

**Anritsu** envision : ensure

# BTS Master™

High Performance Handheld Base Station Analyzer

## MT8220T

400 MHz to 6.0 GHz Cable and Antenna Analyzer

150 kHz to 7.1 GHz Spectrum Analyzer

10 MHz to 7.1 GHz Power Meter



**Introduction**

Anritsu introduces the next-generation, high-performance handheld Base Station Analyzer for installation and maintenance of wireless networks. Delivered with a standard three-year warranty, the MT8220T BTS Master is the only all-in-one, touchscreen handheld tool that combines cable and antenna testing, signal analysis for all cellular standards, ultra-sensitive spectrum analysis, sophisticated interference tracking, and a vector signal generator for receiver testing in a compact, easy-to-use instrument.

**Cable and Antenna Analyzer Highlights**

- Measurements: RL, VSWR, Cable Loss, DTF, Phase, Gain
- 2-port Gain Measurement Uncertainty: < 0.45 dB
- 2-port Dynamic Range: > 100 dB
- RF Immunity: +17 dBm on-channel, +10 dBm on-frequency
- Calibration: OSL and FlexCal™
- Bias Tee: 32 V internal

**Spectrum and Interference Analyzer Highlights**

- Measurements: Occupied Bandwidth, Channel Power, ACPR, C/I, Field Strength, Spectral Emissions
- Interference Analyzer: Spectrogram, Signal Strength, RSSI, Signal ID
- Dynamic Range: > 95 dB in 1 Hz RBW
- DANL: -163 dBm in 1 Hz RBW
- PIM Hunting
- Phase Noise: -100 dBc/Hz @ 10 kHz offset
- Frequency Accuracy: ± 2.5 × 10<sup>-8</sup> with GPS On
- Burst Detect™ Sweep Mode: sweep 1000x in 15 MHz span
- Coverage Mapping: plot RSSI to on-screen map
- Interference Mapping: on-screen mapping with triangulation

**Capabilities and Functional Highlights**

- LTE/LTE-A FDD/TDD; MIMO (2x2, 4x4)
- NB-IoT measurements
- GSM/GPRS/EDGE
- W-CDMA/HSPA+
- TD-SCDMA/HSPA+
- CDMA/EV-DO
- WiMAX Fixed/Mobile
- PIM Alert Application
- Vector Signal Generator
- High Accuracy Power Meter
- Zero-span IF Output
- Gated Sweep
- Standard GPS receiver, GPS information on stored traces
- Standard Internal Preamp
- Internal Power Meter
- USB Power Sensors up to 26 GHz
- Channel Scanner
- 2.5 hour battery operation time
- < 5 minute warm-up time
- Ethernet/USB data transfer
- Remote Access Tool
- Line Sweep Tools
- Standard 3-year warranty



BTS Master™ MT8220T Base Station Analyzer featuring Vector Signal Generator  
 Handheld Size: 315 mm x 211 mm x 102 mm (12.4 in x 8.3 in x 4.0 in), Lightweight: 4.7 kg (10.3 lb)

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Definitions

All specifications and characteristics apply to Revision 2 instruments under the following conditions, unless otherwise stated:

Warm-Up Time	After 10 minutes of warm-up time, where the instrument is left in the ON state.
Reference Signal	When using internal reference signal.
Time Base Error	Time base error = frequency accuracy x measured frequency
Typical Performance	Typical specifications in parenthesis () represent the mean value of measured units and do not include any guard-bands or uncertainties. They are not warranted. Typical specifications that are not in parenthesis are not tested and not warranted. They are generally representative of characteristic performance.
Uncertainty	A coverage factor of x1 is applied to the measurement uncertainties to facilitate comparison with other industry handheld analyzers.
Calibration Cycle	Calibration is within the recommended 12 month period (residual specifications also require calibration kit calibration cycle adherence.)



**Cable and Antenna Analyzer**

**Measurements**

Measurements VSWR, Return Loss, Cable Loss, Distance-to-Fault (DTF) VSWR, Distance-to-Fault (DTF) Return Loss, 1-port Phase, 2-port Phase, 2-port Gain, Smith Chart

**Setup Parameters**

Frequency	Start/Stop, Signal Standard, Start Cal
DTF	Start/Stop, DTF Aid, Units (m/ft), Cable Loss, Propagation Velocity, Cable, Windowing
Windowing	Rectangular, Normal Side Lobe, Low Side Lobe, Minimum Side Lobe
Amplitude	Top, Bottom, Auto Scale, Full Scale
Sweep	Run/Hold, Single/Continuous, RF Immunity (High/Low), Data Points, Averaging/Smoothing, Output Power (High/Low)
Data Points	137, 275, 551
Markers	Markers 1 to 6 each with a Delta Marker, Marker to Peak/Valley, Time Marker (DTF), Marker Table (On/Off), All Markers Off
Traces	Recall, Copy to Display Memory, No Trace Math, Trace ± Memory, Trace Overlay (On/Off)
Limit Line	On/Off, Single Limit, Multi-segment Edit, Limit Alarm (On/Off), Pass Fail Message (On/Off), Warning Limit Offset, Clear Limit
Limit Line Edit	Frequency, Amplitude, Add Point, Delete Point, Next Point Left, Next Point Right, Move Limit
Calibration	Start Cal, 1/2-port, Low/High Power, Standard/FlexCal™, DUT Connector, Configure DUT
Save/Recall	Setups, Measurements, Screen Shots (JPEG - save only)
Application Options	Bias-Tee (On/Off)

**Frequency**

Frequency Range	400 MHz to 6 GHz
Frequency Accuracy	$\pm 3.0 \times 10^{-6}$
Frequency Resolution	1 kHz (RF immunity low) 100 kHz (RF immunity high)

**Output Power**

High	-7 dBm, typical, 1 or 2-port
Low	-40 dBm, typical, 2-port

**Dynamic Range** (output power high, 25-trace average)

400 MHz to 2800 MHz	> 100 dB, 110 dB typical
> 2800 MHz to 4000 MHz	> 90 dB
> 4000 MHz to 6000 MHz	> 85 dB

**Interference Immunity**

On-Channel	+17 dBm @ >1.0 MHz from carrier frequency
On-Frequency	+10 dBm within ±10 kHz from the carrier frequency

**Measurement Speed**

Return Loss	≤ 4.5 ms/data point, RF immunity low, typical
Distance-to-Fault	≤ 4.5 ms/data point, RF immunity low, typical

**Return Loss**

Measurement Range	0 dB to 60 dB
Resolution	0.01 dB

**VSWR**

Measurement Range	1:1 to 65:1
Resolution	0.01

**Cable Loss**

Measurement Range	0 dB to 30 dB
Resolution	0.01 dB

**2-Port Gain**

Measurement Range	-120 dB to +100 dB
Resolution	0.01 dB



**Cable and Antenna Analyzer** (continued)

**Distance-to-Fault**

Vertical Range Return Loss	0 dB to 60 dB
Vertical Range VSWR	1 to 65
Fault Resolution (m)	$(1.5 \times 10^8 \times Vp) / \Delta F$ (Vp = velocity propagation constant, $\Delta F$ is F2 - F1 in Hz)
Horizontal Range (m)	0 to (Data Points-1) $\times$ Fault Resolution, to a maximum of 1500 m (4921 ft)

**Phase (1- and 2-Port)**

Measurement Range	-180° to +180°
Resolution	0.01°

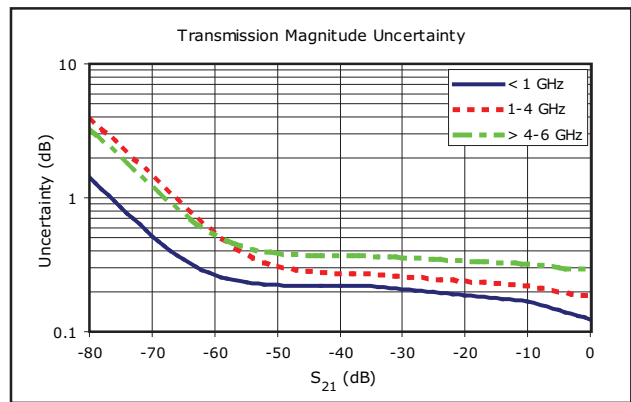
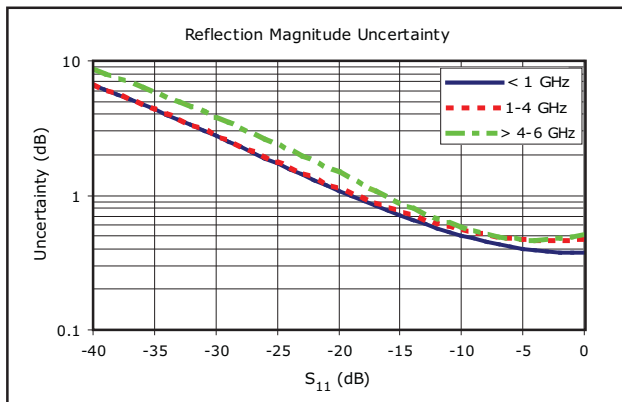
**Smith Chart**

Resolution	0.01
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**Measurement Accuracy**

Corrected Directivity	> 42 dB
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**Measurement Uncertainty**





**Spectrum Analyzer**

**Measurements**

Smart Measurements	Field Strength (Uses antenna calibration tables to measure dBm/m <sup>2</sup> , dBμV/m, dBV/m, dBmV/m, V/m, W/m <sup>2</sup> , dBW/m <sup>2</sup> , A/m, dBA/m and W/cm <sup>2</sup> ) 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 (AM, 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) IQ Waveform Capture (requires Option 24) PIM Alert Application (available for download) PIM Hunting
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**Setup Parameters**

Frequency	Center/Start/Stop, Span, Frequency Step, Frequency Offset, 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 Ratio, Span/RBW Ratio
Application Options	Bias-Tee (On/Off), Impedance (50 Ω, 75 Ω, Other)

**Sweep Functions**

Sweep	Single/Continuous, Manual Trigger, Reset, Detection, Minimum Sweep Time, Trigger Type, Gated Sweep (requires Option 90)
Sweep Mode	Fast (100x Performance), Performance, No FFT, Burst Detect (1000x Fast in 15 MHz span)
Detection	Peak, RMS/Avg, Negative, Sample, Quasi-peak
Triggers	Free Run, External, Video, Change Position, Manual

**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	150 kHz to 7.1 GHz (usable to 0 Hz)
Maximum Continuous Input	+30 dBm
Tuning Resolution	1 Hz
Frequency Reference	Aging: ± 1.0 × 10 <sup>-6</sup> /10 years
Frequency Span Accuracy	± 3 × 10 <sup>-7</sup> (25 °C ± 25 °C) + aging, 10 Hz to 7.1 GHz including zero span
Sweep Time	Minimum 100 ms, 7 μs to 3600 s in zero span
Sweep Time Accuracy	± 2 % in zero span

**Bandwidth**

Resolution Bandwidth (RBW)	1 Hz to 3 MHz in 1-3 sequence ± 10 % (-3 dB bandwidth)
Video Bandwidth (VBW)	1 Hz to 3 MHz in 1-3 sequence ± 10 % (-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
VBW/Average Type	Linear/Log



**Spectrum Analyzer** (continued)

**Spectral Purity**

SSB Phase Noise -100 dBc/Hz @ 10 kHz, 20 kHz, and 30 kHz offset from carrier  
 -102 dBc/Hz @ 100 kHz offset from carrier

**Amplitude Ranges**

Dynamic Range > 95 dB (600 MHz, 3.5 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 dB to 65 dB, 5.0 dB steps  
 Amplitude Units Log Scale Modes: dBW, dBm, dBμW, dBV, dBmV, dBμV, dBA, dBmA, dBμA  
 Linear Scale Modes: nV, μV, mV, V, kV, nW, μW, mW, W, kW, fA, pA, nA, μA, mA, A

**Amplitude Accuracy** (Power level > -50 dBm)

Input attenuation	Preamp Off (≤ 35 dB)	Preamp Off (40 to 55 dB)	Preamp Off (60 to 65 dB)	Preamp On (0 or 10 dB)
150 kHz to ≤10 MHz	± 1.50 dB	± 1.50 dB	± 1.50 dB	-
150 kHz to 4.0 GHz	-	-	-	± 1.50 dB
>10 MHz to 4.0 GHz	± 1.25 dB	± 1.75 dB	± 1.75 dB	-
>4.0 GHz to 6.5 GHz	-	± 1.75 dB	± 1.75 dB	-
>4.0 GHz to 7.1 GHz	± 1.75 dB	-	-	± 1.75 dB
>6.5 GHz to 7.1 GHz	-	± 2.00 dB	± 3.00 dB	-

**Displayed Average Noise Level (DANL)**

DANL in 1 Hz RBW, 0 dB attenuation	Preamp Off (Reference level -20 dBm)		Preamp On (Reference level -50 dBm)	
	Maximum	Typical	Maximum	Typical
3 MHz to 1.0 GHz	-137 dBm	-150 dBm	-161 dBm	-163 dBm
> 1.0 GHz to 2.2 GHz	-133 dBm	-147 dBm	-159 dBm	-160 dBm
> 2.2 GHz to 4.0 GHz	-133 dBm	-143 dBm	-156 dBm	-159 dBm
> 4.0 GHz to 7.1 GHz	-130 dBm	-138 dBm	-154 dBm	-156 dBm

**Spurs**

Residual Spurs Preamp Off (RF input terminated, 0 dB input attenuation)  
 -90 dBm, 150 kHz to 3.2 GHz  
 -84 dBm, > 3.2 GHz to 7.1 GHz

Exceptions -70 dBm @ 3200 MHz

Preamp On (RF input terminated, 0 dB input attenuation)  
 -100 dBm, 10 MHz to 7.1 GHz

Exceptions -95 dBm @ 50 MHz, 100 MHz, 150 MHz

Input-Related Spurious (0 dB attenuation, -30 dBm input, span < 1.7 GHz, carrier offset > 4.5 MHz)  
 -60 dBc, -70 dBc typical

Exceptions -40 dBc, -60 dBc typical @ 1672 MHz

**Third-Order Intercept (TOI)**

Preamp Off  
 600 MHz +8 dBm typical  
 3.5 GHz +9 dBm typical

**Second Harmonic Distortion**

Preamp Off -50 dBc maximum  
 -70 dBc typical

**VSWR**

< 4.0 GHz 1.5:1 typical  
 4.0 GHz to 7.1 GHz 1.8:1 typical



**GPS Receiver**

**General**

Setup	On/Off, Antenna Voltage 3.3 V/5.0 V, GPS Info
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, Wireless Measurements
GPS Lock Accuracy	when GPS antenna is connected: $\pm 2.5 \times 10^{-8}$ with GPS On, 3 minutes after satellite lock in selected mode after antenna is disconnected: $\pm 5.0 \times 10^{-8}$ for 3 days, 0 °C to 50 °C ambient temperature
Connector	SMA, female
Supplied Antenna	2000-1760-R GPS Antenna, SMA(m), 25 dB gain, 2.5 VDC to 3.7 VDC



**Power Meter**

**General**

Frequency	Center/Start/Stop, Span, Frequency Step, Signal Standard, Channel #, Full Band
Amplitude	Maximum, Minimum, Offset, Relative On/Off, Units, Auto Scale
Average	Acquisition Fast/Med/Slow, # of Running Averages
Limits	Limit On/Off, Limit Upper/Lower
Frequency Range	10 MHz to 7.1 GHz
Span	1 kHz to 100 MHz
Display Range	-140 dBm to +30 dBm, $\leq 40$ dB span
Measurement Range	-120 dBm to +30 dBm
Offset Range	0 dB to +100 dB
VSWR	1.5:1 typical
Maximum Power	+30 dBm without attenuator
Accuracy	Same as Spectrum Analyzer
Application Options	Impedance (50 $\Omega$ , 75 $\Omega$ , Other)



**High Accuracy Power Meter (Option 19)** (requires external USB power sensor, sold separately)

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	MA24105A	MA24106A	MA24108A/18A/26A	MA24208A/18A	MA24330A/40A/50A
Description	Inline High Power Sensor	High Accuracy RF Power Sensor	Microwave USB Power Sensor	Microwave Universal USB Power Sensor	Microwave CW USB Power Sensor
Frequency Range	350 MHz to 4 GHz	50 MHz to 6 GHz	10 MHz to 8/18/26 GHz	10 MHz to 8/18 GHz	10 MHz to 33/40/50 GHz
Connector	Type N(f), 50 $\Omega$	Type N(m), 50 $\Omega$	Type N(m), 50 $\Omega$ (8/18 GHz) Type K(m), 50 $\Omega$ (26 GHz)	Type N(m), 50 $\Omega$	Type K(m), 50 $\Omega$ (33/40 GHz) Type V(m), 50 $\Omega$ (50 GHz)
Dynamic Range	+3 dBm to +51.76 dBm (2 mW to 150 W)	-40 dBm to +23 dBm (0.1 $\mu$ W to 200 mW)	-40 dBm to +20 dBm (0.1 $\mu$ W to 100 mW)	-60 dBm to +20 dBm (1 nW to 100 mW)	-70 dBm to +20 dBm (0.1 nW to 100 mW)
Measurand	True-RMS	True-RMS	True-RMS, Slot Power, Burst Average Power	True-RMS, Slot Power, Burst Average Power	Average Power
Measurement Uncertainty	$\pm 0.17$ dB <sup>a</sup>	$\pm 0.16$ dB <sup>b</sup>	$\pm 0.18$ dB <sup>c</sup>	$\pm 0.17$ dB <sup>d</sup>	$\pm 0.17$ dB <sup>e</sup>
Data sheet (for complete specifications)	11410-00621	11410-00424	11410-00504	11410-00841	11410-00906

- Notes:
- a. 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.
  - b. Total RSS measurement uncertainty (0 °C to 50 °C) for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
  - c. Expanded uncertainty with K=2 for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
  - d. Power uncertainty expressed with two sigma confidence level for CW measurement after zero operation. Includes calibration factor and linearity over temperature uncertainties, but not the effects of mismatch, zero set and drift, or noise.
  - e. Includes linearity over temperature uncertainties, but not the effects of calibration factor, mismatch, zero set and drift, and noise.







### I/Q Waveform Capture (Option 24)

**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 Ratio (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 168 hours (one week)
Signal ID	ID up to 12 FM, GSM, W-CDMA, CDMA or Wi-Fi signals based on RF bandwidth
Interference Mapping	Draw multiple bearings of signal strength from GPS location on on-screen map Pan and Zoom on-screen maps Support for MA2700A Handheld Interference Hunter (see Optional Accessories)
Application Options	Bias-Tee (On/Off), 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 Customer List, Scan Script Master™
Amplitude	Reference Level, Scale
Custom Scan	Signal Standard, Channel, # of Channels, Channel Step Size, Custom Scan
Frequency Range	150 kHz to 7.1 GHz
Frequency Accuracy	± 10 Hz + time base error
Measurement Range	-110 dBm to +30 dBm
Application Options	Bias-Tee (On/Off), Impedance (50 Ω, 75 Ω, Other)



**Zero Span IF Output (Option 89)**

**General**

Mode	Spectrum Analyzer/Span/Zero Span
Center Frequency	140 MHz ± 130 kHz
Output Level	-25 dBm typical
Reference Level	-57 dBm to +30 dBm (Preamp Off) -87 dBm to -40 dBm (Preamp On)
IF Bandwidth	Up to 30 MHz (3 dB bandwidth)
RF Attenuation	Auto
Connector	BNC female



**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



**Coverage Mapping (Option 431)**

**Measurements**

Indoor Mapping	RSSI, ACPR
Outdoor Mapping	RSSI, ACPR

**Setup Parameters**

Mode	Spectrum Analyzer
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 Ratio, Span/VBW Ratio
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



**GSM/GPRS/EDGE Measurements (Option 880)**

**Measurements**

RF	Demodulation	Over-the-Air (OTA)	Pass/Fail
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)	There are no additional OTA Measurements RF and Demodulation Measurements can be made OTA	View Pass/Fail Limits GSM, EDGE Available 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 Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screen	Overall Measurements

**RF Measurements**

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

**Demodulation Measurements**

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



W-CDMA/HSPA+ Measurements (Option 881)

Measurements

RF	Demodulation	Over-the-Air (OTA)	Pass/Fail
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 $E_c/I_0$ $E_c$ Pilot Dominance OTA Total Power  Multipath Scanner (Six) Six Multipaths Tau Distance RSCP Relative Power Multipath Power	View Pass/Fail Limits All, RF, Demod  Available 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), (-CPICH) 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/W)
Marker	Six Markers, Table On/Off
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

RF Measurements

RF Channel Power Accuracy	$\pm 1.25$ dB; $\pm 0.7$ dB typical (temperature range 15 °C to 35 °C)
Occupied Bandwidth Accuracy	$\pm 100$ kHz
Adjacent Channel Leakage Ratio (ACLR)	-54 dB/-59 dB $\pm 0.8$ dB @ 5 MHz/10 MHz offset, typical, 824 MHz to 894 MHz, 1710 MHz to 2170 MHz -54 dB/-57 dB $\pm 1.0$ dB @ 5 MHz/10 MHz offset, typical, 2300 MHz to 2700 MHz

Demodulation Measurements

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, 16QAM, 64QAM
Frequency Error	$\pm 10$ Hz + time base error, 99 % confidence level
EVM Accuracy	$\pm 2.5$ %, $6\% \leq \text{EVM} \leq 25\%$
Residual EVM	2.5 % typical
Code Domain Power	$\pm 0.5$ dB for code channel power $> -25$ dB, 16, 32, 64 DCPH (test model 1), 16, 32 DCPH (test model 2, 3)
CPICH (dBm) Accuracy	$\pm 0.8$ dB typical

Over-the-Air (OTA) Measurements

Scrambling Code Scanner	Six strongest Scrambling Codes
Multipath Scanner	Multipath power of six signals relative to strongest pilot



**TD-SCDMA/HSPA+ Measurements (Option 882)**

**Measurements**

RF	Demodulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum	Code Domain Power/Error (QPSK/8PSK/16QAM/64QAM)	Code Scan (32)	View Pass/Fail Limits
Channel Power	Slot Power	Scrambling Code Group	All, RF, Demod
Occupied Bandwidth	DwPTS Power	Tau	Available Measurements
Left Channel Power	Noise Floor	$E_c/I_0$	Occupied Bandwidth
Left Channel Occ B/W	Frequency Error	DwPTS Power	Channel Power
Right Channel Power	Tau	Pilot Dominance	Channel Power RCC
Right Channel Occ B/W	Scrambling Code	Tau Scan (Six)	On/Off Ratio
Power vs. Time	EVM	Sync-DL#	Peak-to-Average Ratio
Six Slot Powers	Peak EVM	Tau	Frequency Error
Channel Power (RRC)	Peak Code Domain Error	$E_c/I_0$	EVM
DL-UL Delta Power	CDP Marker	DwPTS Power	Peak EVM
UpPTS Power	Modulation Summary	Pilot Dominance	Peak Code Domain Error
DwPTS Power		Record	Tau
On/Off Ratio		Run/Hold	Noise Floor
Slot Peak-to-Average Power			
Spectral Emission			
RF Summary			

**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, 8PSK, 16QAM, 64QAM
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/W)
Sweep	Hold/Run, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**RF Measurements**

RF Channel Power Accuracy (RRC)	$\pm 1.5$ dB; $\pm 1.0$ dB typical, (slot power -40 dBm to +10 dBm)
Frequency Error	$\pm 10$ Hz + time base error, in the presence of a downlink slot

**Demodulation Measurements**

Supported Modulation	QPSK, 8PSK, 16QAM, 64QAM
Residual EVM (rms)	3 % typical, P-CCPH Slot Power > -50 dBm
PN Offset	Within $1 \times 64$ chips
Pilot Power Accuracy	$\pm 1.0$ dB typical
Timing Error (Tau) for Dominant SYNC-DL	$\pm 0.2$ $\mu$ s (external trigger)
Spreading Factor	1, 16

**Over-the-Air (OTA) Measurements**

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



**LTE/LTE-A FDD/TDD Measurements (Options 883 and 886)**

**LTE/LTE-A FDD Measurements**

RF	Modulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum Channel Power Occupied Bandwidth 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 OSTP, Frame EVM by modulation Constellation QPSK, 16QAM, 64QAM 256QAM Demod (Option 886) 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 per Control Channel Tx Time Alignment Modulation Summary Includes EVM by modulation Antenna Icons Detects active antennas (1 or 2)	Scanner Cell ID (Group, Sector) S-SS, RSRP, RSRQ, SINR Dominance Modulation Results - On/Off Auto Save - On/Off Tx Test Scanner RS Power of MIMO antennas (2x2, 4x4) Cell ID, Average Power Delta Power (Max-Min) Graph of Antenna Power Modulation Results - On/Off Mapping On-screen S-SS, RSRP, RSRQ, or SINR Scanner Modulation Results - Off Carrier Aggregation Up to 5 component carriers (CC1 to CC5) CP, MIMO status, RS & SS Power, EVM, Frequency Error, Time Alignment Error, Cell ID eMBMS Cell ID, RSRP	View Pass/Fail Limits All, RF, Modulation Available Measurements Channel Power Occupied Bandwidth ACLR Frequency Error Carrier Frequency Dominance EVM peak, rms Frame EVM, rms Frame EVM by mod type RS, SS Power RS EVM P-SS, S-SS, Power, EVM PBCH, PCFICH, PHICH, PDCCH Power, EVM Cell, Group, Sector ID OSTP Tx Time Alignment

**Setup Parameters**

Frequency	E-UTRA Bands 1 - 14, 17 - 21, 23 - 32, 66A (tunable 10 MHz to 4.0 GHz) Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Bandwidth (MHz)	1.4, 3, 5, 10, 15, 20
Span (MHz)	Auto, 1.4, 3, 5, 10, 15, 20, 30
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous
EVM Mode	Auto, PBCH only, Max Hold
Cyclic Prefix (CP)	Auto, Normal, Extended
Sync Type	Normal (SS), RS/Cell ID
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**LTE/LTE-A FDD RF Measurements**

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

**LTE/LTE-A FDD Modulation Measurements**

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)

**LTE/LTE-A FDD Over-the-Air (OTA) Measurements**

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, 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)
Carrier Aggregation	Up to 5 component carriers specified (CC1 to CC5) Automatic detection of CP and MIMO status for each active CC RS Power & RS Delta Power, SS Power, EVM (peak and rms), Freq Error (Hz & ppm), TAE, Cell ID
Evolved Multimedia Broadcast Multicast Services (eMBMS)	Reports the Cell ID and measures the Received Signal Received Power (RSRP)



**LTE/LTE-A FDD/TDD Measurements (Options 883 and 886)** (continued)

**LTE/LTE-A TDD Measurements**

RF	Modulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum Channel Power Occupied Bandwidth	Power vs. Resource Block (RB) RB Power (PDSCH) Active RBs, Utilization %	Scanner Cell ID (Group, Sector) S-SS, RSRP, RSRQ, SINR	View Pass/Fail Limits All, RF, Modulation
Power vs. Time Frame View Sub-Frame View Total Frame Power DwPTS Power Transmit Off Power Cell ID Timing Error	Channel Power, Cell ID OSTP, Frame EVM by modulation Constellation QPSK, 16QAM, 64QAM 256QAM Demod (Option 886)	Dominance Modulation Results - On/Off Auto Save - On/Off	Available Measurements Channel Power Occupied Bandwidth ACLR
ACL	Modulation Results Ref Signal Power (RS) Sync Signal Power (SS) EVM - rms, peak, max hold	Tx Test Scanner RS Power of MIMO antennas (2x2, 4x4) Cell ID, Average Power Delta Power (Max-Min) Graph of Antenna Power Modulation Results - On/Off	Frequency Error Carrier Frequency Dominance EVM peak, rms Frame EVM, rms Frame EVM by mod type RS, SS Power RS EVM
Spectral Emission Mask Category A or B (Opt 1)	Frequency Error - Hz, ppm Carrier Frequency Cell ID	Mapping On-screen S-SS, RSRP, RSRQ, or SINR	P-SS, S-SS, Power, EVM PBCH, PCFICH, PHICH, PDCCH Power, EVM
RF Summary	Control Channel Power Bar Graph or Table View RS, P-SS, S-SS PBCH, PCFICH, PHICH, PDCCH Total Power (Table View) EVM per Control Channel Tx Time Alignment Modulation Summary Includes EVM by modulation Antenna Icons Detects active antennas (1/2)	Scanner Modulation Results - Off Carrier Aggregation Up to 5 component carriers (CC1 to CC5) CP, MIMO status, RS & SS Power, EVM, Frequency Error, Time Alignment Error, Cell ID	Cell, Group, Sector ID OSTP Tx Time Alignment Frame Power DwPTS Power Transmit Off Power Timing Error

**Setup Parameters**

Frequency	E-UTRA bands 33 - 44 (tunable 10 MHz to 4.0 GHz) Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Bandwidth (MHz)	1.4, 3, 5, 10, 15, 20
Span (MHz)	Auto, 1.4, 3, 5, 10, 15, 20, 30
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
EVM Mode	Auto, PBCH only, Max Hold
Cyclic Prefix (CP)	Auto, Normal, Extended
Trigger	No Trigger/Ext Trigger, Rising/Falling
Uplink/Downlink Configuration	0 to 6
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**LTE/LTE-A TDD RF Measurements**

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

**LTE/LTE-A TDD Modulation Measurements**

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 -30 dBm to +10 dBm)

**LTE/LTE-A TDD Over-the-Air (OTA) Measurements**

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, 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)
Carrier Aggregation	Up to 5 component carriers specified (CC1 to CC5) Automatic detection of CP and MIMO status for each active CC RS Power & RS Delta Power, SS Power, EVM (peak and rms), Freq Error (Hz & ppm), TAE, Cell ID





**NB-IoT Measurements (Option 887)**

**Measurements**

NB-IoT Mode    Guard Band, Standalone

**RF Measurements**

Summary Screen	Carrier Frequency Channel Power Occupied Bandwidth NPSS Power NSSS Power NPBCH Power NPDCCH or NPDSCH Power Cell ID RSRP RSRQ SINR Spectral Emission Mask Pass/Fail
Channel Spectrum	Spans supported: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz, 30 MHz
Spectral Emission Mask	Mask Type: NB-IoT Fixed Summary Table Off/On (Mask Segment; Start, Stop, Peak Frequencies; Power; Power Margin; RBW; Status)
Save/Recall	Measurement (.iot), Setup (.stp), Screen Shots (.jpg) to Internal or External Memory



**CDMA/EV-DO Measurements (Option 884)**

**CDMA Measurements**

RF	Demodulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum	Code Domain Power Graph	Pilot Scanner (Nine)	View Pass/Fail Limits
Channel Power	Pilot Power	PN	All, RF, Modulation
Occupied Bandwidth	Channel Power	$E_c/I_o$	Available Measurements
Peak-to-Average Power	Noise Floor	Tau	Channel Power
Spectral Emission Mask	Rho	Pilot Power	Occupied Bandwidth
Single Carrier ACPR	Carrier Feed Through	Channel Power	Peak-to-Average Power
Multi-carrier ACPR	Tau	Pilot Dominance	Spectral Mask Test
RF Summary	RMS Phase Error	Multipath Scanner (Six)	Frequency Error
	Frequency Error	$E_c/I_o$	Channel Frequency
	Abs/Rel/ Power	Tau	Pilot Power
	Pilot	Channel Power	Noise Floor
	Page	Multipath Power	Rho
	Sync	Limit Test - 10 Tests Averaged	Carrier Feed Through
	Q Page	Rho	Tau
	Code Domain Power Table	Adjusted Rho	RMS Phase Error
	Code	Multipath	Code Utilization
	Status	Pilot Dominance	Measured PN
	Power	Pilot Power	Pilot Dominance
	Multiple Codes	Pass/Fail Status	Multipath Power
	Code Utilization		
	Modulation Summary		

**CDMA 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 (MHz)	1.23, 1.24, 1.25
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/W)
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**CDMA RF Measurements**

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

**CDMA Demodulation Measurements**

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 × 64 chips
Pilot Power Accuracy	± 1.0 dB typical, relative to channel power
Tau	± 0.5 µs typical, ± 1.0 µs maximum

**CDMA Over-the-Air (OTA) Measurements**

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



**CDMA/EV-DO Measurements (Option 884)** (continued)

**EV-DO Measurements**

RF	Demodulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum Channel Power Occupied Bandwidth Peak-to-Average Power	MAC Code Domain Power Graph Pilot & MAC Power Channel Power Frequency Error Rho Pilot Rho Overall	Pilot Scanner (Nine) PN $E_c/I_o$ Tau Pilot Power Channel Power Pilot Dominance	View Pass/Fail Limits All, RF, Modulation Available Measurements Channel Power Occupied Bandwidth Peak-to-Average Power Carrier Frequency Frequency Error Spectral Mask Noise Floor Pilot Power RMS Phase Error Tau
Power vs. Time Pilot & MAC Power Channel Power Frequency Error Idle Activity On/Off Ratio	Data Modulation Noise Floor MAC Code Domain Power Table Code Status Power Code Utilization	Multipath Scanner (Six) $E_c/I_o$ Tau Channel Power Multipath Power	Code Utilization Measured PN Pilot Dominance Multipath Power
Spectral Emission Mask Single Carrier ACPR Multi-carrier ACPR RF Summary	Data Code Domain Power Active Data Power Data Modulation Rho Pilot Rho Overall Maximum Data CDP Minimum Data CDP Modulation Summary		

**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 (MHz)	1.23, 1.24, 1.25
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/W)
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**EV-DO RF Measurements**

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

**EV-DO Demodulation Measurements**

EV-DO Compatibility	Rev 0 and Rev A
Frequency Error	± 10 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 × 64 chips
Pilot Power Accuracy	± 1.0 dB typical, relative to channel power
Tau	± 0.5 μs typical, ± 1.0 μs maximum

**EV-DO Over-the-Air (OTA) Measurements**

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



**WiMAX Fixed/Mobile Measurements (Option 885)**

**WiMAX Fixed Measurements**

RF	Demodulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum Channel Power Occupied Bandwidth	Constellation RCE (RMS/Peak) EVM (RMS/Peak)	There are no additional OTA Measurements RF and Demodulation Measurements can be made OTA	View Pass/Fail Limits All, RF, Modulation Available Measurements Channel Power Occupied Bandwidth Burst Power Preamble Power Crest Factor Frequency Error Carrier Frequency EVM RCE Base Station ID
Power vs. Time Channel Power Preamble Power Data Burst Power Crest Factor	Frequency Error Carrier Frequency Base Station ID Spectral Flatness Adjacent Subcarrier Flatness		
ACPR RF Summary	EVM vs. Subcarrier/Symbol RCE (RMS/Peak) EVM (RMS/Peak) Frequency Error Carrier Frequency Base Station ID Sector ID (Mobile) Modulation Summary		

**Setup Parameters**

Bandwidth (MHz)	1.25, 1.50, 2.50, 3.50, 5.00, 5.50, 6.00, 7.00, 10.00
Cyclic Prefix Ratio (CP)	1/4, 1/8, 1/16, 1/32
Span (MHz)	5, 10, 15, 20
Frame Length (ms)	2.5, 5.0, 10.0
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 (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**WiMAX Fixed RF Measurements** (temperature range 15 °C to 35 °C)

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

**WiMAX Fixed Demodulation Measurements** (temperature range 15 °C to 35 °C)

Frequency Error  $7 \times 10^{-8}$  + time base error, 99 % confidence level  
Residual EVM (rms) 3 % typical, 3.5 % maximum (RF Input -50 dBm to +20 dBm)



**WiMAX Fixed/Mobile Measurements (Option 885)** (continued)

**WiMAX Mobile<sup>1</sup> Measurements**

RF	Demodulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum	Constellation	Channel Power Monitor	View Pass/Fail Limits
Channel Power	RCE (RMS/Peak)	Preamble Scanner (Six)	All, RF, Modulation
Occupied Bandwidth	EVM (RMS/Peak)	Preamble	Available Measurements
Power vs. Time	Frequency Error	Relative Power	Channel Power
Channel Power	CINR	Cell ID	Occupied Bandwidth
Preamble Power	Base Station ID	Sector ID	Downlink Burst Power
Downlink Burst Power	Sector ID	PCINR	Uplink Burst Power
Uplink Burst Power	Spectral Flatness	Dominant Preamble	Preamble Power
ACPR	Adjacent Subcarrier Flatness	Base Station ID	Crest Factor
Spectral Emission Mask	EVM vs. Subcarrier/Symbol	Auto Save - On/Off	Frequency Error
RF Summary	RCE (RMS/Peak)		Carrier Frequency
	EVM (RMS/Peak)		EVM
	Frequency Error		RCE
	CINR		Sector ID
	Base Station ID		
	Sector ID		
	DL-MAP (Tree View)		
	Modulation Summary		

**Setup Parameters**

Zone Type	PUSC
DL-MAP Auto Decoding	Convolutional Coding (CC), Convolutional Turbo Coding (CTC)
Bandwidths (MHz)	3.50, 5.00, 7.00, 8.75, 10.00
Cyclic Prefix Ratio (CP)	1/8
Span (MHz)	5, 10, 20, 30
Frame Lengths (ms)	5, 10
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 (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**WiMAX Mobile RF Measurements** (temperature range 15 °C to 35 °C)

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

**WiMAX Mobile Demodulation Measurements** (temperature range 15 °C to 35 °C)

Frequency Error  $2 \times 10^{-8}$  + time base error, 99 % confidence level  
 Residual EVM (rms) 2.5 % typical, 3.0 % maximum (RF Input -50 dBm to +20 dBm)

**WiMAX Mobile Over-the-Air (OTA) Measurements**

Channel Power Monitor Over time (one week), measurement time interval 1 s to 60 s  
 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<sup>®</sup> Air Interface - Mobile System Profile - Release 1.0 Certified, System Profiles according to WMF-T24-001-R010v07



## General Specifications

<b>System Parameters</b>	System	Status (Temperature, Battery Info, Serial Number, Firmware Version, Options Installed) Self Test, Application Self Test, GPS
	System Options	Name, Date and Time, Ethernet Configuration, Volume, Display (Brightness, Blank, Default, Black & White, Night Vision, High Contrast, Invert Black & White) Share Center Frequency and Power Offset (All Modes or Not Shared) Language (English, French, German, Spanish, Chinese, Japanese, Korean, Italian, Russian, Portuguese) Reset (Factory Defaults, Master Reset, Update Firmware)
	Internal Trace/Setup Memory	> 30,000 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
<b>File Management</b>		
	File Types	Vary with measurement mode
	File	Save, Recall, Copy, Delete
	Save	Setups, Measurements, Screen Shots (JPEG)
	Recall	Setups, Measurements
	Copy	Selected file or files to internal/external memory (USB)
	Delete	Selected file or files from internal/external memory (USB)
	File Sort Method	By Name/Date/Type, Ascend/Descend
<b>Connectors</b>		
	RF Out	Type N, female, 50 $\Omega$ , Maximum Input +23 dBm, $\pm$ 50 VDC, (Reflection In)
	RF In	Type N, female, 50 $\Omega$ , Maximum Input +30 dBm, $\pm$ 50 VDC
	GPS	SMA, female
	External Power	5.5 mm barrel connector, 12 VDC to 14.5 VDC, < 5.0 A
	Ethernet Interface	RJ45, 10/100 Mbps, connect to PC or LAN for remote access
	USB Interface	Two Type A, Connect Flash Drive and Power Sensor One 5-pin mini-B, Connect to PC for data transfer
	Headset Jack	3.5 mm 3-wire headset jack
	External Reference In	BNC, female, 50 $\Omega$ , Maximum Input +10 dB
	Reference Out	BNC, female, 50 $\Omega$ , 10 MHz
	External Trigger In	BNC, female, 50 $\Omega$ style, 100 k $\Omega$ input impedance (nominal), TTL levels, Maximum Input $\pm$ 5 VDC
	IF Out	BNC, female, 50 $\Omega$ , 140 MHz
<b>Display and Keyboard</b>		
	Display	8.4 inch touchscreen, 800 x 600 resolution
	Pixel Defects	No more than five defective pixels (99.9989% good pixels)
	Keyboard	Backlit (Red for Night Vision, White for all other display modes)
<b>Battery</b>		
	Type	Li-Ion
	Battery Operation	2.5 hours, typical
	Battery Charging Limits	0 $^{\circ}$ C to +45 $^{\circ}$ C, Relative Humidity $\leq$ 80 %
<b>Regulatory Compliance</b>		
	European Union	EMC 2014/30/EU, EN 61326:2013, CISPR 11/EN 55011, IEC/EN 61000-4-2/3/4/5/6/8/11 Low Voltage Directive 2014/35/EU Safety EN 61010-1:2010 RoHS Directive 2011/65/EU applies to instruments with CE marking placed on the market after July 22, 2017
	Australia and New Zealand	RCM AS/NZS 4417:2012
	Canada	ICES-1(A)/NMB-1(A)
	South Korea	KCC-REM-A21-0004
<b>Environmental</b>		
	Operating Temperature Range	MIL-PRF-28800F Class 2 -10 $^{\circ}$ C to 55 $^{\circ}$ C
	Storage Temperature Range	-51 $^{\circ}$ C to 71 $^{\circ}$ C
	Maximum Relative Humidity	95 % RH at 30 $^{\circ}$ C, non-condensing
	Vibration, Sinusoidal	5 Hz to 55 Hz
	Vibration, Random	10 Hz to 500 Hz
	Half Sine Shock	30 g <sub>n</sub>
	Altitude	4600 meters, operating and non-operating
	Explosive Atmosphere	MIL-PRF-28800F Section 4.5.6.3 MIL-STD-810G, Method 511.5, Procedure 1
<b>Size and Weight</b>		
	Size	315 mm x 211 mm x 102 mm (12.4 in x 8.3 in x 4.0 in)
	Weight	4.7 kg (10.3 lb)
<b>Warranty</b>		
	Duration	Standard three-year warranty (one-year warranty on battery)



**Line Sweep Tools™** (for your PC)

<b>Trace Capture</b>		
Browse to Instrument		View and copy traces from the test equipment to your PC using Windows Explorer
Open Legacy Files		Open DAT files captured with Handheld Software Tools v6.61
Open Current Files		Open VNA or DAT files
Capture Plots To		The Line Sweep Tools screen, DAT files, Database, or JPEG
<b>Traces</b>		
Trace Types		Return Loss, VSWR, DTF-RL, DTF-VSWR, Cable Loss, Smith Chart, and PIM
Trace Formats		DAT, VNA, CSV, PNG, BMP, JPG, HTML, Data Base, and PDF
<b>Report Generation</b>		
Report Generator		Includes GPS location along with measurements
Report Format		Create reports in HTML or PDF format
Report Setup		Report Title, Company, Prepared for, Location, Date and Time, Filename, Company logo
Trace Setup		1 Trace Portrait Mode, 2 Trace Portrait Mode, 1 Trace Landscape Mode
<b>Trace Validation</b>		
Presets		7 presets allow "one click" setting of up to 6 markers and one limit line
Marker Controls		6 regular Markers, Marker Peak, Marker Valley, Marker between, and frequency entry
Delta Markers		6 Delta markers
Limit Line		Enable and drag or value entry. Also works with presets
Next Trace Button		Next Trace and Previous Trace arrow keys allow quick switching between traces
<b>Tools</b>		
Cable Editor		Allows creation of custom cable parameters
Distance to Fault		Converts a Return Loss trace to a Distance to Fault trace
Measurement Calculator		Converts Real, Imaginary, Magnitude, Phase, RL, VSWR, Rho, and Transmit power
Signal Standard Editor		Creates new band and channel tables
Renaming Grid		36 user definable phrases for creation of file names, trace titles, and trace subtitles
<b>Connectivity</b>		
Connections		Ethernet, USB cable, and USB memory stick



**Master Software Tools™** (for your PC)

<b>Mapping</b> (GPS required)		
Spectrum Analyzer Mode		MapInfo, MapPoint
Mobile WiMAX OTA, LTE OTA Options		Google Earth, Google Maps, MapInfo
<b>Folder Spectrogram</b> (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)
<b>List/Parameter Editors</b>		
Traces		Add, delete, and modify limit lines and markers
Product Updates		Auto-checks Anritsu website for latest revision firmware
Pass/Fail		Create, download, or edit Signal Analysis Pass/Fail Limits
Languages		Add custom language or modify non-English language menus
<b>Script Master™</b>		
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
<b>Connectivity</b>		
Connections		Connect to PC using USB or Ethernet



**easyMap Tools™** (for your PC)

**Outdoor Maps**

On-Line Sources	Google Maps, Cloud Made Open-Source Maps
Pan & Zoom Mode	AZM map file format allows pan and zoom on-instrument
Legacy Mode	MAP format is compatible with older firmware
Geo-Referenced	Works with instrument based GPS
Map Conversion	Convert scanned maps to geo-referenced

**Indoor Maps**

Sources	Scanned images in JPG, JPEG, JPE, JFIF, GIF, TIF, TIFF, PNG
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**General**

Color Filter	Grayscale, High Contrast
Coverage	Worldwide
Zoom Levels	16 total zoom levels, 7 available in any one map
Map Size	Less than 1 MB to over 1 GB

**Web Remote Control**

















Control	Full instrument control through a browser – all instrument functions except power switch and rotary knob
Connections	RJ45 Ethernet jack Third party Wi-Fi router
Protocol	HTTP/TCP/IP
Physical Layer	Cat 5 Cable, Wi-Fi router compatible
Software Required	HTML 5 Compliant Browser – Newer versions of Chrome, Firefox, Internet Explorer and others
Operating System	iOS, Windows, Linux, Android operating systems that can host the HTML 5 Compliant browser
Remote Hardware	PCs, Tablets, and Smart Phones with Ethernet or Wi-Fi connections and a HTML 5 Compliant browser
Download	Individual instrument files downloaded via browser Multiple instrument files and directories zipped and downloaded via browser Screen capture capability
Display Modes	Normal: All modes & displays supported Fast: Spectrum traces update faster (up to 5 updates per second)
Password	The instrument can be password protected Passwords may be used to manage who is controlling the instrument
Users/Instruments	One user/device can view and control many instruments

**Programmable Remote Control**

Functionality	Many instrument functions are programmable. See the Programming Manual for details.
Programming Language	Standard Commands for Programmable Instruments (SCPI)
Interfaces	USB, LAN
Available Drivers	LabView (visit NI.com for driver)



Ordering Information – Instrument Options

MT8220T Description	
	400 MHz to 6 GHz Cable and Antenna Analyzer
	150 kHz to 7.1 GHz Spectrum Analyzer
	10 MHz to 7.1 GHz Power Meter
Options	
	MT8220T-0010 Bias-Tee
	MT8220T-0019 High-Accuracy Power Meter (requires external power sensor)
	MT8220T-0025 Interference Analyzer
	MT8220T-0027 Channel Scanner
	MT8220T-0089 Zero-Span IF Output
	MT8220T-0431 Coverage Mapping
	MT8220T-0090 Gated Sweep
	MT8220T-0024 I/Q Waveform Capture
	MT8220T-0023 Vector Signal Generator
	MT8220T-0880 GSM/GPRS/EDGE Measurements
	MT8220T-0881 W-CDMA/HSPA+ Measurements
	MT8220T-0882 TD-SCDMA/HSPA+ Measurements
	MT8220T-0883 LTE/LTE-A FDD/TDD Measurements
	MT8220T-0886 LTE 256QAM Demodulation (requires Option 883)
	MT8220T-0887 NB-IoT Measurements
	MT8220T-0884 CDMA/EV-DO Measurements
	MT8220T-0885 WiMAX Fixed/Mobile Measurements
	MT8220T-0098 Standard Calibration to ISO17025 and ANSI/NCSL Z540-1. Includes calibration certificate.
	MT8220T-0099 Premium Calibration to ISO17025 and ANSI/NCSL Z540-1. Includes calibration certificate, test report, and uncertainty data.

**Standard Accessories** (included with instrument)

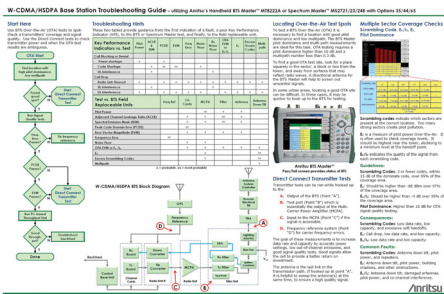


Part Number	Description
2000-1686-R	Soft Carrying Case
2000-1760-R	GPS Antenna, SMA(m), 25 dB gain, 2.5 VDC to 3.7 VDC
2000-1691-R	Stylus with Coiled Tether
633-75	Rechargeable Li-Ion Battery, 7500 mAh
40-187-R	AC/DC Power Supply
806-141-R	Automotive Power Adapter, 12 VDC, 60 Watts
2000-1371-R	Ethernet Cable, 213 cm (7 ft)
3-2000-1498	USB A-mini B Cable, 305 cm (10 ft) Certificate of Calibration

**Manuals** (Soft copy at [www.anritsu.com](http://www.anritsu.com))

Part Number	Description
10100-00065	Product Information, Compliance, and Safety
10580-00366	BTS Master User Guide
10580-00230	Cable and Antenna Analyzer Measurement Guide
10580-00349	Spectrum Analyzer Measurement Guide
10580-00240	Power Meter Measurement Guide
10580-00232	Vector Signal Generator Measurement Guide
10580-00234	3GPP Signal Analyzer Measurement Guide
10580-00235	3GPP2 Signal Analyzer Measurement Guide
10580-00236	WiMAX Signal Analyzer Measurement Guide
10580-00367	Programming Manual
10580-00368	Maintenance Manual

**Troubleshooting Guides** (soft copy at [www.anritsu.com](http://www.anritsu.com))



Part Number	Description
11410-00473	Cable, Antenna and Components
11410-00551	Spectrum Analyzers
11410-00472	Interference
11410-00566	LTE eNodeB Base Stations
11410-00615	TD-LTE eNodeB Base Stations
11410-00466	GSM/GPRS/EDGE Base Stations
11410-00463	W-CDMA/HSDPA Base Stations
11410-00465	TD-SCDMA/HSDPA 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

**Power Sensors** (for complete ordering information, see the respective data sheets of each sensor)



Part Number	Description
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
MA24208A	Microwave Universal USB Power Sensor, 10 MHz to 8 GHz, +20 dBm to -60 dBm
MA24218A	Microwave Universal USB Power Sensor, 10 MHz to 18 GHz, +20 dBm to -60 dBm
MA24330A	Microwave CW USB Power Sensor, 10 MHz to 33 GHz, +20 dBm
MA24340A	Microwave CW USB Power Sensor, 10 MHz to 40 GHz, +20 dBm
MA24350A	Microwave CW USB Power Sensor, 10 MHz to 50 GHz, +20 dBm
MA25100A	RF Power Indicator

Optional Accessories

Backpack and Transit Cases



Part Number	Description
67135	Anritsu Backpack (for handheld instrument and PC)
760-243-R	Large Transit Case with Wheels and Handle 56 cm x 45.5 cm x 26.5 cm (22.07" x 17.92" x 10.42")
760-261-R	Large Transit Case with Wheels and Handle 63.1 cm x 50 cm x 30 cm (24.83" x 19.69" x 11.88"), space for MA2700A, antennas, filters, instrument inside soft case, and other interference hunting accessories/tools
760-262-R	Transit Case for MA2700A, several Yagi antennas and filters
760-271-R	Transit Case for Portable Directional Antennas and Port Extender 52.4 cm x 42.8 cm x 20.6 cm (20.62" x 16.87" x 8.12") (for 2000-1777-R, 2000-1778-R, 2000-1779-R, 2000-1798-R)
760-286-R	Compact Transit Case with Wheels and Handle 55.6 cm x 35.5 cm x 22.9 cm (21.89" x 13.98" x 9.01")

Miscellaneous Accessories



Part Number	Description
2000-1374-R	External Dual Charger for Li-Ion Batteries
633-75	Rechargeable Li-Ion Battery, 7500 mAh
2000-1689-R	EMI Near Field Probe Kit
2000-1797-R	Touchscreen Protective Film, 8.4 in
MA2700A	Handheld Interference Hunter (For full specifications, refer to the MA2700A Technical Data Sheet 11410-00692)
2000-1884-R	PIM Hunter™ Test Probe (For full specifications, refer to the 2000-1884-R Technical Data Sheet 11410-00999)
2000-1691-R	Stylus with Coiled Tether
MA25401A	Atomic Clock, External, 10 MHz Frequency Reference (see 11410-01134 for details)
2000-1798-R	Port Extender, DC to 6 GHz, N(m) to N(f)

Calibration Components, 50 Ω



Part Number	Description
OSLN50A-8	High Performance Type N(m), DC to 8 GHz, 50 Ω
OSLNF50A-8	High Performance Type N(f), DC to 8 GHz, 50 Ω
2000-1914-R	Precision Open/Short/Load, 4.3-10(f), DC to 6 GHz, 50 Ω
2000-1915-R	Precision Open/Short/Load, 4.3-10(m), DC to 6 GHz, 50 Ω
2000-1618-R	Precision Open/Short/Load, 7/16 DIN(m), DC to 6.0 GHz 50 Ω
2000-1619-R	Precision Open/Short/Load, 7/16 DIN(f), DC to 6.0 GHz 50 Ω
22N50	Open/Short, N(m), DC to 18 GHz, 50 Ω
22NF50	Open/Short, N(f), DC to 18 GHz, 50 Ω
SM/PL-1	Precision Load, N(m), 42 dB, 6.0 GHz
SM/PLNF-1	Precision Load, N(f), 42 dB, 6.0 GHz

Calibration Components, 75 Ω



Part Number	Description
22N75	Open/Short, N(m), DC to 3 GHz, 75 Ω
22NF75	Open/Short, N(f), DC to 3 GHz, 75 Ω
26N75A	Precision Termination, N(m), DC to 3 GHz, 75 Ω
26NF75A	Precision Termination, N(f), DC to 3 GHz, 75 Ω
12N50-75B	Matching Pad, DC to 3 GHz, 50 Ω to 75 Ω

**Precision Adapters**



Part Number	Description
34NN50A	N(m) to N(m), DC to 18 GHz, 50 Ω
34NFN50	N(f) to N(f), DC to 18 GHz, 50 Ω

**Adapters**



Part Number	Description
1091-26-R	DC to 18 GHz, N(m) to SMA(m), 50 Ω
1091-27-R	DC to 18 GHz, N(m) to SMA(f), 50 Ω
1091-80-R	DC to 18 GHz, N(f) to SMA(m), 50 Ω
1091-81-R	DC to 18 GHz, N(f) to SMA(f), 50 Ω
1091-172-R	DC to 1.3 GHz, N(m) to BNC(f), 50 Ω
1091-465-R	DC to 6 GHz, 4.3-10(f) to N(f), 50 Ω
1091-467-R	DC to 6 GHz, 4.3-10(m) to N(f), 50 Ω
1091-417-R	DC to 6 GHz, N(m) to QMA(f), 50 Ω
1091-418-R	DC to 18 GHz, N(m) to QMA(m), 50 Ω
510-90-R	DC to 7.5 GHz, 7/16 DIN(f) to N(m), 50 Ω
510-91-R	DC to 7.5 GHz, 7/16 DIN(f) to N(f), 50 Ω
510-92-R	DC to 7.5 GHz, 7/16 DIN(m) to N(m), 50 Ω
510-93-R	7/16 DIN(m) to N(f), DC to 7.5 GHz, 50 Ω
510-96-R	DC to 7.5 GHz, 7/16 DIN(m) to 7/16 DIN (m), 50 Ω
510-97-R	DC to 7.5 GHz, 7/16 DIN(f) to 7/16 DIN (f), 50 Ω
510-102-R	DC to 11 GHz, N(m)-N(m), 90 degrees, 50 Ω

**InterChangeable Adaptor Phase Stable Test Port Cables, Armored w/Reinforced Grip** (recommended for cable and antenna line sweep applications. It uses the same ruggedized grip as the Reinforced grip series cables. Now you can also change the adaptor interface on the grip to four different connector types)



Part Number	Description
15RCN50-1.5-R	1.5 m, DC to 6 GHz, N(m), N(f), 7/16 DIN(m), 7/16 DIN(f), 50 Ω
15RCN50-3.0-R	3.0 m, DC to 6 GHz, N(m), N(f), 7/16 DIN(m), 7/16 DIN(f), 50 Ω

**Phase-Stable Test Port Cables, Armored w/ Reinforced Grip** (Recommended for cable & antenna line sweep applications)



Part Number	Description
15RNF50-1.5-R	1.5 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15RDF50-1.5-R	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(f), 50 Ω
15RDN50-1.5-R	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(m), 50 Ω
15RNF50-3.0-R	3.0 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15RDF50-3.0-R	3.0 m, DC to 6 GHz, N(m) to 7/16 DIN(f), 50 Ω
15RDN50-3.0-R	3.0 m, DC to 6 GHz, N(m) to 7/16 DIN(m), 50 Ω

**Phase-Stable Test Port Cables, Armored** (ideal for use with tightly spaced connectors and other general use applications)



Part Number	Description
15NMF50-1.5C	1.5 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15NN50-1.5C	1.5 m, DC to 6 GHz, N(m) to N(m), 50 Ω
15NDF50-1.5C	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(f), 50 Ω
15ND50-1.5C	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(m), 50 Ω
15NMF50-3.0C	3.0 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15NN50-3.0C	3.0 m, DC to 6 GHz, N(m) to N(m), 50 Ω
15NMF50-5.0C	5.0 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15NN50-5.0C	5.0 m, DC to 6 GHz, N(m) to N(m), 50 Ω
15N43M50-1.5C	Test Port Extension Cable, Armored, 1.5 meters, DC to 6GHz, N(m) to 4.3-10(m)
15N43F50-1.5C	Test Port Extension Cable, Armored, 1.5 meter, DC to 6GHz, N(m) to 4.3-10(f)
15N43M50-3.0C	Test Port Extension Cable, Armored, 3 meters, DC to 6 GHz, N(m) to 4.3-10(m)
15N43F50-3.0C	Test Port Extension Cable, Armored, 3 meters, DC to 6 GHz, N(m) to 4.3-10(f)

**GPS Antennas (active)**



Part Number	Description
2000-1528-R	Magnet Mount, SMA(m) with 5 m (16.4 ft) cable, requires 5 VDC
2000-1652-R	Magnet Mount, SMA(m) with 0.3 m (1 ft) cable, requires 3.3 VDC or 5 VDC
2000-1760-R	Miniature Antenna, SMA(m), requires 2.5 VDC to 3.7 VDC

**Directional Antennas**



Part Number	Description
2000-1411-R	824 MHz to 896 MHz, N(f), 12.3 dBi, Yagi
2000-1412-R	885 MHz to 975 MHz, N(f), 12.6 dBi, Yagi
2000-1413-R	1710 MHz to 1880 MHz, N(f), 12.3 dBi, Yagi
2000-1414-R	1850 MHz to 1990 MHz, N(f), 11.4 dBi, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N(f), 14.1 dBi, Yagi
2000-1416-R	1920 MHz to 2170 MHz, N(f), 14.3 dBi, Yagi
2000-1659-R	698 MHz to 787 MHz, N(f), 10.1 dBi, Yagi
2000-1660-R	1425 MHz to 1535 MHz, N(f), 14.3 dBi, Yagi
2000-1715-R	Directional Antenna, 698 MHz to 2500 MHz, N(f), gain of 2 dBi to 10 dBi, typical
2000-1726-R	Antenna, 2500 MHz to 2700 MHz, N(f), 14.1 dBi, Yagi
2000-1747-R	Antenna, Log Periodic, 300 MHz to 7000 MHz, N(f), 5.1 dBi, typical
2000-1748-R	Antenna, Log Periodic, 1 GHz to 18 GHz, N(f), 6 dBi, typical
2000-1777-R	Portable Directional Antenna, 9 kHz to 20 MHz, N(f)
2000-1778-R	Portable Directional Antenna, 20 MHz to 200 MHz, N(f)
2000-1779-R	Portable Directional Antenna, 200 MHz to 500 MHz, N(f)
2000-1812-R	Portable Yagi Antenna, 450 MHz to 512 MHz, N(f), 7.1 dBi
2000-1825-R	Portable Yagi Antenna, 380 MHz to 430 MHz, N(f), 7.1 dBi

**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 and 5000 MHz to 6000 MHz, SMA(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)
2000-1751-R	LTE Dipole, 698-960/1710-2170/2500-2700 MHz, SMA(m), 2 dBi, typical, 50 Ω

**Mag Mount and Broadband Antennas**



Part Number	Description
2000-1616-R	20 MHz to 21000 MHz, N(f), 50 Ω
2000-1645-R	694 MHz to 894 MHz, 3 dBi peak gain 1700 MHz to 2700 MHz, 3 dBi peak gain, N(m), 50 Ω, 10 ft
2000-1646-R	750 MHz to 1250 MHz, 3 dBi peak gain, 1650 MHz to 2700 MHz, 5 dBi peak gain
2000-1647-R	Cable 1: 698 MHz to 1200 MHz, 2 dBi peak gain, 1700 MHz to 2700 MHz, 5 dBi peak gain, N(m), 50 Ω, 10 ft Cable 2: 3000 MHz to 6000 MHz, 5 dBi peak gain, N(m), 50 Ω, 10 ft Cable 3: GPS 26 dB gain, SMA(m), 50 Ω, 10 ft
2000-1946-R	Cable 1: 617 MHz to 960 MHz, 3 dBi peak gain, 1710 MHz to 3700 MHz, 4 dBi peak gain, N(m), 50 Ω, 10 ft Cable 2: 3000 MHz to 6000 MHz, 5 dBi peak gain, N(m), 50 Ω, 10 ft Cable 3: GPS 26 dB gain, SMA(m), 50 Ω, 10 ft
2000-1648-R	1700 MHz to 6000 MHz, 3 dBi peak gain, N(m), 50 Ω, 10 ft

**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
1030-111-R	1850 MHz to 1910 MHz, N(m) to SMA(f), 50 Ω
1030-112-R	2400 MHz to 2484 MHz, N(m) to SMA(f), 50 Ω
1030-105-R	890 MHz to 915 MHz, N(m) to N(f), 50 Ω
1030-106-R	1710 MHz to 1790 MHz, N(m) to N(f), 50 Ω
1030-107-R	1910 MHz to 1990 MHz, N(m) to N(f), 50 Ω
1030-149-R	High Pass, 150 MHz, N(m) to N(f), 50 Ω
1030-150-R	High Pass, 400 MHz, N(m) to N(f), 50 Ω
1030-151-R	High Pass, 700 MHz, N(m) to N(f), 50 Ω
1030-152-R	Low Pass, 200 MHz, N(m) to N(f), 50 Ω
1030-153-R	Low Pass, 550 MHz, N(m) to N(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 798 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
2000-1734-R	Bandpass Filter, 699 MHz to 715 MHz, N(m) and N(f), 50 Ω
2000-1735-R	Bandpass Filter, 776 MHz to 788 MHz, N(m) and N(f), 50 Ω
2000-1736-R	Bandpass Filter, 815 MHz to 850 MHz, N(m) and N(f), 50 Ω
2000-1737-R	Bandpass Filter, 1711 MHz to 1756 MHz, N(m) and N(f), 50 Ω
2000-1738-R	Bandpass Filter, 1850 MHz to 1910 MHz, N(m) and N(f), 50 Ω
2000-1739-R	Bandpass Filter, 880 MHz to 915 MHz, N(m) and N(f), 50 Ω
2000-1740-R	Bandpass Filter, 1710 MHz to 1785 MHz, N(m) and N(f), 50 Ω
2000-1741-R	Bandpass Filter, 1920 MHz to 1980 MHz, N(m) and N(f), 50 Ω
2000-1742-R	Bandpass Filter, 832 MHz to 862 MHz, N(m) and N(f), 50 Ω
2000-1743-R	Bandpass Filter, 2500 MHz to 2570 MHz, N(m) and N(f), 50 Ω
2000-1799-R	Bandpass Filter, 2305 MHz to 2320 MHz, N(m) and N(f), 50 Ω
2000-1911-R	Bandpass Filter, 703 MHz to 748 MHz, N(m) and N(f), 50 Ω
2000-1912-R	Bandpass Filter, 788 MHz to 798 MHz, N(m) and N(f), 50 Ω
2000-1925-R	Bandpass Filter, 663 MHz to 698 MHz, N(m) and N(f), 50 Ω
2000-1926-R	Bandpass Filter, 776 MHz to 806 MHz, N(m) and N(f), 50 Ω



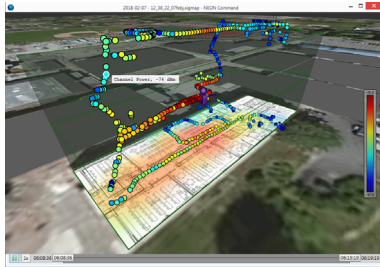
**Attenuators**



**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-R	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)

NEON® MA8100A Signal Mapper



**Model Number Description**

- MA8100A-000 NEON Signal Mapper with Anritsu Integration and Tracking Unit. Includes 1 year NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service (PN: 2300-607).
- MA8100A-001 NEON Signal Mapper with Anritsu Integration and Tracking Unit. Includes 1 year NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service (PN: 2300-574).
- MA8100A-003 NEON Signal Mapper with Anritsu Integration and Tracking Unit. Includes 3 year NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service (PN: 2300-575).
- MA8100A-005 NEON Signal Mapper with Anritsu Integration and Tracking Unit. Includes 5 year NEON Software License with 5 years of maintenance and support and 5 years of Cloud Service (PN: 2300-576).
- MA8100A-100 NEON Signal Mapper with Anritsu Integration and Tracking Unit. Includes Perpetual NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service (PN: 2300-606).
  - 2300-606 Perpetual NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service. Part number can also be used to order a perpetual license after a limited term license has expired.
  - 2300-612 Renewal of 1 year NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service.
  - 2300-613 Renewal of 3 year NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service.
  - 2300-614 Renewal of 5 year NEON Software License with 5 years of maintenance and support and 5 years of Cloud Service.
- 2000-1852-R NEON Tracking Unit (includes USB cable and belt clip, Worldwide version)
- 2000-2015-R NEON Tracking Unit (includes USB cable and belt clip, Japan version)
- 2000-1853-R Belt clip (for NEON Tracking Unit)