Product Brochure

Anritsu

Cell Master™

Compact Handheld Base Station Analyzer

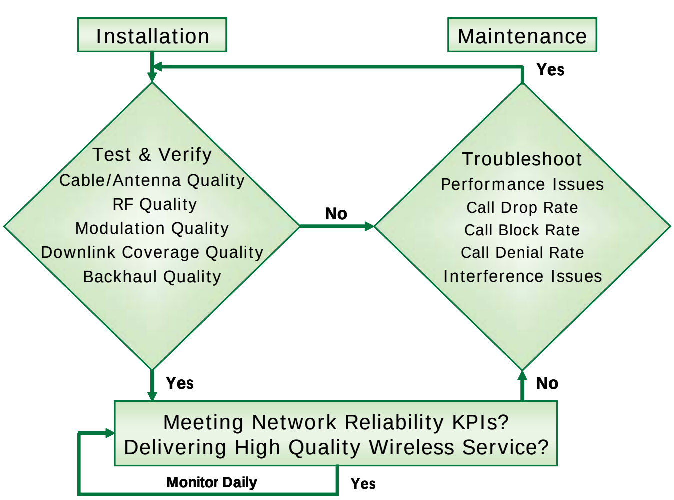
Signal Analyzers for 2G, 3G, 4G and Digital Broadcast

MT8212E	MT8213E	
2 MHz to 4 GHz	2 MHz to 6 GHz	Cable and Antenna Analyzer
100 kHz to 4 GHz	100 kHz to 6 GHz	Spectrum Analyzer
10 MHz to 4 GHz	10 MHz to 6 GHz	Power Meter

Cell Master™ Base Station Analyzer Specifications

Overview

Cell Master in Pass/Fail Mode



Installation and Maintenance Processes Supported by the Cell Master

Introduction

The Cell Master is a compact handheld base station analyzer that has been specifically developed for cell site technicians to meet virtually all of the measurements needs in and around a cell site of 2G, 3G and WiMAX networks.

The Cell Master features over 30 analyzers in one to meet virtually every measurement need. Standard features are:

- Cable and Antenna Analyzer: 2 MHz to 4/6 GHz
- Spectrum Analyzer: 100 kHz to 4/6 GHz
- Power Meter: 10 MHz tto 4/6 GHz

A user can select from many options including:

- 2-port Transmission Measurement
- High Accuracy Power Meter
- Interference Analyzer
- Channel Scanner
- CW Signal Generator
- 3GPP Signal Analyzers
  GSM/EDGE, W-CDMA/HSDPA, TD-SCDMA/HSDPA
- 3GPP2 Signal Analyzers
  cdmaONE/CDMA2000 1X, CDMA2000 1xEV-DO
- IEEE 802.16 Signal Analyzers
  Fixed WiMAX, Mobile WiMAX
- Digital Broadcast Signal Analyzers
  ISDB-T, ISDB-T SFN
- Backhaul Analyzers: E1, T1, T3/T1

Signal Analyzers have three methods for verifying the performance of a base station transmitter by measuring:

- RF Quality
- Modulation Quality (up to 10 MHz capability)
- Downlink Coverage Quality

Cell site technicians and RF engineers can use the Cell Master MT8212E to accurately and quickly test and verify the installation and commissioning of base stations and cell sites, for optimal wireless network performance. It is equally suited for on-going maintenance and troubleshooting to help ensure the operation of wireless network infrastructure.

Meeting Key Performance Indicators (KPIs)

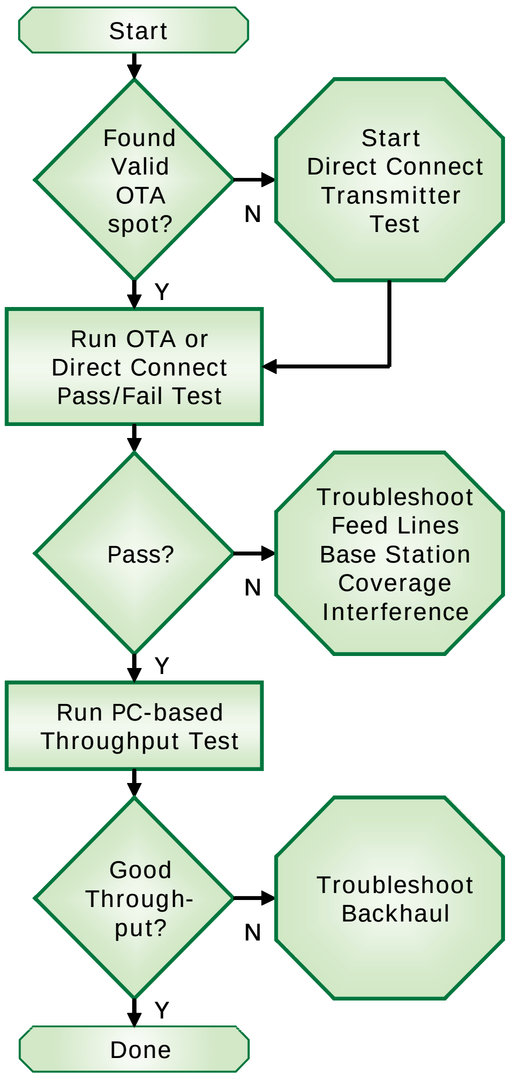
Degradation in KPIs, such as dropped call and/or blocked call rates due to a malfunction at the cell site or due to interference, can be easily and accurately diagnosed down to the base station field replaceable unit (FRU) or the offending interfering signal with the Cell Master.

Master Software Tools (MST)

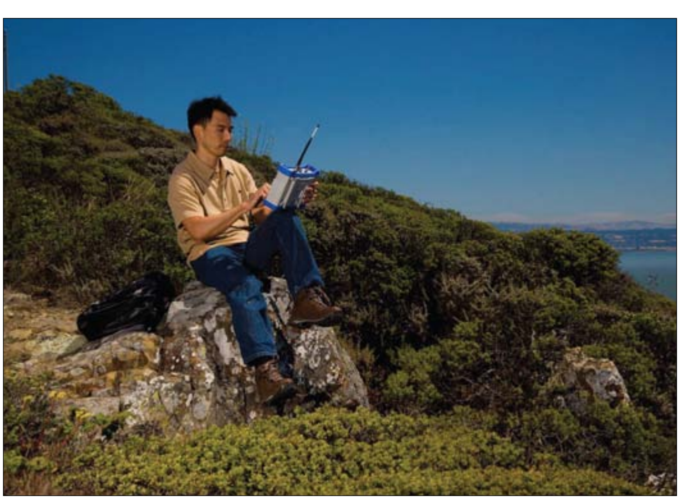
MST is a PC program that post processes data collected on your instrument. It provides an efficient Report Generator for line sweeps and powerful data analysis tools for spectrum clearing and interference monitoring.

With Anritsu's design know-how and demanding production testing and performance verification you can count on the Cell Master to give you years of reliable dependable service.

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

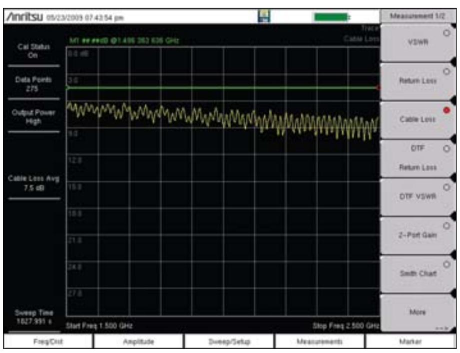
By outfitting cell site technicians with Cell Masters an operator can attack these reasons for churn. Benchmarking undertaken by Anritsu has shown that technicians equipped with base station analyzers provides them with the necessary tools to troubleshoot degrading KPIs which in-turn can reduce churn.

Learn what the return on investment is on equipping more technicians with the Cell Master MT8212E Base Station Analyzers from your local Anritsu sales professional. The Cell Master MT8212E Base Station Analyzer can become your vital tool to achieving optimal network performance.

Cable and Antenna Analyzer

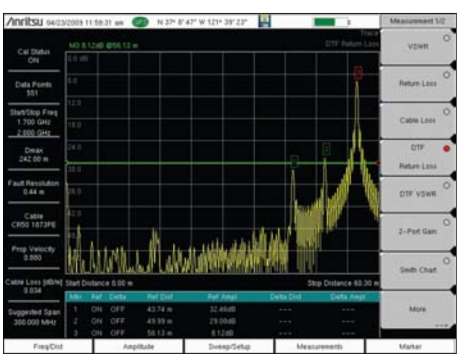
Return Loss/VSWR Measurement

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



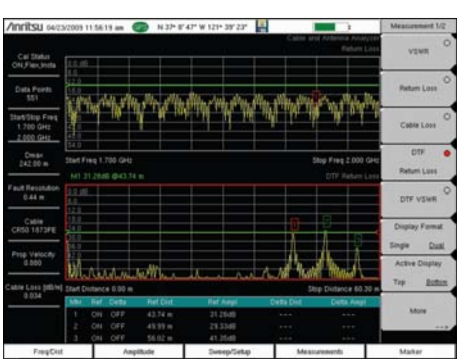
Cable Loss Measurement

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

The Cell Master features 1-port Cable and Antenna Analysis and optional 2-port Transmission Measurement 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

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 1-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
- Internal Bias Tee to power up TMAs for testing when off-line
- GPS tagging of data to verify location of tests
- Master Software Tools for post-analysis and report generation

2-port Transmission Measurement

2-port Transmission Measurement can identify poor antenna isolation on base stations and repeaters and degraded tower mounted amplifiers that can be the cause of dropped and blocked calls.

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)

Calibration

OSL (Open, Short, Load)
OSLIT (Open, Short, Load, Isolation, Through)
FlexCal™

Sweep Functions

Run/Hold, Single/Continuous
RF Immunity (High/Low)
Averaging/Smoothing
Output Power (High/Low)

Trace Functions

Save/Recall, Copy to Display Memory
No Trace Math, Trace ± Memory
Trace Overlay

Marker Functions

1-6 Markers each with a Delta Marker
Marker to Peak/Valley
Marker to/Peak Valley between Markers
Marker Table

Limit Line Functions

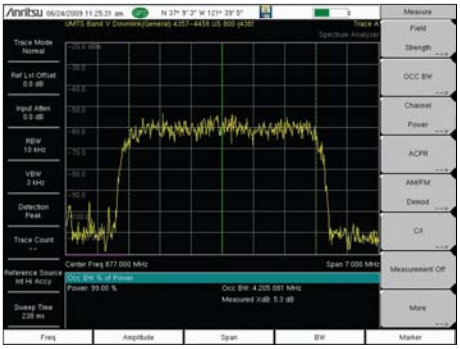
Limit Lines
- Single Limit
- Multi-segment (41)
- Limit Alarm

Limit Line Edit
- Frequency, Amplitude
- Add/Delete Point
- Next Point Left/Right
- Move Limit

Windowing Functions

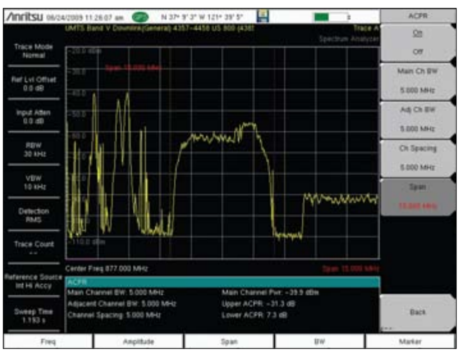
Rectangular
Normal Side Lobe
Low Side Lobe
Minimum Side Lobe

Spectrum Analyzer



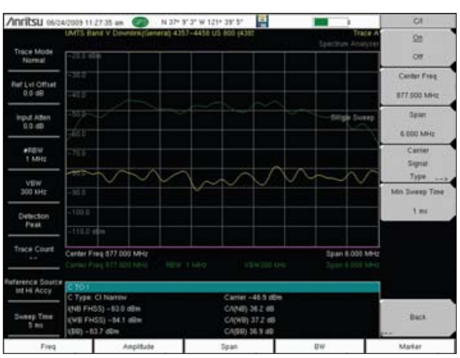
Occupied Bandwidth

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



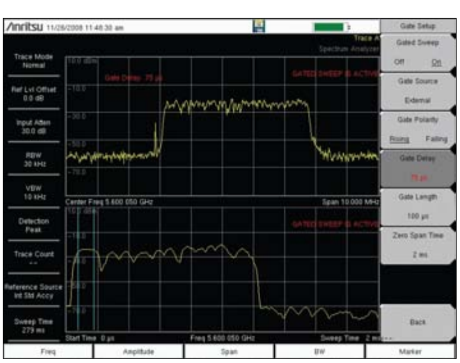
Adjacent Channel Power Ratio (ACPR)

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 Analyzers' measurements is to be able to monitor, measure, and analyze RF signals and their environments. It finds rouge 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 s 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 25 ppb (parts per billion). After the GPS antenna is disconnected, the accuracy is 50 ppb for three days. 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 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/m² 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

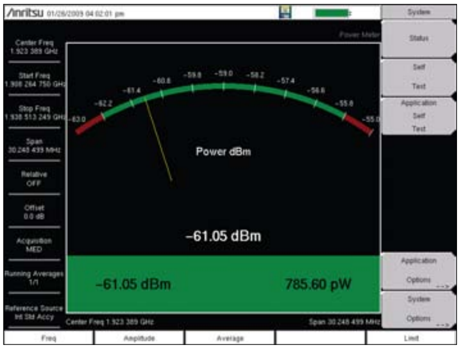
Limit Line Move
- To Current Center Frequency, By dB or Hz, To Marker 1, Offset from Marker 1

Limit Line Envelope
- Create, Update Amplitude, Number of Points (41), Offset, Shape Square/Slope

Limit Line Advanced
- Absolute/Relative, Mirror, Save/Recall

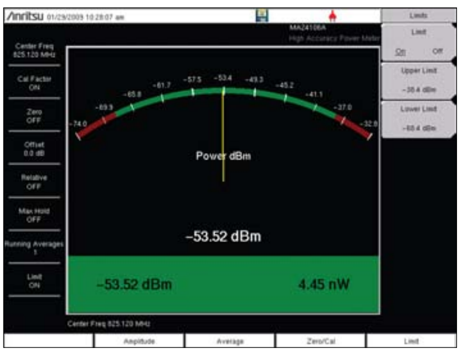
Power Meter

High Accuracy Power Meter (Option 0019)



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.

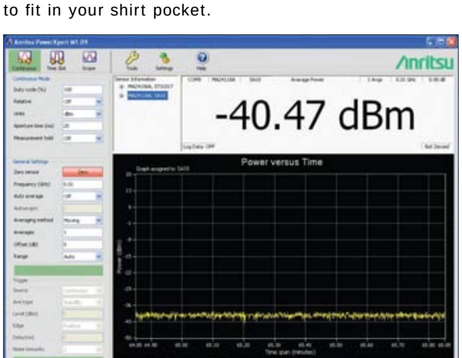


High Accuracy Power Meter (Option 0019)

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.

Power Meters

The Cell Master offers 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 wireless network. A 1.5 dB change in power levels means a 15% change in coverage area.

To much power means overlapping coverage which translates into cell-to-cell self interference. To little power, to 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 19)

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

- Frequency ranges: 10 MHz to 18 GHz
- Power ranges: -40 dBm to +51.76 dBm
- Measurement uncertainties: ≤±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 Ω
-30 to + 20 dBm
(.001 to 100 mW)
True-RMS

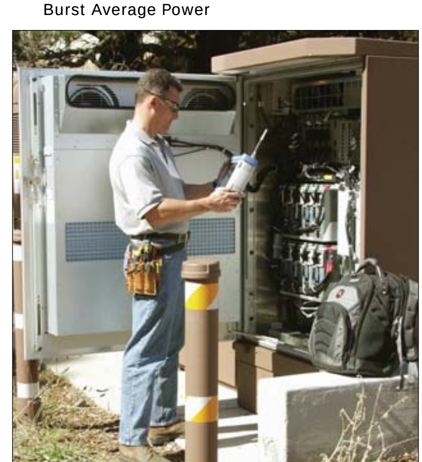
MA24104A
Inline High Power Sensor
600 MHz to 4 GHz
+3 to +51.76 dBm
(2 mW to 150 W)
True-RMS

MA24106A
High Accuracy RF Power Sensor
50 MHz to 6 GHz
-40 to +23 dBm
(0.1 µW to 200 mW)
True-RMS

MA24108A
Microwave USB Power Sensor
10 MHz to 8 GHz
-40 to +20 dBm
(0.1 µW to 100 mW)
True-RMS
Slot Power
Burst Average Power

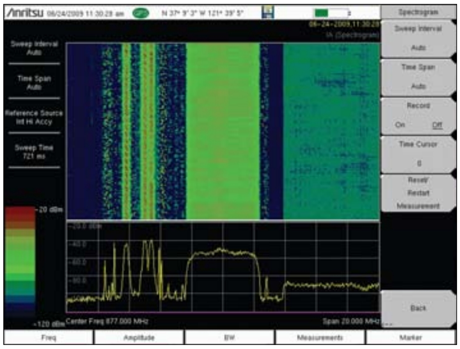
MA24118A
Microwave USB Power Sensor
10 MHz to 1 8 GHz,
-40 to +20 dBm
(0.1 µW to 100 mW)
True-RMS
Slot Power
Burst Average Power

MA24126A
Microwave USB Power Sensor
10 MHz to 26 GHz,
-40 to +20 dBm
(0.1 µW to 100 mW)
True-RMS
Slot Power
Burst Average Power



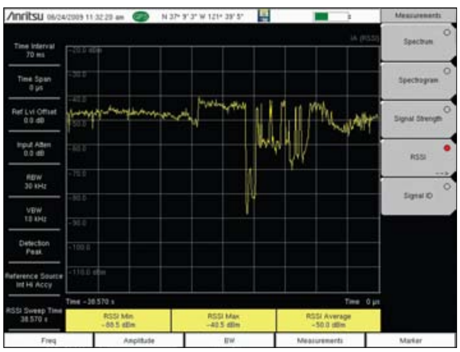
Cell Master™ Base Station Analyzer Features

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



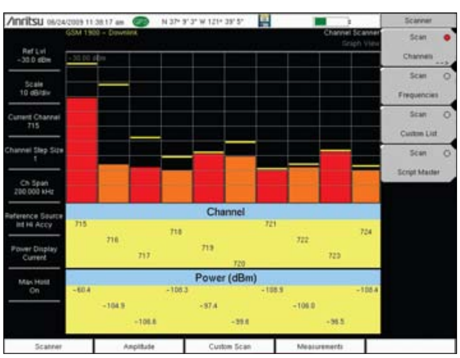
Spectrogram

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



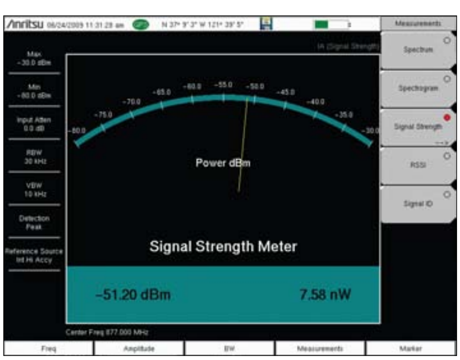
Received Signal Strength Indicator (RSSI)

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 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)
- FM
- GSM/GPRS/EDGE
- W-CDMA/HSDPA
- CDMA/EV-DO
- Wi-Fi

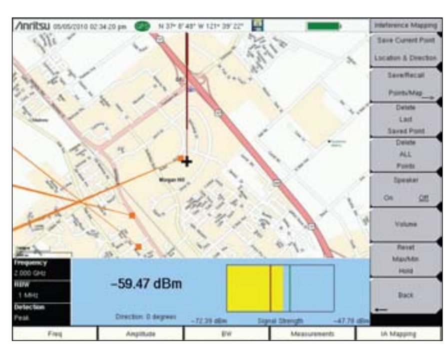
Interference Mapping
Spectrum
- Field Strength – in dBm/m² or dBmV/m
- Occupied Bandwidth - 1% to 99% of power
- Channel Power - in specified bandwidth
- ACPR - adjacent channel power ratio
- AM/FM/SSB Demodulation - audio out only
- C/I - carrier-to-interference ratio
- SEM - spectral emission mask

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

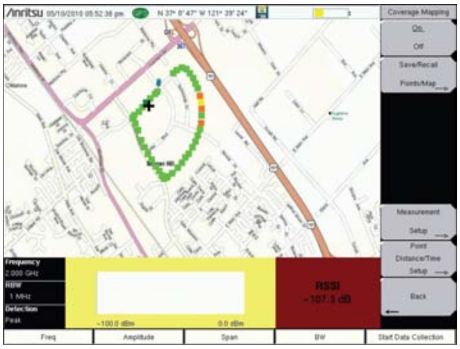


Interference Mapping

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

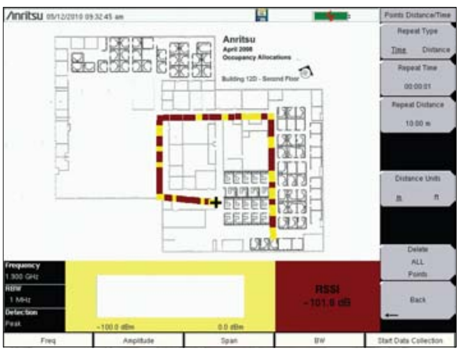
Cell Master™ Base Station Analyzer Features

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.

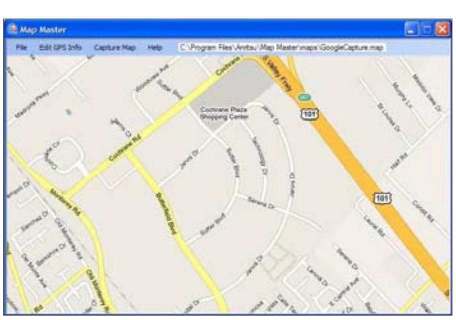


On-screen Indoor Coverage Mapping

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.



Map Master™

Map Master is a PC-based program that allows you to capture maps with GPS coordinates that can be imported into the instrument via a USB drive.

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 ratio operators, and government officials with indoor and outdoor mapping capabilities

Outdoor Mapping

With a GPS antenna 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 Spectrum 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.

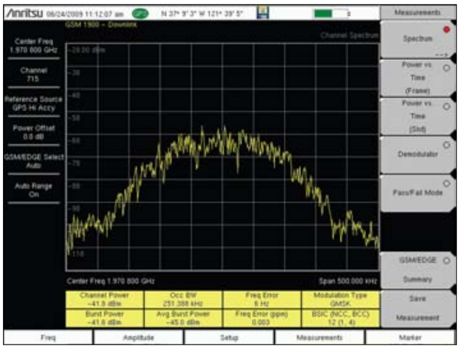
Map Master™

The Map Master program creates maps on your PC compatible with the Cell Master. Maps are created by typing in the address or by converting existing JPEG, TIFF, BMP, GIF, and PNG files to MAP files. Utilizing the built-in zoom in and zoom out features, it is easy to create maps of the desired location on your PC and transfer to the instrument with a USB flash drive. Map Master also includes a GPS editor for inputting latitude and longitude information of maps from different formats.

Coverage Mapping Measurements

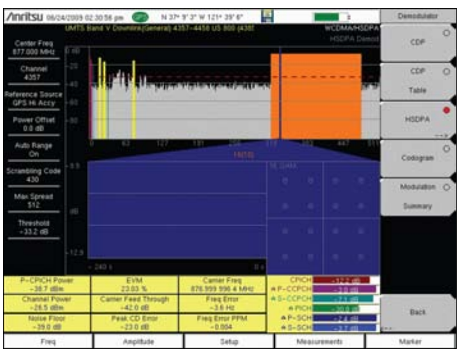
Spectrum Analyzer Mode
- ACPR
- RSSI

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.

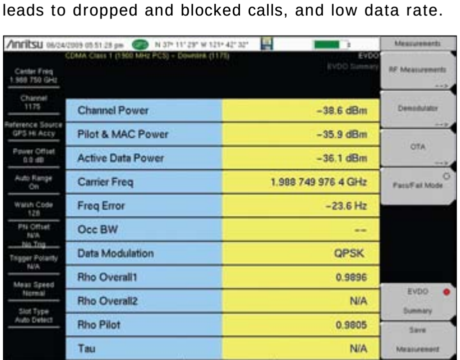


Demodulation – HSDPA

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 MT8212E on commercial base stations carrying live traffic. To understand when, where, how, and why you make these measurements Anritsu publishes Troubleshooting Guides which explains 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 Base Stations
- GSM/GPRS/EDGE Base Stations
- W-CDMA/HSDPA Base Stations
- CDMA2000 1X Base Stations
- CDMA2000 1xEV-DO Base Stations
- Fixed WiMAX Base Stations
- Mobile WiMAX Base Stations
- TD-SCDMA/HSDPA Base Station

Signal Analyzers

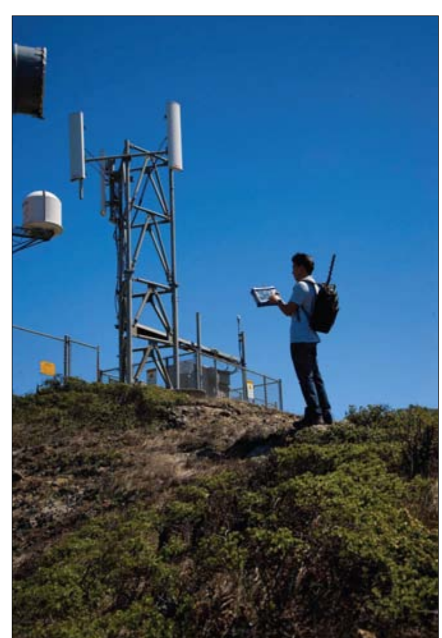
LTE
GSM/GPRS/EDGE
W-CDMA/HSDPA
cdmaOne/CDMA2000 1X
CDMA2000 1xEV-DO
Fixed WiMAX
Mobile WiMAX
TD-SCDMA

Typical Signal Analyzer Options

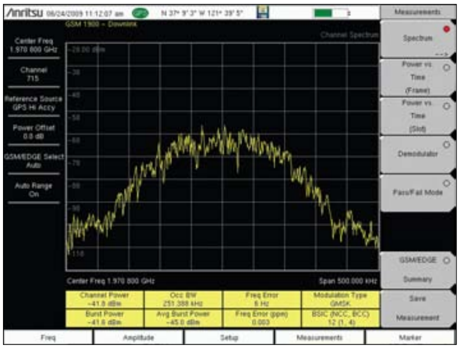
RF Measurements
Demodulation
Over-the-Air Measurements

Signal Analyzer Features

Measurement Summary Display
Pass/Fail Limit Testing

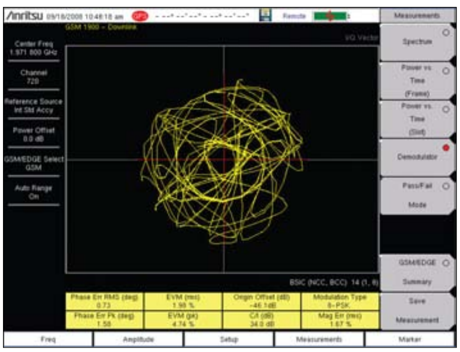


GSM / GPRS / EDGE Signal Analyzers (Options 0040, 0041)



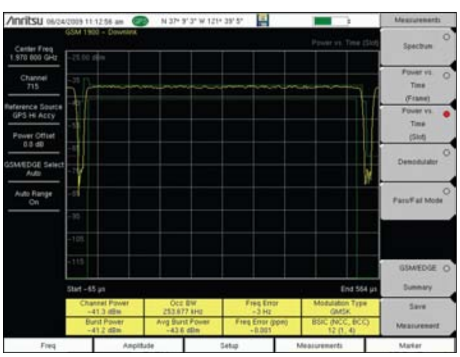
RF Measurement – Occupied Bandwidth

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



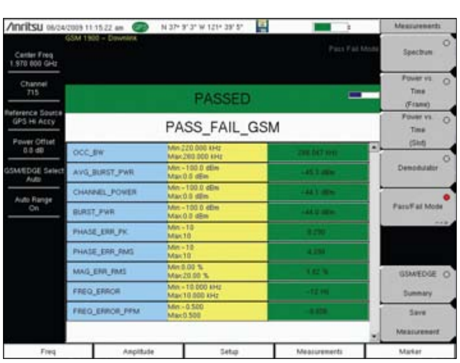
Demodulation – Error Vector Magnitude (EVM)

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 / GPRS / EDGE Analyzers

The Cell Master features two GSM/GPRS/ 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 your 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

(Option 0040)

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

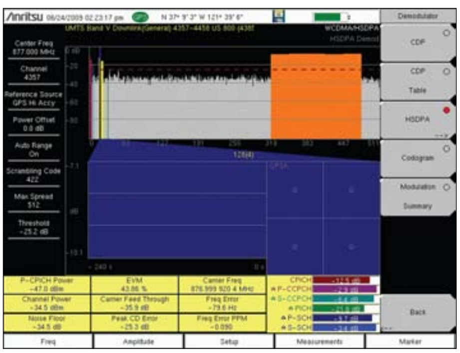
(Option 0041)

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

W-CDMA/HSDPA Signal Analyzers (Options 0044, 0045 or 0065, 0035)

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.

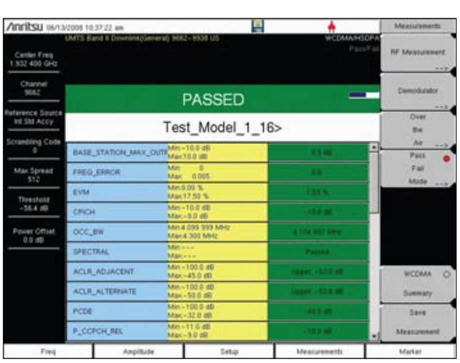


Demodulation – Error Vector Magnitude (EVM)

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/HSDPA Signal Analyzers

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

- RF Measurements
- Demodulation (two choices)
- 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 correct. 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

(Option 0044)

Band Spectrum
Channel Spectrum
- Channel Power
- Occupied Bandwidth
- Peak-to-Average Power

Spectral Emission Mask
Single carrier ACLR
Multi-carrier ACLR

Demodulation

(Option 0045 or 0065)

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
- HSDPA (Option 0065 only)
  - 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

(Option 0035)

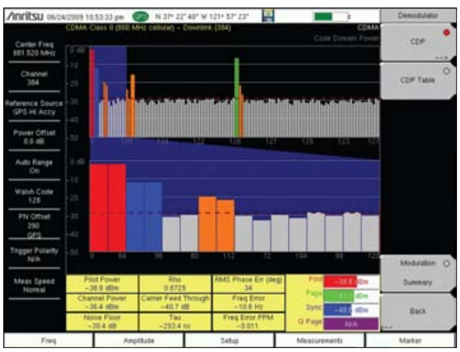
Scrambling Code Scanner (Six)
- Scrambling Codes
- CPICH
- E_c/I_o
- E_c
- Pilot Dominance
- OTA Total Power

Multipath Scanner (Six)
- Six Multipaths
- Tau
- Distance
- RSCP
- Relative Power
- Multipath Power

cdmaOne/CDMA2000 1X Signal Analyzers (Options 0042, 0043, 0033)

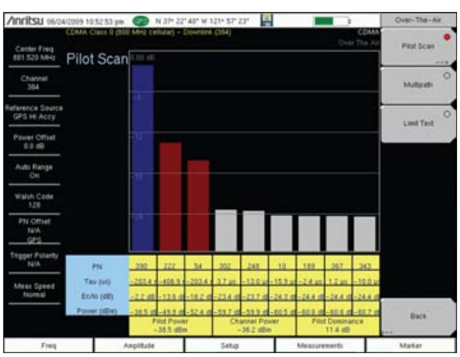
RF Measurements – Spectral Emissions Mask

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



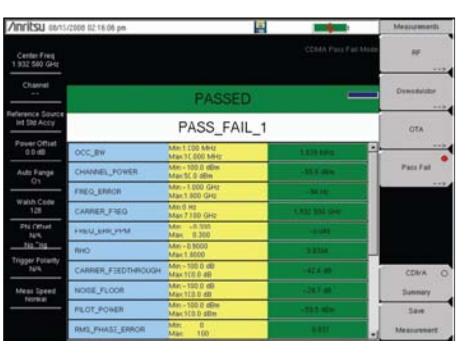
Modulation Quality – EVM

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

(Option 0042)

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

Demodulation

(Option 43)

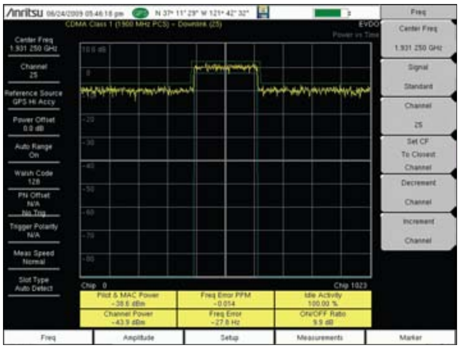
- Code Domain Power Graph
  - Pilot Power
  - Channel Power
  - Noise Floor
  - Rho
  - Carrier Feed Through
  - Tau
  - RMS Phase Error
  - Frequency Error
  - Abs/Rel/ Power
    - Pilot
    - Page
    - Sync
    - Q Page
- Code Domain Power Table
  - Code
  - Status
  - Power
  - Multiple Codes
  -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

Over-the-Air (OTA) Measurements

(0ption 33)

- 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

CDMA2000 1xEV-DO Signal Analyzers (Options 0062, 0063, 0034)

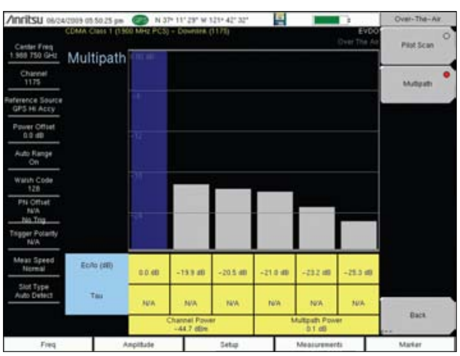


RF Measurements – Pilot and MAC Power

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

(Option 0062)

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

Demodulation

(Option 0063)

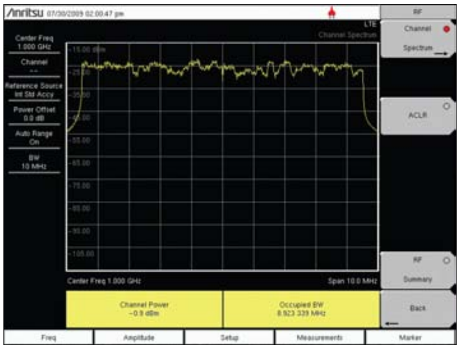
- MAC Code Domain Power Graph
  - Pilot & MAC Power
  - Channel Power
  - Frequency Error
  - Rho Pilot
  - Rho Overall
  - Data Modulation
  - Noise Floor
- MAC Code Domain Power Table
  - Code
  - Status
  - Power
  - Code Utilization
- Data Code Domain Power
  - Active Data Power
  - Data Modulation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

Over-the-Air (OTA) Measurements

(Option 0034)

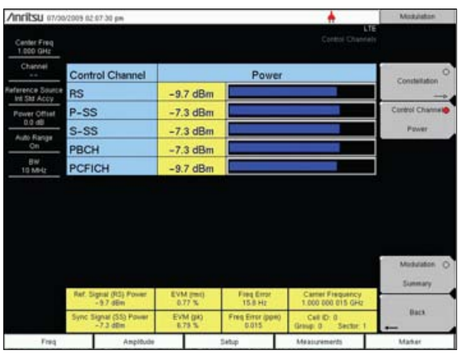
- Pilot Scanner (Nine)
  - PN
  - E_c/I_o
  - Tau
  - Pilot Power
  - Channel Power
  - Pilot Dominance
- Mulitpath Scanner (Six)
  - E_c/I_o
  - Tau
  - Channel Power
  - Multipath Power

LTE Signal Analyzers (Options 0541, 0542, 0546)



RF Measurements – Occupied Bandwidth

The bandwidth that contains 99% of the total carrier power. Excessive occupied bandwidth means excessive adjacent channel interference.



Modulation Quality – 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 – 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.

LTE Signal Analyzers

The Cell Master features three 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

Frequency Error

Frequency Error is a check to see that the carrier frequency is precisely correct. 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.

Sync Signal Mapping

Sync Signal Scanner can be used with the GPS to save scan results for later display on a map. The EVM of the strongest synch signal available at that spot is also recorded. The Cell, Sector, and Group ID information is also included so that it's easier to interpret the results. Once the Synch Signals are mapped, it becomes much easier to understand and troubleshoot any interference or coverage issues.

RF Measurements (Option 0541)

Channel Spectrum
- Channel Power
- Occupied Bandwidth

ACLR

Modulation Measurements (10 MHz Bandwidth) (Option 0542)

Constellation
- Reference Signal Power
- Sync Signal Power
- EVM
- Frequency Error
- Carrier Frequency
- Cell ID
- Sector ID
- Group ID

Control Channel Power
- RS
- P-SS
- S-SS
- PBCH
- PCFICH

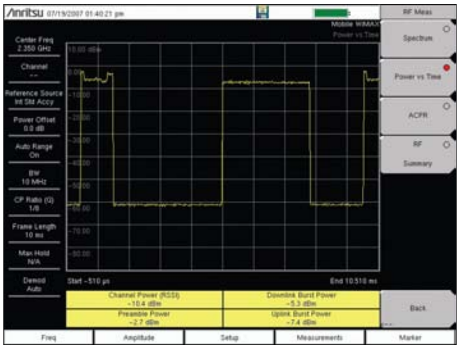
Over-the-Air Scanner (OTA) (Option 0546)

Synch Signal Power (Six Strongest)
- Power
- Cell ID
- Sector ID
- Group ID

Dominance

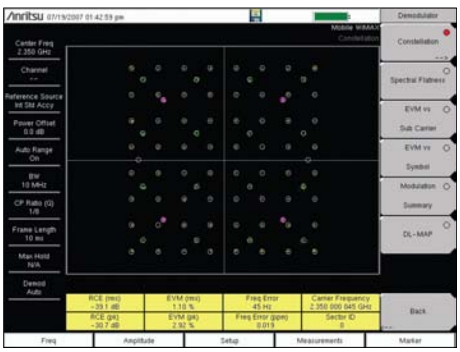
Auto-Save with GPS Tagging and Logging

Fixed and Mobile WiMAX Signal Analyzers (Options 0046, 0047, 0066, 0067, 0037)



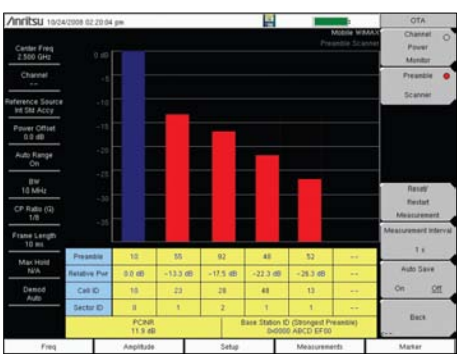
RF Measurement – Preamble Power

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.



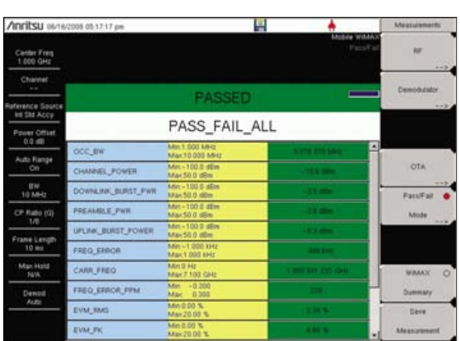
Demodulation – Frequency Error

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) Reletive 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
(Option 0046/0066, Fixed/Mobile)

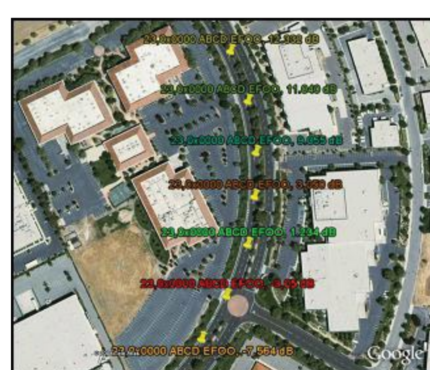
- Channel Spectrum
  - Channel Power
  - Occupied Bandwidth
- Power vs. Time
  - Channel Power
  - Preamble Power
  - Downlink Burst Power (Mobile only)
  - Uplink Burst Power (Mobile only)
  - Data Burst Power (Fixed only)
  - Crest Factor (Fixed only)
- ACPR

Demodulation (10 MHz maximum)
(Option 0047/0067, Fixed/Mobile)

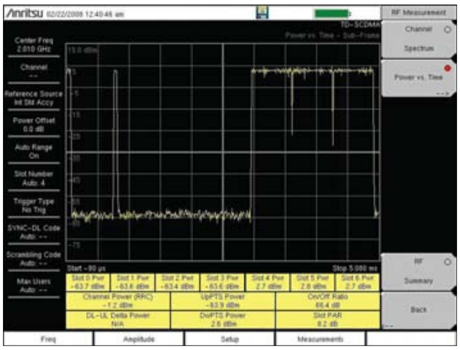
- Constellation
  - RCE (RMS/Peak)
  - EVM (RMS/Peak)
  - Frequency Error
  - CINR (Mobile only)
  - Base Station ID
  - Carrier Frequency
  - Sector ID
- Spectral Flatness
  - Adjacent Subcarrier Flatness
- EVM vs. Subcarrier/Symbol
  - RCE (RMS/Peak)
  - EVM (RMS/Peak)
  - Frequency Error
  - CINR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

Over-the-Air (OTA)
(Option 0037 Mobile only)

- 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

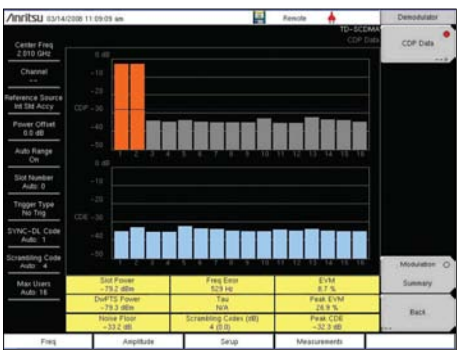


TD-SCDMA / HSDPA Signal Analyzers (Options 0060, 0061, 0038)



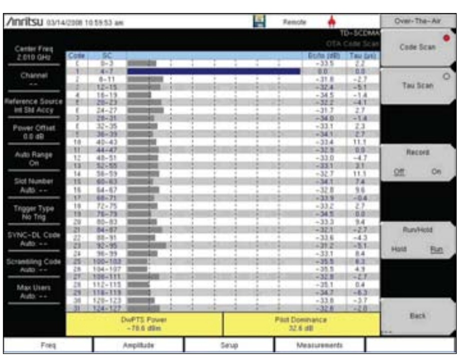
RF Measurement – Time Slot Power

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.



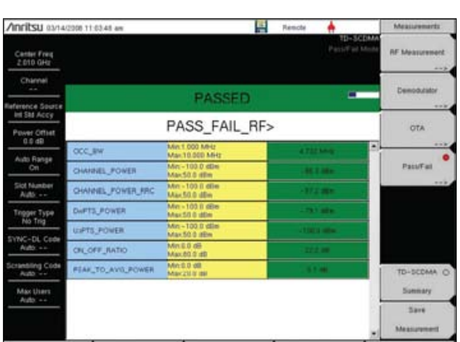
Demodulation – Scrambling Code

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 / HSDPA Signal Analyzers

The Cell Master features three TD-SCDMA/ HSDPA 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_o

E_c/I_o 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 Ec/ Io 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

(Option 0060)

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

(Option 0061)

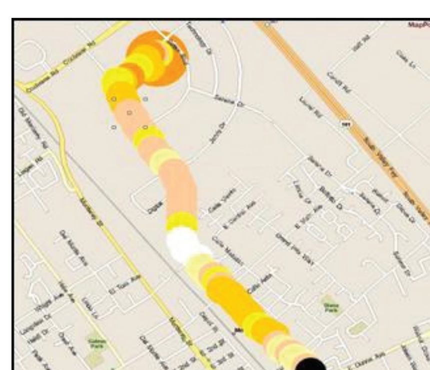
Code Domain Power/Error
- (QPSK/8 PSK/16 QAM)
- Slot Power
- DwPTS Power
- Noise Floor
- Frequency Error
- Tau
- Scrambling Code
- EVM
- Peak EVM
- Peak Code Domain Error

Over-the-Air (OTA) Measurements

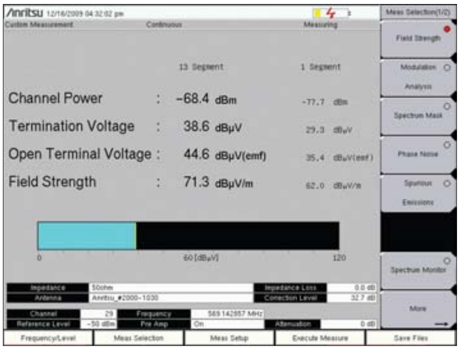
(Option 0038)

Code Scan (32)
- Scrambling Code Group
- Tau
- E_c/I_o
- DwPTS Power
- Pilot Dominance

Tau Scan (Six)
- Sync-DL#
- Tau
- E_c/I_o
- DwPTS Power
- Pilot Dominance

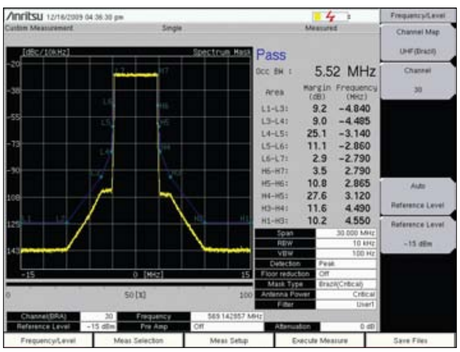


ISDB-T Signal Analyzers (Options 0030, 0032)



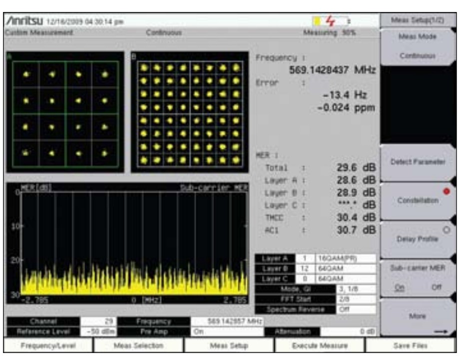
RF Measurements – Signal Power

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



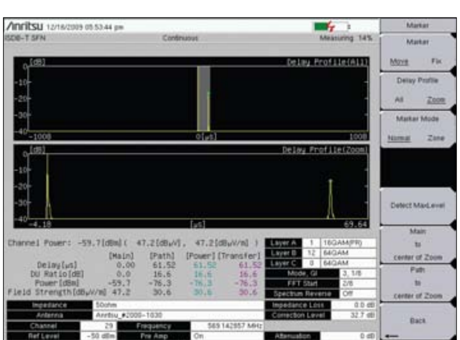
RF Measurements – Spectrum Mask

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 televisual 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) Japan
  - Mask (Standard B) Japan
  - Mask (Critical) Brazil
  - Mask (Sub-critical) Brazil
  - Mask (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

Measurement Modes

(Option 0030)

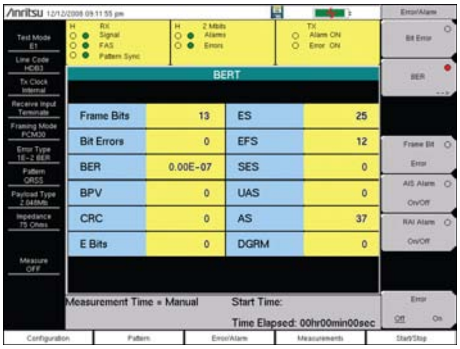
- Custom
  - User specified measurement and setup parameters
- Easy
  - User specified measurements. Some setup parameters are automatically set or detected
- Batch
  - User specified measurements and channels for automatic measurement, display of results and storage

SFN Analysis

(Option 0032)

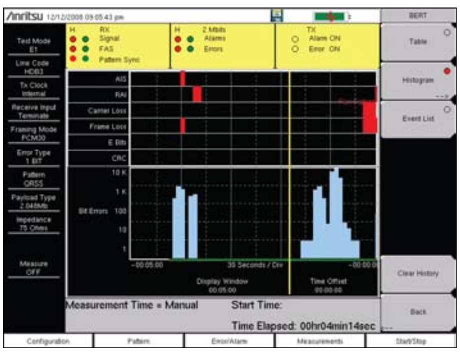
- Delay Profile (w/zoom)
- Inband Spectrum
- Measured Data
  - Channel Power
  - Delay
  - DU Ratio
  - Power
  - Field Strength

Backhaul Analyzers (Options 0051, 0052, 0053)



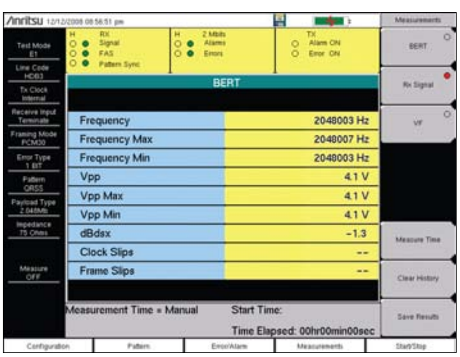
Bi-Polar Violation (BPV)

BPVs occur when the polarity does not switch every time a "1" is transmitted. BPVs are symptoms of low signal quality and result in lower, or no, throughput.



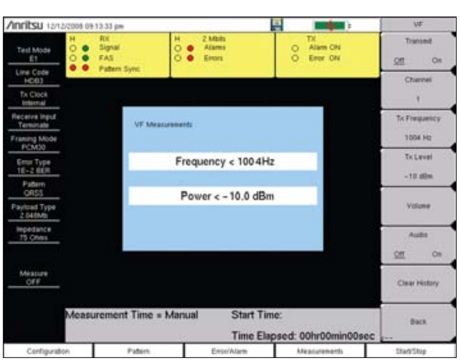
Histogram – Cyclic Redundancy Check (CRC)

CRC errors result in a lower overall throughput for the T1 link. CRC errors can indicate problems bad enough to shut down the link.



Rx Signal Measurements – Vpp

Unusually low Vpp leads to a high bit error rate or alarms, loss of sync and loss of carrier. Unusually high Vpp leads to signal clipping and bit errors.



VF Channel Measurements

Verifies the level and frequency of the VF Channel. Through the speaker the tester can make an audible assessment of the signal quality of the circuit.

Backhaul Analyzers

The Cell Master features three Backhaul Analyzer measurement modes:

- E1 Analyzer
- T1 Analyzer
- T13/T1 Analyzer

The goal of these measurements is to maximize throughput for the cell site so the base station can operate at maximum call capacity and data rates for a good customer experience.

Wireless operators need to test the backhaul circuits prior to acceptance from the Telco and for troubleshooting faults. When troubleshooting cell site technicians or RF engineers first step is decide if the fault is on the Telco side of the demarcation point or on the wireless operator's side, since that determines who needs to fix the fault.

When identifying faults, the troubleshooting can often be done by monitoring an in-service signal, looking for data related errors. However, in some cases, in-service testing is not enough, and an out-of-service test must be performed.

Bit Error Rate Test (BERT)

A Bit Error Rate Test will measure how accurately a backhaul circuit can send and receive data. BER testing is always an out-of-service activity. Errors will cause re-transmissions and a lower over-all data rate. Large numbers of errors will shut down the circuit.

Frame Loss

Frame Loss counts errors in the framing bits. Framing errors do not accumulate as fast as other errors. When monitored for extended periods of time, framing errors can become a valuable indication of signal quality. Frame Loss result in lower, or no, throughput.

Carrier Loss

Carrier Loss keeps track of times that the carrier is interrupted which means the line is dropped and the cell site is off the air.

Frequency Accuracy

Frequency refers to the number of bits per second on the backhaul line. Poor frequency accuracy leads to slipped frames and data loss.

E1 Measurements

(Option 0052)

Error Detection
- Frame Bits, Bit Errors, BER, BPV, CRC, E Bits

Error Analysis
- Errored Seconds (ES)
- Error Free Seconds (EFS)
- Severely Errored Seconds (SES)
- Unavailable Seconds (UAS)
- Available Seconds (AS)
- Degraded Minutes (DGRM)

Rx Signal
- Frequency, Vpp (Max/Min), dBdsx, Clock Slips, Frame Slips

VF
- Frequency, Power

T1 Measurements

(Option 0051)

Error Detection
- Frame Bits, Bit Errors, BER, BPV, CRC, PATLS

Error Analysis
- Errored Seconds (ES)
- Error Free Seconds (EFS)
- Severely Errored Seconds (SES)
- Unavailable Seconds (UAS)
- Available Seconds (AS)
- Degraded Minutes (DGRM)

Rx Signal
- Frequency, Vpp (Max/Min), dBdsx, Clock Slips, Frame Slips

VF
- Frequency, Power

T3 Measurements

(Option 0053)

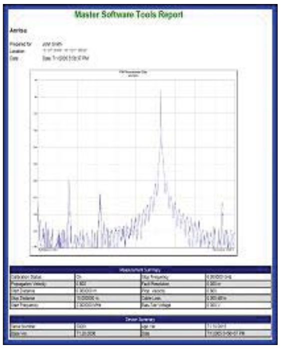
Error Detection
- Frame Bits, Bit Errors, BER, BPV, Lof Count, P-bit Errors, C-bit Errors, FEBE Errors

Error Analysis
- Excess Zeros
- Errored Seconds (ES)
- Error Free Seconds (EFS)
- Severely Errored Seconds (SES)
- Unavailable Seconds (UAS)
- Available Seconds (AS)
- Degraded Minutes (DGRM)
- Pattern Loss Seconds (PATLS)

Rx Signal
- Frequency, Vpp (Max/Min), dBdsx

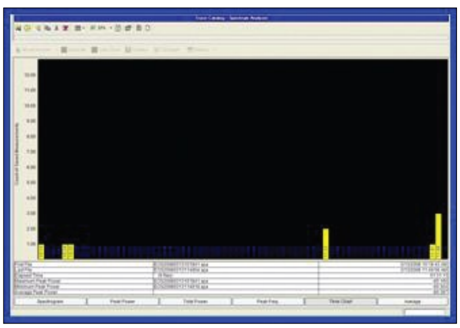
VF
- Frequency, Power

Master Software Tools (for your PC)



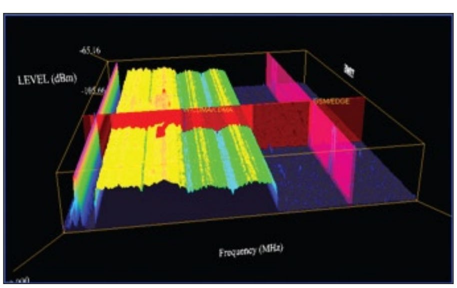
Report Generation

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



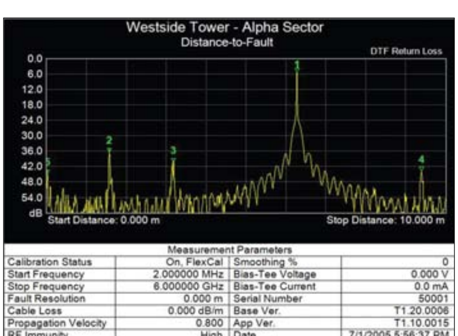
Histogram

Once certain frequencies have been identified, the data can be filtered and displayed in a histogram with the number of occurrences and time of day.



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.



Import HHST *.DAT Files

Compatiblity is retained with Handheld Software Tools (HHST) with a *.dat file converter which converts HHST files to MST file format and vice-versa.

Master Software Tools

Master Software Tools (MST) is a powerful PC software post-processing tool designed to enhance the productivity of technicians in report generation, data analysis, and testing automation. Master Software Tools can be downloaded from us.anritsu.com. Cell Master cable and antenna measurements can be saved as .DAT and are compatible with HHST.

Trace Rename Utility and Group Edit

Trace Rename Utility allows a user to rename filenames, titles, and subtitles globally. Group Edit allows users to edit the actual traces simultaneously on similar files, both without opening the files.

Trace Editor

For VNA traces, select markers to peak and valley and displays individual values for Return Loss, Cable Loss, VSWR, Magnitude, Phase and milliRho. For SPA measurements set limit line envelopes, edit limit lines segments and turn on and off segments. Also, edit frequency and amplitude parameters.

Folder Spectrogram

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

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

Script Master™

Script Master is an automation tool which allows the user to embed the operator's test procedure inside the Cell Master. This feature is available for GSM/EDGE, WCDMA/HSDPA and Channel Scanner applications.

In W-CDMA/HSDPA and GSM/EDGE the user can include instructions in the form of pictures and text to help the technicians configure their setup prior to the test. One test can be configured to run across both W-CDMA and GSM modes.

Using Channel Scanner Script Master, the user can create a list of up to 1200 channels and let the Cell Master sequence through the channels 20 at a time and automatically make measurements.

Database Management
Full Trace Retrieval
Trace Catalog
Trace Rename Utility
Group Edit
Trace Editor
DAT File Converter

Data Analysis
Trace Math and Smoothing
Data Converter
Measurement Calculator

Report Generation
Report Generator
Edit Graph
Report Format
Export Measurements
Notes

Mapping (GPS Required)
Spectrum Analyzer Mode
Mobile WiMAX OTA Option
TS-SCDMA OTA Option

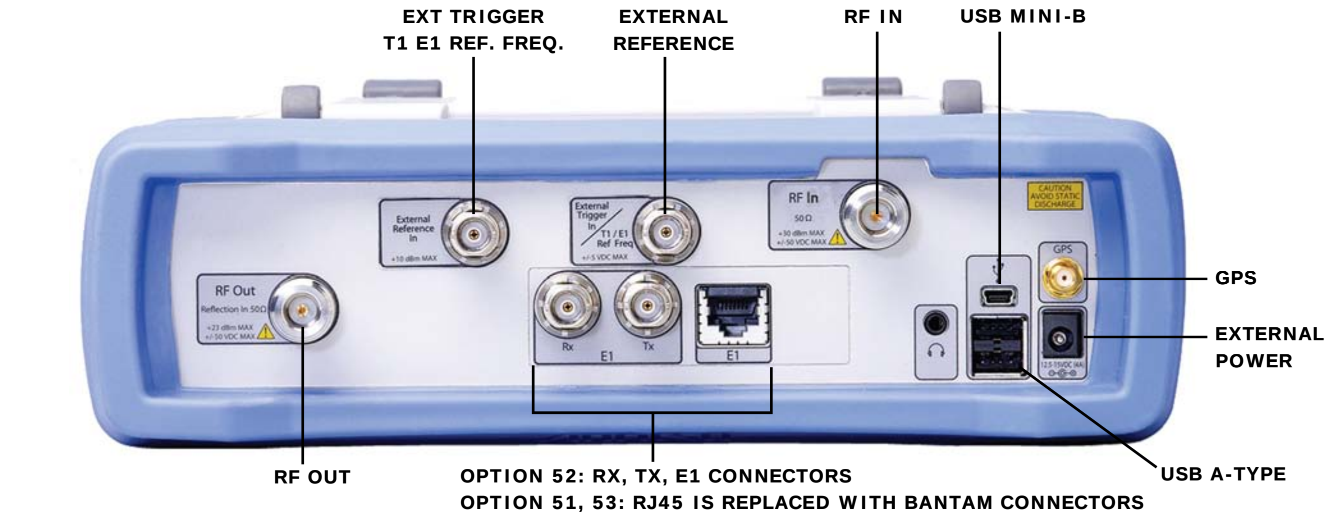
Folder Spectrogram
Folder Spectrogram – 2D View
Video Folder Spectrogram – 2D View
Folder Spectrogram – 3D View

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

Script Master™
Channel Scanner Mode
GSM/GPRS/EDGE Mode
W-CDMA/HSDPA Mode

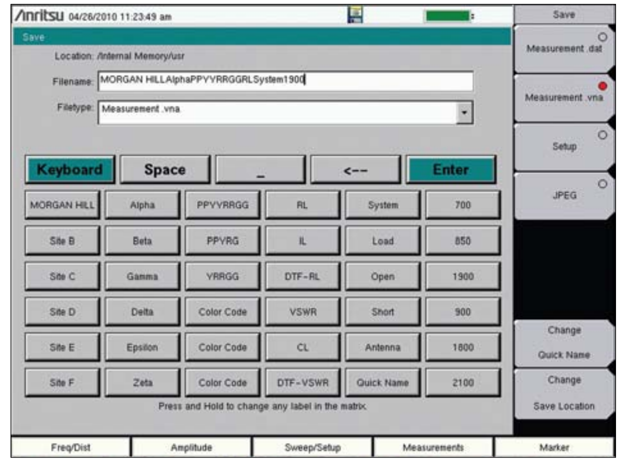
Connectivity
Connect PC using USB, Ethernet
Download measurements and live traces
Firmware Updates

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)



TOUCHSCREEN MENU

The Menu Key activates the touchscreen menu for one button access to all of the Analyzers.

User defined shortcuts can be created for one-button access to commonly used functions.

TOUCHSCREEN KEYBOARD

A built-in touchscreen 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 BAILS 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
100 kHz to 4 GHz	100 kHz to 6 GHz	Spectrum Analyzer
10 MHz to 4 GHz	10 MHz to 6 GHz	Power Meter
Options		
MT8212E-0021	MT8213E-0021	2-Port Transmission Measurement
MT8212E-0010	MT8213E-0010	Bias Tee
MT8212E-0031	MT8213E-0031	GPS Receiver (Requires Antenna P/N 2000-1528-R)
MT8212E-0019	MT8213E-0019	High-Accuracy Power Meter
MT8212E-0025	MT8213E-0025	Interference Analyzer*
MT8212E-0027	MT8213E-0027	Channel Scanner
MT8212E-0431	MT8213E-0431	Coverage Mapping*
MT8212E-0090	MT8213E-0090	Gated Sweep
MT8212E-0028	MT8213E-0028	C/W Signal Generator (Requires CW Signal Generator Kit, P/N 69793)
MT8212E-0040	MT8213E-0040	GSM/GPRS/EDGE RF Measurements
MT8212E-0041	MT8213E-0041	GSM/GPRS/EDGE Demodulation
MT8212E-0044	MT8213E-0044	W-CDMA/HSDPA RF Measurements
MT8212E-0045	MT8213E-0045	W-CDMA Demodulation
MT8212E-0065	MT8213E-0065	W-CDMA/HSDPA Demodulation
MT8212E-0035	MT8213E-0035	W-CDMA/HSDPA Over-the-Air Measurements*
MT8212E-0060	MT8213E-0060	TD-SCDMA/HSDPA Measurements
MT8212E-0061	MT8213E-0061	TD-SCDMA/HSDPA Demodulation
MT8212E-0038	MT8213E-0038	TD-SCDMA/HSDPA Over-the-Air Measurements
MT8212E-0541	MT8213E-0541	LTE RF Measurements*
MT8212E-0542	MT8213E-0542	LTE Modulation Measurement*
MT8212E-0546	MT8213E-0546	LTE Over-the-Air Measurements*
MT8212E-0042	MT8213E-0042	cdmaOne/CDMA2000 1X RF Measurements
MT8212E-0043	MT8213E-0043	cdmaOne/CDMA2000 1X Demodulation
MT8212E-0033	MT8213E-0033	cdmaOne/CDMA2000 1X Over-the-Air Measurements*
MT8212E-0062	MT8213E-0062	CDMA2000 1xEV-DO RF Measurements
MT8212E-0063	MT8213E-0063	CDMA2000 1xEV-DO Demodulation
MT8212E-0034	MT8213E-0034	CDMA2000 1xEV-DO Over-the-Air Measurements*
MT8212E-0046	MT8213E-0046	IEEE 802.16 Fixed WiMAX RF Measurements
MT8212E-0047	MT8213E-0047	IEEE 802.16 Fixed WiMAX Demodulation
MT8212E-0066	MT8213E-0066	IEEE 802.16 Mobile WiMAX RF Measurements
MT8212E-0067	MT8213E-0067	IEEE 802.16 Mobile WiMAX Demodulation
MT8212E-0037	MT8213E-0037	IEEE 802.16 Mobile WiMAX Over-the-Air Measurements
MT8212E-0030	MT8213E-0030	ISDB-T Digital Video Measurements
MT8212E-0032	MT8213E-0032	ISDB-T SFN Measurements
MT8212E-0051	MT8213E-0051	T1 Analyzer**
MT8212E-0052	MT8213E-0052	E1 Analyzer**
MT8212E-0053	MT8213E-0053	T3/T1 Analyzer**
MT8212E-0098	MT8213E-0098	Standard Calibration (ANSI Z540-1-1994)
MT8212E-0099	MT8213E-0099	Premium Calibration (ANSI Z540-1-1994 plus test data)

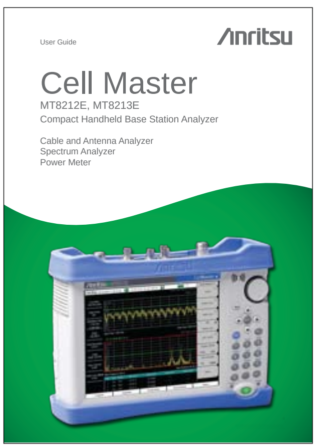
*Requires GPS Receiver Option 0031
**Mutually exclusive

Cell Master™ Base Station Analyzer Ordering Information

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

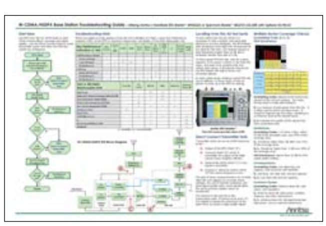
Part Number	Description
PSN50	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +20 dBm
MA24104A	Inline High Power Sensor, 600 MHz to 4 GHz, +51.76 dBm
MA24106A	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +23 dBm
MA24108A	Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
MA24118A	Microwave USB Power Sensor, 10 MHz to 18 GHz, +20 dBm
MA24126A	Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 dBm

Manuals (soft copy included on MST CD and at www.anritsu.com)



Part Number	Description
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
10580-00231	Spectrum Analyzer Measurement Guide - Interference Analyzer, Channel Scanner, Gated Sweep, CW Signal Generator, AM/FM/PM Analyzer, Interference Mapping, Coverage Mapping
10580-00240	Power Meter Measurement Guide - High Accuracy Power Meter
10580-00234	3GPP Signal Analyzer Measurement Guide - GSM/EDGE, W-CDMA/HSDPA, TD-SCDMA/HSDPA, LTE
10580-00235	3GPP2 Signal Analyzer Measurement Guide - CDMA, EV-DO
10580-00236	WiMAX Signal Analyzer Measurement Guide - Fixed WiMAX, Mobile WiMAX
10580-00237	Digital TV Measurement Guide - DVB-T/H, ISDB-T
10580-00238	Backhaul Analyzer Measurement Guide - T1, E1, T3/T1
10580-00215	ODTF-1 Optical Distance-to-Fault Module
10580-00256	Programming Manual

Troubleshooting Guides (soft copy included on MST CD and at www.anritsu.com)



11410-00473	Cable, Antenna and Components
11410-00551	Spectrum Analyzers
11410-00472	Interference
11410-00566	LTE eNode 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	E1 Backhaul Testing

Standard Accessories (included with instrument)

10580-00250	Cell Master User Guide (includes Bias-Tee, GPS Receiver)
3-68736	Soft Carrying Case
2300-498	MST CD: Master Software Tools, User/Measurement Guides, Programming Manual, Troubleshooting Guides, Application Notes
633-44	Rechargeable Li-Ion Battery
40-168-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

Cell Master™ Base Station Analyzer Ordering Information

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
OSLN50-1	Precision Open/Short/Load, N(m), 42 dB, 6.0 GHz, 50 Ω
OSLNF50-1	Precision Open/Short/Load, N(f), 42 dB, 6.0 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

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)

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)

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)

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

Adapters


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	BNC(f) to N(m), DC to 1.3 GHz, 50 Ω
510-90	7/16 DIN(f) to N(m), DC to 7.5 GHz, 50 Ω
510-91	7/16 DIN(f) to N(f), DC to 7.5 GHz, 50 Ω
510-92	7/16 DIN(m) to N(m), DC to 7.5 GHz, 50 Ω
510-93	7/16 DIN(m) to N(f), DC to 7.5 GHz, 50 Ω
510-96	7/16 DIN(m) to 7/16 DIN (m), DC to 7.5 GHz, 50 Ω
510-97	7/16 DIN(f) to 7/16 DIN (f), DC to 7.5 GHz, 50 Ω
1091-379-R	7/16 DIN(f) to 7/16 DIN(f), DC to 6 GHz, 50 Ω, w/ Reinforced Grip
510-102-R	N(m) to N(m), DC to 11 GHz, 50 Ω, 90 degrees right angle

Optional Accessories (continued)

Precision Adapters

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

Miscellaneous Accessories

2000-1528-R	GPS Antenna, SMA(m)
69793	CW Signal Generator Kit
ODTF-1	Optical Distance-to-Fault Module, 1550 nm, Single Mode
2000-1520-R	2 GB USB Flash Drive
2000-1374	External Charger for Li-Ion Batteries
2300-532	Map Master CD

Backpack and Transit Case

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

Directional Antennas

Part Number	Description
2000-1411-R	824 MHz to 896 MHz, N(f), 10 dBd, Yagi
2000-1412-R	885 MHz to 975 MHz, N(f), 10 dBd, Yagi
2000-1413-R	1710 MHz to 1880 MHz, N(f), 10 dBd. Yagi
2000-1414-R	1850 MHz to 1990 MHz, N(f), 9.3 dBd, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N(f), 10 dBd, Yagi
2000-1416-R	1920 MHz to 2170 MHz, N(f), 10 dBd, Yagi
2000-1519	500 MHz to 3000 MHz, log periodic

Portable Antennas

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 (1/4 wave)
2000-1030-R	1710 MHz to 1880 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1474-R	1710 MHz to 1880 MHz with knuckle elbow (1/2 wave)
2000-1031-R	1850 MHz to 1990 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1475-R	1920 MHz to 1980 MHz and 2110 MHz to 2170 MHz, SMA(m), 50 Ω
2000-1032-R	2400 MHz to 2500 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1361-R	2400 MHz to 2500 MHz, 5000 MHz to 6000 MHz, SMA(m), 50 Ω
2000-1636-R	Antenna Kit (Consists of: 2000-1030, 2000-1031, 2000-1032-R, 2000-1200, 2000-1035, 2000-1361, and carrying pouch)

Cell Master™ Base Station Analyzer Ordering Information

Optional Accessories (continued)

Bandpass Filters

1030-114-R	806-869 MHz, N(m) to SMA(f), 50 Ω
1030-109-R	824-849 MHz, N(m) to SMA(f), 50 Ω
1030-110-R	880-915 MHz, N(m) to SMA(f), 50 Ω
1030-105-R	890-915 MHz Band, 0.41 dB loss, N(m) to SMA(f), 50 Ω
1030-111-R	1850-1910 MHz, N(m) to SMA(f), 50 Ω
1030-106-R	1710-1790 MHz Band, 0.34 dB loss, N(m) to SMA(f), 50 Ω
1030-107-R	1910-1990 MHz Band, 0.41 dB loss, N(m) to SMA(f), 50 Ω
1030-112-R	2400-2484 MHz, N(m) to SMA(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	2500-2700 MHz, N(m) to N(f), 50 Ω

Attenuators

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, 5 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)

T1 / E1 Extender Cables

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 to BNC, 75 1/2 RG59 Type Coax Cable
806-176-R	Bantam Plug to Alligator Clips

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