

# Spectrum Master™

Compact Handheld Spectrum Analyzer

MS2711E

9 kHz to 3 GHz



## Anritsu Introduces its Next Generation Compact Spectrum Analyzer

The wireless communications market is rapidly growing as the telecommunications and defense sectors continue to evolve. Whether you are installing, troubleshooting, or solving problems for military communications facilities, public safety providers, or wireless service providers, Anritsu has a solution.

Anritsu's new Spectrum Master MS2711E has been designed for technicians, installers, field radio frequency (RF) engineers, and contractors who struggle with both keeping track of the growing number of interfering signals and assessing signal quality on a wide range of increasingly complex signals. Easy-to-use, integrated and high performing, the MS2711E helps users address those challenges and more. Its feature-rich and compact design helps users comply to regulatory requirements, manage and maximize efficiency, improve system up-time, and increase revenue – all in a rugged and field-proven device designed to withstand even the most punishing conditions.

This next generation of Anritsu's best-in-class Spectrum Master series is ideal for spectrum monitoring, interference analysis, RF and microwave measurements, field strength measurements, transmitter spectrum analysis, electromagnetic field analysis and overall field analysis.

### Designed for Field Use

The MS2711E was designed specifically for field environments. Weighing less than 3.45 kg, it is small compact and easy to carry. Its field replaceable Li-Ion battery typically lasts for more than 3 hours, and a new bright 8.4-inch color display provides visibility even in broad daylight. With an operating temperature range from -10 °C to 55 °C, a rugged case and splash proof design, the MS2711E works in the most extreme weather conditions with guaranteed performance anywhere and anytime.

### Integrated Solution

The MS2711E is a multifunctional instrument that eliminates the need for you to carry and learn multiple instruments. It can be configured to include a broad range of parameters, including an interference analyzer with signal mapping, 2-port transmission measurement with channel scanner, power meter, high accuracy power meter, AM/FM/PM Analyzer, and GPS receiver for time/location stamping and accuracy enhancements.

### Easy-To-Use

The new Spectrum Master MS2711E leverages the user interface from Anritsu's popular MS2712E and MS2713E analyzers, giving users intuitive spectrum analyzer menus. A touchscreen keypad combination provides you with an intuitive menu-driven interface designed to give a familiar menu structure with quick access to popular measurements.

### Key Facts

- 9 kHz to 3 GHz
- One-Button Measurements: ACPR, Channel Power, Field Strength, Occupied BW, AM/FM/SSB Demod
- Interference Analyzer: Spectrogram, Signal Strength, RSSI, Signal ID, Interference Mapping
- PIM Hunting
- DANL: -142 dBm (Typical) With Optional Preamp in 100 Hz RBW
- Dynamic Range: > 85 dB in 100 Hz RBW
- +25 dBm TOI Typical @ 2 GHz
- < Phase Noise: -90 dBc/Hz @ 10 kHz at 1 GHz
- Frequency Accuracy: < ± 50 ppb With GPS On
- Detection Methods: Peak, RMS, Negative, Sample, Quasi-Peak
- Save-On-Event: Automatically Saves a Sweep When Crossing a Limit Line or at the End of the Sweep.
- Three Hours of Battery Life
- Touchscreen Display
- USB for Data Transfer and Instrument Control
- 8.4-Inch Daylight Viewable Touchscreen Display
- Lightweight: < 3.45 kg





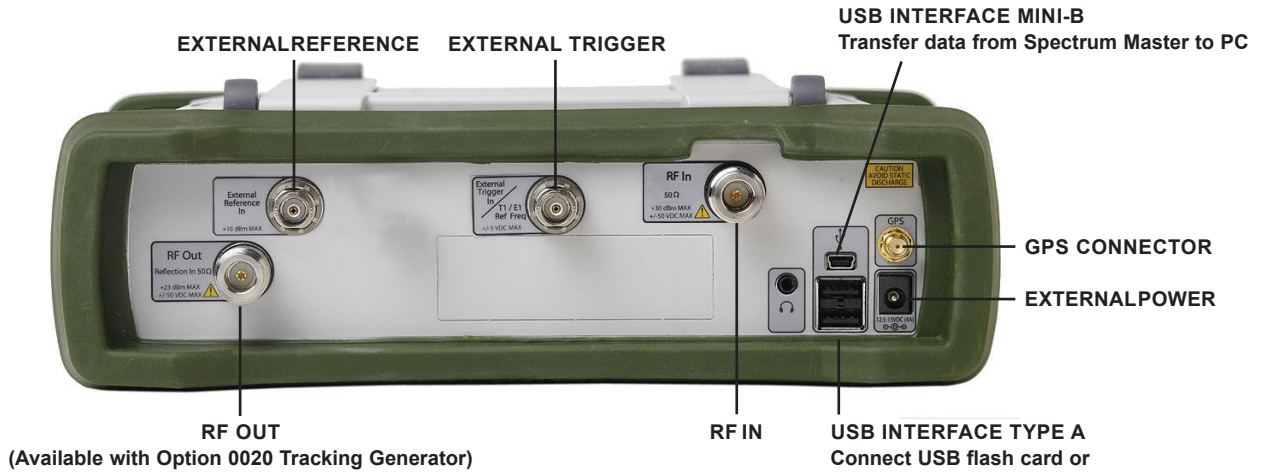
## Integrated Measurement Capabilities



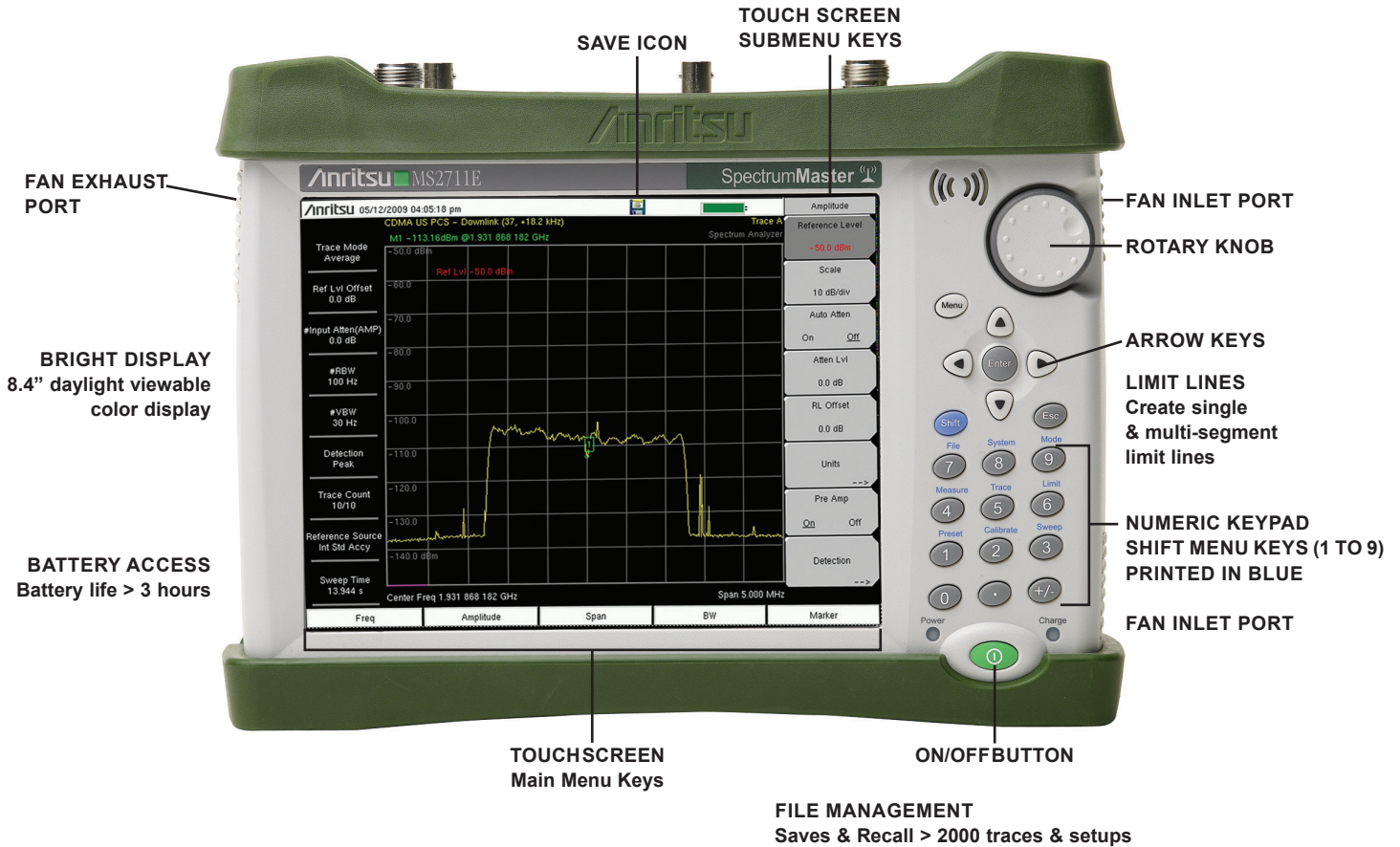
### Configuration Overview

Function	Description
<b>Spectrum Analyzer 9 kHz to 3 GHz</b>	Locates and identifies various signals over a wide frequency range. Detects signals as low as -142 dBm with phase noise better than -90 dBc/Hz
<b>Preamplifier (Option 8)</b>	Improves DANL performance, 17 dB gain (typical). Range 100 kHz to 3 GHz
<b>Interference Analyzer (Option 25)</b>	Includes everything you need to monitor, identify, and locate interference using the spectrogram display, RSSI, Signal ID, signal strength meter, and interference mapping
<b>GPS Receiver (Option 31)</b>	Provides location and UTC time information. Also improves the accuracy of the reference oscillator
<b>Tracking Generator (Option 20)</b>	Enables transmission measurement capability. Can also be used as a CW source. Adjustable from -50 dBm to 0 dBm in 0.1 dB steps
<b>High Accuracy Power Meter (Option 19)</b>	Connects high accuracy Anritsu USB Power Sensors. Sensor models range between 4 and 50 GHz
<b>Power Meter (Option 29)</b>	Makes channelized transmitter power measurements, up to 100 MHz in bandwidth
<b>Channel Scanner (Option 27)</b>	Measures the power of multiple transmitted signals. Scans up to 1200 channels using Script Master
<b>AM/FM/PM Analyzer (Option 509)</b>	Analyzes AM/FM/PM signals and measures FM/PM deviation, AM depth, SINAD, Total Harmonic Distortion and much more

# Designed for the Field



ALL CONNECTORS ARE CONVENIENTLY LOCATED ON THE TOP PANEL, LEAVING THE SIDES CLEAR FOR HANDHELD USE.





# Convenient Soft Case and Tilt Bail

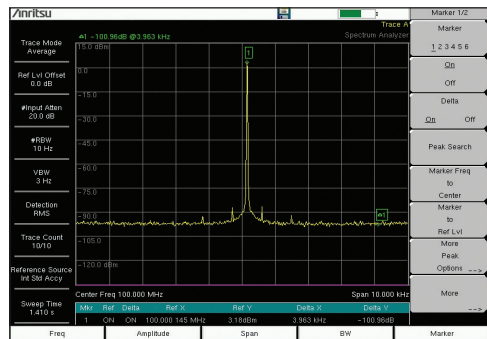


TILT BAILS ARE INTEGRATED INTO THE CASE AND SOFT CASE FOR BETTER SCREEN VIEWING

## Best Performance in its Class

Anritsu's MS2711E Spectrum Master spectrum analyzers provide users with high-performance for field environments and for applications requiring mobility. There is no other spectrum analyzer in this class that can deliver the same performance.

The combination of its performance and compact design makes it ideal for a broad range of activities, including spectrum monitoring, interference analysis, field strength measurements, transmitter spectrum analysis, electromagnetic field strength, and overall field analysis.



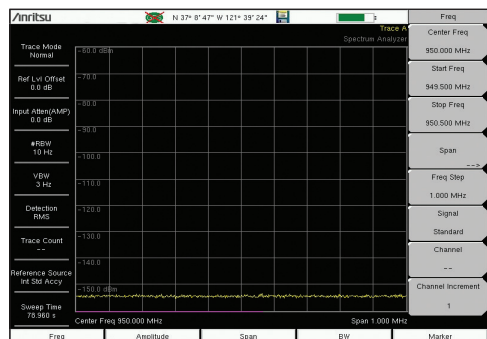
### High Performance

The dynamic range is better than 85 dB in 100 Hz RBW, enabling measurement of very small signals in the presence of much larger signals. The picture demonstrates the dynamic range in the Spectrum Master.

### Displayed Average Noise Level

Spectrum Master delivers impressive and best-in-class DANL performance. With the built-in pre-amp, -142 dBm DANL can typically be realized in 100 Hz RBW and -162 dBm when normalized to 1 Hz. This low-level performance capability is essential when looking for low-level interference signals.

### Dynamic Range Performance



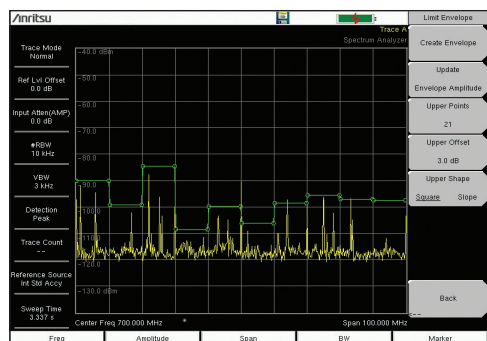
### GPS-Assisted Frequency Accuracy

With GPS Option 0031 the frequency accuracy is < 50 ppb. This additional accuracy is important when characterizing 3GPP signals using counted frequency markers. Also all measurements can be GPS tagged for exporting to maps.

### Simple But Powerful For Field Use

Convenience is a must in the field. This is why the Spectrum Master is equipped with features that will enhance productivity in the field.

### Low Level Performance

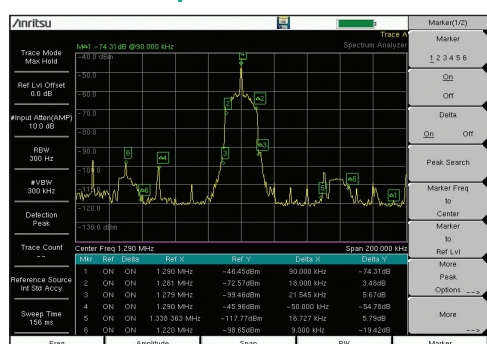


The Spectrum Master is equipped with limit lines for all user levels. You can create single limit lines and segmented limit lines in one step using the one-button limit envelope feature.

The Spectrum Master automatically sets the fastest sweep possible while still ensuring accurate measurements. This allows users to rely on the instrument to optimize accuracy and consistency.

Auto Attenuation ties the input attenuation to the reference level eliminating the need for the user to determine how much attenuation is needed.

### Limit Envelope



Six regular and six delta markers can be displayed with a marker table that can be turned on as needed. The capability to measure noise level in terms of dBm/Hz or dBμV/Hz is a standard feature of the Spectrum Master.

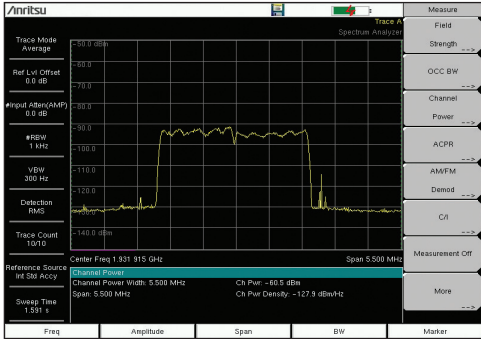
### Comprehensive Marker Menu



# Master Transmitter Testing

## Smart Measurements for Transmitter Systems

Commonly needed transmitter measurements are built in and can be accessed easily. These include field strength, occupied bandwidth, channel power, adjacent channel power ratio (ACPR), and emission mask.



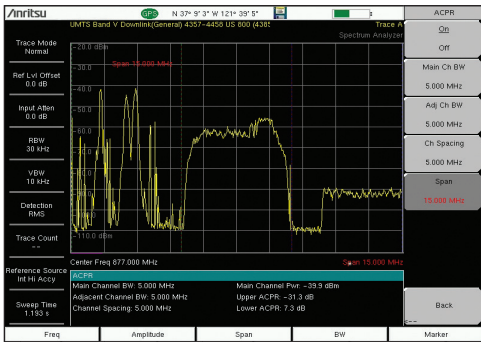
### Occupied Bandwidth

### Occupied Bandwidth

This measurement determines the amount of spectrum used by a modulated signal. The Spectrum Master allows you to choose between two different methods of determining bandwidth: the percent-of-power method or the “x” dB down method.

### Adjacent Channel Power Ratio

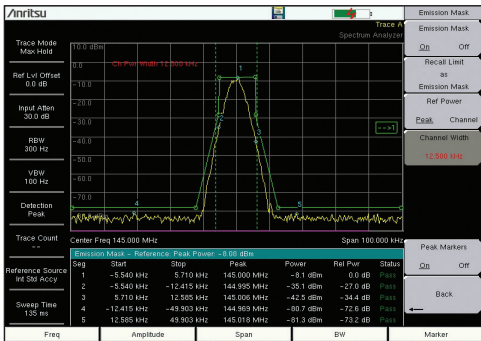
Adjacent Channel Power Ratio is a common transmitter measurement. High ACPR will create interference for neighboring carriers. This measurement can be used to replace the traditional two-tone Intermodulation Distortion (IMD) test for system non-linear behavior.



### Adjacent Channel Power Ratio

### Field Strength Measurements

The Spectrum Master can determine the effects of electromagnetic fields caused by transmitter systems. Specific antenna factors of the connected antenna are automatically taken into account, and field strength is displayed directly in dBµV/m. The Spectrum Master also supports a wide range of directional antennas. If you are using a different antenna, Master Software Tools can be used to edit the antenna list and upload the custom antenna list to the instrument to accurately measure the maximum field strength.



### Emission Mask

### Emission Mask

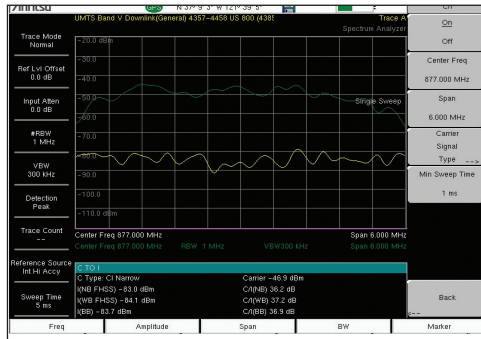
The emission mask is a segmented upper limit line that will display frequency range, peak power and frequency, relative power and pass/fail status for each segment of the mask. The emission mask must have at least two segments. Emission mask adjusts to the peak power value of transmitted signal level per government emission mask requirements.



## Master the Location of Interference

As the wireless industry continues to expand, more diverse uses for the radio spectrum emerge, and the number of signals that may potentially cause interference is constantly increasing.

Compounding the problem are the many sources that can generate interference, including intentional radiators, unintentional radiators, and self interference. Interference causes Carrier-to-Interference degradation robbing the network of capacity.



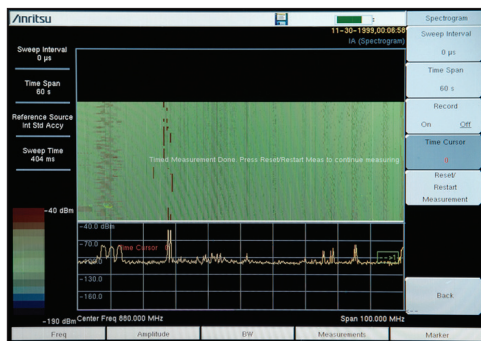
### Carrier-to-Interference (C/I)

#### Carrier-to-Interference Measurement

Spectrum Master's carrier-to-interference measurement capability makes it simple for you to determine if the level of interference will affect users in the intended service area.

#### AM/FM/SSB Demodulation

A built-in demodulator for AM, narrowband FM, wideband FM and single sideband allows you to easily listen to, and identify the interfering signal.



#### Interference Analysis (Option 25)

The interference analyzer option provides you with a spectrogram display, RSSI, signal strength meter, signal ID, and signal mapping capabilities. Spectrum Master's integrated spectrum analyzer can detect signals as low as -142 dBm.

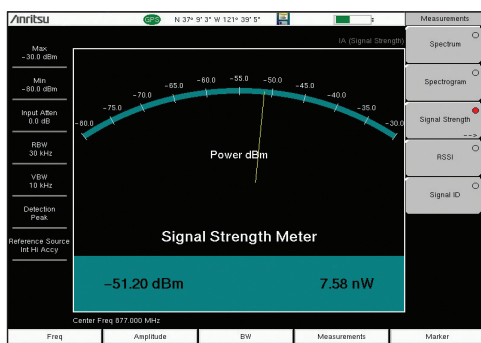
#### Spectrogram Display

This option provides you with a three-dimensional display of frequency, power, and time of the spectrum activity to identify intermittent interference and track signal levels over time. The dual display screen allows for easy viewing of both the spectrum and spectrogram display. The Spectrum Master allows you to save a history of data up to one week.

### Spectrogram Display

#### Received Single Strength Indicator (RSSI)

You can use the Spectrum Master's RSSI measurement to observe the signal strength of a single frequency over time, and collect data for up to one week.



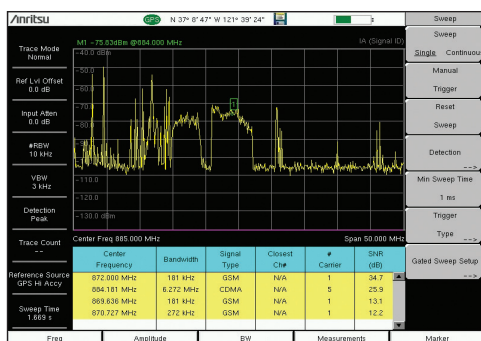
#### Signal Strength Meter

The Spectrum Master's signal strength meter can locate an interfering signal by using a directional antenna and measuring the signal strength. It displays power in Watts or dBm, in the graphical analog meter display and by an audible beep proportional to its strength.

### Signal Strength Meter

#### Signal ID

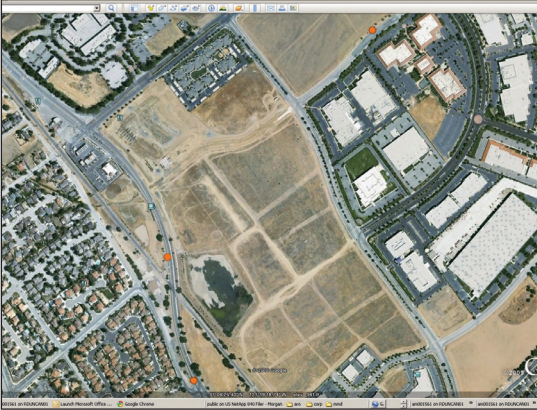
Spectrum Master's signal ID feature in the interference analyzer can help you quickly identify the type of the interfering signal. You can configure this measurement to identify all signals in the selected band or to simply monitor one single interfering frequency. The Spectrum Master then displays results that include center frequency, signal bandwidth, and signal type.



### Signal ID



# Pin Point Location of Interfering Signal with Interference Mapping



Interference Mapping with Google Earth

### Interference Mapping

The Interference Mapping measurement eliminates the need to use printed maps and draw lines to triangulate the interfering signal.

Using Map Master, it is easy to convert maps and make them compatible with the Spectrum Master. With a valid GPS signal, the instrument identifies the user location on the map. Using one of the recommended Anritsu Yagi antennas, you can identify the direction of the interfering signal and input the angle information with the rotary knob. With two or more lines from different locations, it is possible to obtain an estimate location of the interfering signal. The Interference Mapping can be done directly on the Spectrum Master. Files can also be saved as kml and opened with Google Earth™.



### Directional Antennas

Anritsu offers more than eight different directional antennas covering a wide range of frequency bands including: 822 to 900 MHz, 885 to 975 MHz, 1710 to 1880 MHz, 1850 to 1990 MHz, 2400 to 2500 MHz, 1920 to 2170 MHz, 500 to 3000 MHz, and 600 to 21000 MHz.



### GPS Antenna

The 2000-1528-R GPS antenna and Option 31 are required for the interference mapping measurements.

**Anritsu** GPS N 37° 8' 48" W 121° 39' 22"

Interference Mapping

- Save Current Point
- Location & Direction
- Save/Recall
- Points/Map
- Delete Last Saved Point
- Delete ALL Points
- Speaker On Off
- Volume
- Reset Max/Min Hold
- Back

Frequency: 2.000 GHz  
 RBW: 1 MHz  
 Detection: Peak

**-59.47 dBm**

Direction: 0 degrees

Signal Strength: -72.39 dBm to -47.78 dBm

Freq | Amplitude | BW | Measurements | IA Mapping

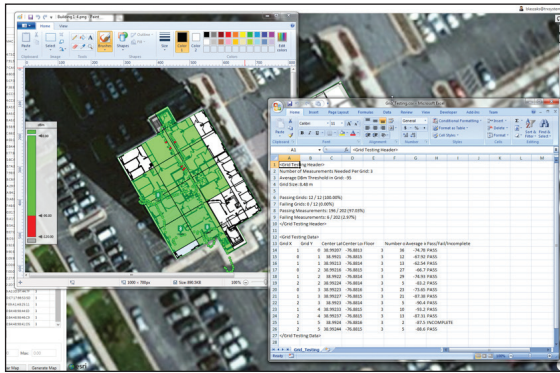
On Screen Interference Mapping

# Spectrum Master™ Compact Handheld Spectrum Analyzer Features

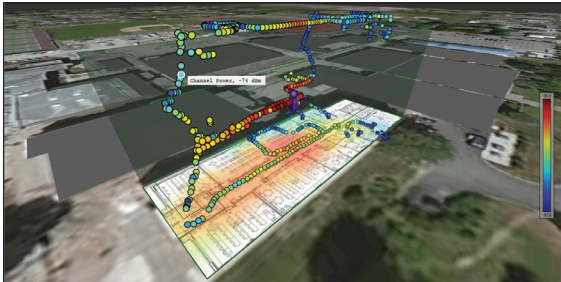
## MA8100A Series NEON Signal Mapper



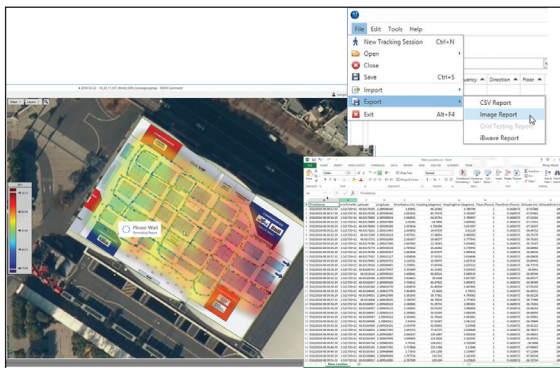
NEON Signal Mapping with Anritsu Handhelds



Support for NFPA Gridding Requirements



Automatically Generate 3-D Heatmaps



Automatic Report Generation

### MA8100A Series NEON® Signal Mapper\*

The most powerful 3D in-building coverage mapping tool specially for Anritsu Handheld Spectrum Analyzers

Anritsu's NEON Signal Mapper, a 3D in-building coverage mapping solution, is compatible with all Anritsu handheld instruments with spectrum analyzer mode. Instruments supported include Spectrum Master, LMR Master, Site Master, BTS Master, Cell Master, and VNA Master.

The MA8100A-xxx consists of both hardware and software from TRX Systems, a 3rd party partner. The MA8100A-xxx consists of a NEON Tracking Unit, NEON Signal Mapper Software for Android devices, and NEON Command Software for a PC.

The NEON Tracking Unit supports collection and processing of sensor data that delivers 3D location information. The Tracking Unit connects to the NEON Signal Mapper application which is run on an Android device via a Bluetooth connection.

The NEON Signal Mapper application provides an intuitive Android user interface enabling lightly trained users to map RF signals within buildings. Users can initialize their location, start/stop mapping and save mapping data to the cloud. RF data is captured by an Anritsu Handheld spectrum analyzer product and the data is sent to the Android device via a USB connection.

The NEON Command Software, run on a PC, enables creation and visualization of 3D building maps and provides centralized access to the NEON Cloud Service to access stored maps and measurement data.

### Key Features and Benefits

Integrating NEON's capability to automatically collect geo-referenced test data with Anritsu handheld spectrum analyzer products saves valuable time and money by:

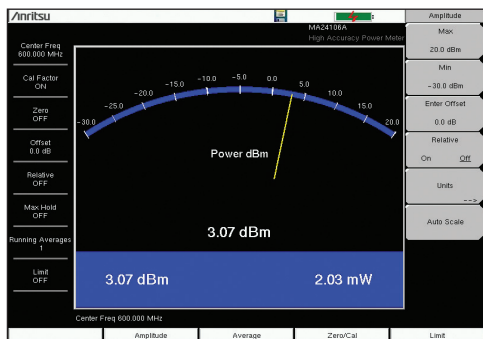
- Eliminating the need to manually perform "check-ins" at each test point by automatically calculating indoor location
- Providing vastly more data than is possible with manual processes by recording data with every step
- Removing typical data recording errors caused by "guesstimating" locations in large buildings through automatic indoor location and path estimation
- Delivering actionable data in areas not easily analyzed such as stairways and elevators by recording and referencing measurements in 3D
- Enabling quick analysis of signal coverage and faster problem resolution by delivering the industry's only geo-referenced 3D visualization
- Provides color-graded measurement results in 2D and 3D views. Measurement values can be seen by clicking on each point. A .csv file of all measurements is also provided.

\* Android device and PC are NOT included in the MA8100A-xxx. Customers must purchase their own Android device and PC.

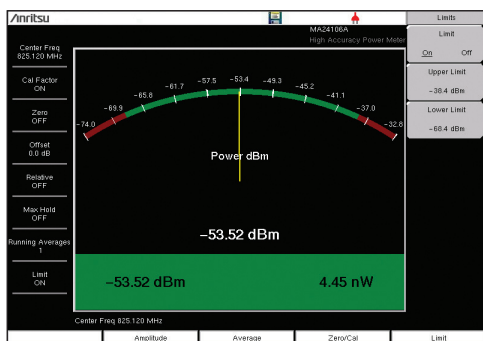


## Power Measurements for a Wide Range of Applications

The Spectrum Master supports many different power measurements, including the channel scanner, high accuracy power meter, internal power meter, and channel power measurement.



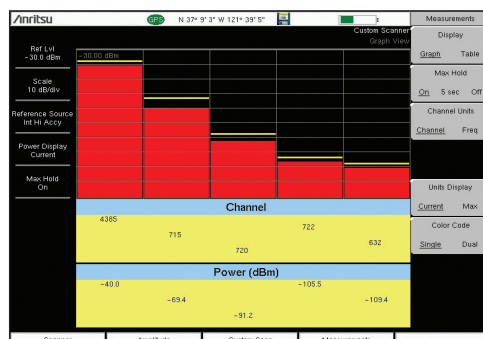
**Power Meter**



**High Accuracy Power Meter**



**High Accuracy Power Sensors**



**Channel Scanner**

### Channel Power

Use Spectrum Master's channel power measurement to determine the power and power density of a transmission channel. Using the built-in signal standard list, or your own specific settings, you can measure the channel power of a wide range of signals.

### Power Meter (Option 29)

Spectrum Master's internal power meter provides power measurements without any additional tools and is ideal for making channelized power measurements. You can display the results in both dBm and Watts. This option is easy to use and requires limited setup entries.

### High Accuracy Power Meter (Option 19)

Anritsu's high accuracy power meter option enables you to make high accuracy RMS measurements. This capability is perfect for measuring both CW and digitally modulated signals such as CDMA/EV-DO, GSM/EDGE, WCDMA/HSDPA, and P25. You can select from a wide range of USB sensors delivering better than  $\pm 0.16$  dB accuracy. An additional benefit of using the USB connection is that a separate DC supply (or battery) is not needed because the necessary power is supplied by the USB port.

- MA24104A Inline High Power Sensor, 600 MHz to 4 GHz, +3 dBm to +51.76 dBm (150 W), True-RMS
- MA24106A High Accuracy RF Power Sensor, 50 MHz to 6 GHz, -40 dBm to +23 dBm, True-RMS
- MA24108A Microwave USB Power Sensor, 10 MHz to 8 GHz, -40 dBm to +20 dBm, True-RMS
- MA24118A, Microwave USB Power Sensor, 10 MHz to 18 GHz, -40 dBm to +20 dBm, True-RMS
- MA24126A, Microwave USB Power Sensor, 10 MHz to 26 GHz, -40 dBm to +20 dBm, True-RMS

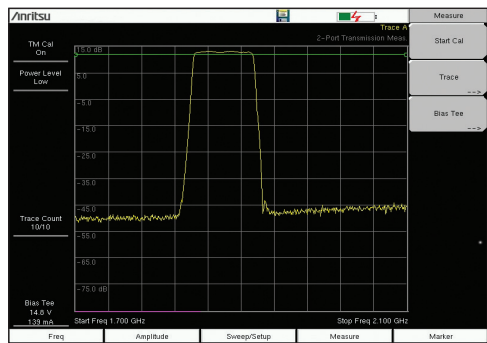
### PC Power Meter

The High Accuracy USB Power sensors can also be used with a PC running Microsoft Windows® via USB. They come with PowerXpert™ application, a data analysis, and control software. The application has abundant features, such as data logging, power versus time graph, big numerical display, and many more, that enable quick and accurate measurements.

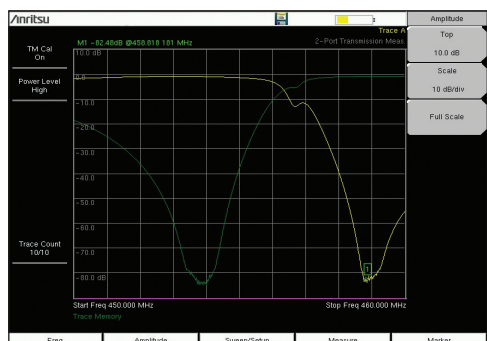
### Channel Scanner (Option 27)

The channel scanner option measures the power of multiple transmitted signals, making it very useful for simultaneously measuring channel power of up to 20 channels in GSM, TDMA, CDMA, W-CDMA, HSDPA, LTE, and public safety networks. You can select the frequencies or the scanned data to be displayed, either by frequencies or the channel number. And in the custom setup menu, each channel can be custom built with different frequency bandwidth, or with channels from different signal standards. With Script Master, scans can be automated for up to 1200 channels.

## Passive 2-Port Measurements



**2-Port Transmission Measurements**



**Duplexer Measurement**

### Tracking Generator (Option 20)

Spectrum Master's Tracking Generator capability allows you to make gain, isolation and insertion loss measurements of passive and active devices such as filters, cables, attenuators, duplexers, and tower mounted amplifiers. The Tracking Generator can also be used to make antenna-to-antenna isolation measurements and for repeater testing. The output power level can be varied from -50 dBm to 0 dBm in 0.1 dB steps.

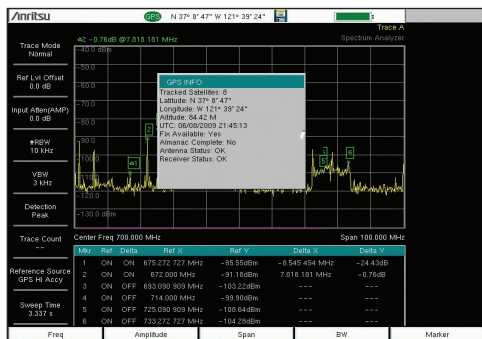
### Duplexers

Fast sweep speeds, 80 dB dynamic range, and easy-to-use trace math menus make the Spectrum Master well suited for duplexer applications.





## Valuable Options and Features

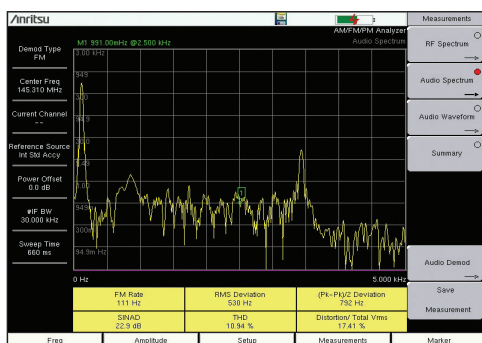


GPS Receiver

### GPS Receiver (Option 31)

Spectrum Master's GPS option can be used to confirm the exact measurement location (longitude, latitude, altitude) and Universal Time (UTC) information. Each trace can be stamped with location information to ensure you are taking measurements at the right location.

In addition, the GPS option enhances the frequency accuracy of the internal reference oscillator. Within three minutes of acquiring the GPS satellite, the built-in GPS receiver provides a frequency accuracy to better than  $\pm 50$  ppb.

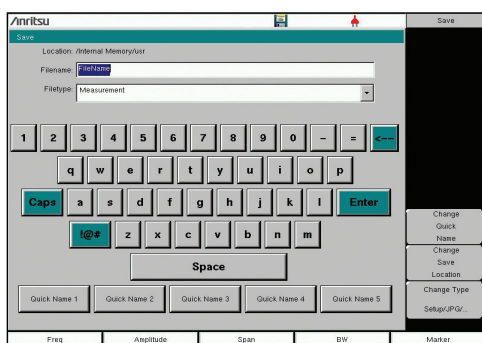


AM/FM/PM Analyzer

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

The AM/FM/PM analyzer provides analysis and display of analog modulation. Four measurement displays are provided.

The RF Spectrum display shows the spectrum with carrier power, frequency, and occupied BW. The Audio Spectrum display shows the demodulated audio spectrum along with the Rate, RMS deviation, Pk-Pk/2 deviation, SINAD, Total Harmonic Distortion (THD), and Distortion/Total. Audio Waveform display shows the time-domain demodulated waveform. Finally, there is a Summary Table Display that includes all the RF and Demod parameters.



Touchscreen Keyboard

### Built-In Keyboard

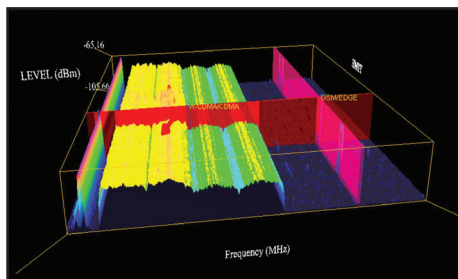
The built-in touchscreen keyboard gives you access to a fully functional keyboard, saving valuable time in the field when entering trace names. You can create shortcuts to customer-configurable user "quick names" to program frequently used words.

### Local Language Support

Spectrum Master features ten languages, including English, French, German, Spanish, Japanese, Chinese, Korean, Italian, Russian, Portuguese.

# Spectrum Master™ Compact Handheld Spectrum Analyzer Features

## Master Software Tools (for your PC)



### 3D Spectrogram

For in-depth analysis with 3-axis rotation viewing, threshold, reference level, and marker control. Turn on Signal ID to see the types of signals.

## Master Software Tools

Master Software Tools (MST) is a powerful PC software post-processing tool designed to enhance the productivity of technicians in data analysis and testing automation.

### Folder Spectrogram

Folder Spectrogram – creates a composite file of up to 15,000 multiple traces for quick review, also create:

- Peak Power, Total Power, and Peak Frequency plotted over time
- Histogram – filter data and plot number of occurrences over time
- Minimum, Maximum, and Average Power plotted over frequency
- Movie playback – playback data in the familiar frequency domain view
- 3D Spectrogram – for in-depth analysis with 3-axis rotation viewing control

## Master Software Tools Features

Mapping (GPS Required)  
Spectrum Analyzer Mode  
Mobile WiMAX OTA Option  
TS-SCDMA OTA Option  
LTE, both FDD and TDD Options

Folder Spectrogram  
Folder Spectrogram – 2D View  
Video Folder Spectrogram – 2D View  
Folder Spectrogram – 3D View

List/Parameter Editors  
Traces  
Antennas, Cables, Signal Standards  
Product Updates  
Firmware Upload  
Pass/Fail  
VSG Pattern Converter  
Languages  
Mobile WiMAX  
Display

### Script Master™

Channel Scanner Mode  
GSM/GPRS/EDGE Mode  
W-CDMA/HSDPA Mode










### Connectivity

Serial, USB  
Download measurements and live traces  
Upload Lists/Parameters and VSG Patterns  
Firmware Updates  
Remote Access Tool over the Internet



# Spectrum Master™ Ordering Information

## Options

	<b>MS2711E</b>	<b>Description</b>
	9 kHz to 3 GHz	Spectrum Analyzer
<b>Options</b>		
	MS2711E-0008	Preamplifier
	MS2711E-0020	Tracking Generator
	MS2711E-0031	GPS Receiver (requires Antenna)
	MS2711E-0019	High-Accuracy Power Meter (requires External Power Sensor)
	MS2711E-0029	Power Meter
	MS2711E-0025	Interference Analyzer (Option 31 recommended)
	MS2711E-0027	Channel Scanner
	MS2711E-0444	EMF Measurements (requires Anritsu Isotropic Antenna)
	MS2711E-0509	AM/FM/PM Analyzer
	MS2711E-0098	Standard Calibration (ANSI Z540-1-1994)
	MS2711E-0099	Premium Calibration (ANSI Z540-1-1994) plus printed test data

## Standard Accessories (included with instrument)

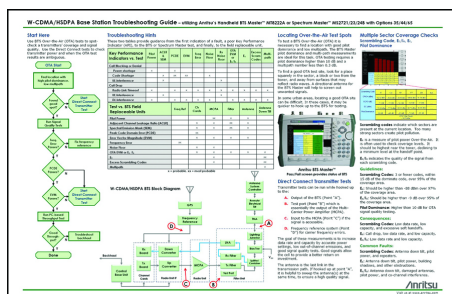


<b>Part Number</b>	<b>Description</b>
2000-1654-R	Soft Carrying Case
2000-1691-R	Stylus with Coiled Tether
2000-1797-R	Touchscreen Protective Film, 8.4 in
633-75	Rechargeable Li-Ion Battery, 7500 mAh
40-187-R	AC-DC Adapter
806-141-R	Automotive Power Adapter, 12 VDC, 60 W
3-2000-1498	USB A/5-pin mini-B Cable, 10 ft/305 cm

## Manuals (available at [www.anritsu.com](http://www.anritsu.com))

<b>Part Number</b>	<b>Description</b>
10580-00328	Spectrum Master User Guide
10580-00349	Spectrum Analyzer Measurement Guide - Interference Analyzer, Channel Scanner AM/FM/PM Analyzer, Interference Mapping
10580-00240	Power Meter Measurement Guide - High Accuracy Power Meter
10580-00339	Tracking Generator Measurement Guide
10580-00256	Programming Manual

## Troubleshooting Guides (available at [www.anritsu.com](http://www.anritsu.com))



<b>Part Number</b>	<b>Description</b>
11410-00551	Spectrum Analyzers
11410-00472	Interference

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