scanner	Six strongest Scrambling Codes
Multipath Scanner	Multipath power of six signals relative to strongest pilot

CDMA Signal Analyzers (Option 42, 43, 33)

Measurements

RF (Option 42)	Demodulation (Option 43)	Over-the-Air (OTA) (0ption 33)	Pass/Fail (User Editable)
Channel Spectrum -Channel Power -Occupied Bandwidth -Peak-to-Average Power Spectral Emission Mask Multi-carrier ACPR RF Summary	Code Domain Power Graph -Pilot Power -Channel Power -Noise Floor -Rho -Carrier Feed Through -Tau -RMS Phase Error -Frequency Error -Abs/Rel/ Power –Pilot –Page –Sync –Q Page Code Domain Power Table -Code -Status -Power -Multiple Codes -Code Utilization Modulation Summary	Pilot Scanner (Nine) -PN -Ec/Io -Tau -Pilot Power -Channel Power -Pilot Dominance Multipath Scanner (Six) -Ec/Io -Tau -Channel Power -Multipath Power Limit Test – 10 Tests Averaged -Rho -Adjusted Rho -Multipath -Pilot Dominance -Pilot Power -Pass/Fail Status	Measurements Channel Power Occupied Bandwidth Peak-to-Average Power Spectral Mask Test Frequency Error Channel Frequency Pilot Power Noise Floor Rho Carrier Feed Through Tau RMS Phase Error Code Utilization Measured PN Pilot Dominance Multipath Power

Setup Parameters

PN Setup	PN Trigger (No Trigger, GPS, External), PN Search Type (Auto, Manual), PN Offset
Walsh Codes	64, 128
Measurement Speed	Fast, Normal, Slow
External Trigger Polarity	Rising, Falling
Number of Carriers	1 to 5
Carrier Bandwidth	1.23 MHz, 1.24 MHz, 1.25 MHz
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 42)

RF Channel Power Accuracy	±1.5 dB, ±1.0 dB typical, (RF input –50 dBm to +20 dBm)

Demodulation (Option 43)

Frequency Error	±10 Hz + time base error, 99% confidence level (in slow mode)
Rho Accuracy	±0.005, for Rho > 0.9
Residual Rho	> 0.995, typical, > 0.99 maximum, (RF input –50 dBm to +20 dBm)
PN Offset	1 x 64 chips
Pilot Power Accuracy	±1.0 dB typical, relative to channel power
Tau	±0.5 µs typical, ±1.0 µs maximum

Over-the-Air (OTA) Measurements (Option 33)

Pilot Scanner	Nine strongest pilots
Multipath Scanner	Multipath power of six signals relative to strongest pilot
Limit Test	Average of ten tests compared to limit

EV-DO Signal Analyzers (Option 62, 63, 34)

Measurements

RF (Option 62)	Demodulation (Option 63)	Over-the-Air (OTA) (Option 34)	Pass/Fail (User Editable)
Channel Spectrum -Channel Power -Occupied Bandwidth -Peak-to-Average Power Power vs. Time -Pilot & MAC Power -Channel Power -Frequency Error -Idle Activity -On/Off Ratio Spectral Emission Mask Multi-carrier ACPR RF Summary	MAC Code Domain Power Graph -Pilot & MAC Power -Channel Power -Frequency Error -Rho Pilot -Rho Overall -Data Modulation -Noise Floor MAC Code Domain Power Table -Code -Status -Power -Code Utilization Data Code Domain Power -Active Data Power -Data Modulation -Rho Pilot -Rho Overall -Maximum Data CDP -Minimum Data CDP Modulation Summary	Pilot Scanner (Nine) -PN -Ec/Io -Tau -Pilot Power -Channel Power -Pilot Dominance Mulitpath Scanner (Six) -Ec/Io -Tau -Channel Power -Multipath Power	Measurements -Channel Power -Occupied Bandwidth -Peak-to-Average Power -Carrier Frequency -Frequency Error -Spectral Mask -Noise Floor -Pilot Power -RMS Phase Error -Tau -Code Utilization -Measured PN -Pilot Dominance -Mulitpath Power

Setup Parameters

PN Setup	PN Trigger (No Trigger, GPS, External), PN Search Type (Auto, Manual), PN Offset
Walsh Codes	64, 128
Measurement Speed	Fast, Normal, Slow
External Trigger Polarity	Rising, Falling
Slot Type	Auto, Active, Idle
Number of Carriers	1 to 5
Carrier Bandwidth	1.23 MHz, 1.24 MHz, 1.25 MHz
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 62)

RF Channel Power Accuracy	±1.5 dB, ±1.0 dB typical, (RF input −50 dBm to +20 dBm)

Demodulation (Option 63)

EV-DO Compatibility	Rev 0 and Rev A
Frequency Error	±20 Hz + time base error, 99% confidence level
Rho Accuracy	±0.01, for Rho > 0.9
Residual Rho	> 0.995 typical, > 0.99, maximum (RF input −50 dBm to +20 dBm)
PN Offset	Within 1 x 64 chips
Pilot Power Accuracy	±1.0 dB typical, relative to channel power
Tau	±0.5 µs typical, ±1.0 µs maximum

Over-the-Air (OTA) Measurements (Option 34)

Pilot Scanner	Nine strongest pilots
Multipath Scanner	Multipath power of six signals relative to strongest pilot

LTE Signal Analyzers (Options 541, 542, 543, 546)

Measurements

RF (Option 541)	Modulation (Option 542)	Over-the-Air (OTA) (Option 546)	Pass/Fail (User Editable)
Channel Spectrum -Channel Power -Occupied Bandwidth ACPR Spectral Emission Mask -Category A or B (Opt 1) RF Summary	Power vs. Resource Block (RB) -RB Power (PDSCH) -Active RBs, Utilization % -Channel Power, Cell ID -OSTP, Frame EVM by modulation Constellation -QPSK, 16 QAM, 64 QAM -Modulation Results –Ref Signal Power (RS) –Sync Signal Power (SS) –EVM – rms, peak, max hold –Frequency Error – Hz, ppm –Carrier Frequency –Cell ID Control Channel Power -Bar Graph or Table View -RS, P-SS, S-SS -PBCH, PCFICH, PHICH, PDCCH -Total Power (Table View) -EVM Tx Time Alignment Modulation Summary -Includes EVM by modulation Antenna Icons -Detects active antennas (1 or 2)	Scanner -Cell ID (Group, Sector) -S-SS Power, RSRP, RSRQ, SINR -Dominance -Modulation Results – On/Off Tx Test -Scanner -RS Power of MIMO antennas –Cell ID, Average Power –Delta Power (Max-Min) –Graph of Antenna Power –Modulation Results – On/Off Mapping –On-screen –S-SS Power, RSRP, RSRQ, or SINR	View Pass/Fail Limits -All, RF, Modulation Available Measurements -Channel Power -Occupied Bandwidth -ACLR -Frequency Error -Carrier Frequency -Dominance -EVM peak, rms -RS Power, EVM -SS, P-SS, S-SS Power, EVM -PBCH Power, EVM -PCFICH Power, EVM -PHICH Power, EVM -PDCCH Power, EVM -Cell, Group, Sector ID -OSTP -Tx Time Alignment

Setup Parameters

Frequency	E-UTRA bands 1 - 5, 7 - 14, 17 - 21, 23 - 25 (tunable 10 MHz to 4.0 GHz) Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Bandwidth	1.4, 3, 5, 10, 15, 20 MHz (15, 20 MHz requires Option 543)
Span	Auto, 1.4, 3, 5, 10, 15, 20, 30 MHz
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
EVM Mode	Auto, PBCH only, Max Hold
Save/Recall	Setup, Measurement, JPEG (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

RF Measurements (Option 541)

RF Channel Power Accuracy	±1.5 dB, ±1.0 dB typical, (RF input −50 dBm to +10 dBm)

Modulation Measurements (Option 542)

RS Power Accuracy	±1.0 dB typical, (RF input −50 dBm to +10 dBm)
Frequency Error	±10 Hz + time base error, 99% confidence level
Residual EVM (rms)	2.0% typical (E-UTRA Test Model 3.1, RF Input −50 dBm to +10 dBm)

BW = 15 MHz, 20 MHz (Option 543)

Bandwidths	15 MHz, 20 MHz

Over-the-Air (OTA) Measurements (Option 546)

Scanner	Six strongest signals if present Auto Save – Sync Signal power and Modulation Results with GPS Information
Tx Test	Scanner – three strongest signals if present RS Power – strongest signal
Mapping	Map On-screen S-SS Power, RSRP, RSRQ, or SINR of Cell ID with strongest signal Scanner – three strongest signals if present Save and Export Mapping data: *.kml, *.mtd (tab delimited)

TD-LTE Signal Analyzers (Options 551, 552, 543, 556)

Measurements

RF (Option 551)	Modulation (Option 552)	Over-the-Air (OTA) (Option 556)	Pass/Fail (User Editable)
Channel Spectrum -Channel Power -Occupied Bandwidth Power vs. Time -Frame View -Sub-Frame View -Total Frame Power -DwPTS Power -Transmit Off Power -Cell ID -Timing Error ACLR Spectral Emission Mask -Category A or B (Opt 1) RF Summary	Power vs. Resource Block (RB) -RB Power (PDSCH) -Active RBs, Utilization % -Channel Power, Cell ID Constellation -QPSK, 16 QAM, 64 QAM -Modulation Results –Ref Signal Power (RS) –Sync Signal Power (SS) –EVM – rms, peak, max hold –Frequency Error – Hz, ppm –Carrier Frequency –Cell ID Control Channel Power -Bar Graph or Table View -RS, P-SS, S-SS -PBCH, PCFICH -Total Power (Table View) -Modulation Results Modulation Summary Antenna Icons -Detects active antennas (1 or 2)	Scanner -Cell ID (Group, Sector) -S-SS Power, RSRP, RSRQ, SINR -Dominance -Modulation Results – On/Off Tx Test -Scanner -RS Power of MIMO antennas –Cell ID, Average Power –Delta Power (Max-Min) –Graph of Antenna Power –Modulation Results – On/Off Mapping -On-screen –S-SS Power, RSRP, RSRQ, or SINR	View Pass/Fail Limits -All, RF, Modulation Available Measurements -Channel Power -Occupied Bandwidth -ACLR -Frequency Error -Carrier Frequency -Dominance -EVM peak, rms -RS Power -SS, P-SS, S-SS Power -PBCH Power -PCFICH Power -Cell, Group, Sector ID -Frame Power -DwPTS Power -Transmit Off Power -Timing Error

Setup Parameters

Frequency	E-UTRA bands 33 - 43 (tunable 10 MHz to 4.0 GHz) Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Bandwidth	1.4, 3, 5, 10, 15, 20 MHz (15, 20 MHz requires Option 543)
Span	Auto, 1.4, 3, 5, 10, 15, 20, 30 MHz
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
EVM Mode	Auto, PBCH only, Max Hold
Trigger	No Trigger/Ext Trigger, Rising/Falling
Save/Recall	Setup, Measurement, JPEG (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

RF Measurements (Option 551)

RF Channel Power Accuracy	± 1.5 dB, ± 1.0 dB typical, (RF input −30 dBm to +10 dBm)

Modulation Measurements (Option 552)

RS Power Accuracy	±1.0 dB typical, (RF input −30 dBm to +10 dBm)
Frequency Error	±10 Hz + time base error, 99% confidence level
Residual EVM (rms)	2.0% typical (E-UTRA Test Model 3.1, RF Input −30 dBm to +10 dBm)

BW = 15, 20 MHz (Option 543)

Bandwidths	15 MHz, 20 MHz

Over-the-Air (OTA) Measurements (Option 556)

Scanner	Six strongest signals if present Auto Save – Sync Signal power and Modulation Results with GPS Information
Tx Test	Scanner – three strongest signals if present RS Power – strongest signal
Mapping	Map On-screen S-SS Power, RSRP, RSRQ, or SINR of Cell ID with strongest signal Scanner – three strongest signals if present Save and Export Mapping data: *.kml, *.mtd (tab delimited)

Fixed and Mobile WiMAX[1] Signal Analyzers (Options 46, 47, 66, 67, 37)

Measurements

RF (Option 46 - Fixed) (Option 66 - Mobile)	Demodulation (Option 47 - Fixed) (Option 67 - Mobile)	Over-the-Air (OTA) (Option 37 - Mobile)	Pass/Fail (User Editable)
Channel Spectrum -Channel Power -Occupied Bandwidth Power vs. Time -Channel Power -Preamble Power -Downlink Burst Power (Mobile) -Uplink Burst Power (Mobile) -Data Burst Power (Fixed) -Crest Factor (Fixed) ACPR RF Summary	Constellation -RCE (RMS/Peak) -EVM (RMS/Peak) -Frequency Error -CINR (Mobile) -Base Station ID -Sector ID (Mobile) Spectral Flatness -Adjacent Subcarrier Flatness EVM vs. Subcarrier/Symbol -RCE (RMS/Peak) -EVM (RMS/Peak) -Frequency Error -CINR (Mobile) -Base Station ID -Sector ID (Mobile) DL-MAP (Tree View) (Mobile) Modulation Summary	Channel Power Monitor Preamble Scanner (Six) -Preamble -Relative Power -Cell ID -Sector ID -PCINR -Dominant Preamble –Base Station ID	Pass Fail All Pass/Fail RF Pass Fail Demod Measurements Channel Power Occupied Bandwidth Downlink Bust Power Uplink Burst Power Preamble Power Crest Factor Frequency Error Carrier Frequency EVM RCE Sector ID (Mobile)

Setup Parameters

Fixed WiMAX Frequency Ranges	2.3 to 2.7 GHz, 3.3 to 3.8 GHz, 5.25 to 5.875 GHz
Mobile WiMAX Frequency Ranges	2.3 to 2.7 GHz, 3.3 to 3.8 GHz
Fixed WiMAX Bandwidth	1.25, 1.50, 2.50, 3.50, 5.00, 5.50, 6.00, 7.00, 10.00 MHz
Fixed WiMAX Cyclic Prefix Ratio (CP)	1/4, 1/8, 1/16, 1/32
Fixed WiMAX Span	5, 10, 15, 20 MHz
Fixed WiMAX Frame Length	2.5, 5.0, 10.0 msec
Mobile WiMAX Zone Type	PUSC
Mobile WiMAX DL-MAP Auto Decoding	Convolutional Coding (CC), Convolutional Turbo Coding (CTC)
Mobile WiMAX Bandwidths	3.50, 5.00, 7.00, 8.75, 10.00 MHz
Mobile WiMAX Cyclic Prefix Ratio (CP)	1/8
Mobile WiMAX Span	5, 10, 20, 30 MHz
Mobile WiMAX Frame Lengths	5, 10 msec
Mobile WiMAX Demodulation	Auto, Manual, FCH
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 46 – Fixed, Option 66 – Mobile)

RF Channel Power Accuracy	±1.5 dB, ±1.0 dB typical, (RF input –50 dBm to +20 dBm)

Demodulated Signal Analyzer (Option 47 – Fixed, Option 67 – Mobile)

Frequency Error	±10 Hz + time base error, 99% confidence level
Fixed WiMAX Residual EVM (rms)	3% typical, 3.5% maximum (RF Input –50 dBm to +20 dBm)
Mobile WiMAX Residual EVM (rms)	2.5% typical, 3.0% maximum, (RF Input –50 dBm to +20 dBm)

Over-the-Air (OTA) Measurements (Option 37)

Channel Power Monitor	Over time (one week), measurement time interval 1 to 60 sec
Preamble Scanner	Six Strongest Preambles
Auto Save	Yes
GPS Tagging and Logging	Yes

1. Mobile WiMAX conforms to IEEE Std. 802.16e-2005, WiMAX Forum® Air Interface - Mobile System Profile - Release 1.0 Certified, System Profiles according to WMF-T24-001-R010v07.

TD-SCDMA / HSPA+ Signal Analyzers (Options 60, 61, 38)

Measurements

RF Measurements (Option 60)	Demodulation (Option 61)	Over-the-Air (OTA) (Option 38)	Pass/Fail (User Editable)
Channel Spectrum -Channel Power -Occupied Bandwidth -Left Channel Power -Left Channel Occ B/W -Right Channel Power -Right Channel Occ B/W Power vs. Time -Six Slot Powers -Channel Power (RRC) -DL-UL Delta Power -UpPTS Power -DwPTS Power -On/Off Ratio -Slot Peak-to-Average Power Spectral Emission RF Summary	Code Domain Power/Error -(QPSK/8 PSK/16 QAM) -Slot Power -DwPTS Power -Noise Floor -Frequency Error -Tau -Scrambling Code -EVM -Peak EVM -Peak Code Domain Error -CDP Marker Modulation Summary	Code Scan (32) -Scrambling Code Group -Tau -Ec/Io -Pilot Dominance Tau Scan (Six) -Sync-DL# -Tau -Ec/Io -DwPTS Power -Pilot Dominance Record Run/Hold	Pass Fail All Pass/Fail RF Pass Fail Demod Measurements -Occupied Bandwidth -Channel Power -Channel Power RCC -On/Off Ratio -Peak-to-Average Ratio -Frequency Error -EVM -Peak EVM -Peak Code Domain Error -Tau -Carrier Feedthrough -Noise Floor

Setup Parameters

Slot Selection	Auto, 0-6
Trigger	Trigger Type (No Trigger/GPS/External), External Trigger (Rising/Falling), Tau Offset
SYNC-DL Code	Auto, 0-31
Scrambling/Midamble Code	Auto, 0-127
Maximum Users	Auto, 2, 4, 6, 8, 10, 12, 14, 16
Measurement Speed	Fast, Normal, Slow
User Selectable	Uplink Switch Point, Number of Carriers (1, 3), Tau Offset
Demodulation Type	Auto, QPSK, 8 PSK, 16 QAM
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)
Sweep	Hold/Run, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 60)

RF Channel Power Accuracy (RRC)	±1.5 dB, ±1.0 dB typical, (slot power −40 dBm to +10 dBm)
Frequency Error	±20 Hz + time base error, in the presence of a downlink slot

Demodulation (Option 61)

Supported Modulation	QPSK, 8 PSK, 16 QAM, MBMS
Residual EVM (rms)	3% typical, P-CCPH slot power > −50 dBm
PN Offset	Within 1 x 64 chips
Pilot Power Accuracy	±1.0 dB typical
Timing Error (Tau) for Dominant SYNC-DL	±0.2 µs (external trigger)
Spreading Factor	1, 16

Over-the-Air (OTA) Measurements (Option 38)

Code Scanner	32 Sync Codes and associated Scrambling Code Groups
Tau Scanner	Six strongest Sync Codes
Auto Save	Yes
GPS Tagging and Logging	Yes

General Specifications

All specifications and characteristics apply under the following conditions, unless otherwise stated: 1) After 5 minutes of warm-up time, where the instrument is left in the ON state; 2) Apply when using internal reference and performance sweep mode; 3) Subject to change without notice; 4) Typical performance is the measured performance of an average unit; 5) Recommended calibration cycle is 12 months.

Setup Parameters

System	Status (Temperature, Battery Info, S/N, Firmware Ver, IP Address, Options Installed) Self Test, Application Self Test GPS (see Option 31)
System Options	Name, Date and Time, Ethernet Configuration, Display, Volume Display (Brightness, Default Colors, Black and White, Night Vision, High Contrast) Language (English, French, German, Spanish, Chinese, Japanese, Korean, Italian, Russian, User defined) Share Center Frequency and Power Offset between Modes Reset (Factory Defaults, Master Reset, Update Firmware)
File	Save, Recall, Delete, Directory Management
Save/Recall	Setups, Measurements, Screen Shots JPEG (save only)
Delete	Selected File, All Measurements, All Mode Files, All Content
Directory Management	Sort Method (Name/Type/Date), Ascend/Descend, Internal/USB, Copy, Format USB
Internal Trace/Setup Memory	> 13,000 traces
External Trace/Setup Memory	Limited by size of USB Flash drive
Mode Switching	Auto-Stores/Recalls most recently used Setup Parameters in the Mode

Connectors

RF In	Type N, male, 50 Ω, Maximum Input +30 dBm, ±50 VDC
GPS	SMA Female
External Power	5.5 mm barrel connector, 12 to 15 VDC, < 5.0 Amps
LAN Connection	RJ48C, 10/100 Mbps, Connect to PC or LAN for Remote Access
USB Interface (2)	Type A, Connect Flash Drive and Power Sensor
USB Interface	5-pin mini-B, Connect to PC for data transfer
Headset Jack	2.5 mm 3-wire headset jack
External Reference In	BNC, female, 50 Ω, Maximum Input −10 dBm to +10 dBm
External Reference Out	BNC, female, 50 Ω, 10 MHz
External Trigger	BNC, female, 50 Ω, Maximum Input ±5 VDC
IF Out	BNC, female, 50 Ω, 140 MHz

Display

Size	8.4 in
Resolution	800 x 600

Battery

Type	Li-Ion
Battery Operation	2.5 hours, typical

Electromagnetic Compatibility

European Union	CE Mark, EMC Directive 89/336/EEC, 92/31/EEC, 93/68/EEC and Low Voltage Directive 73/23/EEC, 93/68/EEC
Australia and New Zealand	C-tick N274
Interference	EN 61326-1
Emissions	EN 55011
Immunity	EN 61000-4-2/-3/-4/-5/-6/-11

Safety

Safety Class	EN 61010-1 Class 1
Product Safety	IEC 60950-1 when used with Company supplied Power Supply

Environmental

Operating Temperature	−10 °C to 55 °C
Maximum Humidity	85%
Shock	MIL-PRF-28800F Class 2
Storage	−51 °C to 71 °C
Altitude	4600 meters, operating and non-operating

Size and Weight

Size	315 mm x 211 mm x 77 mm, (12.4 in x 8.3 in x 3.0 in)
Weight	3.5 kg, (7.8 lb)

Master Software Tools (for your PC)

Database Management	
Full Trace Retrieval	Retrieve all traces from instrument into one PC directory
Trace Catalog	Index all traces into one catalog
Trace Rename Utility	Rename measurement traces
Group Edit	Titles, subtitles, plot scaling, markers and limit lines, simultaneously on similar files
DAT File Converter	Converts HHST files to MST file format and vice-versa
Data Analysis	
Trace Math and Smoothing	Compare multiple traces
Data Converter	Convert from/to Return Loss/ VSWR/ Cable Loss/ DTF and also into Smith Charts
Measurement Calculator	Translates into other units
Report Generation	
Report Generator	Includes GPS, power level, and calibration status along with measurements
Edit Graph	Change scale, limit lines, and markers
Report Format	Create reports in HTML for PDF format
Export Measurements	Export measurements to *.s2p, *.jpg or *.csv format
Notes	Annotate measurements
Mapping (GPS Required)	
Spectrum Analyzer Mode	MapInfo, MapPoint
Mobile WiMAX OTA Option	Google Earth, Google Maps, MapInfo
Folder Spectrogram	(Spectrum Monitoring for Interference Analysis and Spectrum Clearing)
Folder Spectrogram – 2D View	Creates a composite file of multiple traces Peak Power, Total Power, Peak Frequency, Histogram, Average Power (Max/Min) File Filter (Violations over limit lines or deviations from averages) Playback
Video Folder Spectrogram – 2D View	Create AVI file to export for management review/reports
Folder Spectrogram – 3D View	Views (Set Threshold, Markers) - 3D (Rotate X, Y, Z Axis, Level Scale, Signal ID) - 2D View (Frequency or Time Domain, Signal ID) - Top Down Playback (Frequency and/or Time Domain)
List / Parameter Editors	
Traces	Add, delete, and modify limit lines and markers
Antennas, Cables, Signal Standards	Modify instrument's Antenna, Cable, and Signal Standard List
Product Updates	Auto-checks Anritsu Web site for latest revision firmware
Firmware Upload	Upload new firmware into the instrument
Pass/Fail	Create, download, or edit Signal Analysis Pass/Fail Limits
VSG Pattern Converter	Import user-defined patterns (ASCII text or MATLAB file format required)
Languages	Add up to two languages or modify non-English language menus
Mobile WiMAX	DL-MAP Parameters
Display	Modify display settings
Script Master™	
Channel Scanner Mode	Automate scan up to 1200 channels, repeat for sets of 20 channels, repeat all channels
GSM/GPRS/EDGE or W-CDMA/HSPA+ Mode	Automate Signal Analysis testing requirements with annotated how-to pictures
Connectivity	
Connections	Connect to PC using USB, LAN, or Direct Ethernet connection
Download	Download measurements and live traces to PC for storage and analysis
Upload	Upload measurements from PC to instrument
Firmware Updates	Product Update: download latest firmware version
Remote Access Tool	Remote control and monitoring of instrument (via Ethernet port) over the Internet

Ordering Information

MS2722C	Description
9 kHz to 9 GHz	Spectrum Analyzer
Options	
MS2722C-0007	Secure Data Operation
MS2722C-0019	High-Accuracy Power Meter (requires Power Sensor)
MS2722C-0031	GPS Receiver (requires Antenna P/N 2000-1528-R or 2000-1652-R)
MS2722C-0025	Interference Analyzer (recommend Option 31)
MS2722C-0027	Channel Scanner
MS2722C-0089	Zero-Span IF Output
MS2722C-0431	Coverage Mapping (requires Option 31)
MS2722C-0509	AM/FM/PM Analyzer
MS2722C-0090	Gated Sweep
MS2722C-0009	I/Q Demodulation Hardware
MS2722C-0024	I/Q Waveform Capture[a]
MS2722C-0040	GSM/EDGE RF Measurements[a]
MS2722C-0041	GSM/EDGE Demodulation[a]
MS2722C-0044	W-CDMA/HSPA+ RF Measurements[a]
MS2722C-0065	W-CDMA/HSPA+ Demodulation[a]
MS2722C-0035	W-CDMA/HSPA+ Over-the-Air (OTA) Measurements[a]
MS2722C-0060	TD-SCDMA/HSPA+ Measurements[a]
MS2722C-0061	TD-SCDMA/HSPA+ Demodulation[a]
MS2722C-0038	TD-SCDMA/HSPA+ Over-the-Air (OTA) Measurements[a] (recommend Option 31)
MS2722C-0541	LTE RF Measurements[a]
MS2722C-0542	LTE Modulation Measurements[a]
MS2722C-0546	LTE Over-the-Air (OTA) Measurements[a] (recommend Option 31)
MS2722C-0543	15 MHz and 20 MHz LTE Modulation Measurements[a] (requires Option 541, 542, 551 or 552)
MS2722C-0551	TD-LTE RF Measurements[a]
MS2722C-0552	TD-LTE Modulation Measurements[a]
MS2722C-0556	TD-LTE Over-the-Air (OTA) Measurements[a] (recommend Option 31)
MS2722C-0042	CDMA RF Measurements[a]
MS2722C-0043	CDMA Demodulation[a]
MS2722C-0033	CDMA Over-the-Air (OTA) Measurements[b]
MS2722C-0062	EV-DO RF Measurements[a]
MS2722C-0063	EV-DO Demodulation[a]
MS2722C-0034	EV-DO Over-the-Air (OTA) Measurements[b]
MS2722C-0046	Fixed WiMAX RF Measurements[a]
MS2722C-0047	Fixed WiMAX Demodulation[a]
MS2722C-0066	Mobile WiMAX RF Measurements[a]
MS2722C-0067	Mobile WiMAX Demodulation[a]
MS2722C-0037	Mobile WiMAX Over-the-Air (OTA) Measurements[a] (recommend Option 31)
MS2722C-0098	Standard Calibration (ANSI Z540-1-1994)
MS2722C-0099	Premium Calibration (ANSI Z540-1-1994 plus test data)

a.Requires Option 9

b.Requires Option 9 and Option 31

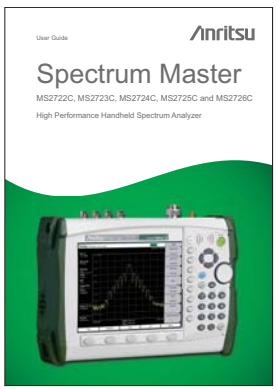
Power Sensors

(For complete ordering information see the respective datasheets of each sensor)

Part Number	Description
PSN50	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +20 dBm
MA24105A	Inline Peak Power Sensor, 350 MHz to 4 GHz, +51.76 dBm
MA24106A	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +23 dBm
MA24108A	Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
MA24118A	Microwave USB Power Sensor, 10 MHz to 18 GHz, +20 dBm
MA24126A	Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 dBm

Manuals

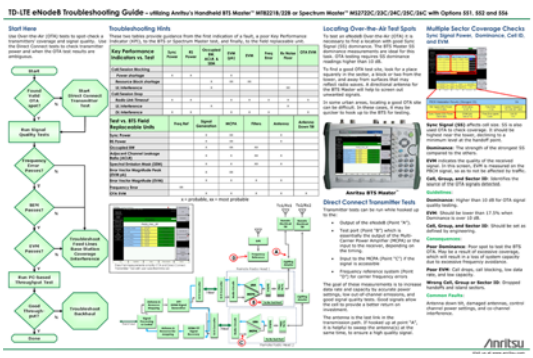
(soft copy included on Handhelds Instruments Documentation Disc and at www.anritsu.com)



Part Number	Description
10920-00060	Handheld Instruments Documentation Disc (included)
10580-00277	Spectrum Master User Guide (Hard copy included), - GPS Receiver
10580-00244	Spectrum Analyzer Measurement Guide - Interference Analyzer, Channel Scanner, IF Output
10580-00240	Power Meter Measurement Guide - High Accuracy Power Meter
10580-00234	3GPP Signal Analyzer Measurement Guide - GSM/EDGE, W-CDMA/HSPA+, TD-SCDMA/HSPA+, LTE, TD-LTE
10580-00235	3GPP2 Signal Analyzer Measurement Guide - CDMA, EV-DO
10580-00236	WiMAX Signal Analyzer Measurement Guide - Fixed WiMAX, Mobile WiMAX
10580-00278	Spectrum Master Programming Manual
10580-00279	Spectrum Master Maintenance Manual

Troubleshooting Guides

(soft copy at www.anritsu.com)



Part Number	Description
11410-00551	Spectrum Analyzers
11410-00472	Interference
11410-00466	GSM/GPRS/EDGE Base Stations
11410-00566	LTE eNodeB
11410-00615	TD-LTE eNodeB
11410-00463	W-CDMA/HSPA+ Base Stations
11410-00465	TD-SCDMA/HSPA+ Base Stations
11410-00467	cdmaOne/CDMA2000 1X Base Stations
11410-00468	CDMA2000 1xEV-DO Base Stations
11410-00470	Fixed WiMAX Base Stations
11410-00469	Mobile WiMAX Base Stations

Standard Accessories (included with instrument)

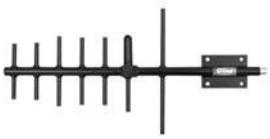
Part Number	Description
10920-00060	Handheld Instruments Documentation Disc
10580-00277	Spectrum Master User Guide (includes GPS Receiver)
2300-498	Master Software Tools (MST) CD Disc
2000-1685-R	Soft Carrying Case
633-44	Rechargeable Li-Ion Battery (for replacement, use high-capacity battery, part number 633-75)
40-187-R	AC/DC Power Supply
806-141-R	Automotive Cigarette Lighter 12 Volt DC Adapter
2000-1371-R	Ethernet Cable, 7 feet/213 cm
3-2000-1498	USB A-mini B Cable, 10 feet/305 cm
11410-00529	MS2722C Spectrum Master Technical Data Sheet

One Year Warranty (Including battery, firmware, and software)

Certificate of Calibration and Conformance

Optional Accessories

Directional Antennas



Part Number	Description
2000-1411-R	824 MHz to 896 MHz, N(f), 10 dBd, Yagi
2000-1412-R	885 MHz to 975 MHz, N(f), 10 dBd, Yagi
2000-1413-R	1710 MHz to 1880 MHz, N(f), 10 dBd. Yagi
2000-1414-R	1850 MHz to 1990 MHz, N(f), 9.3 dBd, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N(f), 10 dBd, Yagi
2000-1416-R	1920 MHz to 2170 MHz, N(f), 10 dBd, Yagi
2000-1659-R	698 MHz to 787 MHz, 8 dBd gain
2000-1660-R	1425 MHz to 1535 MHz, 12 dBd gain
2000-1617	600 MHz to 21 GHz, N(f), 5-8 dBi to 12 GHz, 0-6 dBi to 21 GHz, log periodic

Portable Antennas

Part Number	Description
2000-1200-R	806 MHz to 866 MHz, SMA(m), 50 Ω
2000-1473-R	870 MHz to 960 MHz, SMA(m), 50 Ω
2000-1035-R	896 MHz to 941 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1030-R	1710 MHz to 1880 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1474-R	1710 MHz to 1880 MHz with knuckle elbow (1/2 wave)
2000-1031-R	1850 MHz to 1990 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1475-R	1920 MHz to 1980 MHz and 2110 MHz to 2170 MHz, SMA(m), 50 Ω
2000-1032-R	2400 MHz to 2500 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1361-R	2400 MHz to 2500 MHz, 5000 MHz to 6000 MHz, SMA(m), 50 Ω
2000-1616	20 MHz to 21000 MHz, omnidirectional, N(f), 50 Ω
2000-1487	VHF/UHF, Telescopic Whip antenna, straight or 90°, BNC(m), 50 Ω
2000-1636-R	Antenna Kit (Consists of: 2000-1030-R, 2000-1031-R, 2000-1032-R, 2000-1200-R, 2000-1035-R, 2000-1361-R, and carrying pouch)

Mag Mount Broadband Antenna

Part Number	Description
2000-1647-R	Cable 1: 698–1200 MHz 2 dBi peak gain, 1700–2700 MHz 5 dBi peak gain, N(m), 50 Ω, 10 ft Cable 2: 3000–6000 MHz 5 dBi peak gain, N(m), 50 Ω, 10 ft Cable 3: GPS 26 dB gain, SMA(m), 50 Ω, 10 ft GPS Dual voltage 3 VDC or 5 VDC
2000-1645-R	694-894 MHz 3 dBi peak gain, 1700-2700 MHz 3 dBi peak gain, N(m), 50 Ω, 10 ft
2000-1646-R	750-1250 MHz 3 dBi peak gain, 1650-2000 MHz 5 dBi peak gain, 2100-2700 MHz 3 dBi peak gain, N(m), 50 Ω, 10 ft
2000-1648-R	1700-6000 MHz 3 dBi peak gain, N(m), 50 Ω, 10 ft

Bandpass Filters

Part Number	Description
1030-114-R	806 MHz to 869 MHz, N(m) to SMA(f), 50 Ω
1030-109-R	824 MHz to 849 MHz, N(m) to SMA(f), 50 Ω
1030-110-R	880 MHz to 915 MHz, N(m) to SMA(f), 50 Ω
1030-105-R	890 MHz to 915 MHz Band, 0.41 dB loss, N(m) to SMA(f), 50 Ω
1030-111-R	1850 MHz to 1910 MHz, N(m) to SMA(f), 50 Ω
1030-106-R	1710 MHz to 1790 MHz Band, 0.34 dB loss, N(m) to SMA(f), 50 Ω
1030-107-R	1910 MHz to 1990 MHz Band, 0.41 dB loss, N(m) to SMA(f), 50 Ω
1030-112-R	2400 MHz to 2484 MHz, N(m) to SMA(f), 50 Ω
1030-155-R	2500 MHz to 2700 MHz, N(m) to N(f), 50 Ω
1030-178-R	1920 MHz to 1980 MHz, N(m) to N(f), 50 Ω
1030-179-R	777 MHz to 787 MHz, N(m) to N(f), 50 Ω
1030-180-R	2500 MHz to 2570 MHz, N(m) to N(f), 50 Ω
2000-1684-R	791 MHz to 821 MHz, N(m) to N(f), 50 Ω

Attenuators

Part Number	Description
3-1010-122	20 dB, 5 W, DC to 12.4 GHz, N(m) to N(f)
42N50-20	20 dB, 5 W, DC to 18 GHz, N(m) to N(f)
42N50A-30	30 dB, 50 W, DC to 18 GHz, N(m) to N(f)
3-1010-123	30 dB, 50 W, DC to 8.5 GHz, N(m) to N(f)
1010-127-R	30 dB, 150 W, DC to 3 GHz, N(m) to N(f)
3-1010-124	40 dB, 100 W, DC to 8.5 GHz, N(m) to N(f), Uni-directional
1010-121	40 dB, 100 W, DC to 18 GHz, N(m) to N(f), Uni-directional
1010-128-R	40 dB, 150 W, DC to 3 GHz, N(m) to N(f)

Adapters

Part Number	Description
1091-26-R	SMA(m) to N(m), DC to 18 GHz, 50 Ω
1091-80-R	SMA(m) to N(f), DC to 18 GHz, 50 Ω
1091-81-R	SMA(f) to N(f), DC to 18 GHz, 50 Ω
1091-379-R	7/16 DIN(f) to 7/16 DIN(f), DC to 6 GHz, 50 Ω, w/ Reinforced Grip
510-102-R	N(m) to N(m), DC to 11 GHz, 50 Ω, 90 degrees right angle

Precision Adapters

Part Number	Description
34NN50A	Precision Adapter, N(m) to N(m), DC to 18 GHz, 50 Ω
34NFNF50	Precision Adapter, N(f) to N(f), DC to 18 GHz, 50 Ω

Miscellaneous Accessories

Part Number	Description
2000-1528-R	GPS Antenna, SMA(m) with 15 ft cable requires 5 Vdc
2000-1652-R	GPS Antenna, SMA(m) with 1 foot cable, requires 5 Vdc
2000-1374	External Charger for Li-Ion Batteries
633-75	High Capacity Battery Pack, 7000 mAh
66864	Rack Mount Kit, Master Platform

Backpack and Transit Case

Part Number	Description
67135	Anritsu Backpack (For Handheld Instrument and PC)
760-243-R	Large Transit Case with Wheels and Handle

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