

**Anritsu** envision : ensure

# Cell Master™

Compact Handheld Base Station Analyzer

Signal Analyzers for 2G, 3G, 4G and Digital Broadcast

MT8212E

MT8213E

2 MHz to 4 GHz

2 MHz to 6 GHz

Cable and Antenna Analyzer

9 kHz to 4 GHz

9 kHz to 6 GHz

Spectrum Analyzer

10 MHz to 4 GHz

10 MHz to 6 GHz

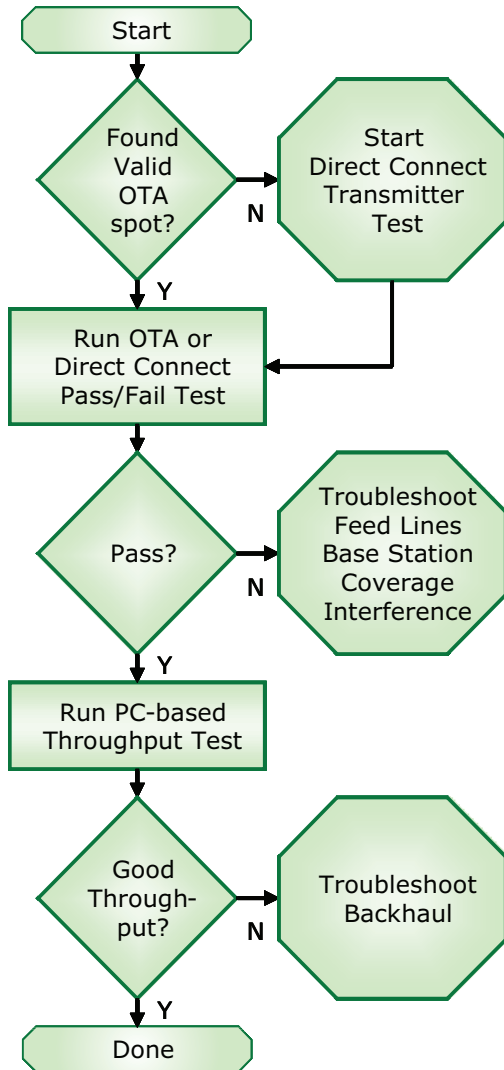
Power Meter





# Cell Master™ Base Station Analyzer Features

## Overview (continued)



Fast Over-the-Air Pass/Fail Testing Process

### Troubleshooting Fast

An Anritsu exclusive is its Signal Analysis Over-the-Air (OTA) Pass/Fail Tests. Technicians and RF engineers can quickly determine the health of a cell site with a one-step Pass/Fail test. A one-step OTA Pass/Fail test verifies:

- Antenna Feed Line Quality
- Base Station RF Quality
- Base Station Modulation Quality

If a cell site passes, the technician can move on to the next cell site. If the test fails, the Cell Master equips the technician to troubleshoot:

- Feed lines and antenna systems
- Base station field replaceable units
- Downlink coverage issues
- Interference problems
- Backhaul bit-error-rates

By quickly determining the health of the cell site with Pass/Fail testing, the cell site technician becomes more productive and the Cell Master equips him with the tools to properly diagnose the root-cause of the problem minimizing costly no trouble found parts and service calls.

### Network Reliability

Studies have shown that network reliability plays a significant part in subscriber churn. Leading reasons stated for churn are:

- Dropped calls
- Poor coverage
- Network outages

As wireless users come to depend more and more on their wireless service they expect more and more in network performance. This makes it more critical than ever to meet your KPI optimization goals for network availability, network quality, and network coverage. Ultimately it is about eliminating reasons for demanding subscribers to churn.

### Network Maintenance and Return on Investment

By outfitting cell site technicians with Cell Masters an operator can attack these reasons for churn. Benchmarking undertaken by Anritsu has shown that technicians equipped with base station analyzers provides them with the necessary tools to troubleshoot degrading KPIs which in-turn can reduce churn.

Learn what the return on investment is on equipping more technicians with the Cell Master MT8212/3E Base Station Analyzers from your local Anritsu sales professional. The Cell Master MT8212/3E Base Station Analyzer can become your vital tool to achieving optimal network performance.

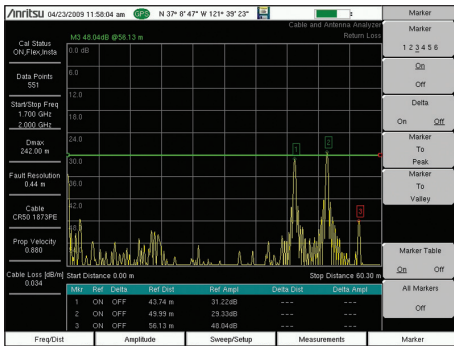


# Cell Master™ Base Station Analyzer Features



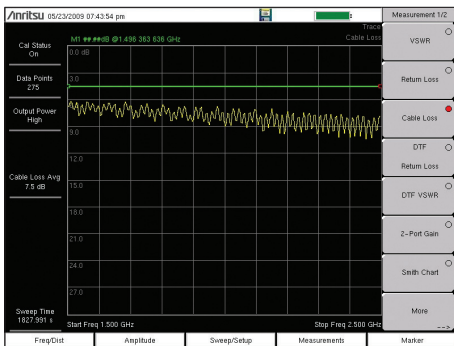
## Cable and Antenna Analyzer

## PIM Analyzer



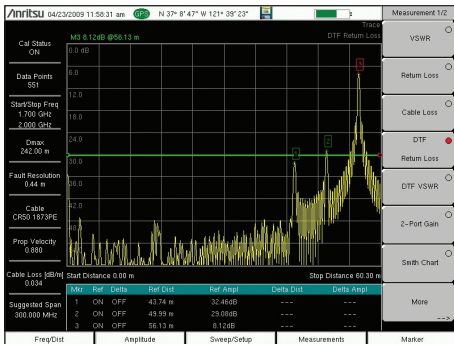
### Return Loss/VSWR Measurement

Poor Return Loss/VSWR can damage transmitters, reduce the coverage area, increase dropped and blocked calls, and lower data rates.



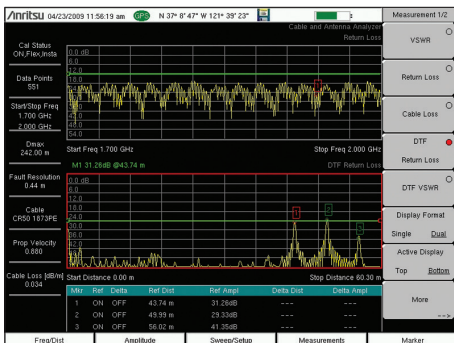
### Cable Loss Measurement

This an important commissioning check. Excessive loss reduces the coverage area and can mask return loss issues, creating false good readings later.



### Distance-to- Fault (DTF) Measurement

DTF can be used to identify and locate faulty cable components or connector pairs with poor Return Loss/VSWR in meters or feet.



### Dual Trace Display with Independent Markers

Make two traces at once to increase productivity. Select which two traces to display from the Cable and Antenna Analyzer measurements.

## Cable and Antenna Analyzer PIM Analyzer

The Cell Master features 1-port Cable and Antenna Analyzer and optional 2-port Transmission Measurement and PIM Analyzer to be able to test and verify the performance of nearly every feed-line and antenna component. This includes:

- Connectors
- Cables/Jumpers
- Antenna Isolation
- Diplexers/Duplexers
- Tower Mounted Amplifiers

The goal of these measurements is to maximize the coverage, data rate and capacity with problem-free antenna systems minimizing dropped calls and blocked calls for a good customer experience.

## Antenna Systems Failure Mechanisms

Maintenance is an on-going requirement as antenna systems' performance can degrade at any point in time due to:

- Loose connectors
- Improperly weatherized connectors
- Pinched cables
- Poor grounding
- Corroded connectors
- Lightning strikes
- Strong winds misaligning antennas
- Rain getting into cables
- Bullet holes/nails in the cable
- Intermodulation of multiple signals

## Making Measurements Easier

The Cell Master provides features for making measurements easier to perform and to analyze test results such as:

- InstaCal™ provides the most accurate one-step calibration process
- FlexCal™ eliminates the need to recalibrate when changing frequencies
- High RF Immunity for testing in harsh RF environments
- Trace Overlay compares reference traces to see changes over time
- Limit Lines and Alarming for providing reference standards
- High Power output to test tower-top components without climbing the tower
- GPS tagging of data to verify location of tests
- Line Sweep Tools for post-analysis and report generation

## PIM Analyzer

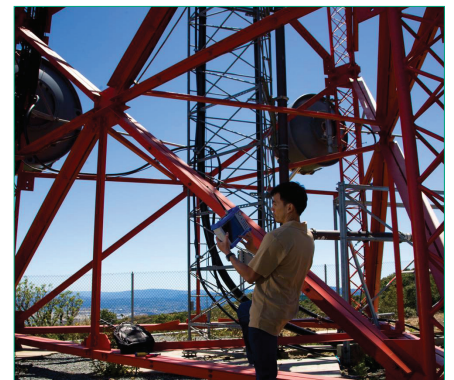
The PIM Analyzer measures the 3<sup>rd</sup>, 5<sup>th</sup>, or 7<sup>th</sup> order intermodulation products in the receive band of two high power tones generated by the 40 Watt PIM Master. To learn more about PIM and finding the location of PIM with the Distance-to-PIM™ option see the PIM Master™ product brochure 11410-00824.

## Cable and Antenna Analyzer Measurements

- VSWR
- Return Loss
- Cable Loss
- Distance-to-Fault (DTF) Return Loss
- Distance-to-Fault (DTF) VSWR
- 1-port Phase
- Smith Chart
- 2-port Transmission Measurement (Option 0021)

## PIM Analyzer Measurements

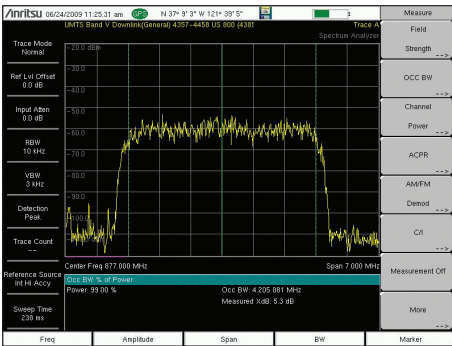
- (Requires PIM Master™)
- PIM
- Noise Floor
- Distance-to-PIM™ (DTP)
- (see PIM Master Product Brochure 11410-00824)



# Cell Master™ Base Station Analyzer Features

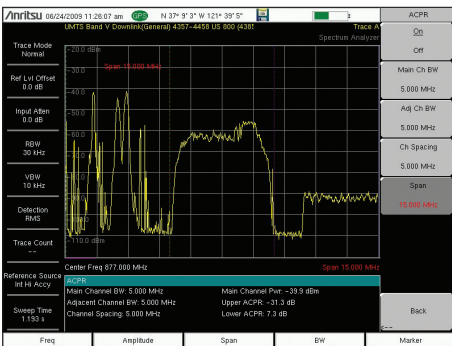


## Spectrum Analyzer



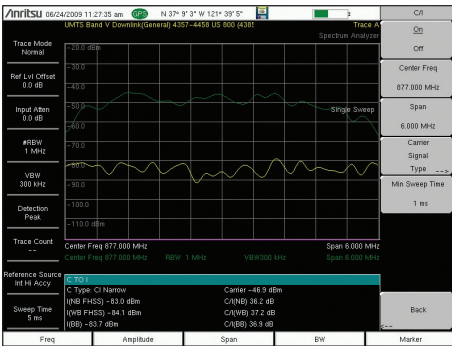
### Occupied Bandwidth

Excessive occupied bandwidth can create interference with adjacent channels or be a sign of poor signal quality, leading to dropped calls.



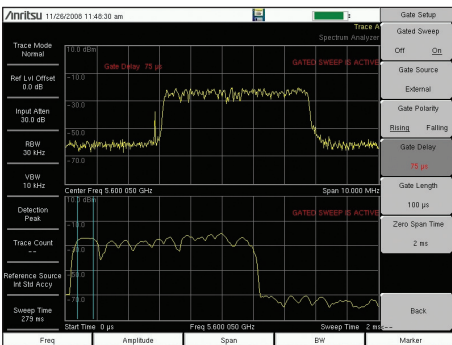
### Adjacent Channel Power Ratio (ACPR)

High ACPR will create interference for neighboring carriers. This is also an indication of low signal quality and low capacity, which can lead to blocked calls.



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

Low C/I ratios will cause coverage issues including dropped calls, blocked calls, and other handset reception problems.



### Gated Sweep – Option 0090

The gate is in the off-time of this WiMAX signal, which would let the user see interfering signals or user signals when the base station is not transmitting.

## Spectrum Analyzer

The Cell Master features the most powerful handheld spectrum analyzer for field use with unmatched performance such as:

- Sensitivity
- Dynamic Range
- Phase Noise
- Frequency Accuracy
- Resolution Bandwidth (RBW)

The goal of the Spectrum Analyzer's measurements is to be able to monitor, measure, and analyze RF signals and their environments. It finds rogue signals, measures carriers and distortion, and verifies base stations' signal performance. It validates carrier frequency and identifies desired and undesired signals.

### Simple But Powerful

The Cell Master features dedicated routines for one-button measurements and for more in-depth analysis the technician has control over the setting and features not even found on lab-grade benchtop spectrum analyzers, for instance:

- Multiple sweep detection methods – true RMS detector, quasi-peak, ...
- Multiple traces and control – three traces, trace math, ...
- Advanced marker functions – noise marker, frequency counter, ...
- Advanced limit line functions – one-button envelope creation, relative, ...
- Save-on-Event – automatically saves a sweep when crossing a limit line
- Gated sweep - view pulsed or burst signals only when they are on, or off

The Cell Master automatically sweeps as fast as possible for the selected settings consistent with accurate results.

### GPS-Assisted Frequency Accuracy

With GPS Option 0031 the frequency accuracy is 50 ppb (parts per billion). Also all measurements can be GPS tagged for exporting to maps.

### Rx Noise Floor Testing

The Cell Master can measure the Rx Noise Floor on the uplink of a base station using the channel power measurement. An elevated noise floor indicates interference and leads to call blocking, denial of services, call drops, low data rate, and low capacity.

## Measurements

One Button Measurements

- Field Strength – in dBm/m<sup>2</sup> or dBmV/m
- Occupied Bandwidth - 1% to 99% of power
- Channel Power - in specified bandwidth
- ACPR - adjacent channel power ratio
- AM/FM/SSB Demodulation - audio out only
- C/I - carrier-to-interference ratio

Gated Sweep – Option 0090

## Sweep Functions

Sweep

- Single/Continuous, Manual Trigger, Reset, Minimum Sweep Time

Detection

- Peak, RMS, Negative, Sample, Quasi-peak

Triggers

- Free Run, External, Video, Change Position, Manual

## Trace Functions

Traces

- 1-3 Traces (A, B, C), View/Blank, Write/Hold

Trace A Operations

- Normal, Max Hold, Min Hold, Average, Number 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

- 1-6 Markers each with a Delta Marker, or Marker 1 Reference with 6 Delta Markers

Marker Types

- Fixed, Tracking, Noise, Frequency Counter

Marker Auto-Position

- Peak Search, Next Peak (Right/Left), Peak Threshold %, To Channel, To Center,

To Reference Level, Delta Marker to Span

Marker Table

- 1-6 markers' frequency & amplitude plus delta markers' frequency offset & amplitude

## Limit Line Functions

Limit Lines

- Upper/Lower, Limit Alarm, Default Limit

Limit Line Edit

- Frequency, Amplitude, Add/Delete Point, Add Vertical, 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, Update Amplitude, Number of Points (41), Offset, Shape Square/Slope

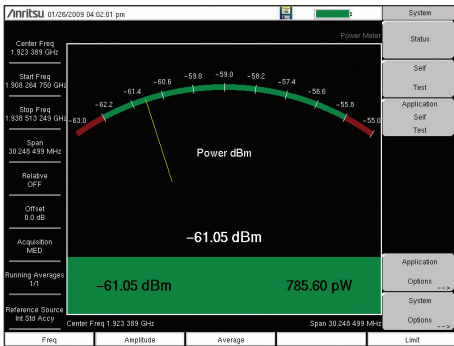
Limit Line Advanced

- Absolute/Relative, Mirror, Save/Recall

# Cell Master™ Base Station Analyzer Features

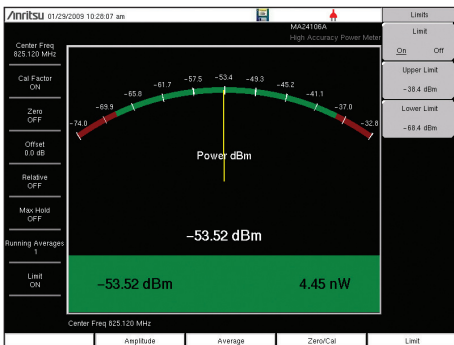


## Power Meter



### Power Meter (built-in)

Power is displayed in an analog type display and supports both Watts and dBm. RMS averaging can be set to low, medium, or high.



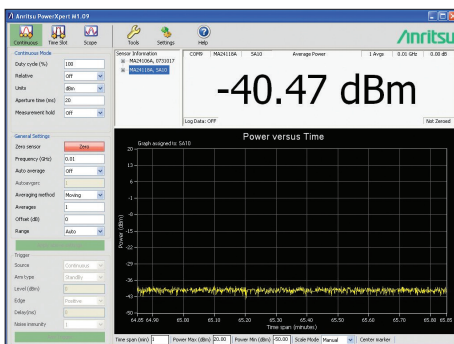
### High Accuracy Power Meter (Option 0019)

Requires external power sensor with convenient connection via a USB A/mini-B cable. Use upper/lower limit activation during pass/fail measurements.



### Power Sensors

Anritsu offers a family of Power Sensors for your power measurement requirements. They are compact enough to fit in your shirt pocket.



### PC Power Meter

These power sensors can be used with a PC running Microsoft Windows® via USB. A front panel display makes the PC appear like a traditional power meter.

## High Accuracy Power Meter (Option 0019)



### Power Meters

The Cell Master offers as standard a built-in Power Meter utilizing the Spectrum Analyzer and an optional High Accuracy Power Meter requiring external power sensors.

Setting the transmitter output power of a base station properly is critical to the overall operation of a wireless network. A 1.5 dB change in power levels means a 15% change in coverage area.

Too much power means overlapping coverage which translates into cell-to-cell self interference. Too little power, too little coverage, creates island cells with non-overlapping cell sites and reduced in-building coverage. High or low values will cause dead zones/dropped calls, lower data rates/reduced capacity near cell edges, and cell loading imbalances/blocked calls.

### High Accuracy Power Meter (Option 0019)

For the most accurate power measurement requirements select the high accuracy measurement option with a choice of sensors with:

- Frequency ranges: 10 MHz to 50 GHz
- Power ranges: -40 dBm to +51.76 dBm
- Measurement uncertainties:  $\leq \pm 0.18$  dB

These sensors enable users to make accurate measurements for CW and digitally modulated signals for 2G/3G and upcoming 4G wireless networks.

The power sensor easily connects to the Cell Master via a USB A/mini-B cable. An additional benefit of using the USB connection is that a separate DC supply (or battery) is not needed since the necessary power is supplied by the USB port.

### PC Power Meter

These power sensors can 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.

### Remote Power Monitoring via LAN

A USB-to-LAN hub converter enables power monitoring via the Internet across continents, if desired.

### Power Sensors PSN50

High Accuracy RF Power Sensor  
 50 MHz to 6 GHz  
 Type N(m), 50  $\Omega$   
 -30 dBm to +20 dBm  
 (.001 to 100 mW)  
 True-RMS

### MA24104A

Inline High Power Sensor  
 600 MHz to 4 GHz  
 +3 dBm to +51.76 dBm  
 (2 mW to 150 W)  
 True-RMS

### MA24105A

Inline Peak Power Sensor  
 350 MHz to 4 GHz  
 +3 dBm to +51.76 dBm  
 (2 mW to 150 W)  
 True-RMS

### MA24106A

High Accuracy RF Power Sensor  
 50 MHz to 6 GHz  
 -40 dBm to +23 dBm  
 (0.1  $\mu$ W to 200 mW)  
 True-RMS

### MA24108A

Microwave USB Power Sensor  
 10 MHz to 8 GHz  
 -40 dBm to +20 dBm  
 (0.1  $\mu$ W to 100 mW)  
 True-RMS  
 Slot Power  
 Burst Average Power

### MA24118A

Microwave USB Power Sensor  
 10 MHz to 18 GHz,  
 -40 dBm to +20 dBm  
 (0.1  $\mu$ W to 100 mW)  
 True-RMS  
 Slot Power  
 Burst Average Power

### MA24126A

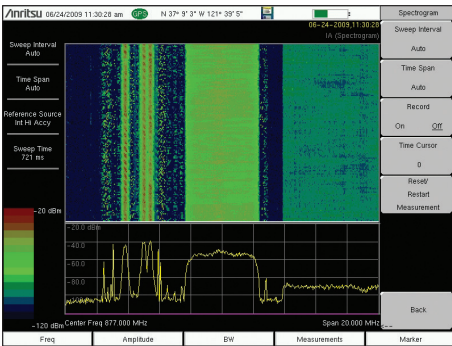
Microwave USB Power Sensor  
 10 MHz to 26 GHz,  
 -40 dBm to +20 dBm  
 (0.1  $\mu$ W to 100 mW)  
 True-RMS  
 Slot Power  
 Burst Average Power

# Cell Master™ Base Station Analyzer Features



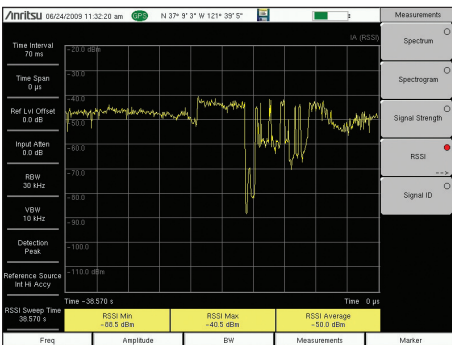
## Interference Analyzer (Option 0025)

## Channel Scanner (Option 0027)



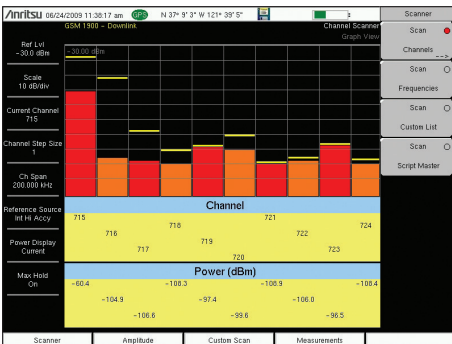
### Spectrogram

For identifying intermittent interference and tracking signal levels over time for up to 72 hours with an external USB flash drive.



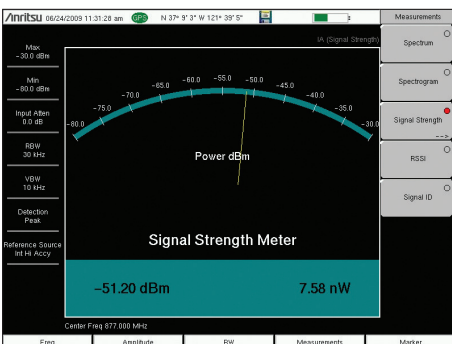
### Received Signal Strength Indicator (RSSI)

Used to observe the signal strength of a single frequency over time. Data can be collected for up to one week with an external USB flash drive.



### Channel Scanner

Works on any signal and is useful when looking for IM or harmonics. Can help spot signals widely separated in frequency that turn on and off together.



### Signal Strength Meter

Can locate an interfering signal, by using a directional antenna and measuring the signal strength and by an audible beep proportional to its strength.

## Interference Analyzer (Option 0025) Channel Scanner (Option 0027)

Interference is a continuously growing problem for wireless network operators. Compounding the problem are the many sources that can generate interference such as:

- Intentional Radiators
- Unintentional Radiators
- Self Interference

Interference causes Carrier-to-Interference degradation robbing the network of capacity. In many instances interference can cause an outage to a sector, a cell, and/or neighboring cells. The goal of these measurements is to resolve interference issues as quickly as possible.

### Monitoring Interference

The Cell Master offers many tools for monitoring intermittent interferers over time to determine patterns:

- Spectrogram
- Received Signal Strength Indicator
- Remote Monitoring over the Internet
- Save-on-Event – crossing a limit line

Master Software Tools for your PC features diagnostic tools for efficient analysis of the data collected during interference monitoring. These features include:

- Folder Spectrogram – creates a composite file of multiple traces for quick review
- Movie playback – playback data in the familiar frequency domain view
- Histogram – filter data and search for number of occurrences and time of day
- 3D Spectrogram – for in-depth analysis with 3-axis rotation viewing control

### Identifying Interference

The Cell Master provides several tools to identify the interference – either from a neighboring wireless operator, illegal repeater or jammer, or self-interference:

- Signal ID (up to 12 signals at once)
- Signal Analyzer Over-the-Air Scanners
- Channel Scanner (up to 1200 channels, 20 at a time)
- Interference Mapping

### Locating Interference

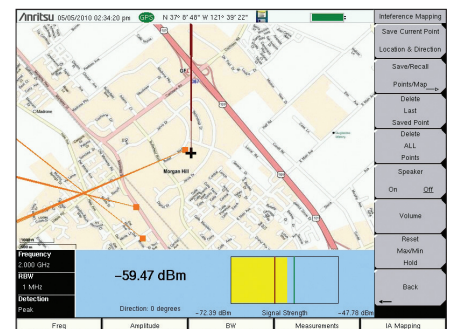
Once interference has been identified the Signal Strength Meter with its audible output beep coupled with a directional antenna makes finding the interference easier. Use Interference Mapping to triangulate the interference signal on an on-screen map.

### Interference Analyzer Measurements

- Spectrogram
- Signal Strength Meter
- Received Signal Strength Indicator (RSSI)
- Signal ID (up to 12 signals)
- Interference Mapping
- Spectrum
  - Field Strength – in dBm/m<sup>2</sup> or dBm/Vm
  - Occupied Bandwidth - 1% to 99% of power
  - Channel Power - in specified bandwidth
  - ACPR - adjacent channel power ratio
  - AM/FM/SSB Demodulation - audio out only
  - C/I - carrier-to-interference ratio
  - SEM - spectral emission mask

### Channel Scanner

- Scan
  - 20 channels at once, by frequency or channel
  - Noncontiguous channels
  - Different channel bandwidths in one scan
- Display
  - Current plus Max hold display
  - Graph View
  - Table View
- Script Master™
  - Up to 1200 Channels
  - Auto-repeat sets of 20 channels and total
  - Auto-Save with GPS tagging



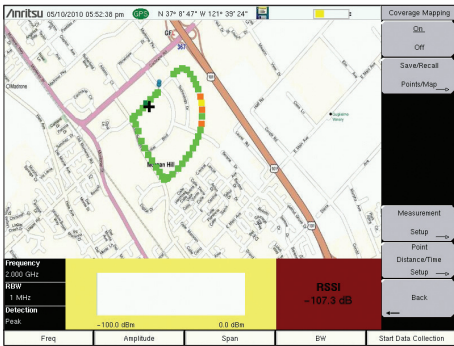
### Interference Mapping

Eliminates the need to use printed maps and draw lines to triangulate location. Use on-screen maps generated with GPS coordinates with Map Master™.

# Cell Master™ Base Station Analyzer Features

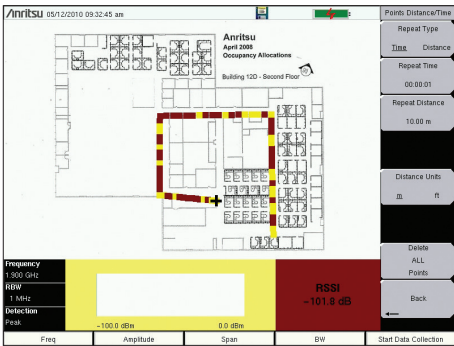


## Coverage Mapping (Option 0431)



### On-screen Outdoor Coverage Mapping

Enables a maintenance technician to make low cost coverage measurements to quickly verify coverage around a base station site.



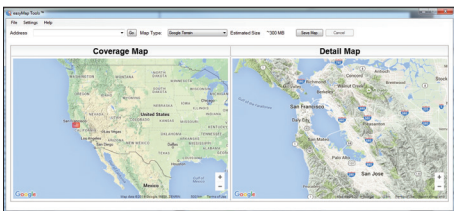
### On-screen Indoor Coverage Mapping

Import an image of an office floor plan and use the start-walk-stop method to record coverage strength. Validates coverage for enterprise accounts.



### Plot Coverage on PC-based Map

Once coverage data has been collected on the instrument, the data can be imported into a mapping program for further review and reporting.



### easyMap Tools™

These capabilities make it possible to find and prepare maps and floor plans for use on Anritsu handheld spectrum analyzers.

## Coverage Mapping

There is a growing demand for low cost coverage mapping solutions. Anritsu's Coverage Mapping measurements option provides wireless service providers, public safety users, land mobile radio operators, and government officials with indoor and outdoor mapping capabilities

## Outdoor Mapping

With a connected to the instrument and a valid GPS signal, the instrument monitors RSSI and ACPR levels automatically. Using a map created with Map Master, the instrument displays maps, the location of the measurement, and a special color code for the power level.

The refresh rate can be set up in time (1 sec, minimum) or distance.

The overall amplitude accuracy coupled with the GPS update rate ensures accurate and reliable mapping results.

## Indoor Mapping

When there is no GPS signal valid, the Cell Master uses a start-walk-stop approach to record RSSI and ACPR levels. You can set the update rate, start location, and end location and the interpolated points will be displayed on the map.

## Export KML Files

Save files as KML or JPEG. Open KML files with Google Earth™. When opening up a pin in Google Earth, center frequency, detection method, measurement type, and RBW are shown on screen.

## easyMap Tools™

easyMap Tools provides maps in formats that Anritsu's handheld spectrum analyzers can use for either coverage mapping or interference hunting. It helps users find and prepare geo-referenced maps and building floor plans for use by Anritsu handheld spectrum analyzers.

easyMap allows users to quickly:

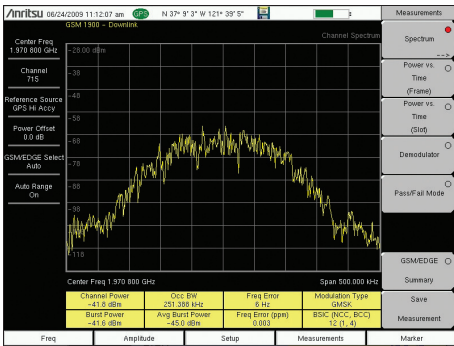
- Create geo-referenced maps with pan and zoom capability
- Use either Google Maps or MapQuest (an Open Source map provider) to source maps
- Create legacy mode geo-referenced maps
- Convert maps and floor plans to a form suitable for use on Anritsu handheld spectrum analyzers
- Insert GPS information into previously non-geo-referenced maps

## Coverage Mapping Measurements

Spectrum Analyzer Mode  
ACPR  
RSSI

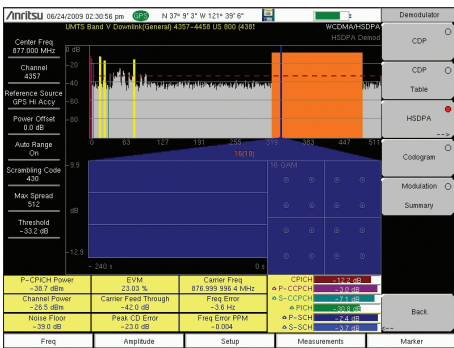
# Cell Master™ Base Station Analyzer Features

## Introduction to Signal Analyzers



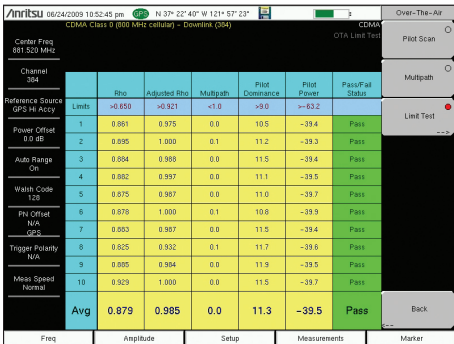
### RF Measurement – GSM

High Frequency Error will cause calls to drop when mobiles travel at higher speed. In some cases, cell phones cannot hand off into, or out of the cell.



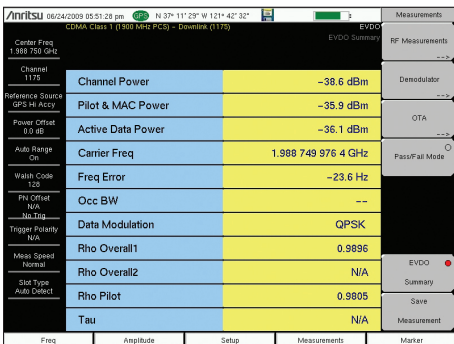
### Demodulation – HSPA+

This is the single most important signal quality measurement. Poor EVM leads to dropped calls, low data rate, low sector capacity, and blocked calls.



### Over-the-Air Measurement – CDMA

Having low multi-path and high pilot dominance is required for quality Rho measurements OTA. Poor Rho leads to dropped and blocked calls, and low data rate.



### Measurement Summary – EV-DO

Having a summary of all key measurements is a quick way for a technician to see the health of the base station and record the measurements for reference.

## Signal Analyzers

The Cell Master features Signal Analyzers for the major wireless standards around the world. The Signal Analyzers are designed to test and verify the:

- RF Quality
- Modulation Quality
- Downlink Coverage Quality

of the base stations' transmitters. The goal of these tests are to improve the Key Performance Indicators (KPIs) associated with:

- Call Drop Rate
- Call Block Rate
- Call Denial Rate

By understanding which test to perform on the Cell Master when the KPIs degrade to an unacceptable level, a technician can troubleshoot down to the Field Replacement Unit (FRU) in the base station's transmitter chain. This will minimize the problem of costly no trouble founds (NTF) associated with card swapping. This will allow you to have a lower inventory of spare parts as they are used more efficiently.

## Troubleshooting Guides

The screen shots on this page are all measurements made over-the-air with the MT8212/3E on commercial base stations carrying live traffic. To understand when, where, how, and why you make these measurements Anritsu publishes Troubleshooting Guides which explain for each measurement the:

- Guidelines for a good measurement
- Consequences of a poor measurement
- Common faults in a base station

These *Troubleshooting Guides for Base Stations* are one-page each per Signal Analyzer. They are printed on tear-resistant and smudge-resistant paper and are designed to fit in the soft case of the instrument for easy reference in the field. They are complimentary and their part numbers can be found in the ordering information.

- LTE, TD-LTE Base Stations
- GSM/GPRS/EDGE Base Stations
- W-CDMA/HSPA+ Base Stations
- CDMA2000 1X Base Stations
- CDMA2000 1xEV-DO Base Stations
- Fixed WiMAX Base Stations
- Mobile WiMAX Base Stations
- TD-SCDMA/HSPA+ Base Station

## Signal Analyzers

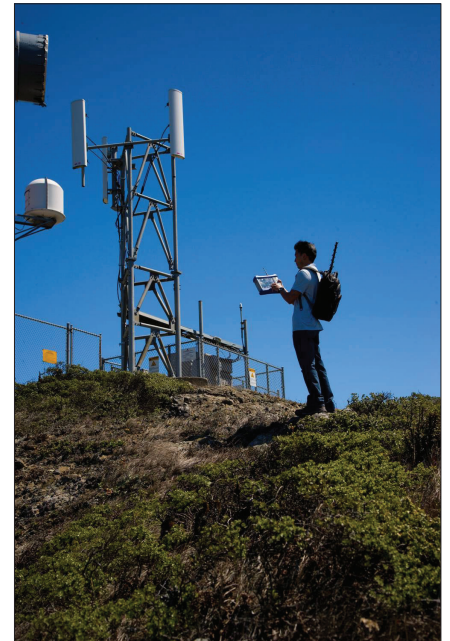
- LTE, TD-LTE
- GSM/EDGE
- W-CDMA/HSPA+
- cdmaOne/CDMA2000 1X
- CDMA2000 1xEV-DO
- Fixed WiMAX
- Mobile WiMAX
- TD-SCDMA/HSPA+

## Typical Signal Analyzer Options

- RF Measurements
- Demodulation
- Over-the-Air Measurements

## Signal Analyzer Features

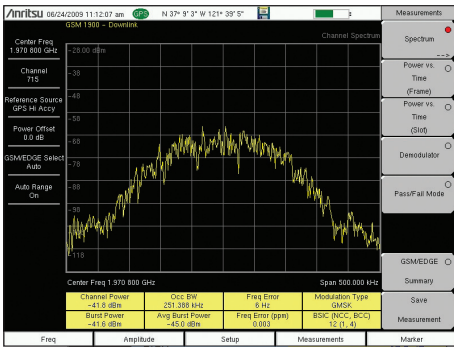
- Measurement Summary Display
- Pass/Fail Limit Testing



# Cell Master™ Base Station Analyzer Features

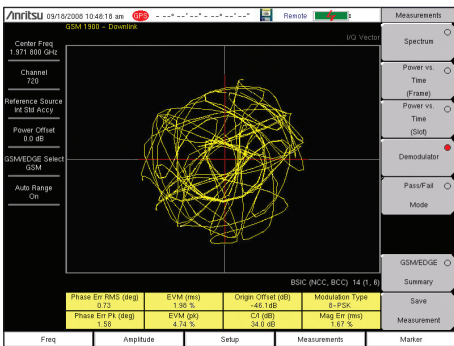


## GSM/EDGE Signal Analyzers (Option 0880)



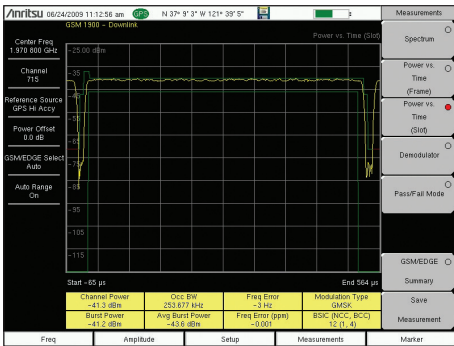
### RF Measurement – Occupied Bandwidth

Excessive occupied bandwidth can create interference with adjacent channels or be a sign of poor signal quality, leading to dropped calls.



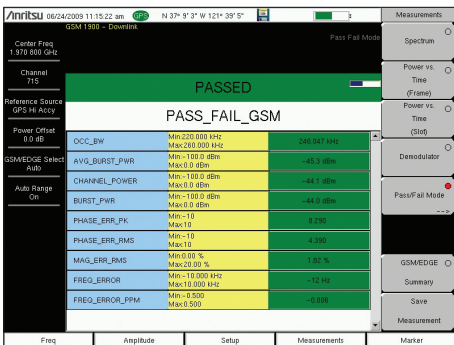
### Demodulation – Error Vector Magnitude (EVM)

This is the single most important signal quality measurement. Poor EVM leads to dropped calls, low data rate, low sector capacity, and blocked calls.



### RF Measurement – Average Burst Power

High or low values will create larger areas of cell-to-cell interference and create lower data rates near cell edges. Low values create dropouts and dead zones.



### Pass/Fail Test

Set up common test limits, or sets of limits, for each instrument. Inconsistent settings between base stations, leads to inconsistent network behavior.

## GSM/EDGE Analyzers

The Cell Master features two GSM/EDGE measurement modes.

- RF Measurements
- Demodulation

The goal of these measurements is to increase data rate and capacity by accurate power settings, ensuring low out-of-channel emissions, and good signal quality. These attributes help to create a low dropped call rate, a low blocked call rate, and a good customer experience.

Cell site technicians or RF engineers can make measurements Over-the-Air (OTA) to spot-check a transmitter's coverage and signal quality without taking the cell site off-line. When the OTA test results are ambiguous one can directly connect to the base station to check the signal quality and transmitter power.

For easy identification of which cell you are measuring the Base Station Identity Code (BSIC) gives the base station id, the Network Color Code (NCC) identifies the owner of the network, and the Base Station Color Code (BCC) provides the sector information.

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

C/I indicates the quality of the received signal. It also can be used to identify areas of poor signal quality. Low C/I ratios will cause coverage issues including dropped calls, blocked calls, and other handset reception problems.

## Phase Error

Phase Error is a measure of the phase difference between an ideal and actual GMSK modulated voice signal. High phase error leads to dropped calls, blocked calls, and missed handoffs.

## Origin Offset

Origin Offset is a measure of the DC power leaking through local oscillators and mixers. A high Origin Offset will lower EVM and Phase Error measurements and create higher dropped call rates.

## Power versus Time (Slot and Frame)

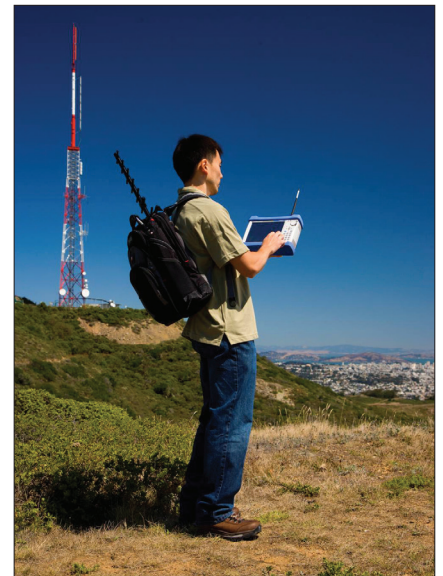
Power versus Time (Slot and Frame) should be used if the GSM base station is setup to turn RF power off between timeslots. When used OTA, this measurement can also spot GSM signals from other cells. Violations of the mask create dropped calls, low capacity, and small service area issues.

## RF Measurements

- 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)

## Demodulation

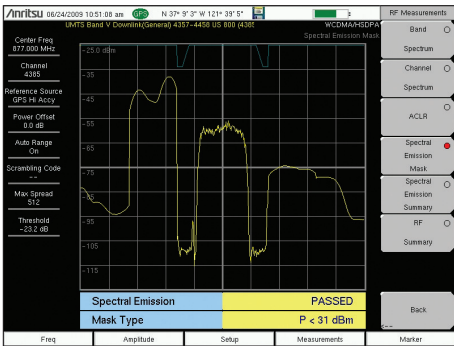
- Phase Error
- EVM
- Origin Offset
- C/I
- Modulation Type
- Magnitude Error
- BSIC (NCC, BCC)



# Cell Master™ Base Station Analyzer Features

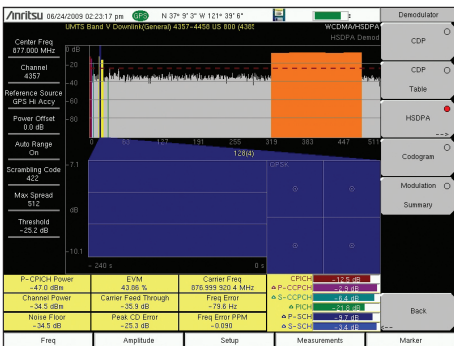


## W-CDMA/HSPA+ Signal Analyzers (Option 0881)



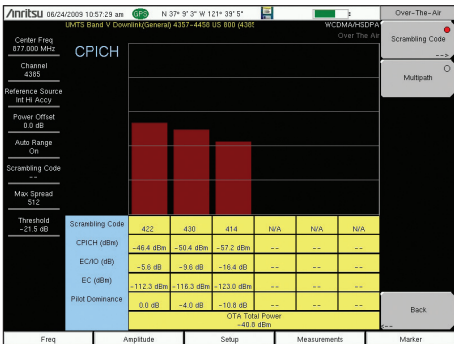
### RF Measurements – Spectral Emissions Mask

The 3GPP spectral emission mask is displayed. Failing this test leads to interference with neighboring carriers, legal liability, and low signal quality.



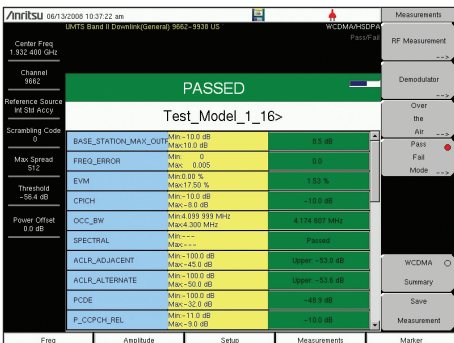
### Demodulation – Error Vector Magnitude (EVM)

This is the single most important signal quality measurement. Poor EVM leads to dropped calls, low data rate, low sector capacity, and blocked calls.



### Over-the-Air Measurements – Scrambling Codes

Too many strong sectors at the same location creates pilot pollution. This leads to low data rate, low capacity, and excessive soft handoffs.



### Pass/Fail Test

Set up common test limits, or sets of limits, for each instrument. Inconsistent settings between base stations, leads to inconsistent network behavior

## W-CDMA/HSPA+ Signal Analyzers

The Cell Master features four W-CDMA/HSPA+ measurement modes:

- RF Measurements
- Demodulation
- Over-the Air Measurements (OTA)

The goal of these measurements is to increase data rate and capacity by accurate power settings, ensuring low out-of-channel emissions, and good signal quality. These attributes help to create a low dropped call rate, a low blocked call rate, and a good customer experience.

Cell site technicians or RF engineers can make measurements Over-the-Air (OTA) to spot-check a transmitter's coverage and signal quality without taking the Node B off-line. When the OTA test results are ambiguous one can directly connect to the base station to check the signal quality and transmitter power.

### Frequency Error

Frequency Error is a check to see that the carrier frequency is precisely set. The Cell Master can accurately measure Carrier Frequency Error OTA if the instrument is GPS enabled or in GPS holdover. Calls will drop when mobiles travel at higher speed. In some cases, cell phones cannot hand off into, or out of the cell.

### Peak Code Domain Error (PCDE)

Peak Code Domain Error is a measure of the errors between one code channel and another. High PCDE causes dropped calls, low signal quality, low data rate, low sector capacity, and blocked calls.

### Multipath

Multipath measurements show how many, how long, and how strong the various radio signal paths are. Multipath signals outside tolerances set by the cell phone or other UE devices become interference. The primary issue is co-channel interference leading to dropped calls and low data rates.

### Pass/Fail Mode

The Cell Master stores the five test models covering all eleven test scenarios specified in the 3GPP specification (TS 25.141) for testing base station performance and recalls these models for quick easy measurements.

### RF Measurements

- Band Spectrum
- Channel Spectrum
- Channel Power
- Occupied Bandwidth
- Peak-to-Average Power
- Spectral Emission Mask
- Single carrier ACLR
- Multi-carrier ACLR

### Demodulation

- 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

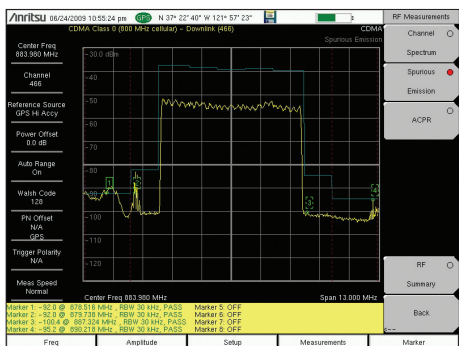
### Over-the-Air (OTA) Measurements

- Scrambling Code Scanner (Six)
- Scrambling Codes
- CPICH
- $E_c/I_o$
- $E_c$
- Pilot Dominance
- OTA Total Power
- Multipath Scanner (Six)
- Six Multipaths
- Tau
- Distance
- RSCP
- Relative Power
- Multipath Power

# Cell Master™ Base Station Analyzer Features



## CDMA Signal Analyzers (Option 0884)



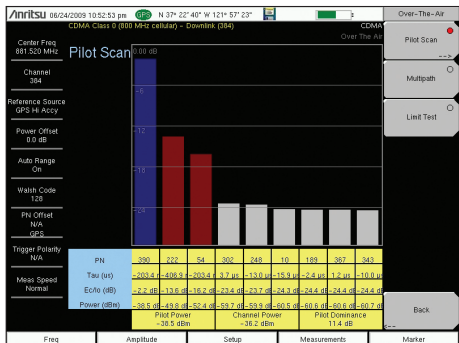
### RF Measurements – Spectral Emissions Mask

The 3GPP spectral emission mask is displayed. Failing this test leads to interference with neighboring carriers, legal liability, and low signal quality.



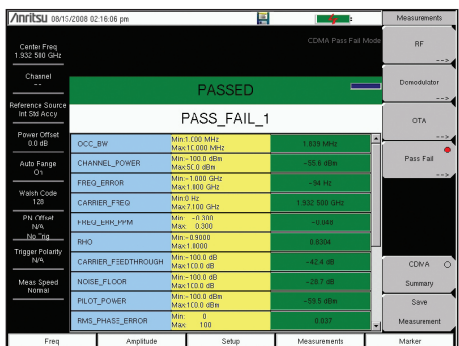
### Modulation Quality – EVM

High or low values will create larger areas of cell-to-cell interference and create lower data rates near cell edges. Low values affect in-building coverage.



### Over-the-Air Measurements – Sync Signal Power

Check for un-even amplitude of sub-carriers. Data will be less reliable on weak sub-carriers, creating a lower over-all data rate.



### Pass/Fail Test

Set up common test limits, or sets of limits, for each instrument. Inconsistent settings between base stations, leads to inconsistent network behavior.

## CDMA Signal Analyzers

The Cell Master features three CDMA measurement modes:

- RF Measurements
- Demodulation
- Over-the Air Measurements (OTA)

The goal of these measurements is to increase data rate and capacity by accurate power settings, ensuring low out-of-channel emissions, and good signal quality. These attributes help to create a low dropped call rate, a low blocked call rate, and a good customer experience.

Cell site technicians or RF engineers can make measurements Over-the-Air (OTA) to spot-check a transmitter's coverage and signal quality without taking the cell site off-line. When the OTA test results are ambiguous one can directly connect to the base station to check the signal quality and transmitter power.

### Adjacent Channel Power Ratio (ACPR)

ACPR measures how much of the carrier gets into neighboring RF channels. ACPR, and multi-channel ACPR, check the closest (adjacent) and second closest (alternate) RF channels for single and multicarrier signals. High ACPR will create interference for neighboring carriers. This is also an indication of low signal quality and low capacity, which can lead to blocked calls.

### RMS Phase Error

RMS Phase Error is a measure of signal distortion caused by frequency instability. Any changes in the reference frequency or the radio's internal local oscillators will cause problems with phase error. A high reading will cause dropped calls, low signal quality, low data rate, low sector capacity, and blocked calls.

### Noise Floor

Noise Floor is the average level of the visible code domain noise floor. This will affect Rho. A high noise floor will result in dropped calls, low signal quality, low data rate, low sector capacity, and blocked calls.

### $E_c/I_o$

$E_c/I_o$  indicates the quality of the signal from each PN. Low  $E_c/I_o$  leads to low data rate and low capacity.

## RF Measurements

- Channel Spectrum
- Channel Power
- Occupied Bandwidth
- Peak-to-Average Power
- Spectral Emission Mask
- Multi-carrier ACPR

## Demodulation

- Code Domain Power Graph
- Pilot Power
- Channel Power
- Noise Floor
- Rho
- Carrier Feed Through
- Tau
- RMS Phase Error
- Frequency Error
- Abs/Rel/ Power
- Pilot
- Page
- Sync
- Q Page

## Code Domain Power Table

- Code
- Status
- Power
- Multiple Codes
- Code Utilization

## Over-the-Air (OTA) Measurements

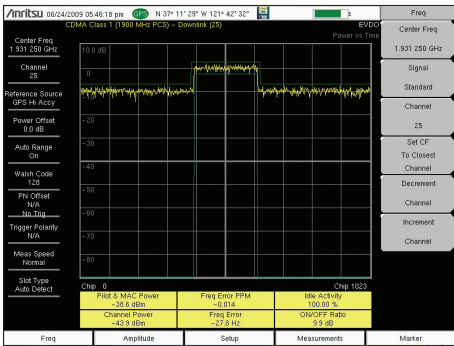
- Pilot Scanner (Nine)
  - PN
  - $E_c/I_o$
  - Tau
  - Pilot Power
  - Channel Power
  - Pilot Dominance
- Multipath Scanner (Six)
  - $E_c/I_o$
  - Tau
  - Channel Power
  - Multipath Power
- Limit Test – 10 Tests Averaged
  - Rho
  - Adjusted Rho
  - Multipath
  - Pilot Dominance
  - Pilot Power
  - Pass/Fail Status



# Cell Master™ Base Station Analyzer Features

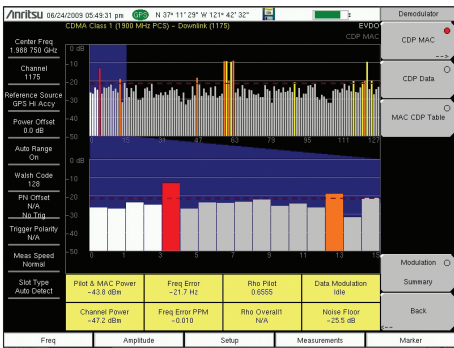


## EV-DO Signal Analyzers (Option 0884)



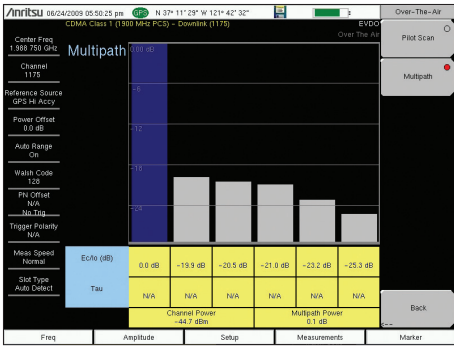
### RF Measurements – Pilot and MAC Power

High values will create pilot pollution. High or low values will cause dead spots/dropped calls and cell loading imbalances/blocked calls.



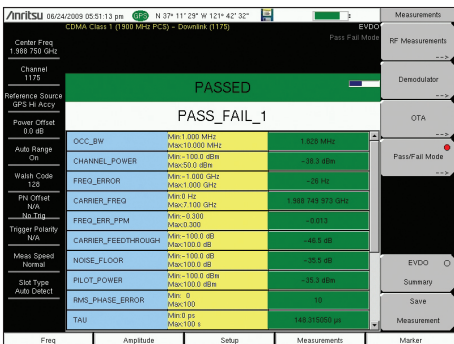
### Demodulation – Frequency Error

Calls will drop when mobiles travel at higher speed. In some cases, cell phones cannot hand off into, or out of the cell, creating island cells.



### Over-the-Air Measurements – Multipath

Too much Multipath from the selected PN Code is the primary issue of co-channel interference leading to dropped calls and low data rates.



### Pass/Fail Test

Set up common test limits, or sets of limits, for each instrument. Inconsistent settings between base stations, leads to inconsistent network behavior.

## EV-DO Signal Analyzers

The Cell Master features three EV-DO measurement modes.

- RF Measurements
- Demodulation
- Over-the Air Measurements (OTA)

The goal of these measurements is to increase data rate and capacity by accurate power settings, ensuring low out-of-channel emissions, and good signal quality. These attributes help to create a low dropped call rate, a low blocked call rate, and a good customer experience.

Cell site technicians or RF engineers can make measurements Over-the-Air (OTA) to spot-check a transmitter's coverage and signal quality without taking the cell site off-line. When the OTA test results are ambiguous one can directly connect to the base station to check the signal quality and transmitter power.

### Spectral Emission Mask (SEM)

SEM is a way to check out-of-channel spurious emissions near the carrier. These spurious emissions both indicate distortion in the signal and can create interference with carriers in the adjacent channels. Faults leads to interference and thus, lower data rates for adjacent carriers. Faults also may lead to legal liability and low in-channel signal quality.

### Rho

Rho is a measure of modulation quality. Rho Pilot, Rho Mac, and Rho Data are the primary signal quality tests for EV-DO base stations. Low Rho results in dropped calls, low signal quality, low data rate, low sector capacity, and blocked calls. This is the single most important signal quality measurement.

### PN Codes

PN Code overlap is checked by the pilot scanner. Too many strong pilots create pilot pollution which results in low data rate, low capacity, and excessive soft handoffs.

### Over-the-Air (OTA) Pilot Power

OTA Pilot Power indicates signal strength. Low OTA Pilot Power causes dropped calls, low data rate, and low capacity.

## RF Measurements

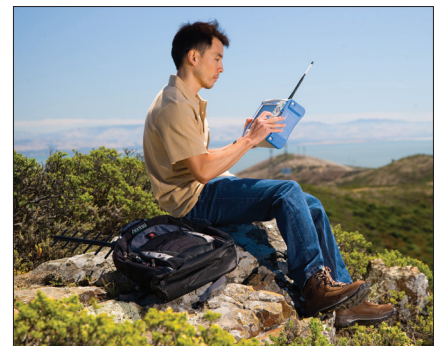
- Channel Spectrum
- Channel Power
- Occupied Bandwidth
- Peak-to-Average Power
- Power vs. Time
- Pilot & MAC Power
- Channel Power
- Frequency Error
- Idle Activity
- On/Off Ratio
- Spectral Emission Mask
- Multi-carrier ACP

## Demodulation

- MAC Code Domain Power Graph
- Pilot & MAC Power
- Channel Power
- Frequency Error
- Rho Pilot
- Rho Overall
- Data Modulation
- Noise Floor
- MAC Code Domain Power Table
- Code
- Status
- Power
- Code Utilization
- Data Code Domain Power
- Active Data Power
- Data Modulation
- Rho Pilot
- Rho Overall
- Maximum Data CDP
- Minimum Data CDP

## Over-the-Air (OTA) Measurements

- Pilot Scanner (Nine)
  - PN
  - $E_c/I_o$
  - Tau
  - Pilot Power
  - Channel Power
  - Pilot Dominance
- Multipath Scanner (Six)
  - $E_c/I_o$
  - Tau
  - Channel Power
  - Multipath Power



# Cell Master™ Base Station Analyzer Features

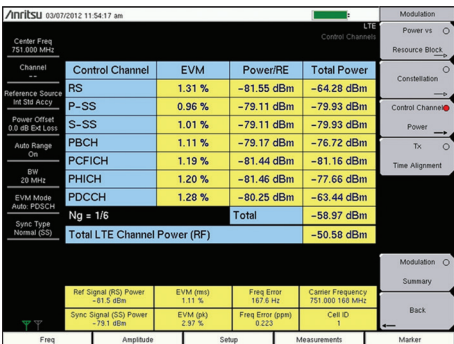


## LTE and TD-LTE Signal Analyzers (Option 0883 and 0886)



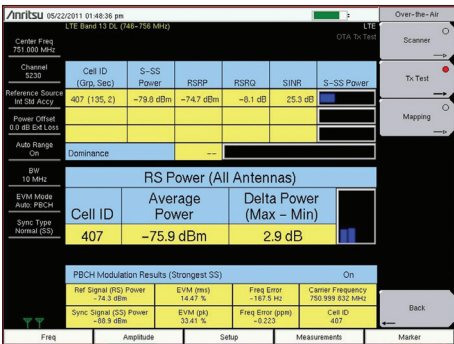
### Modulation Quality – Power vs. Resource Block

A high utilization of the Resource Blocks would indicate a cell site is nearing overload and it may be appropriate to start planning for additional capacity.



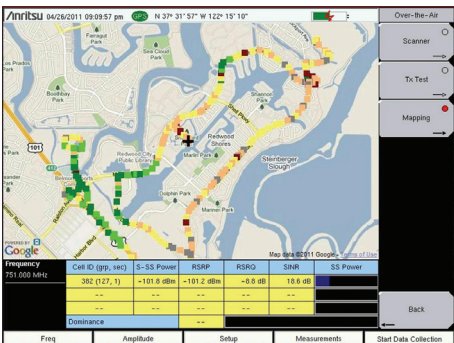
### Modulation Quality – Control Channels

High values will create larger areas of cell-to-cell interference and create lower data rates near cell edges. Low values affect in-building coverage.



### Over-the-Air Measurements – Tx Test

By looking at the reference signals of MIMO antennas one can determine if MIMO is working properly. If the delta power is too large, there is an issue.



### Over-the-Air On-screen Mapping

With Map Master™ import map area on instrument screen to drive test downlink coverage of S-SS Power, RSRP, RSRQ, or SINR.

## LTE and TD-LTE Signal Analyzers

The Cell Master features three LTE and TD-LTE measurement modes:

- RF Measurements
- Modulation Measurements
- Over-the Air Measurements (OTA)

The goal of these measurements is to increase data rate and capacity by accurate power settings, ensuring low out-of-channel emissions, and good signal quality. These attributes help to create a low dropped call rate, a low blocked call rate, and a good customer experience.

Cell site technicians or RF engineers can make measurements Over-the-Air (OTA) to spot-check a transmitter's coverage and signal quality without taking the cell site off-line. When the OTA test results are ambiguous one can directly connect to the base station to check the signal quality and transmitter power.

### Adjacent Channel Leakage Ratio (ACLR)

Adjacent Channel Leakage Ratio (ACLR) measures how much BTS signal gets into neighboring RF channels. ACLR checks the closest (adjacent) and the second closest (alternate) channels. Poor ACLR can lead to interference with adjacent carriers and legal liability. It also can indicate poor signal quality which leads to low throughput.

### Cell ID (Sector ID, Group ID)

Cell ID indicates which base station is being measured OTA. The strongest base station at your current location is selected for measurement. Wrong values for Cell ID lead to inability to register. If the cause is excessive overlapping coverage, it also will lead to poor EVM and low data rates.

### Pass/Fail Test

Set up common test limits, or sets of limits, for each instrument. Inconsistent settings between base stations, leads to inconsistent network behavior.

### EVM

High values will create larger areas of cell-to-cell interference and create lower data rates near cell edges.

### Mapping

On-screen mapping allows field technicians to quickly determine the downlink coverage quality in a given geographic location. Plot S-SS Power, RSRP, RSRQ or SINR with five user definable thresholds. All parameters are collected for the three strongest signals and can be saved as \*.kml and \*.mtd (tab delimited) for importing to third party mapping programs for further analysis.

## RF Measurements

### Channel Spectrum

- Channel Power, Occupied Bandwidth
- Power vs. Time (TDD only)
- Total Frame Power, DwPTS Power
- Transmit Off Power, Cell ID
- Timing Error, Frame/Sub-Frame View

### ACLR

- Spectral Emission Mask
- RF Summary

## Modulation Measurements

### Power vs. Resource Block

- Active RBs, Utilization %, Channel Power, Cell ID
- OSTP, Frame EVM (FDD only)

### Constellation

- QPSK, 16 QAM, 64 QAM, 256 QAM (Opt 886)
- Modulation Results

- RS Power, SS Power, EVM, Freq Error, Carrier Frequency, Cell ID

### Control Channel Power

- Bar Graph or Table View
- RS, P-SS, S-SS, PBCH, PCFICH
- PHICH, PDCCH (FDD only)

### Total Power (Table View)

- Modulation Results
- Tx Time Alignment (FDD only)

### Modulation Summary

## Over-the-Air Measurements (OTA)

### Scanner – six strongest signals

- Cell ID (Group, Sector)
- S-SS, RSRP, RSRQ, SINR, Dominance

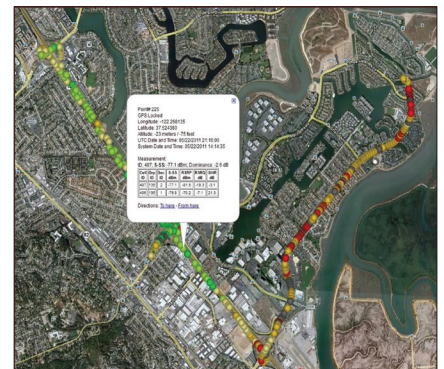
### Tx Test

- Scanner – three strongest signals
- RS Power of MIMO antennas
- Cell ID, Average Power, Delta Power (Max-Min)

- Graph Antenna Power
- Modulation Results – On/Off

### Mapping

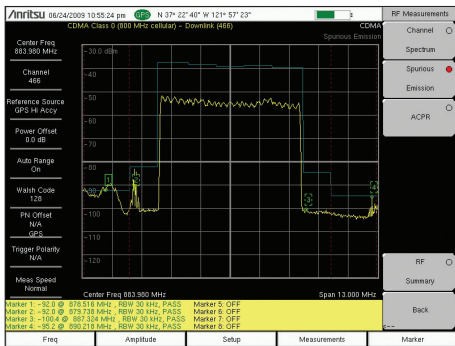
- On-screen S-SS, RSRP, RSRQ, or SINR
- Scanner – three strongest signals



# Cell Master Base Station Analyzer Features



## CDMA/EV-DO Measurements (Option 0884)



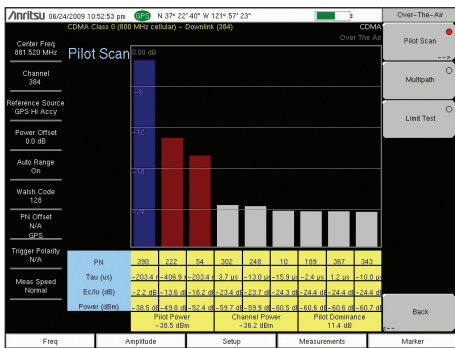
### RF Measurements - Spectral Emissions Mask

The 3GPP2 spectral emission mask is displayed. Failing this test leads to interference with neighboring carriers, legal liability, and low signal quality.



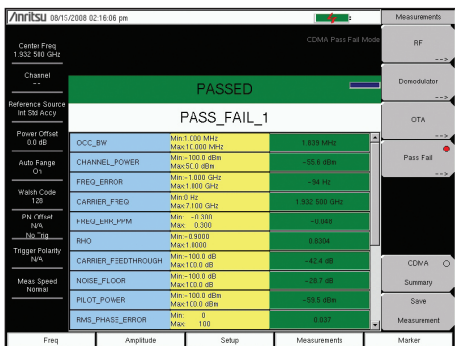
### Modulation Quality - EVM

High or low values will create larger areas of cell-to-cell interference and create lower data rates near cell edges. Low values affect in-building coverage.



### Over-the-Air Measurements - Sync Signal Power

Check for uneven amplitude of sub-carriers. Data will be less reliable on weak sub-carriers, creating a lower overall data rate.



### Pass/Fail Test

Set up common test limits, or sets of limits, for each instrument. Inconsistent settings between base stations lead to inconsistent network behavior.

## CDMA Measurements

The BTS Master features three CDMA measurement modes:

- RF Measurements
- Demodulation
- Over-the Air Measurements (OTA)

The goal of these measurements is to increase data rate and capacity by accurate power settings, ensuring low out-of-channel emissions, and good signal quality. These attributes help to create a low dropped call rate, a low blocked call rate, and a good customer experience.

Cell site technicians or RF engineers can make measurements Over-the-Air (OTA) to spot-check a transmitter's coverage and signal quality without taking the cell site off-line. When the OTA test results are ambiguous, one can directly connect to the base station to check the signal quality and transmitter power.

### Adjacent Channel Power Ratio (ACPR)

ACPR measures how much of the carrier gets into neighboring RF channels. ACPR, and multi-channel ACPR, check the closest (adjacent) and second closest (alternate) RF channels for single and multicarrier signals. High ACPR will create interference for neighboring carriers. This is also an indication of low signal quality and low capacity, which can lead to blocked calls.

### RMS Phase Error

RMS Phase Error is a measure of signal distortion caused by frequency instability. Any changes in the reference frequency or the radio's internal local oscillators will cause problems with phase error. A high reading will cause dropped calls, low signal quality, low data rate, low sector capacity, and blocked calls.

### Noise Floor

Noise Floor is the average level of the visible code domain noise floor. This will affect Rho. A high noise floor will result in dropped calls, low signal quality, low data rate, low sector capacity, and blocked calls.

### $E_c/I_0$

$E_c/I_0$  indicates the quality of the signal from each PN. Low  $E_c/I_0$  leads to low data rate and low capacity.

## RF Measurements

- Channel Spectrum
  - Channel Power
  - Occupied Bandwidth
  - Peak-to-Average Power
- Spectral Emission Mask
- Multi-carrier ACPR
- RF Summary

## Demodulation

- Code Domain Power Graph
  - Pilot Power
  - Channel Power
  - Noise Floor
  - Rho
  - Carrier Feed Through
  - Tau
  - RMS Phase Error
  - Frequency Error
  - Abs/Rel/ Power
    - Pilot
    - Page
    - Sync
    - Q Page
- Code Domain Power Table
  - Code
  - Status
  - Power
  - Multiple Codes
  - Code Utilization
- Modulation Summary

## Over-the-Air (OTA) Measurements

- Pilot Scanner (Nine)
  - PN
  - $E_c/I_0$
  - Tau
  - Pilot Power
  - Channel Power
  - Pilot Dominance
- Multipath Scanner (Six)
  - $E_c/I_0$
  - Tau
  - Channel Power
  - Multipath Power
- Limit Test - 10 Tests Averaged
  - Rho
  - Adjusted Rho
  - Multipath
  - Pilot Dominance
  - Pilot Power
  - Pass/Fail Status

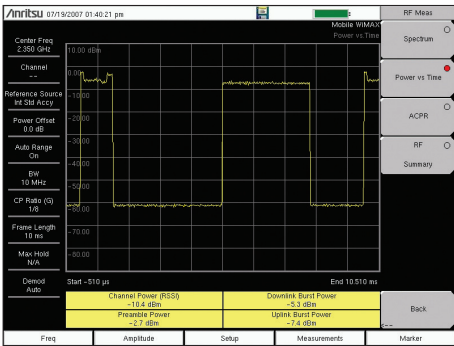
## Pass/Fail (User Editable)

- Measurements
  - Channel Power
  - Occupied Bandwidth
  - Peak-to-Average Power
  - Spectral Mask Test
  - Frequency Error
  - Channel Frequency
  - Pilot Power
  - Noise Floor
  - Rho
  - Carrier Feed Through
  - Tau
  - RMS Phase Error
  - Code Utilization
  - Measured PN
  - Pilot Dominance
  - Multipath Power

# Cell Master™ Base Station Analyzer Features

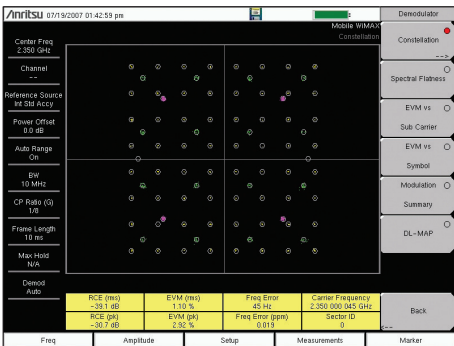


## Fixed and Mobile WiMAX Signal Analyzers (Option 0885)



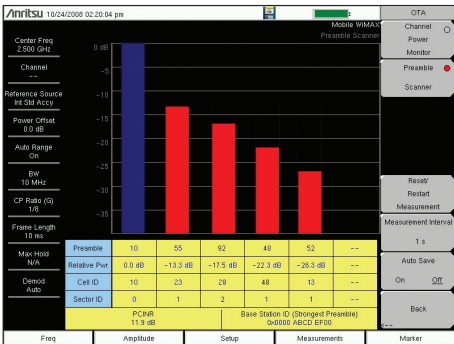
### RF Measurement – Preamble Power

High or low values will create larger areas of cell-to-cell interference and create lower data rates near cell edges. Low values affect in-building coverage.



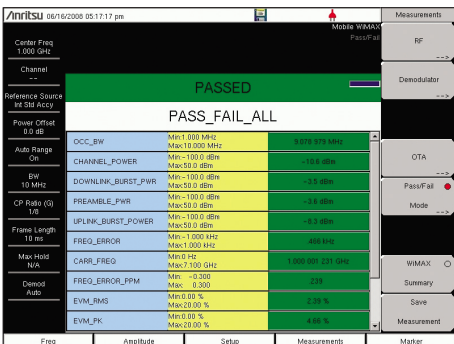
### Demodulation – Frequency Error

Calls will drop when user's equipment travels at high speed. In severe cases, handoffs will not be possible at any speed, creating island cells.



### Over-the-Air Measurements – PCINR

A low Physical Carrier to Interference plus Noise Ratio (PCINR) indicates poor signal quality, low data rate and reduced sector capacity.



### Pass/Fail Test

Set up common test limits, or sets of limits, for each instrument. Inconsistent settings between base stations, leads to inconsistent network behavior.

## Fixed and Mobile WiMAX Signal Analyzers

The Cell Master features two Fixed WiMAX and three Mobile WiMAX measurement modes:

- RF Measurements
- Demodulation (up to 10 MHz)
- Over-the Air Measurements (OTA) (Mobile only)

The goal of these measurements is to increase data rate and capacity by accurate power settings, ensuring low out-of-channel emissions, and good signal quality. These attributes help to create a low dropped call rate, a low blocked call rate, and a good customer experience.

Cell site technicians or RF engineers can make measurements Over-the-Air (OTA) to spot-check a transmitter's coverage and signal quality without taking the cell site off-line. When the OTA test results are ambiguous one can directly connect to the base station to check the signal quality and transmitter power.

### Cell ID, Sector ID, and Preamble

Cell ID, Sector ID, and Preamble show which cell, sector, and segment are being measured OTA. The strongest signal is selected automatically for the additional PCINR and Base Station ID measurement. Wrong values for cell, sector and segment ID lead to dropped handoffs and island cells. If the cause is excessive coverage, it also will lead to large areas of low data rates.

### Error Vector Magnitude (EVM) Relative Constellation Error (RCE)

RCE and EVM measure the difference between the actual and ideal signal. RCE is measured in dB and EVM in percent. A known modulation is required to make these measurements. High RCE and EVM causes low signal quality, low data rate, and low sector capacity. This is the single most important signal quality measurement.

### Preamble Mapping (Mobile WiMAX)

Preamble Scanner can be used with the GPS to save scan results for later display on a map. PCINR ratio for the strongest WiMAX preamble available at that spot. The Base Station ID and Sector ID information are also included so that it's easier to interpret the results. Once PCINR data is mapped, it becomes much easier to understand and troubleshoot any interference or coverage issues.

### RF Measurements

- Channel Spectrum
- Channel Power
- Occupied Bandwidth
- Power vs. Time
- Channel Power
- Preamble Power
- Downlink Burst Power (Mobile only)
- Uplink Burst Power (Mobile only)
- Data Burst Power (Fixed only)
- Crest Factor (Fixed only)

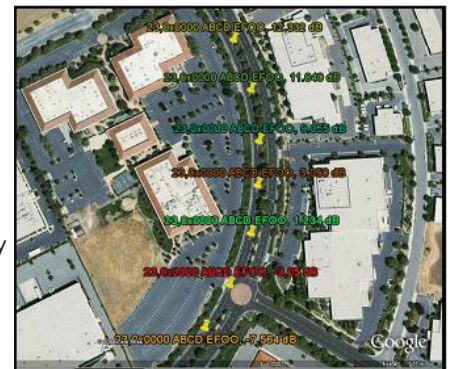
### ACPR

### Demodulation (10 MHz maximum)

- Constellation
- RCE (RMS/Peak)
- EVM (RMS/Peak)
- Frequency Error
- CINR (Mobile only)
- Base Station ID
- Carrier Frequency
- Sector ID
- Spectral Flatness
- Adjacent Subcarrier Flatness
- EVM vs. Subcarrier/Symbol
- RCE (RMS/Peak)
- EVM (RMS/Peak)
- Frequency Error
- CINR (Mobile only)
- Base Station ID
- Sector ID (Mobile only)
- DL-MAP (Tree View) (Mobile only)

### Over-the-Air (OTA)

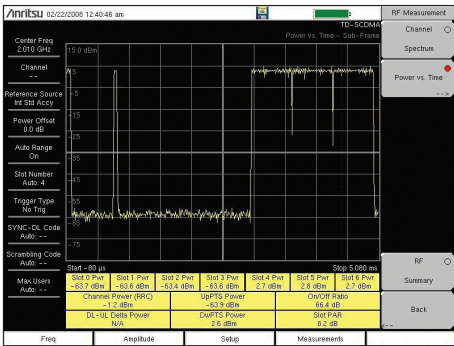
- Channel Power Monitor
- Preamble Scanner (Six)
- Preamble
- Relative Power
- Cell ID
- Sector ID
- PCINR
- Dominant Preamble
- Base Station ID
- Auto-Save with GPS Tagging and Logging



# Cell Master™ Base Station Analyzer Features

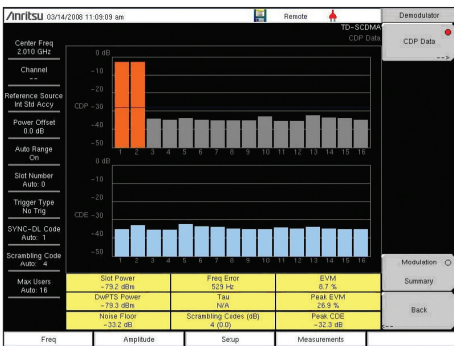


## TD-SCDMA/HSPA+ Signal Analyzers (Option 0882)



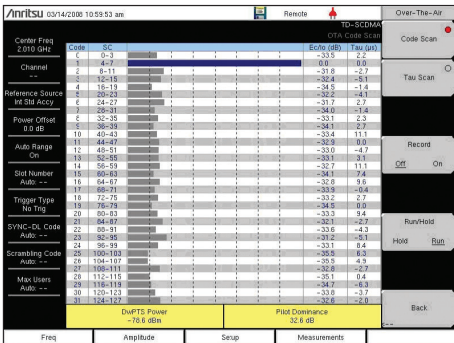
### RF Measurement – Time Slot Power

Empty downlink slots with access power will reduce the sensibility of the receiver and the size of the sector. This will cause dropped and blocked calls.



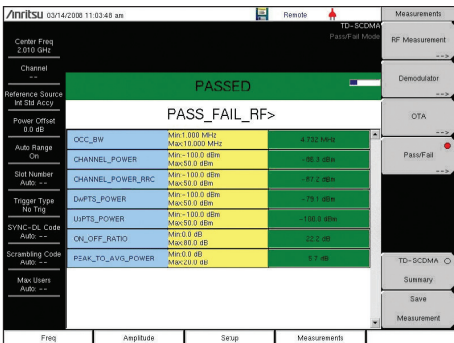
### Demodulation – Scrambling Code

Scrambling Code measurements provide a check for the BTS settings. Scrambling Code errors can cause a very high dropped call rate on hand off.



### Over-the-Air Measurements – Code Scanner

Excessive sync codes produce too much co-channel interference, which leads to lower capacity, low data rate and excessive handoffs.



### Pass/Fail Test

Set up common test limits, or sets of limits, for each instrument. Inconsistent settings between base stations, leads to inconsistent network behavior.

## TD-SCDMA/HSPA+ Signal Analyzers

The Cell Master features three TD-SCDMA/ HSPA+ measurement modes:

- RF Measurements
- Demodulation
- Over-the Air Measurements (OTA)

The goal of these measurements is to increase data rate and capacity by accurate power settings, ensuring low out-of-channel emissions, and good signal quality. These attributes help to create a low dropped call rate, a low blocked call rate, and a good customer experience.

Cell site technicians or RF engineers can make measurements Over-the-Air (OTA) to spot-check a transmitter's coverage and signal quality without taking the cell site off-line. When the OTA test results are ambiguous one can directly connect to the base station to check the signal quality and transmitter power.

Error Vector Magnitude (EVM) EVM is the ratio of errors, or distortions, in the actual signal, compared to a perfect signal. EVM faults will result in poor signal quality to all user equipment. In turn, this will result in extended hand off time, lower sector capacity, and lower data rates, increasing dropped and blocked calls.

### Peak Code Domain Error (Peak CDE)

Peak CDE is the EVM of the worst code. Code Domain displays show the traffic in a specific time slot. Peak CDE faults will result in poor signal quality to all user equipment. In turn, this will result in extended hand off time, lower sector capacity, and lower data rates.

### OTA Tau Scanner $E_c/I_0$

$E_c/I_0$  faults indicate excessive or inadequate coverage and lead to low capacity, low data rates, extended handoffs, and excessive call drops.

### DwPTS OTA Power Mapping

DwPTS OTA Power when added to  $E_c/I_0$  gives the absolute sync code power which is often proportional to PCCPCH (pilot) power. Use this to check and plot coverage with GPS. Coverage plots can be downloaded to PC based mapping programs for later analysis. Poor readings will lead to low capacity, low data rates, excessive call drops and call blocking.

### RF Measurements

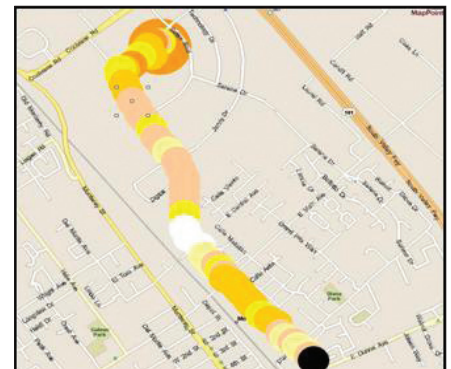
- Channel Spectrum
- Channel Power
- Occupied Bandwidth
- Left Channel Power
- Left Channel Occ B/W
- Right Channel Power
- Right Channel Occ B/W
- Power vs. Time
- Six Slot Powers
- Channel Power (RRC)
- DL-UL Delta Power
- UpPTS Power
- DwPTS Power
- On/Off Ratio
- Slot Peak-to-Average Power
- Spectral Emission

### Demodulation

- Code Domain Power/Error (QPSK/8 PSK/16 QAM)
- Slot Power
- DwPTS Power
- Noise Floor
- Frequency Error
- Tau
- Scrambling Code
- EVM
- Peak EVM
- Peak Code Domain Error

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

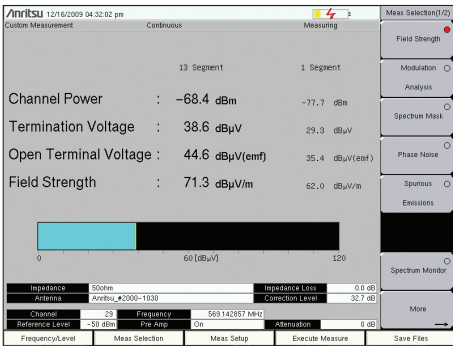
- Code Scan (32)
- Scrambling Code Group
- Tau
- $E_c/I_0$
- DwPTS Power
- Pilot Dominance
- Tau Scan (Six)
- Sync-DL#
- Tau
- $E_c/I_0$
- DwPTS Power
- Pilot Dominance



# Cell Master™ Base Station Analyzer Features

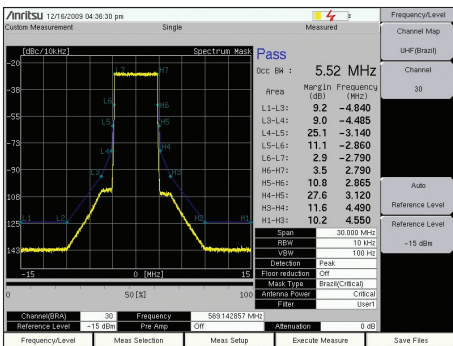


## ISDB-T Signal Analyzers (Option 0030, 0079, 0032)



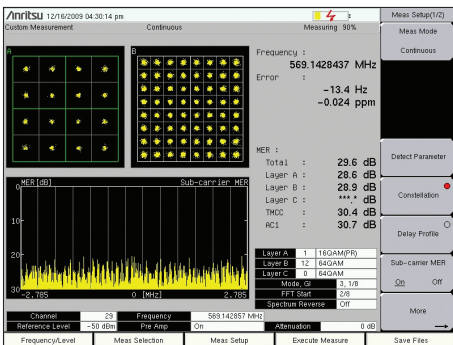
### RF Measurements – Signal Power

The Signal Power screen showing the transmission channel power and signal field strength used to assess suitable reception coverage area.



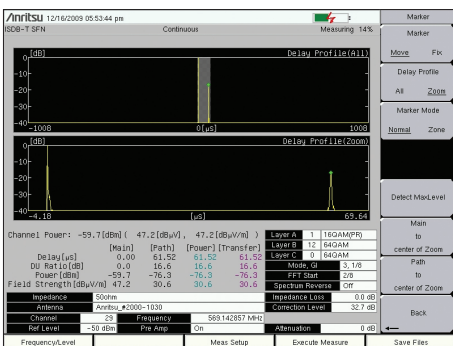
### RF Measurements – Spectrum Mask

The Spectrum Mask measurement is shown. ISDB-T systems in Japan and South America call for different spectrum mask specifications. Both are catered for.



### Signal Analysis – Constellation and MER

This is the single most important signal quality measurement. Poor MER leads to higher received errors which can cause serious picture degradation.



### SFN Analysis – Delay Profile

This measurement indicates whether signals from different transmitters in an SFN are received correctly to prevent interference and high received errors.

## ISDB-T Signal Analyzer

The Cell Master features options that enable area survey measurements and the installation and field maintenance of ISDB-T digital broadcasting equipment in accordance with ARIB (Japan) and ABNT (Brazil) standards.

The user has three measurement modes to choose from depending on the his skill level and test environment: Custom, where specific measurements and setups are chosen; Easy, where some setup parameters are automatically set or detected; Batch, where the user can specify all relevant measurements, setups and channels for automatic measurement and results' display for fast and efficient field testing.

The goal of all measurements is to ensure digital TV transmitters are configured according to license agreements and optimized for error-free reception over the entire coverage area helping to create an excellent television experience.

### Field Strength

Field Strength (dBµV/m) measurement enables a technician to assess whether signals will be detected at a location with sufficient power for good TV reception. The antenna factors of the antenna used for measurement can be compensated for to facilitate easy measurement comparison.

### Modulation Error Ratio (MER)

MER is the fundamental measurement in digital TV broadcast systems. It quantifies the modulation signal quality directly. It is essential for managing signal margin and the deterioration of equipment with time, as well as for maintaining stable broadcast services. MER is independent of modulation type so MER measurements can be easily compared.

### Delay Profile

This function measures the difference in time and frequency of multi-path signals caused by reflections from obstacles or from other transmitters. By measuring the channel frequency response, the multi-path effect or frequency selective fading can be observed. It is important that all signals from reflections or other transmitters are received within the guard interval to prevent inter-symbol interference which will cause reception degradation. Delay Profile measurement is useful for adjusting the timing of SFN repeaters to achieve this.

### RF Measurements (Option 0030)

- Signal Power
  - Channel Power
  - Termination Voltage
  - Open Terminal Voltage
  - Field Strength
- Spectrum Monitor
  - Channel Power
  - Zone Center Channel
  - Zone Center Frequency
- Spectrum Mask
  - Mask (Standard A and B) Japan
  - Mask (Critical, Sub-critical, Non-critical) Brazil
- Phase Noise
- Spurious Emissions

### Signal Analysis (Option 0030)

- Constellation (w/zoom)
  - Layer A, B, C, TMCC
- Sub-carrier MER
- Delay Profile (w/zoom)
- Frequency Response
- Measured Data
  - Frequency
  - Frequency Offset
  - MER (Total, Layer A/B/C, TMCC, AC1)
  - Modulation (Layer A/B/C)
  - Mode, GI
  - Sub-carrier MER w/marker
  - Delay w/marker
  - Frequency Response w/marker

### BER Analysis (Option 0079)

- Layer A, Layer B, Layer C
- BER and Error Count per Layer
  - Before RS
  - Before Viterbi
- PER and Error Count per Layer
- MPEG Bit Rate per Layer
- TMCC Information per Layer
  - Modulation
  - Code Rate
  - Interleave
  - Segments
- Channel Power
- Mode, GI
- Signal Sync Status
- ASI Out

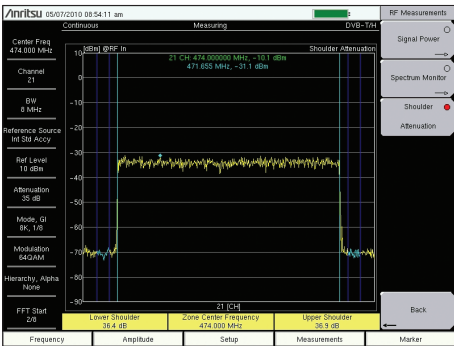
### SFN Analysis (Option 0032)

- Delay Profile (w/zoom)
- Inband Spectrum
- Measured Data
  - Channel Power
  - Delay
  - DU Ratio
  - Power
  - Field Strength

# Cell Master™ Base Station Analyzer Features

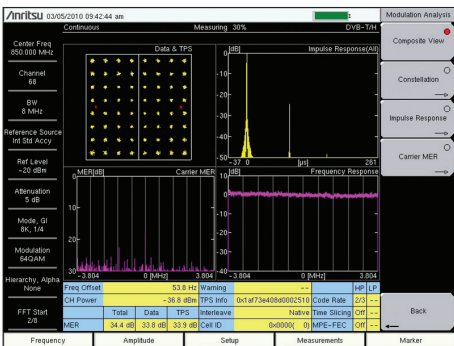


## DVB-T/H Signal Analyzers (Option 0064, 0057, 0078)



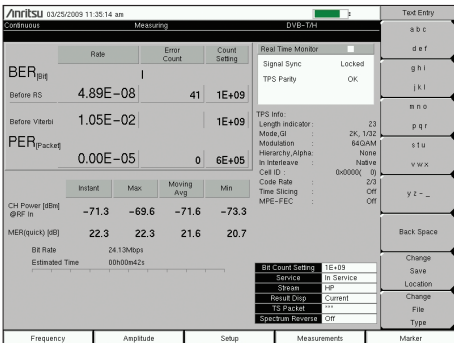
### RF Measurements – Shoulder Attenuation

The Shoulder Attenuation measurement is shown. It assesses power amplifier linearity by measuring the relative level of adjacent spurious components.



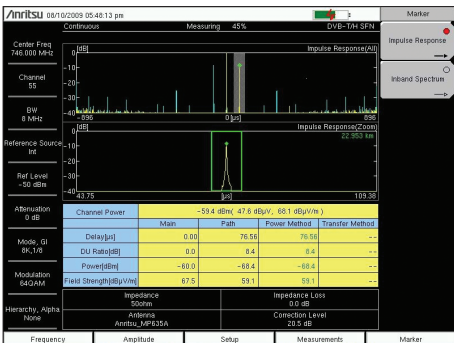
### Signal Analysis – Composite Measurement View

Constellation, MER, impulse response, frequency response are displayed on a single screen for fast and convenient system assessment.



### BER Analysis

Pre-Viterbi and pre-RS bit error rates are recorded along with PER to assess transmitter integrity and reception conditions in the coverage area.



### SFN Analysis – Impulse Response

This measurement indicates whether signals from different transmitters in an SFN are received correctly to prevent interference and high received errors.

## DVB-T/H Signal Analyzer

The Cell Master features options that perform installation, commissioning, field maintenance and area survey measurements of DVB-T/H digital broadcasting equipment in accordance with DVB standards.

The measurements are conveniently organized into RF tests, signal analysis and BER tests. The simplified user interface permits users to quickly set up measurements enabling the efficient characterization and configuration of broadcasting transmitters. The same measurements can be performed remotely from the transmitter using an antenna to assess the coverage and reception quality.

The goal of all measurements is to ensure digital TV transmitters are configured according to license agreements and optimized for error-free reception over the intended coverage area.

### Shoulder Attenuation

Within the RF measurement suite, shoulder attenuation determines the linearity of a transmitter according to ETSI TR 101 290.

### Composite Measurement View

Although individual signal analysis measurement screens are available, the Composite Measurement View combines all onto one display. Other key measurement and set up information is also shown allowing a complete analysis on a single, convenient screenshot.

### BER Analysis

In DTV systems the transmitted data are protected by forward error correction (FEC). The BER analysis option allows the measurement of errors at both levels of correction to assess transmitter performance and reception conditions.

### Impulse Response

This function measures the time difference of multi-path signals caused by reflections from obstacles or other transmitters. By measuring the channel frequency response, the multi-path effect or frequency selective fading can be observed. It is important that all signals from reflections or other transmitters are received within the guard interval to prevent inter-symbol interference which will cause reception degradation. The extended, alias-free delay range measurement in the SFN Analysis option is useful for adjusting the timing of SFN transmitters and repeaters to achieve this.

### RF Measurements (Option 0064)

- Signal Power
  - Channel Power
  - Termination Voltage
  - Open Terminal Voltage
  - Field Strength
- Spectrum Monitor
  - Channel Power
  - Zone Center Channel
  - Zone Center Frequency
- Shoulder Attenuation
  - Upper Shoulder
  - Lower Shoulder
  - Channel Power
  - Peak Power

### Signal Analysis (Option 0064)

- Composite or Individual Views
  - Constellation
  - Impulse Response (w/zoom)
  - Carrier MER (w/zoom)
  - Freq Response (composite view only)
- Measured Data
  - Mode, GI
  - Modulation
  - Hierarchy
  - Freq Offset
  - Channel Power
  - MER (Total/Data/TPS)
  - TPS Warning Message
  - TPS Info
  - Interleave Type
  - Cell ID
  - Code Rate (HP/LP)
  - Time Slicing (HP/LP)
  - MPE-FEC (HP/LP)

### BER Analysis (Option 0057)

- BER
  - Before RS, Before Viterbi
- PER (Packet)
  - Channel Power
  - MER (Quick)
  - Bit Rate
  - TPS Info

- Length Indicator
- Mode, GI
- Modulation
- Hierarchy
- Interleave Type
- Cell ID
- Code Rate
- Time Slicing
- MPE-FEC
- TPS Warning Message
- ASI Out

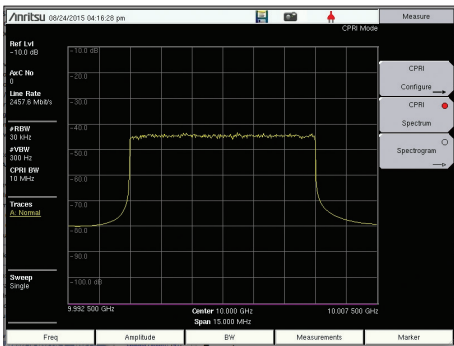
### SFN Analysis (Option 0078)

- Impulse Response (w/zoom)
- Inband Spectrum
- Measured Data
  - Channel Power
  - Delay
  - DU Ratio
  - Power
  - Field Strength

# Cell Master™ Base Station Analyzer Features

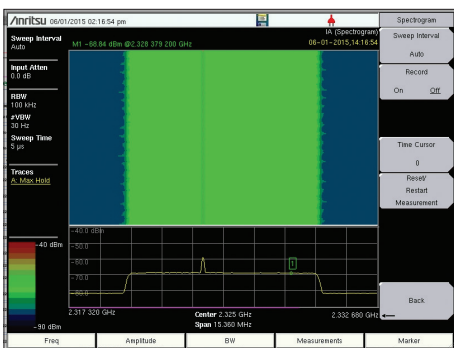


## CPRI LTE RF Measurements (Option 0752)



### CPRI Spectrum

Tapping into the optical CPRI link allows the user to monitor either uplink or downlink spectrums



### CPRI Spectrogram

Identifies transient or intermittent interference signals on the uplink over time



### CPRI Alarms

Verify CPRI transport layer



### SFP Data

Easily Determine the type of SFP is installed in the MT821xE

## CPRI RF Measurements

The CPRI RF measurement option allows the user to make RF based measurements over a fiber optic CPRI link (fiber connection between the BBU & RRU).

Measurements include:

- CPRI spectrum
- CPRI spectrogram
- CPRI Alarms
- SFP Data

## Measurements

- CPRI Spectrum
- Spectrogram
- CPRI Alarms
- SFP Data

## Uplink Interference

One of the biggest issues facing operators is interference on the uplink which can drastically affect KPIs. By tapping into the CPRI fiber link, the uplink spectrum can be monitored.

The ultra-fast sweep speed of the CPRI RF measurements makes it easy to capture and analyze transient and bursty signals typical of many types of interference. For added convenience, the user may tune to anywhere within the spectrum and zoom in for more detailed analysis.

## Automatic Configuration

To improve productivity, preconfigured radio setups and an Auto Detect function allow quick and simple configuration of the CPRI RF measurements.

## CPRI Alarms

Ability to verify and troubleshoot the CPRI (optical) connection with CPRI Alarms. The key CPRI Alarms are always visible at the top of the screen. Optical Power is also available on the CPRI Alarm screen.

## SFP Data

Ability to read the embedded SFP data, quickly determine wavelength, supported line rate, manufacturer information and more.

# Cell Master™ Base Station Analyzer Features



## CPRI LTE RF Measurements (Option 0752) (continued)

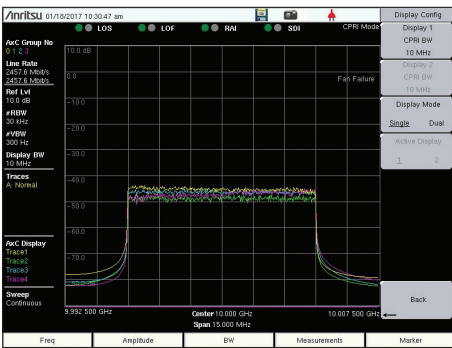


### SFP Data

Ability to read the embedded SFP data, quickly determine wavelength, supported line rate, manufacturer information and more.

### SFP Data

Easily Determine the type of SFP is installed in the MT821xE



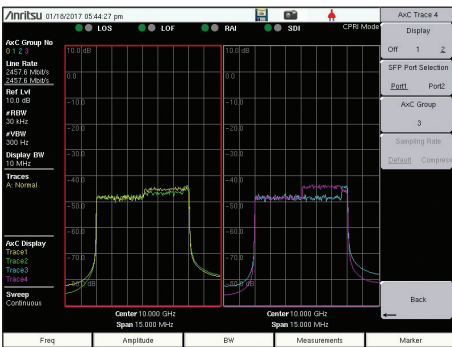
### Multi AxC Trace - Single display Spectrum

Display up to four AxC traces on a single display.

Compare MIMO radios (Diversity testing).

### Multi AxC Traces single display Spectrum

Display up to four AxC Group traces in a single Spectrum display



### Dual Display - Spectrum

Ability to display multiple AxC's in two displays. Useful for Diversity testing and system RF loading.

One to four AxC's in any combination per display.

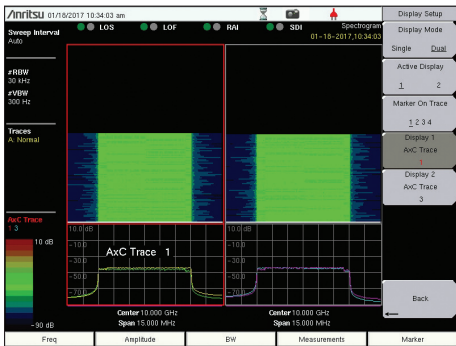
### Multi AxC Traces dual display Spectrum

Display up to four AxC Group traces in any combination on the dual Spectrum display

# Cell Master™ Base Station Analyzer Features



## CPRI LTE RF Measurements (Option 0752) (continued)



### Dual Display – Spectrogram

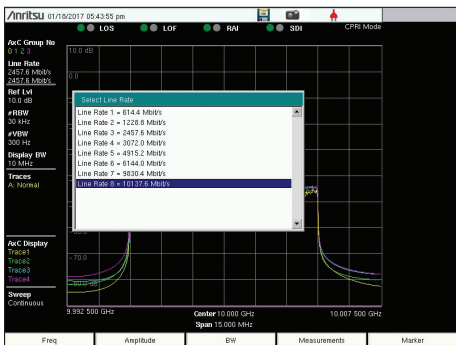
Ability to display multiple AxC's in two displays. Choose One active AxC per display for Waterfall measurement.

One active AxC for Waterfall measurement.

One to four AxC's in a display.

### Multi AxC Traces dual display Spectrogram

Display up to four AxC Group traces in any combination on the dual Spectrogram display

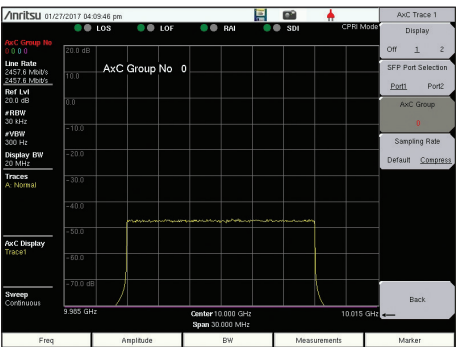


### CPRI Line Rates

Support for CPRI Line Rate 1 (0.6144 Gbps) through CPRI Line Rate 8 (10.1376 Gbps) as standard.

### CPRI Line Rate

Support from Line Rate 1 to Line Rate 8



### Compression

Support for re-sampling of 20 MHz bandwidth CPRI IQ data signals, from 30.72 Msps (Mega Samples per second) or 8 AxC containers, to 23.04 Msps or 6 AxC containers, a 25% reduction, known as Compression in the market.

### CPRI Compression

Supports compressed 20 MHz LTE CPRI signals

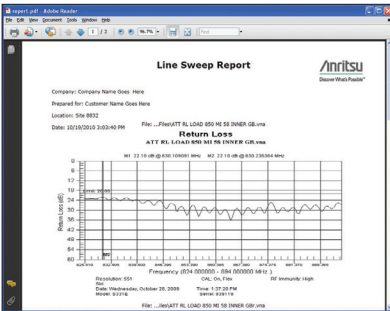
# Cell Master™ Base Station Analyzer Features

## Line Sweep Tools™, Master Software Tools™ and easyTest Tools™ (for your PC)



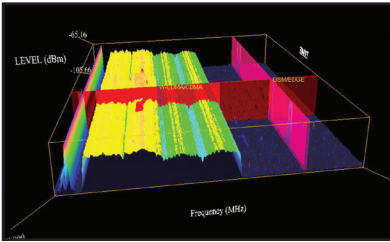
### Trace Validation

Marker and Limit Line presets allow quick checks of traces for limit violations.



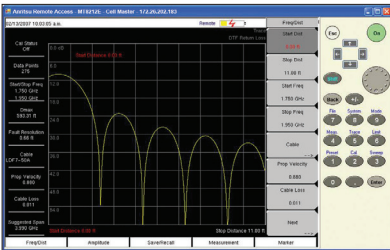
### Report Generation

Create reports with company logo, GPS tagging information, calibration status, and serial number of the instrument for complete reporting.



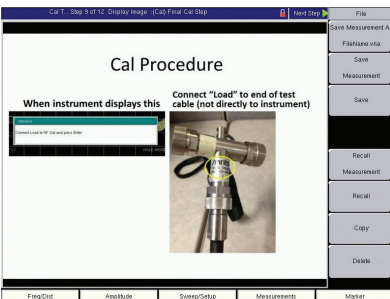
### 3D Spectrogram

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.



### Remote Access Tool

The Remote Access Tool allows user's to remotely view and control the instrument over the Internet.



### easyTest Tools

easyTest Tools is a PC based program that helps create, distribute and display work instructions on Anritsu's Cable and Antenna Analyzers.

## Line Sweep Tools

Line Sweep Tools increases productivity for people who deal with dozens of Cable and Antenna traces, or Passive Inter-Modulation (PIM) traces, every day.

- User Interface will be familiar to users of Anritsu's Hand Held Software Tools. This will lead to a short learning curve.
- Marker and Limit Line Presets make applying markers and a limit line to similar traces, as well as validating traces, a quick task.
- Renaming Grid makes changing file names, trace titles, and trace subtitles from field values to those required for a report much quicker than manual typing and is less prone to error.
- Report Generator will generate a professional looking PDF of all open traces with additional information such as contractor logos and contact information.

## 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** – 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

## easyTest Tools

Anritsu's easyTest Tools is a PC based program that can help create, distribute, and display work instructions on Anritsu's Cable and Antenna Analyzers. easyTest can:

- **Create** – easyTest Tools has a simple-to-use tool set to help create an on-instrument procedure, with setups, pictures, prompts, and easy methods to save results.
- **Distribute** – An easyTest procedure is completely contained in a single compressed file, making electronic distribution simple.
- **Display** – work instructions on the instrument. Prompts, photos, and even Power Point slides can be displayed on your Anritsu handheld cable and antenna analyzers. The ability to recall setups and automatically save results make using easyTest even easier.

## Line Sweep Features

### Presets

7 sets of 6 markers and 1 limit line  
Next trace capability

### File Types

Input: HHST DAT, VNA Measurements: Return Loss (VSWR), Cable Loss, DTF-RL, DTF-VSWR, PIM  
Output: LS DAT, VNA, CSV, PNG, BMP, JPG, PDF

### Report Generator

Logo, title, company name, customer name, location, date and time, filename, PDF, HTML, all open traces

### Tools

Cable Editor  
Distance to Fault  
Measurement calculator  
Signal Standard Editor  
Renaming Grid

### Interfaces

Serial, Ethernet, USB

### Capture Plots to

Screen, Database, DAT files, JPEG, Instrument

## Master Software Tools Features

### Database Management

Full Trace Retrieval  
Trace Catalog  
Group Edit  
Trace Editor

### Data Analysis

Trace Math and Smoothing  
Data Converter  
Measurement Calculator

### 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

### Connectivity

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

## easyTest Tools

Create tests  
Distribute procedures  
Display instructions

# Cell Master™ Base Station Analyzer Features



## OBSAI LTE RF Measurements (Option 0753)

### OBSAI RF Measurements

Anritsu's OBSAI Analyzer (Option 753) allows users to make RF-based measurements over a fiber optic link to look for interference problems affecting an RFM. This is accomplished by tapping into the fiber link between the RFM and BBM, using an optical splitter to connect to the Anritsu test instrument. The instrument will decode the OBSAI protocol IQ data and convert it to RF data.

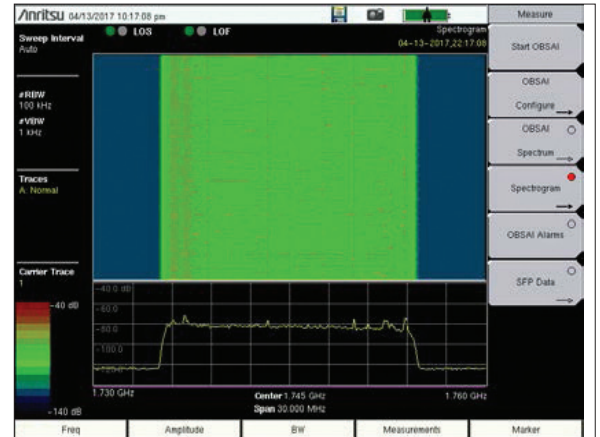
The OBSAI protocol provides the information needed to configure the link within the layer of data we are decoding. This has allowed us to create a one button push to configure and display the OBSAI RF spectrum.

Two types of OBSAI measurements are available:

- Spectrum mode is typically used to test the OBSAI link in real time.
- Spectrogram mode lets users monitor for intermittent interference over a specifiable recording time.

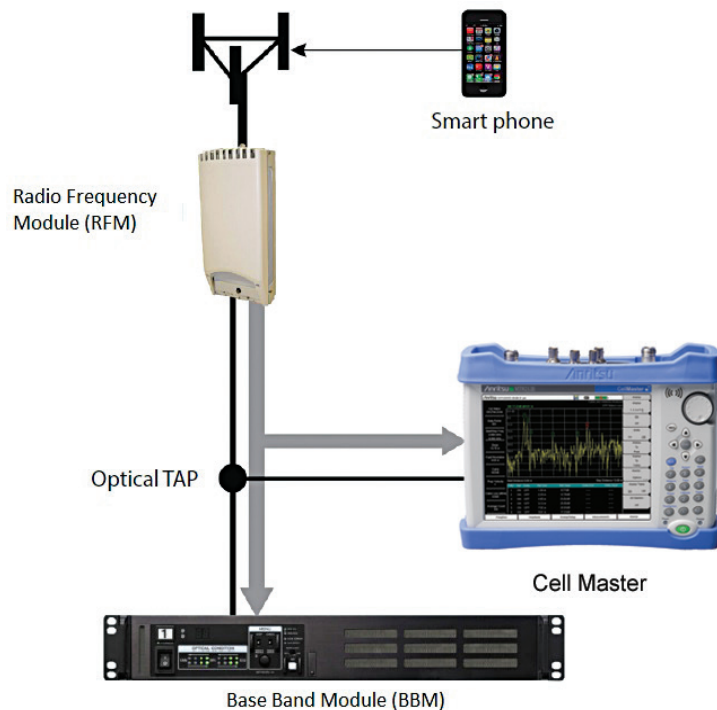


Spectrum Mode



Spectrogram Mode

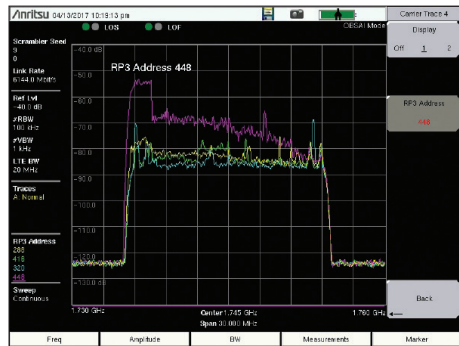
These OBSAI Analyzer test and measurement functions can be performed from ground level, eliminating the risk and costs of climbing towers. The Figure below illustrates a typical connection configuration for OBSAI testing with an Anritsu test instrument.



# Cell Master™ Base Station Analyzer Features



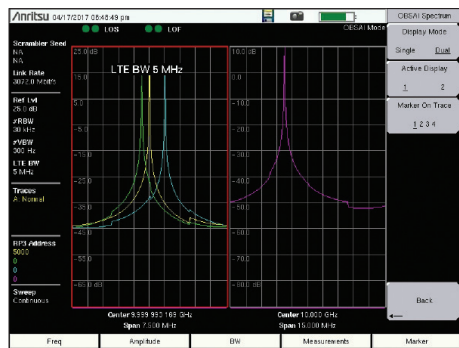
## OBSAI LTE RF Measurements (Option 0753)



Multi Trace Display

### Multi Trace Display

Display up to four RP3 addresses associated with each of the four potential carrier traces on a single display.

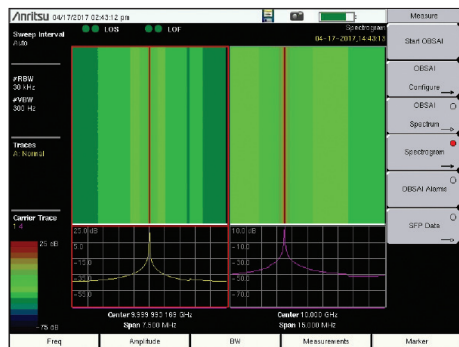


Dual Display - Spectrum

### Dual Display - Spectrum

Ability to display multiple RP3 Addresses in two displays. Useful for Diversity testing and system RF loading.

- One to four RP3 addresses in a display
- Using two SFPs, users can have RP3 address from different fiber connections and different OBSAI BW.
- Using two SFPs, users can look at Uplink in one display and Downlink on the other display



Dual Display - Spectrogram

### Dual Display - Spectrogram

Ability to display multiple RP3 addresses in two displays. Choose One active RP3 per display for Waterfall measurement.

- One active RP3 for Waterfall measurement
- One to four RP3s in a display

OBSAI Config
Link Rate
3072.0 Mbit/s

Link Rate 1x = 768.0 Mbit/s  
 Link Rate 2x = 1536.0 Mbit/s  
 Link Rate 4x = 3072.0 Mbit/s  
 Link Rate 8x = 6144.0 Mbit/s

### Supports Highest OBSAI Link Rate

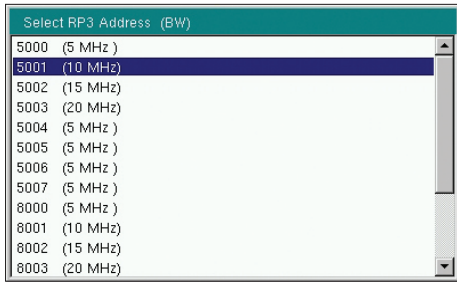
Supports the highest OBSAI Link Rate in a handheld test instrument.

- 6.144 Gbps (8x)

# Cell Master™ Base Station Analyzer Features



## OBSAI LTE RF Measurements (Option 0753) (continued)



### Supports multiple RP3 BWs

Support for 5, 10, 15, and 20 MHz BWs



### OBSAI Alarms

Displays the SFP port alarm status and the Tx and Rx optical power levels.

- “Pass” status is shown as green;
- “Fail” is red. Colors may appear differently depending on the display settings.
- No color, or grey, means there is no connection at the SFP port.

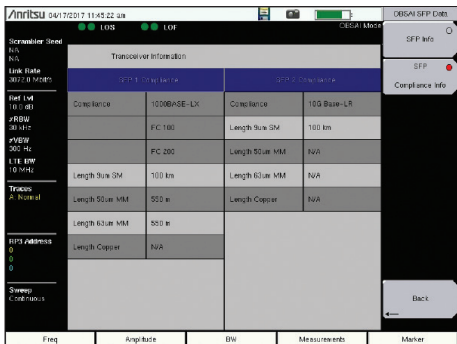
OBSAI Alarms



### SFP Info

Displays a table that lists the signal data and vendor information at the SFP port.

SFP Info



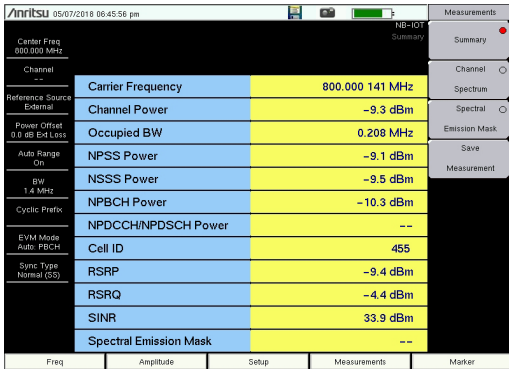
### SFP Compliance Info

Displays the transceiver compliance information for the SFP port.

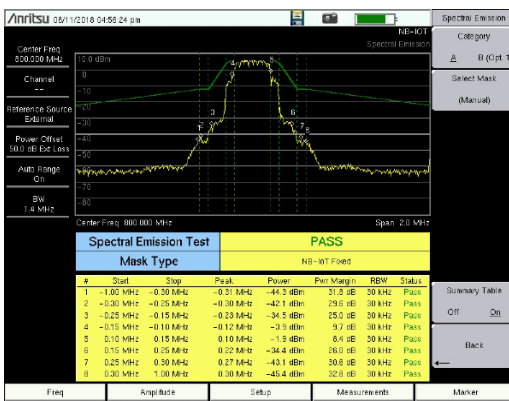
SFP Compliance Info

# Cell Master™ Base Station Analyzer Features

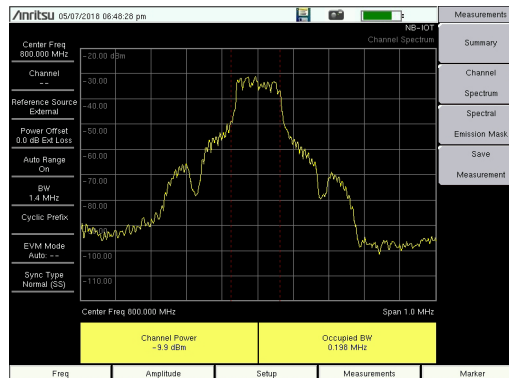
## NB-IoT Analyzer (Option 887)



NB-IoT Analyzer Summary Screen



NB-IoT Analyzer Spectral Emission Mask



NB-IoT Analyzer Channel Spectrum

### NB-IoT Analyzer (Option 887)

Narrowband Internet of Things (NB-IoT), also known as LTE Cat-NB1, is a cellular technology introduced in 3GPP Release 13 for providing wide-area coverage for the Internet of Things (IoT).

The NB-IoT Analyzer is ideal for network operator installation and maintenance teams, along with their contractors that are deploying or have already deployed NB-IoT services. This feature allows field installation and maintenance teams to verify that NB-IoT services are deployed and are working as intended.

### Key Features and Benefits

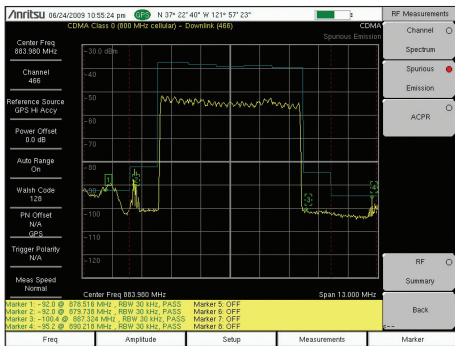
The NB-IoT analyzer, Option 887 has the following features:

- Summary screen showing the following RF measurements:
  - Carrier Frequency
  - Channel Power
  - Occupied BW
  - NPSS Power
  - NSSS Power
  - NPBCH Power
  - NPDCH/NPDSCH Power
  - Cell ID
  - RSRP
  - RSRQ
  - SINR
  - Spectral Emission Mask (Pass/Fail)
- Channel Spectrum
- Spectral Emission Mask

# BTS Master™ MT8220T Base Station Analyzer Features



## CDMA/EV-DO Measurements (Option 0884)



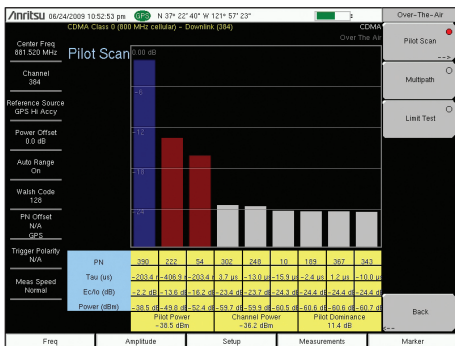
### RF Measurements - Spectral Emissions Mask

The 3GPP2 spectral emission mask is displayed. Failing this test leads to interference with neighboring carriers, legal liability, and low signal quality.



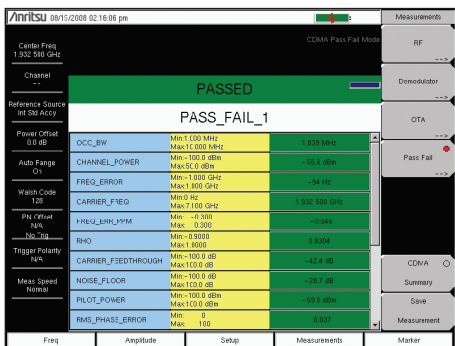
### Modulation Quality - EVM

High or low values will create larger areas of cell-to-cell interference and create lower data rates near cell edges. Low values affect in-building coverage.



### Over-the-Air Measurements - Sync Signal Power

Check for uneven amplitude of sub-carriers. Data will be less reliable on weak sub-carriers, creating a lower overall data rate.



### Pass/Fail Test

Set up common test limits, or sets of limits, for each instrument. Inconsistent settings between base stations lead to inconsistent network behavior.

## CDMA Measurements

The BTS Master features three CDMA measurement modes:

- RF Measurements
- Demodulation
- Over-the Air Measurements (OTA)

The goal of these measurements is to increase data rate and capacity by accurate power settings, ensuring low out-of-channel emissions, and good signal quality. These attributes help to create a low dropped call rate, a low blocked call rate, and a good customer experience.

Cell site technicians or RF engineers can make measurements Over-the-Air (OTA) to spot-check a transmitter's coverage and signal quality without taking the cell site off-line. When the OTA test results are ambiguous, one can directly connect to the base station to check the signal quality and transmitter power.

### Adjacent Channel Power Ratio (ACPR)

ACPR measures how much of the carrier gets into neighboring RF channels. ACPR, and multi-channel ACPR, check the closest (adjacent) and second closest (alternate) RF channels for single and multicarrier signals. High ACPR will create interference for neighboring carriers. This is also an indication of low signal quality and low capacity, which can lead to blocked calls.

### RMS Phase Error

RMS Phase Error is a measure of signal distortion caused by frequency instability. Any changes in the reference frequency or the radio's internal local oscillators will cause problems with phase error. A high reading will cause dropped calls, low signal quality, low data rate, low sector capacity, and blocked calls.

### Noise Floor

Noise Floor is the average level of the visible code domain noise floor. This will affect Rho. A high noise floor will result in dropped calls, low signal quality, low data rate, low sector capacity, and blocked calls.

### $E_c/I_o$

$E_c/I_o$  indicates the quality of the signal from each PN. Low  $E_c/I_o$  leads to low data rate and low capacity.

## RF Measurements

- Channel Spectrum
- Channel Power
- Occupied Bandwidth
- Peak-to-Average Power
- Spectral Emission Mask
- Multi-carrier ACPR
- RF Summary

## Demodulation

- Code Domain Power Graph
- Pilot Power
- Channel Power
- Noise Floor
- Rho
- Carrier Feed Through
- Tau
- RMS Phase Error
- Frequency Error
- Abs/Rel/ Power
- Pilot
- Page
- Sync
- Q Page
- Code Domain Power Table
- Code
- Status
- Power
- Multiple Codes
- Code Utilization
- Modulation Summary

## Over-the-Air (OTA) Measurements

- Pilot Scanner (Nine)
- PN
- $E_c/I_o$
- Tau
- Pilot Power
- Channel Power
- Pilot Dominance
- Multipath Scanner (Six)
- $E_c/I_o$
- Tau
- Channel Power
- Multipath Power
- Limit Test - 10 Tests Averaged
- Rho
- Adjusted Rho
- Multipath
- Pilot Dominance
- Pilot Power
- Pass/Fail Status

## Pass/Fail (User Editable)

- Measurements
- Channel Power
- Occupied Bandwidth
- Peak-to-Average Power
- Spectral Mask Test
- Frequency Error
- Channel Frequency
- Pilot Power
- Noise Floor
- Rho
- Carrier Feed Through
- Tau
- RMS Phase Error
- Code Utilization
- Measured PN
- Pilot Dominance
- Multipath Power

# Cell Master Base Station Analyzer Features

## MA8100A Series TRX NEON Signal Mapper



NEON Signal Mapper with Anritsu Handhelds

### MA8100A Series TRX NEON® Signal Mapper\*

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

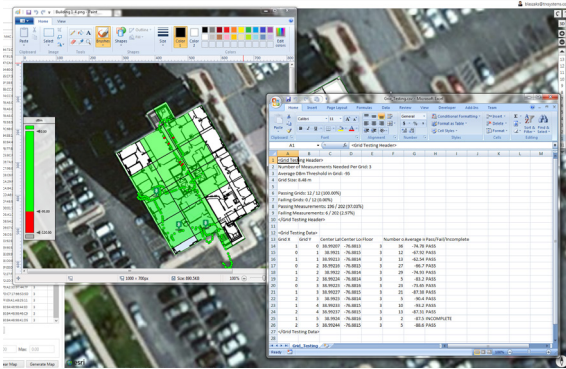
Anritsu’s TRX NEON Signal Mapper, a 3D in-building coverage mapping solution, is compatible with all Anritsu handheld instruments with spectrum analyzer mode. Instruments supported include Spectrum Master, LMR Master, Site Master, BTS Master, Cell Master, and VNA Master.

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

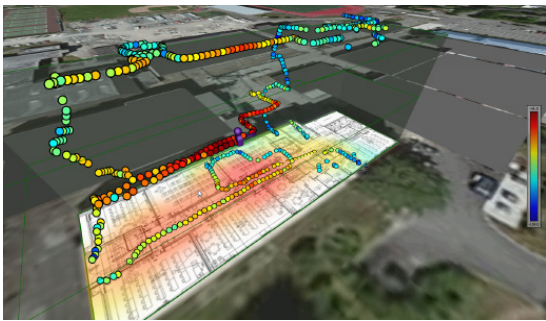
The TRX NEON Tracking Unit supports collection and processing of sensor data that delivers 3D location information. The Tracking Unit connects to the TRX NEON Signal Mapper application which is run on an Android device via a Bluetooth connection.

The TRX 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.

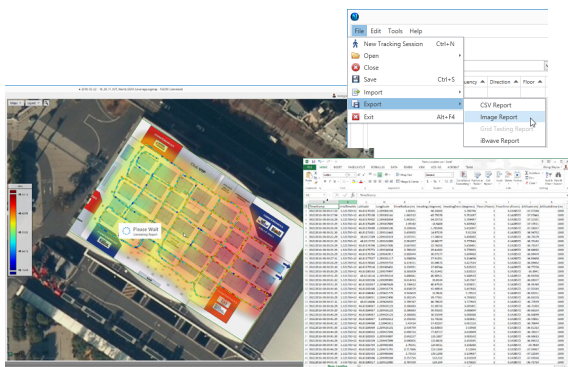
The TRX NEON Command Software, run on a PC, enables creation and visualization of 3D building maps and provides centralized access to the TRX NEON Cloud Service to access stored maps and measurement data.



Support for NFPA Gridding Requirements



Automatically generate 3-D Heatmaps



Automatic Report Generation

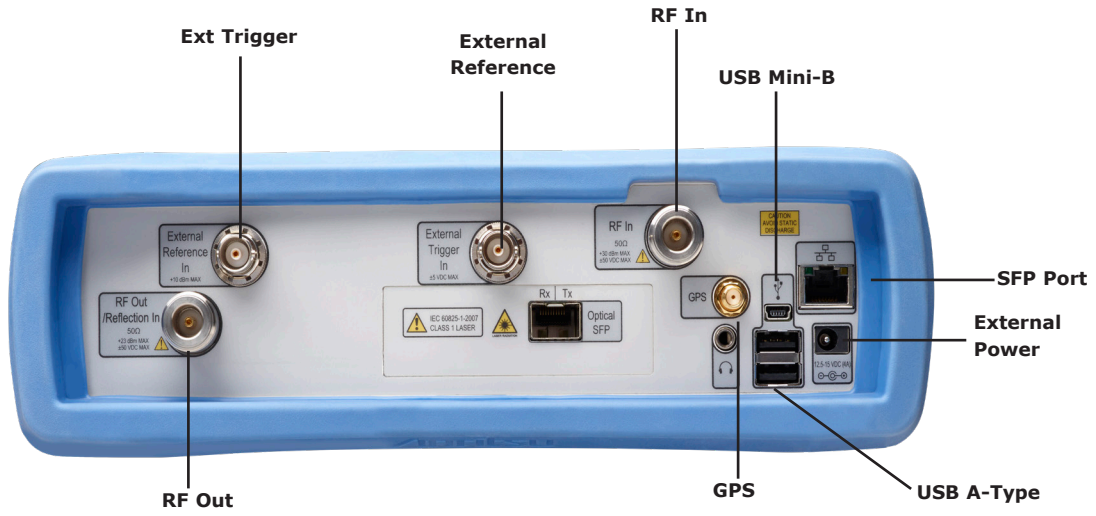
### Key Features and Benefits

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

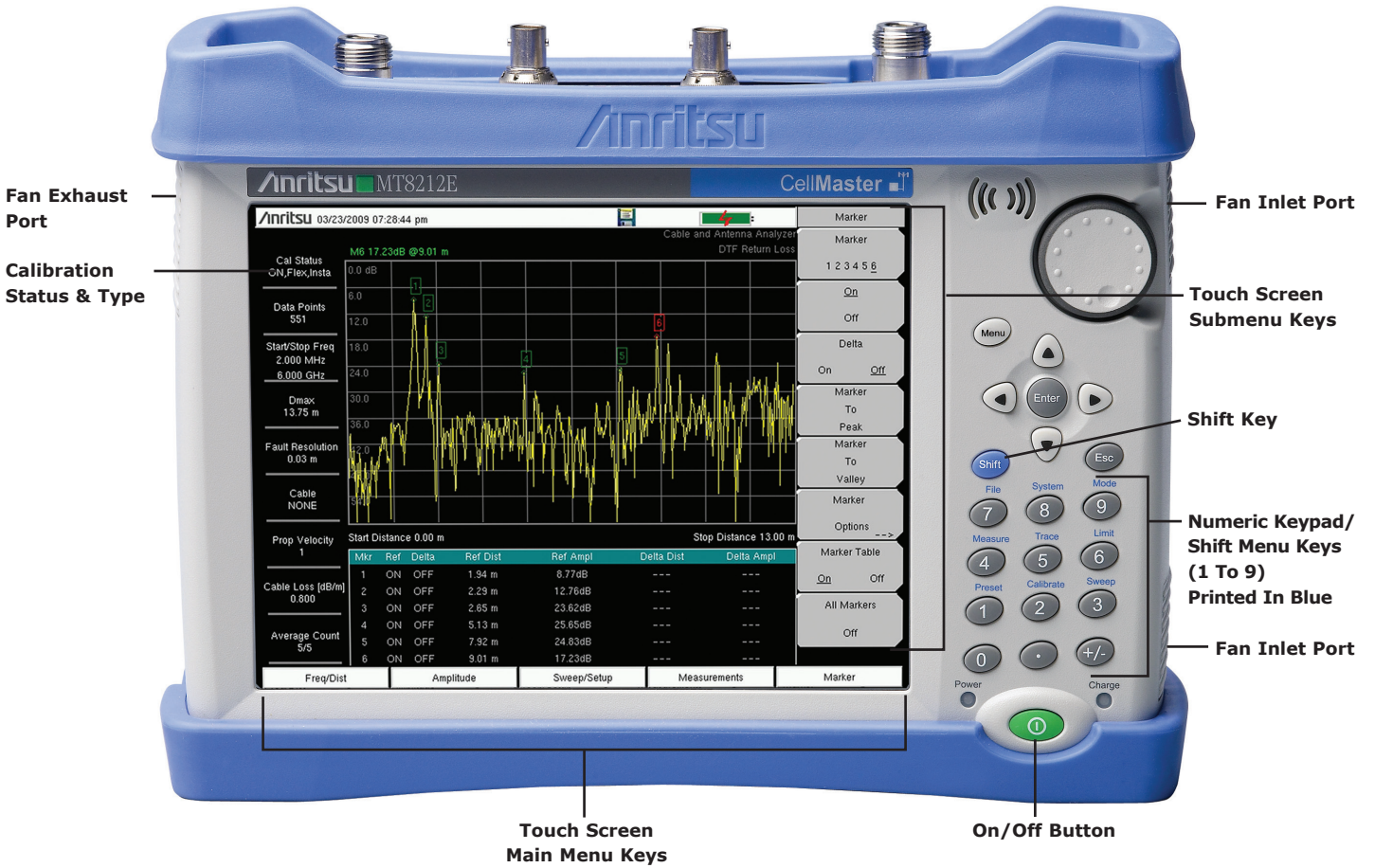
- Eliminating the need to manually perform “check-ins” at each test point by automatically calculating indoor location
- Providing vastly more data than is possible with manual processes by recording data with every step
- Removing typical data recording errors caused by “guesstimating” locations in 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.

# Cell Master™ Base Station Analyzer Features

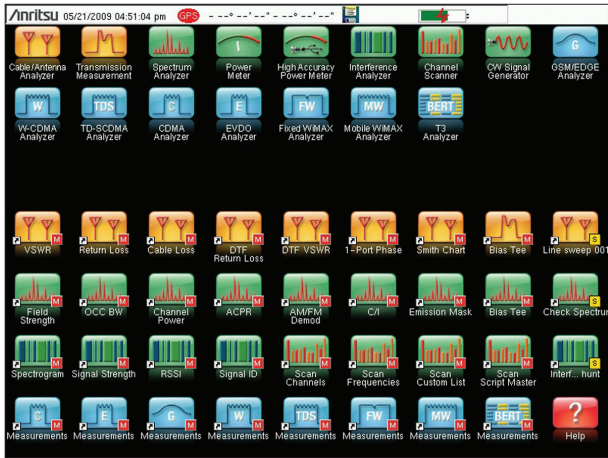


All connectors are conveniently located on the top panel, leaving the sides clear for handheld use



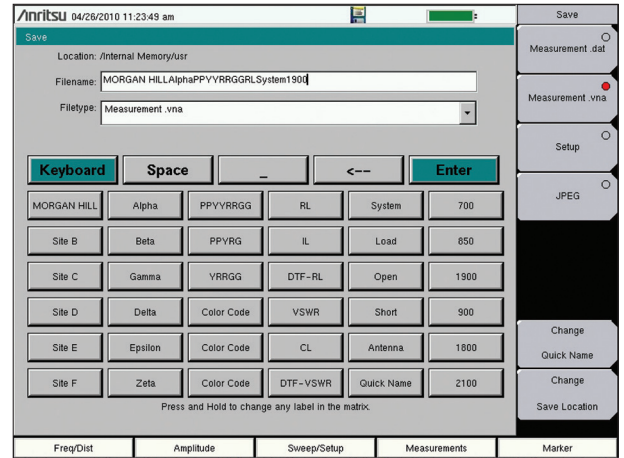
Handheld Size: 273 x 199 x 91 mm (10.7 x 7.8 x 3.6 in), Lightweight: 3.71 kg (8.2 lbs)

# Cell Master™ Base Station Analyzer Features



### Touch screen menu

The Menu Key activates the touch screen menu for one button access to all of the Analyzers.  
 User defined shortcuts can be created for one-button access to commonly used functions.



### Touch screen keyboard



A built-in touch screen keyboard saves valuable time in the field when entering trace names.  
 For Cable and Antenna Analysis, a Quick Name Matrix can be customized for quickly naming naming your line sweeps.



Tilt balls are integrated into the case and soft case for better screen viewing.

# Cell Master™ Base Station Analyzer Ordering Information

## Ordering Information

	MT8212E	MT8213E	Description
	2 MHz to 4 GHz	2 MHz to 6 GHz	Cable and Antenna Analyzer
	9 kHz to 4 GHz	9 kHz to 6 GHz	Spectrum Analyzer
	10 MHz to 4 GHz	10 MHz to 6 GHz	Power Meter
	<b>Options</b>	<b>Options</b>	
	MT8212E-0021	MT8213E-0021	2-Port Transmission Measurement
	MT8212E-0010	MT8213E-0010	Bias-Tee
	MT8212E-0031	MT8213E-0031	GPS Receiver (requires Antenna)
	MT8212E-0019	MT8213E-0019	High-Accuracy Power Meter (requires External Power Sensor)
	MT8212E-0025	MT8213E-0025	Interference Analyzer (Option 31 recommended)
	MT8212E-0027	MT8213E-0027	Channel Scanner
	MT8212E-0431	MT8213E-0431	Coverage Mapping (requires Option 31)
	MT8212E-0444	MT8213E-0444	EMF Measurements (requires Anritsu Isotropic Antenna)
	MT8212E-0090	MT8213E-0090	Gated Sweep
	MT8212E-0028	MT8213E-0028	C/W Signal Generator (requires CW Signal Generator Kit, P/N 69793)
	MT8212E-0752	MT8213E-0752	CPRI RF Measurements (requires Option 759)
	MT8212E-0753	MT8213E-0753	OBSAI LTE RF Measurements (requires Option 759)
	MT8212E-0759	MT8213E-0759	RF Over Fiber Hardware (requires Option 752 or 753, cannot be ordered with Option 57 or 79)
	MT8212E-0880	MT8213E-0880	GSM/GPRS/EDGE Measurements
	MT8212E-0881	MT8213E-0881	W-CDMA/HSPA+ Measurements (Option 31 recommended)
	MT8212E-0882	MT8213E-0882	TD-SCDMA/HSPA+ Measurements (requires Option 31 for full functionality)
	MT8212E-0883	MT8213E-0883	LTE/LTE-A FDD/TDD Measurements (requires Option 31 for full functionality)
	MT8212E-0884	MT8213E-0884	CDMA/EV-DO Measurements (requires Option 31 for full functionality)
	MT8212E-0885	MT8213E-0885	WiMAX Fixed/Mobile Measurements (requires Option 31 for full functionality)
	MT8212E-0886	MT8213E-0886	LTE 256 QAM Demodulation (requires Option 883)
	MT8212E-0887	MT8213E-0887	NB-IoT Analyzer
	MT8212E-0030	MT8213E-0030	ISDB-T Digital Video Measurements
	MT8212E-0032	MT8213E-0032	ISDB-T SFN Measurements
	MT8212E-0079	MT8213E-0079	ISDB-T BER Measurements (requires Option 30; cannot be ordered with Options 759)
	MT8212E-0064	MT8213E-0064	DVB-T/H Digital Video Measurements
	MT8212E-0078	MT8213E-0078	DVB-T/H SFN Measurements
	MT8212E-0057	MT8213E-0057	DVB-T/H BER Measurements (requires Option 64; cannot be ordered with Option 759)
	MT8212E-0413	MT8213E-0413	Ethernet Connectivity
	MT8212E-0098	MT8213E-0098	Standard Calibration (ANSI 2540-1-1994)
	MT8212E-0099	MT8213E-0099	Premium Calibration to (ANSI 2540-1-1994 plus test data)

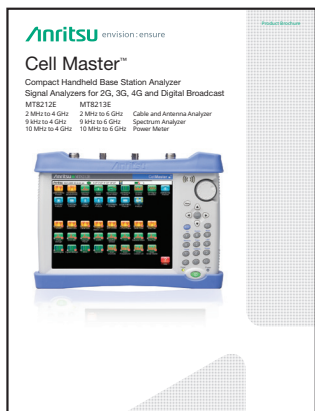
## Cell Master™ Base Station Analyzer Ordering Information

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



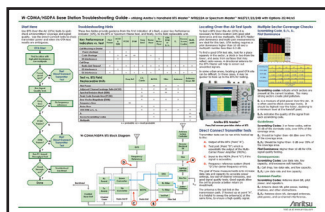
Part Number	Description
PSN50	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +20 dBm
MA24106A	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +23 dBm
MA24104A	Inline High Power Sensor, 600 MHz to 4 GHz, +51.76 dBm
MA24105A	Inline Peak Power Sensor, 350 MHz to 4 GHz, +51.76 dBm
MA24108A	Microwave USB 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
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

**Manuals** (soft copy included on Handheld Instruments Documentation Disc and at [www.anritsu.com](http://www.anritsu.com))



Part Number	Description
10920-00065	Product Information, Compliance, and Safety
10580-00250	Cell Master Instrument User Guide (Hard copy included) - Bias-Tee, GPS Receiver
10580-00241	Cable and Antenna Analyzer Measurement Guide
10580-00242	2-Port Transmission Measurement - Bias-Tee
10580-00349	Spectrum Analyzer Measurement Guide
10580-00240	Power Meter Measurement Guide
10580-00234	3GPP Signal Analyzer Measurement Guide
10580-00235	3GPP2 Signal Analyzer Measurement Guide
10580-00236	WiMAX Signal Analyzer Measurement Guide
10580-00237	Digital TV Measurement Guide
10580-00256	Programming Manual
10580-00237	Backhaul Analyzer Measurement Guide
10580-00415	CPRI LTE RF Analyser Measurement Guide
10580-00434	OBSAI LTE RF Analyzer Measurement Guide
10580-00280	PIM Master User Guide

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



11410-00473	Cable, Antenna and Components
11410-00551	Spectrum Analyzers
11410-00472	Interference
11410-00566	LTE eNodeB Testing
11410-00615	TD-LTE eNodeB Testing
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
11410-00552	T1/DS1 Backhaul Testing
11410-00553	Ei Backhaul Testing

# Cell Master™ Base Station Analyzer Ordering Information

## Standard Accessories (included with instrument)



Part Number	Description
2000-1691-R	Stylus with Coiled Tether
2000-1654-R	Soft Carrying Case
2000-1797-R	Touchscreen Protective Film, 8.4 in
633-75	Rechargeable Li-Ion Battery, 7500mAh
40-187-R	AC-DC Adapter
806-141-R	Automotive Cigarette Lighter 12 VDC Adapter
3-2000-1498	USB A/5-pin mini-B Cable, 10 feet/305 cm
11410-00485	Cell Master MT8212E/MT8213E Technical Data Sheet One Year Warranty (Including battery, firmware, and software) Certificate of Calibration and Conformance

## Optional Accessories

### Calibration Components, 50 Ω



Part Number	Description
ICN50B	InstaCal™ Calibration Module, 38 dB, 2 MHz to 6.0 GHz, N(m), 50 Ω
2000-1914-R	Open/Short/Load, 4.3-10(f), DC to 6 GHz, 50 Ω
2000-1915-R	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 4.0 GHz 50 Ω
2000-1619-R	Precision Open/Short/Load, 7/16 DIN(f), DC to 4.0 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

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



Part Number	Description
15RNFN50-1.5-R	1.5 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15RDFN50-1.5-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
15RNFN50-3.0-R	3.0 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15RDFN50-3.0-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

### 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 (ideal for use with tightly spaced connectors and other general use applications)



Part Number	Description
15NNF50-1.5C	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
15NNF50-3.0C	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
15NNF50-5.0C	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	1.5 m, DC to 6 GHz, N(m) to 4.3-10(m), 50 Ω
15N43F50-1.5C	1.5 m, DC to 6 GHz, N(m) to 4.3-10(f), 50 Ω
15N43M50-3.0C	3 m, DC to 6 GHz, N(m) to 4.3-10(m), 50 Ω
15N43F50-3.0C	3 m, DC to 6 GHz, N(m) to 4.3-10(f), 50 Ω
15NF43M50-1.5C	1.5 m, DC to 6 GHz, N(f) to 4.3-10(m), 50 Ω
15NF43F60-1.5C	1.5 m, DC to 6 GHz, N(f) to 4.3-10(f), 50 Ω
15NF43M50-3.0C	3 m, DC to 6 GHz, N(f) to 4.3-10(m), 50 Ω
15NF43F50-3.0C	3 m, DC to 6 GHz, N(f) to 4.3-10(f), 50 Ω

# Cell Master™ Base Station Analyzer Ordering Information

## Optional Accessories (continued)

### Adapters



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

### Precision Adapters



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

### Miscellaneous Accessories



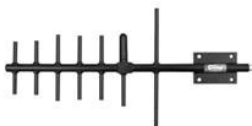
Part Number	Description
69793	CW Signal Generator Kit
2000-1691-R	Stylus with Coiled Tether
2000-1797-R	Touchscreen Protective Film, 8.4 in
2000-1689-R	EMI Near Field Probe Kit
2000-1798-R	Port Extender, DC to 6 GHz, N(m) to N(f)
MA2700A	Handheld Interference Hunter (for full specifications, refer to Ma2700A Technical Data Sheet 11410-00629)
66864	Rack Mount Kit, Master Platform

### Backpack and Transit Case



Part Number	Description
67135	Anritsu Backpack (For Handheld Instrument and PC)
760-243-R	Large Transit Case with Wheels and Handle
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 2000-177-R, 2000-1778-R, 2000-1779-R, 2000-1798-R)

### Directional Antennas



Part Number	Description
2000-1411-R	822 MHz to 900 MHz, N(f), 10 dBd, Yagi
2000-1412-R	885 MHz to 975 MHz, N(f), 10 dBd, Yagi
2000-1413-R	1710 MHz to 1880 MHz, N(f), 10 dBd, Yagi
2000-1414-R	1850 MHz to 1990 MHz, N(f), 9.3 dBd, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N(f), 10 dBd, Yagi
2000-1416-R	1920 MHz to 2170 MHz, N(f), 10 dBd, Yagi
2000-1659-R	698 MHz to 787 MHz, N(f), 8 dBd, Yagi
2000-1660-R	1425 MHz to 1535 MHz, N(f), 12 dBd, 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 200MHz, N(f)
2000-1779-R	Portable Directional Antenna, 2000 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

# Cell Master™ Base Station Analyzer Ordering Information

## Optional Accessories (continued)

### 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 to 2170 MHz, SMA(m), 50 Ω
2000-1032-R	2400 MHz to 2500 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1361-R	2400 MHz to 2500 MHz, 5000 MHz to 6000 MHz, SMA(m), 50 Ω
2000-1636-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	Dipole, 698-960/1710-2170/2500-2700 Mhz, MA(m), 2 dBi, typical, 50 Ω

### Mag Mount Broadband Antenna



Part Number	Description
2000-1616-R	20 MHz to 21000 MHz, N(f), 50 Ω
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
2000-1645-R	694 MHz to 894 MHz 3 dBi peak gain, 1700 MHz to 2700 MHz 3dBi peak gain, N(m), 50 Ω, 10 ft
2000-1646-R	750 MHz to 1250 MHz 3 dBi peak gain, 1650 MHz to 2000 MHz 5 dBi peak gain, 2100 MHz to 2700 MHz 3 dBi peak gain, N(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 Band, N(m) to N(f), 50 Ω
1030-106-R	1710 MHz to 1790 MHz Band, N(m) to N(f), 50 Ω
1030-107-R	1910 MHz to 1990 MHz Band, 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 787 MHz, N(m) to N(f), 50 Ω
1030-180-R	2500 MHz to 2570 MHz, N(m) to N(f), 50 Ω
2000-1684-R	791 MHz to 821 MHz, N(m) to N(f), 50 Ω
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, 80 MHz to 15 MHz, N(m) and N(f), 50 Ω
2000-1740-R	Bandpass Filter, 710 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

### T1/E1 Extender Cables

Part Number	Description
806-16-R	Bantam Plug to Bantam Plug
3-806-116	Bantam Plug to BNC
3-806-117	Bantam "Y" Plug to RJ48
3-806-169	72 inch (1.8 m) BNC, 75 1/2 RF59 Type Coax Cable
806-176-R	Bantam Plug to Alligator Clips

# Cell Master™ Base Station Analyzer Ordering Information

## Optional Accessories (continued)

### Attenuators



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

### CPRI RF Measurement Accessories

Part Number	Description
67-12-R	Optical Tap; Single Mode/Multi Mode
67-13-R	Optical Tap; Single Mode
68-5-R	SFP (Optical Module), 4.25G, 850nm, 500m
68-6-R	SFP+ (Optical Module), 8G FC/10G SR 850nm
68-7-R	SFP (Optical Module), 2.7G, 1310nm, 15km
68-8-R	SFP+ (Optical Module), 10G LR 1310nm
2000-1849-R	ESD Box for SFP (Optical Modules)
2100-29-R	Fiber Optic Cable, 3m, LC/UPC, Single Mode (SM), Simplex
2100-30-R	Fiber Optic Cable, 10m, LC-SC, Multi-Mode (MM), Simplex
2100-31-R	Fiber Optic Cable, 3m, LC/UPC, Single Mode (SM), Duplex
971-14-R	Ferrule cleaner, 2.5mm SC
971-15-R	Ferrule cleaner, 1.25mm LC
971-16	Fiber ferrule cleaner

### GPS Antennas



Part Number	Description
2000-1528-R	GPS Antenna, SMA(m) with 5 m (15 ft) cable, 3 dBi gain, requires 5 VDC
2000-1652-R	GPS Antenna, SMA(m) with 0.3 m (1 ft) cable, 5 dBi gain, requires 3.3 VDC
2000-1760-R	GPS Antenna, SMA(m) with 25 dB gain, 2.5 VDC to 3.7 VDC

### Isotropic Antenna

Part Number	Description
2000-1791-R	Isotropic Antenna, 700 MHz to 6000 MHz, N(m)
2000-1792-R	Isotropic Antenna, 30 MHz to 3000 MHz, N(m)
2000-1800-R	Isotropic Antenna, 9 kHz to 300 MHz, N(m)

### RF Over Fiber Accessories

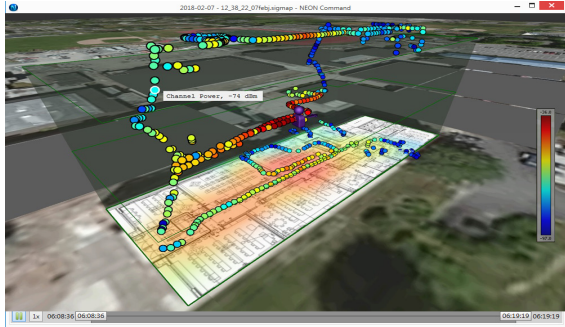


Part Number	Description
67-12-R	Optical Tap; Single Mode/Multi Mode 80/20 Tap
67-13-R	Optical Tap; Single Mode 80/20 Tap
67-14-R	Optical Tap; Single Mode/Multi Mode 50/50 Tap
67-15-R	Optical Tap; Single Mode 50/50 Tap
68-5-R	SFP (Optical Module), MM (Multi Mode) 4.25 Gbps, 850 nm, 500 m
68-6-R	SFP+ (Optical Module), MM (Multi Mode) 8 Gbps FC/10G SR 850 nm, 850 nm, 500 m
68-7-R	SFP (Optical Module), SM (Single Mode) 2.7 Gbps, 1310 nm, 15 km
68-8-R	SFP+ (Optical Module), SM (Single Mode) 10 Gbps LR, 1310 nm
68-9-R	SFP (Optical Module), SM (Single Mode) 3.07 Gbps 1310 nm
68-10-R	SFP (Optical Module), MM (Multi Mode) 3.7 Gbps, 850 nm
68-11-R	SFP+ (Optical Module), SM (Single Mode) 10.5 Gbps, 1310 nm
68-12-R	SFP+ (Optical Module), MM (Multi Mode) 10.5 Gbps, 850 nm
68-16-R	SFP+ (Optical Module), SM (Single Mode) 9.83 Gbps, 1310 nm
808-16-R	Fiber Optic Cable, 3 m, Duplex MM (multi Mode) 1.6 mm LC/PC LC/PC μm
808-17-R	Fiber Optic Cable, 3 m, Simplex MM (Multi Mode) 1.6 mm LC/UPC LC/UPC 50 μm
808-18-R	Fiber Optic Cable, 3 m, Ruggedized Simplex SM (Single Mode) LC/UPC LC/UPC
808-19-R	Fiber Optic Cable, 3 m, Ruggedized Duplex SM (Single Mode) LC/UPC LC/UPC
2100-29-R	Fiber Optic Cable, 3 m, Simplex SM (Single Mode) LC/UPC
2100-30-R	Fiber Optic Cable, 10 m, Simplex MM (Multi Mode) LC-SC
2100-31-R	Fiber Optic Cable, 3 m, Duplex SM (Single Mode) LC/UPC
971-14-R	Ferrule Cleaner, 2.5 mm SC
971-15-R	Ferrule Cleaner, 1.25 mm LC
971-16	Fiber Ferrule Cleaner
2000-1849-R	SFP 4-slot ESD Box

# Cell Master™ Base Station Analyzer Ordering Information

## Optional Accessories (continued)

### MA8100A TRX NEON Signal Mapper



Model Number	Description
MA8100A-001	TRX NEON® Signal Mapper with Anritsu Integration and Tracking Unit. Includes 1 year TRX NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service.
MA8100A-003	TRX NEON® Signal Mapper with Anritsu Integration and Tracking Unit. Includes 3 years TRX NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service.
MA8100A-005	TRX NEON® Signal Mapper with Anritsu Integration and Tracking Unit. Includes 5 years TRX NEON Software License with 5 years of maintenance and support and 5 years of Cloud Service.
MA8100A-100	TRX NEON® Signal Mapper with Anritsu Integration and Tracking Unit. Includes Perpetual TRX NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service.
2300-574	1 year TRX NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service. Cannot be ordered separately from P/N MA8100A-001. See P/N 2300-612 for renewal.
2300-575	3 years TRX NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service. Cannot be ordered separately from P/N MA8100A-003. See P/N 2300-613 for renewal.
2300-576	5 years TRX NEON Software License with 5 years of maintenance and support and 3 years of Cloud Service. Cannot be ordered separately from P/N MA8100A-005. See P/N 2300-614 for renewal.
2300-606	Perpetual TRX NEON Software License with 3 years of maintenance and support and 5 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 TRX NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service.
2300-613	Renewal of 3 year TRX NEON Software License with 3 year of maintenance and support and 3 year of Cloud Service.
2300-614	Renewal of 5 year TRX NEON Software License with 5 year of maintenance and support and 5 year of Cloud Service.

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