Product Brochure

Anritsu

Spectrum Master™

MS2721B MS2723B MS2724B

9 kHz to 7.1 GHz | 9 kHz to 13 GHz | 9 kHz to 20 GHz

A High Performance Handheld Spectrum Analyzer
and Base Station Analyzer

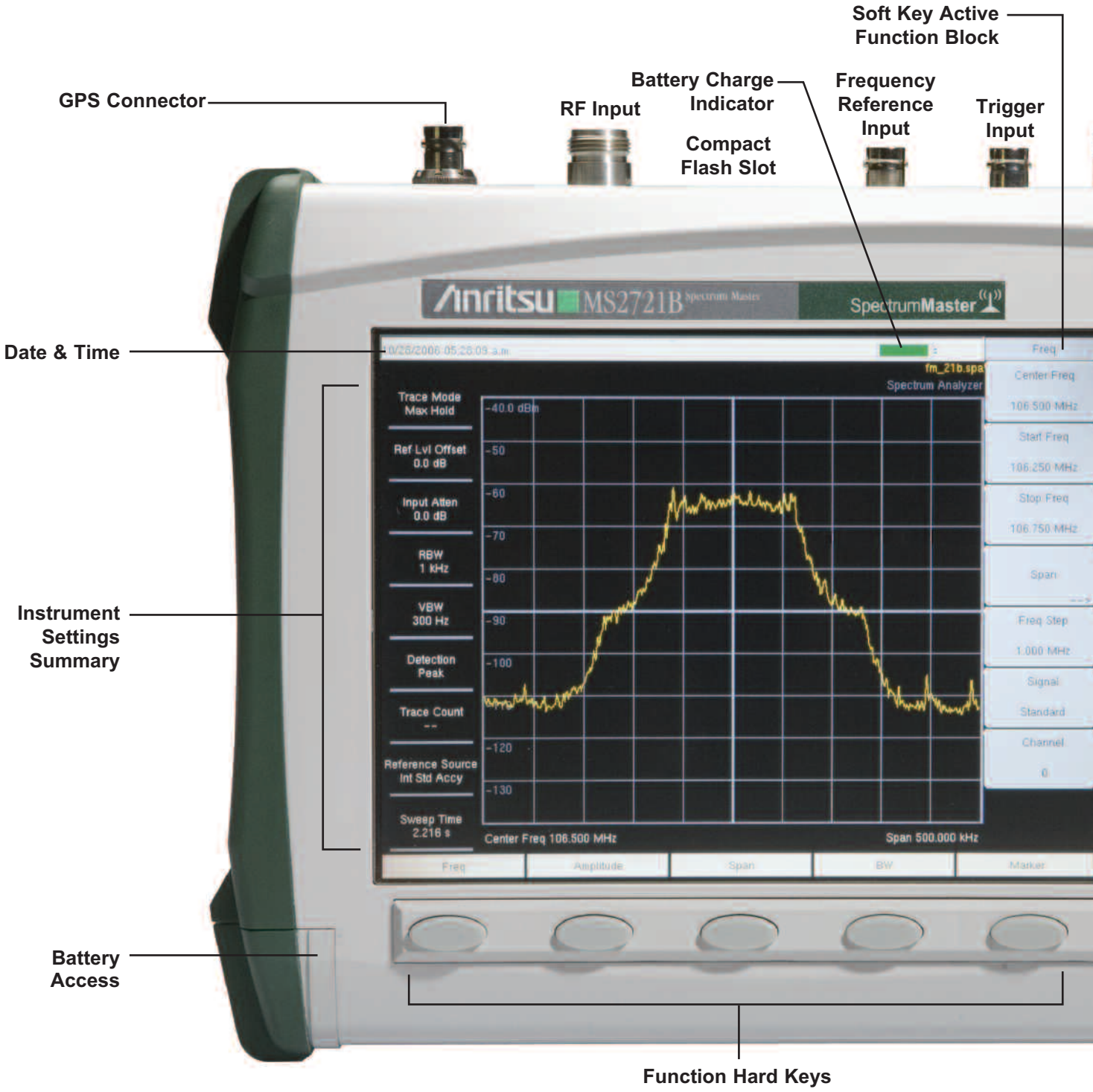
The World's First Available
20 GHz Handheld Spectrum Analyzer

Tracking Generator for MS2721B

3G Demodulation Options for Base Station Test

The World's First 20 GHz Handheld Spectrum Analyzer

The Anritsu MS2721B, MS2723B and MS2724B are the most advanced ultra-portable spectrum analyzers on the market, featuring unparalleled performance and size at a modest price.

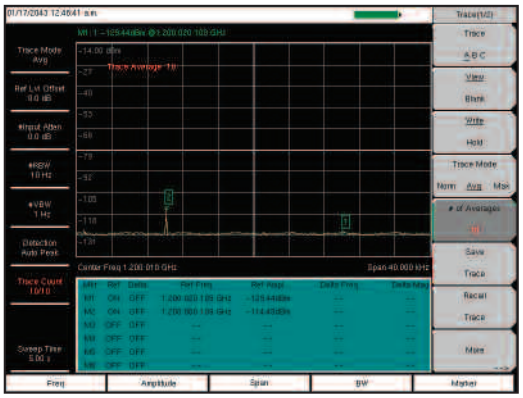


≤–153 dBm Displayed Average Noise Level Typical @ 1 GHz

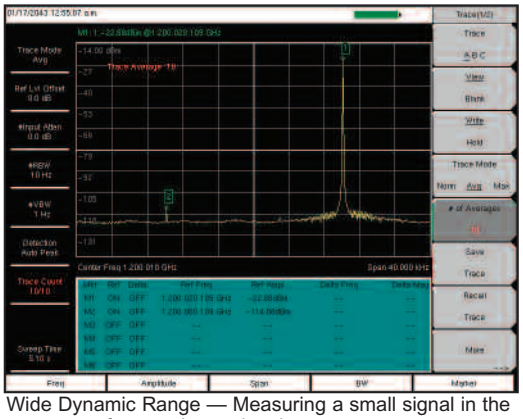
Unprecedented in handheld battery powered spectrum analyzers, the sensitivity of the Spectrum Master family delivers the ability to measure very low level signals. Coupled with a wide range of resolution bandwidth choices, you can configure the Spectrum Master to meet your most challenging measurement needs.

As the spectrum becomes more and more congested, the ability to measure low level signals becomes more and more important not only for interference detection but also for wireless system planning.

Field Use



Measuring a Small Signal



Wide Dynamic Range — Measuring a small signal in the presence of a very large signal

Operating convenience is of paramount importance when equipment is used in the field.

The input attenuation value can be tied to the reference level, reducing the number of parameters a field technician may have to set. The RBW/VBW and the span/RBW ratios can be set to values that are best for the measurements being made, further easing the technician's burden and reducing the chances of errors.

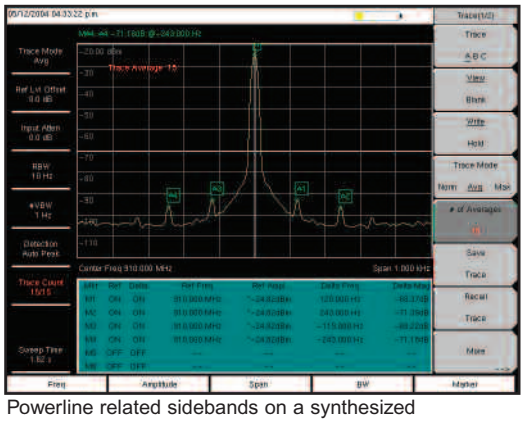
Over 1000 traces with names up to 15 characters long may be saved in the 256 MB non-volatile compact flash memory. These traces can later be copied into a PC using the built-in USB 2.0 connector or the 10/100 Mbit Ethernet connection. Measurements may also be saved directly to Compact Flash or USB Flash Drive.

Commonly needed measurements are built in. These include field strength, occupied bandwidth, channel power, adjacent channel power ratio, AM/FM/SSB demodulation and carrier to interference (C/I) ratio measurements.

The Spectrum Master family has very wide dynamic range, allowing measurement of very small signals in the presence of much larger signals. These pictures show a measurement of a –114 dBm signal with and without the presence of a –22 dBm signal only 20 kHz away.

W-CDMA/HSDPA Signal Analyzer	824 to 894 MHz Band V, VI 1710 to 2170 MHz Band I, II, III, IV 2300 to 2700 MHz
W-CDMA/HSDPA Signal Analyzer	W-CDMA/HSDPA RF Meas W-CDMA Demod W-CDMA/HSDPA Demod W-CDMA/HSDPA OTA
GSM/GPRS/EDGE Signal Analyzer	380 to 400 MHz T-GSM 380 410 to 430 MHz T-GSM 410 450 to 468 MHz GSM 450 478 to 496 MHz GSM 480 698 to 746 MHz GSM 710 747 to 792 MHz GSM 750 806 to 866 MHz T-GSM 810 824 to 894 MHz GSM 850 890 to 960 MHz GSM 900 880 to 960 MHz E-GSM 900 876 to 960 MHz R-GSM 900 870 to 921 MHz T-GSM 900 1710 to 1880 MHz DCS 1800 1850 to 1990 MHz PCS 1900
GSM/GPRS/EDGE Signal Analyzer	GSM/GPRS/EDGE RF Meas GSM/GPRS/EDGE Demod
GPS	Location Indicator Enhance Frequency Reference Oscillator Accuracy

Lab Use



Powerline related sidebands on a synthesized signal generator

Measurement flexibility is important for lab use. Resolution bandwidth and video bandwidth can be independently set to meet a user's measurement needs. In addition the input attenuator value can be set by the user and the preamplifier can be turned on or off as needed.

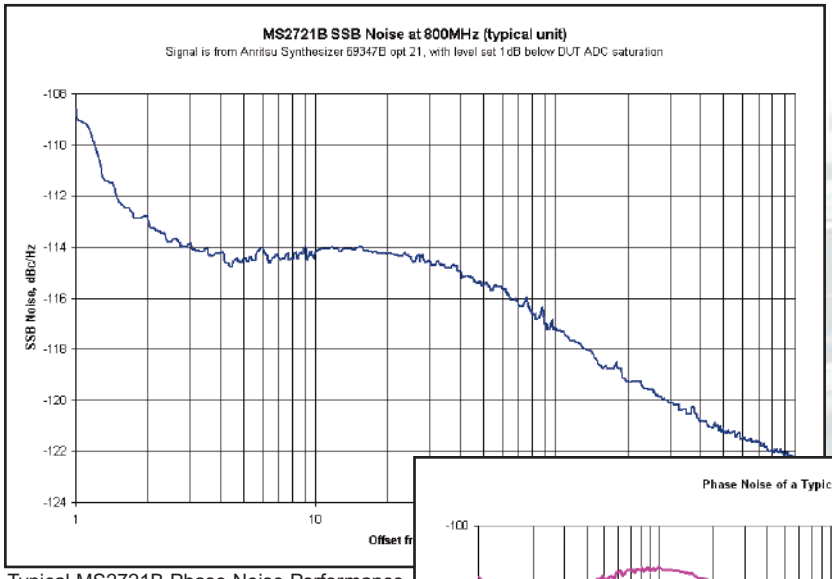
For maximum flexibility, sweep triggering can be set to free run, or to do a single sweep. In zero span, the sweep can be set to trigger when a signal meets or exceeds a certain power level or it can be externally triggered.

The span can be set anywhere from 10 Hz to 7.1, 13, or 20 GHz in addition to zero span.

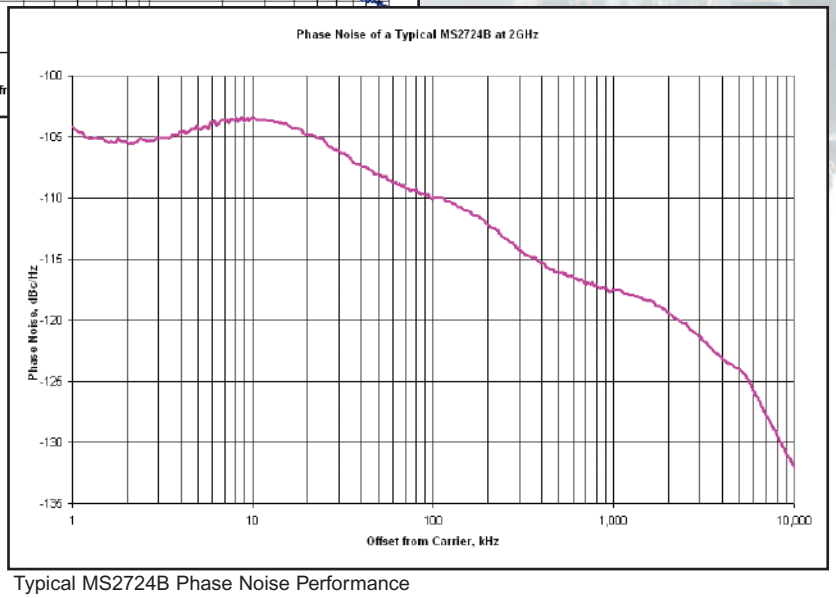
Using battery-powered equipment to measure powerline related sidebands on a signal source removes any question as to the source of the sidebands.

Continuous frequency coverage from 9 kHz to 20 GHz gives the wireless professional the performance needed for the most demanding measurements.

Whether your need is for spectrum monitoring, WiFi and WiFi5 installation and testing, RF and microwave signal measurements or cellular signal measurements, the Spectrum Master family gives you the tools you need to make the job easier and more productive. The built-in AM/FM/SSB demodulator simplifies the job of identifying interfering signals.

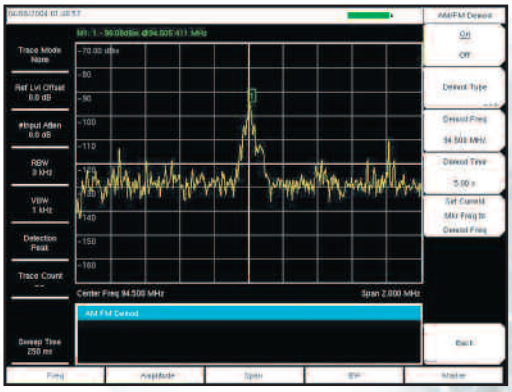


Typical MS2721B Phase Noise Performance

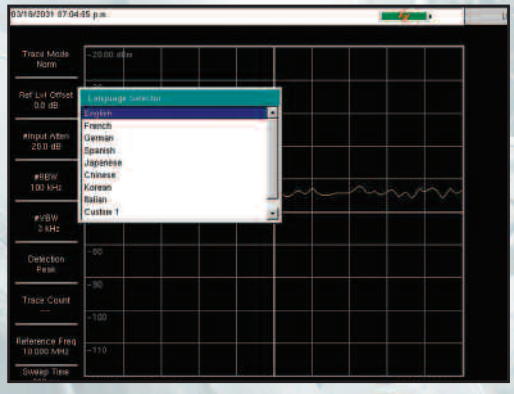


Typical MS2724B Phase Noise Performance

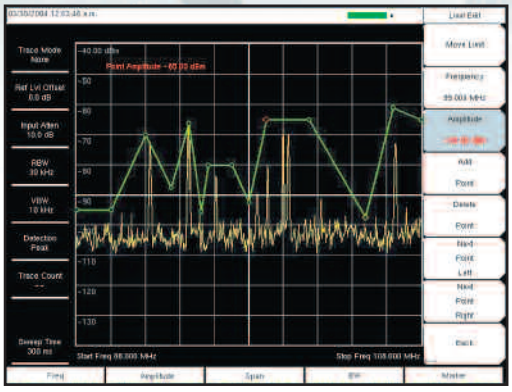
Features



AM, FM and SSB Demodulation



Multiple Language Support



Segmented Limit Lines

Light Weight

Weighing about seven pounds fully loaded, including a Li-Ion battery, this fully functional handheld spectrum analyzer is light enough to take anywhere, including up a tower.

AM/FM/SSB Demodulation

A built-in demodulator for AM, narrowband FM, wideband FM and single sideband (selectable USB and LSB) allows a technician to easily identify interfering signals. The demodulated audio can be heard either through the built-in speaker or through a standard cellphone headset. A demodulation marker is provided for easy tuning.

Remote Tools

Imagine sitting at your desk while controlling an Spectrum Master that is miles away, seeing the screen display and operating with an interface that looks exactly like the instrument itself. That is what Remote Tools lets you do.

Local Language Support

The Spectrum Master features eight languages English, Spanish, German, French, Japanese, Chinese, Italian and Korean, two custom user-defined languages can be uploaded into the instrument using Master Software Tools, supplied with the instrument.

Fast Sweep Speed

The Spectrum Master automatically sets the fastest sweep consistent with accurate measurements, and sweep speed in zero span can be set from 10 microseconds up to 600 seconds. This is faster and more flexible than any portable spectrum analyzer on the market today, simplifying the capture of intermittent interference signals.

+43 dBm Maximum Safe Input Level

Because the MS2721B can survive an input signal of +43 dBm (20 watts) without damage, you can rest assured that the MS2721B can survive in even the toughest RF environments. Maximum continous input for measurement is +30 dBm. For the MS2723B and MS2724B the maximum safe input is +30 dBm.

Spectrum Monitoring

A critical function of any spectrum analyzer is the ability to accurately view a portion of the RF and microwave spectrum. The Spectrum Master performs this function admirably thanks to the wide frequency range and excellent dynamic range. A built-in 256 MB compact flash memory module allows over 1,000 traces to be stored. The Compact Flash connector allows compact flash memory to expand the trace storage without limit. A 512 Mb compact flash module can hold over 13,000 spectrum analyzer sweeps. USB Flash Drives may be used for convenient transfer of data.

Limit Lines

The Spectrum Master includes two types of limit lines, lower limit lines and upper limit lines. Limit lines may be used either for visual reference or for pass/fail criteria by implementing limit alarms. Limit alarm failures are reported if a signal is above the upper limit line or below the lower limit line. Each limit line may consist of up to 40 segments.

Features

Multiple Markers simplify data analysis such as on this CDP display.

Transmissive Color Display

The MS2721B, MS2723B and MS2724B 21.5 cm (8.5 in.) SVGA color transmissive LCD display screen is readable outdoors.

Multiple Markers

Display up to six markers on screen in Spectrum Analyzer mode each with delta marker. Or choose one reference marker with six delta markers. Noise marker and frequency counter marker can be selected. In W-CDMA/HSDPA mode the six markers can display the selected code power, code EVM and type of code.

Noise Markers

The capability to measure noise level in terms of dBm/Hz or dBµV/Hz is a standard feature of the Spectrum Master.

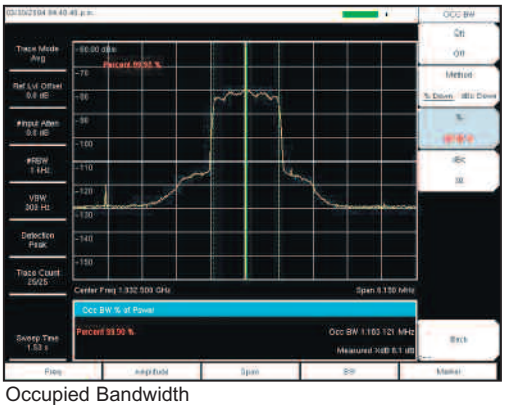
Frequency Counter Markers

The Spectrum Masters have frequency counter markers with resolution to 1 Hz. Add the GPS option to get complementary accuracy.

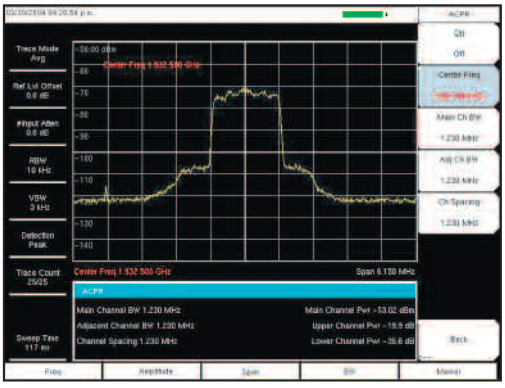
Functions	
Quasi-Peak Detector	When the quasi-peak detector is selected 200 Hz, 9 kHz, and 120 kHz RBW are enabled.
Multiple Marker	Display up to six markers on screen, each marker includes a delta marker.
Marker Table	Display a table of up to six marker frequency and amplitude values plus delta marker frequency offset and amplitude.
Upper/Lower Limit Fixed and Segmented	Each upper and lower limit can be made up of between one and 40 segments.
Marker 1 Reference	Sets marker 1 to be the reference for six delta markers. Ideal for broadcast proofing and medical telemetry monitoring.
Fixed or Tracking Markers	User can choose whether reference markers track signal amplitude or are fixed when the associated delta marker is turned on.

Smart Measurements	
Occupied Bandwidth	Measures 99% to 1% power bandwidth of a spectrum.
Channel Power	Measures the total power in a specified bandwidth.
C/I	Measures the carrier to interference ratio in a specified bandwidth.
ACPR	Measures power levels in the channels immediately above and below the center channel.
Field Strength	Uses antenna calibration tables to measure dBm/meter^2 or dBmV/meter.
AM/FM/SSB Demodulation	Allows the user to listen to interfering signals. De-emphasis is included for narrow-band FM and wideband FM. Upper Sideband and Lower Sideband demodulation includes a BFO that can be tuned ±10 kHz from the center frequency.

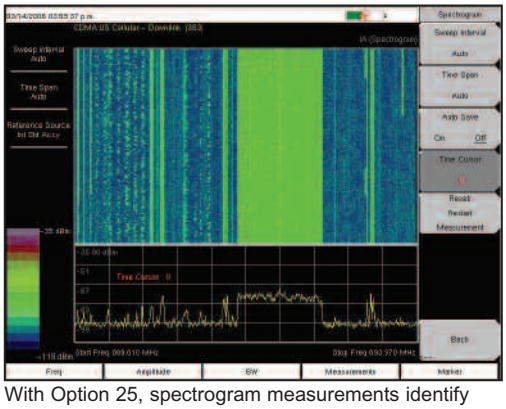
Lab Grade Spectrum Analysis in a Handheld Package



Occupied Bandwidth



Adjacent Channel Power Ratio



With Option 25, spectrogram measurements identify intermittent interference.

Smart Measurements

The Spectrum Master family has dedicated routines for one-button measurements of field strength, channel power, occupied bandwidth, Adjacent Channel Power Ratio (ACPR) and C/I. These are increasingly critical measurements for today's wireless communication systems. The simple interface for these complex measurements significantly reduces test time and increases analyzer usability.

Fast Sweep Speed

The Spectrum Master automatically sets the fastest possible sweep consistent with accurate measurements, and sweep speed in zero span can be set from 10 microseconds to 600 seconds. This is faster and more flexible than any portable spectrum analyzer on the market today, simplifying the capture of intermittent interference signals.

Carrier to Interference Measurement

As more 802.11 access points are installed, there is an increasing level of interference in the 2.4 GHz and 5.8 GHz bands occupied by this service and other devices such as cordless telephones. This measurement capability makes it simple for an access point installer to determine if the level of interference is sufficient to cause difficulty for users in the intended service area, and can show the need to change to another access channel. The wide frequency coverage of the Spectrum Master makes this the only spectrum analyzer you need to install and maintain 802.11a, 802.11b and 802.11g wireless networks.

Occupied Bandwidth

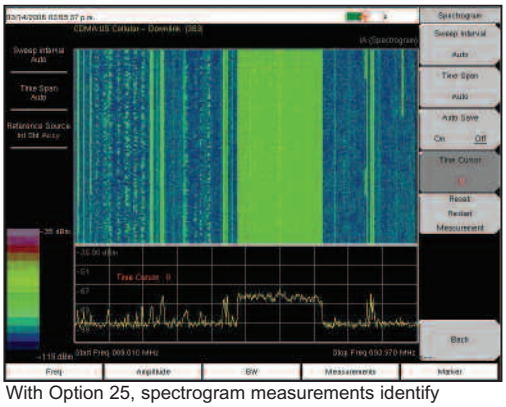
This measurement determines the amount of spectrum used by a modulated signal. You can choose between two different methods of determining bandwidth: the percent of power method or the "x" dB down method, where "x" can be from 1 dB to 100 dB down the skirts of the signal.

Adjacent Channel Power Ratio

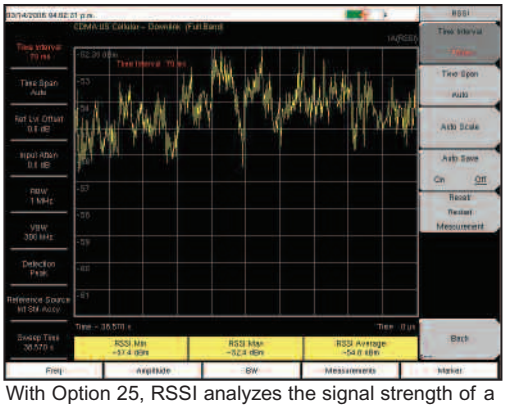
A common transmitter measurement is that of adjacent channel leakage power. This is the ratio of the amount of leakage power in an adjacent channel to the total transmitted power in the main channel, and is used to replace the traditional two-tone intermodulation distortion (IMD) test for system non-linear behavior.

The result of an ACPR measurement can be expressed either as a power ratio or a power density. In order to calculate the upper and lower adjacent channel values, the Spectrum Master allows the adjustment of four parameters to meet specific measurement needs: main channel center frequency, measurement channel bandwidth, adjacent channel bandwidth and channel spacing. When an air interface standard is specified in the Spectrum Master, all these values are automatically set to the normal values for that standard.

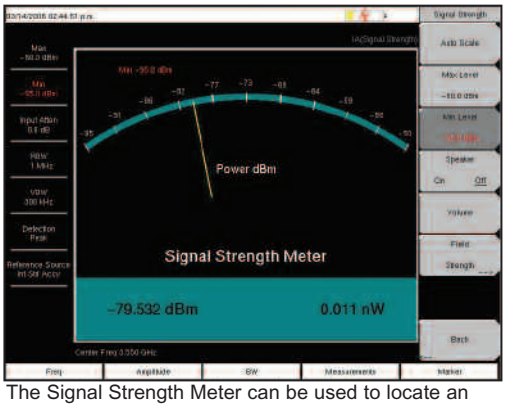
Extend the Functionality with Valuable Options



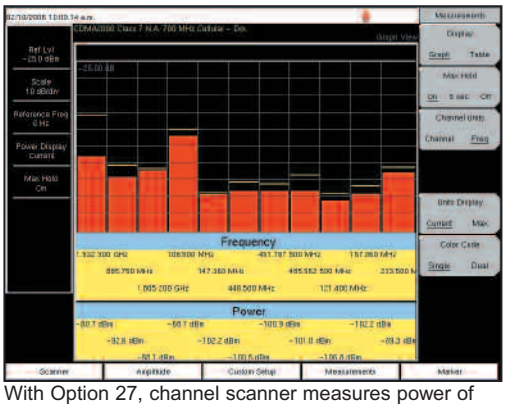
With Option 25, spectrogram measurements identify intermittent interference.



With Option 25, RSSI analyzes the signal strength of a signal over time.



The Signal Strength Meter can be used to locate an interfering signal.



With Option 27, channel scanner measures power of multiple transmitters.

Interference Analyzer (Option 25)

With its built-in low-noise preamplifier, the Spectrum Master with interference analyzer option provides the ability to identify and locate interfering signals down to the noise floor, allowing technicians to better address the quality issues that affect user service.

Spectrogram

The Spectrogram display is a three dimensional display of frequency, power, and time of the spectrum. It is applicable for identifying intermittent interference and tracking signal levels over time. The Spectrum Master can save data for up to 72 hours.

RSSI

The received signal strength indicator is useful to observe the signal strength of a single frequency over time. Data can be collected for up to 72 hours.

Signal Strength Meter

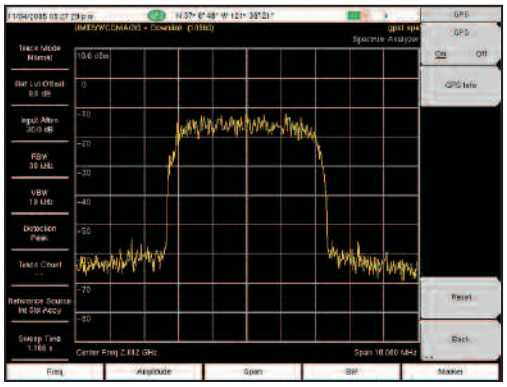
The Signal Strength meter locates an interfering signal by measuring the strength of the interfering signal. Power is displayed in Watts, dBm and in the graphical analog meter display. The strength of the signal is also indicated by an audible beep.

The Field Strength measurement is included to the Signal Strength Meter menu for quick determination of calibrated field strength.

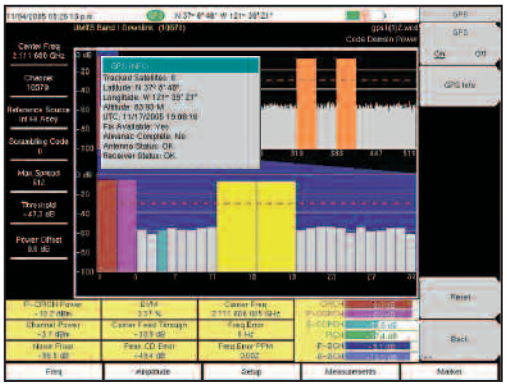
Channel Scanner (Option 27)

The channel scanner option measures the power of multiple transmitted signals and is very useful for measuring channel power in AMPS, iDEN, GSM, TDMA, CDMA, W-CDMA, and HSDPA networks. Up to 20 channels can be scanned at the same time. You can select to display the frequencies or the scanned data, to be displayed by frequencies or the channel number. Display data in graph or table format. In the custom setup menu each channel can be custom built with different frequency, bandwidth, or channels from different signal standards.

Enhance Frequency Accuracy with Built-in GPS



With GPS Option 31, the location information (longitude, latitude) is shown at the top of the screen.



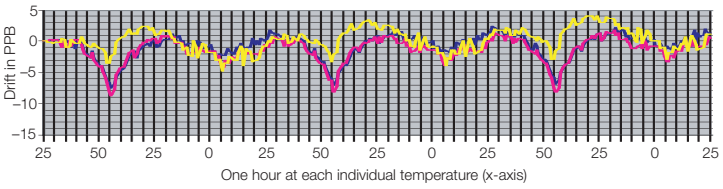
With GPS Option 31, enhance the frequency reference oscillator accuracy to make accurate frequency error measurements.

GPS (Option 31)

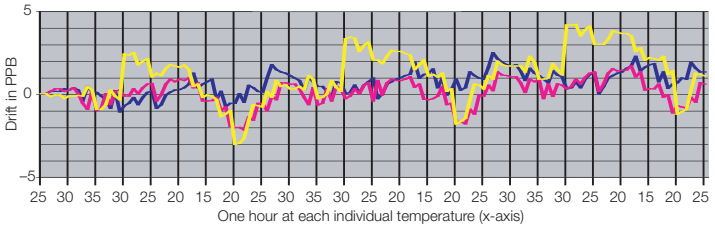
GPS information allows confirmation of the correct measurement location. The GPS option provides exact location information (longitude, latitude) which is saved with each measurement in addition to date and time. Included with the GPS option is a magnet mount antenna with a 5m (15 feet) cable allowing use on a car roof or other useful surface.

The GPS Option also enhances the frequency accuracy of the Spectrum Master's internal OCXO oscillator. Within three minutes of GPS satellite acquisition, the built-in GPS receiver provides a frequency accuracy to better than 25 ppb (parts per billion). After the GPS antenna is disconnected, the instrument will remain in High-Accuracy mode for three days, preserving frequency accuracy to better than 50 ppb.

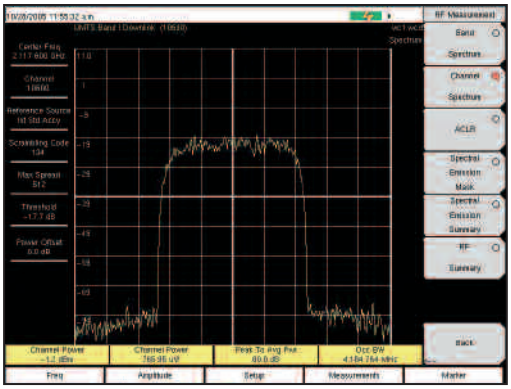
Typical frequency accuracy of the Spectrum Master for 72 hours following the GPS antenna disconnect over full specified temperature range.



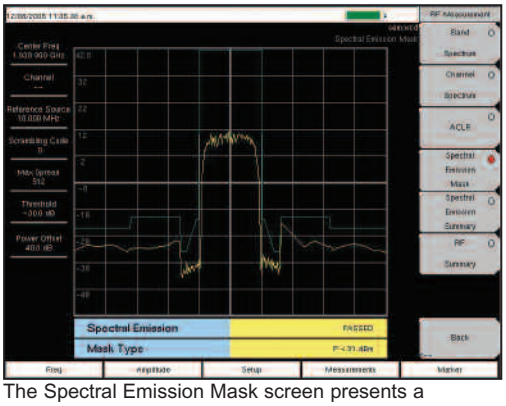
Typical frequency accuracy of the Spectrum Master for 24 hours following the GPS antenna disconnect over temperature range 15° C to 35° C.



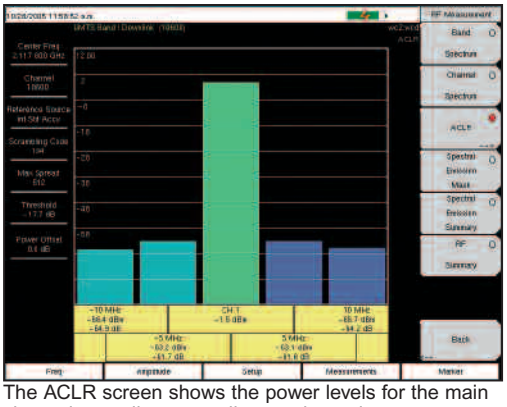
MS2724B Spectrum Master



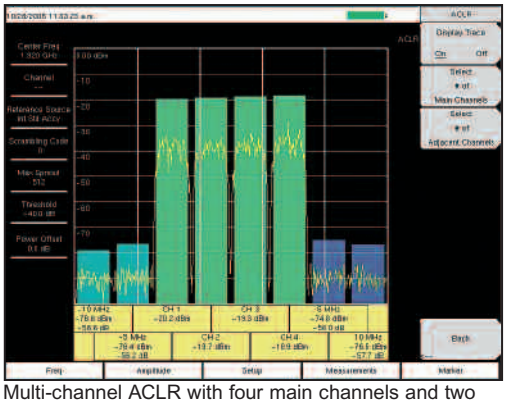
The RF Spectrum screen shows selected signals along with key parameters, such as channel power and occupied bandwidth.



The Spectral Emission Mask screen presents a received signal framed by the 3GPP spectral mask.



The ACLR screen shows the power levels for the main channel as well as two adjacent channels.



Multi-channel ACLR with four main channels and two adjacent channels on both sides.

With four measurement options — W-CDMA/HSDPA RF Meas, W-CDMA Demod, W-CDMA/HSDPA Demod (covering all W-CDMA Demod measurements) and W-CDMA/HSDPA Over The Air (OTA) measurements — technicians and RF engineers can connect the Spectrum Master to any Node B for accurate RF and demodulator measurements. A physical connection is not required for the instrument to receive and demodulate W-CDMA and HSDPA OTA signals. With a Spectrum Master, a technician no longer needs to take a Node B site off line. For details see the Option Comparison Table on page 21.

W-CDMA/HSDPA RF Measurements (Option 44)

RF measurements are used to measure the transmitted signal strength and signal shape of the selected Node B transmitter. For the technician's convenience, the RF measurement option includes Band Spectrum, Channel Spectrum, Spectral Emission Mask, ACLR and RF Summary screens.

Band Spectrum

Select the applicable signal standard downlink spectrum, place a cursor on the desired channel, and the unit automatically selects that channel to make W-CDMA/HSDPA measurements.

Channel Spectrum

The Channel Spectrum screen displays the signals of a selected channel as well as channel power (in dBm and watts), occupied bandwidth and peak to average power. Operators can select a channel by using the band channel or by choosing a signal standard and channel.

Spectral Emission Mask

The Spectral Emission Mask measurement applies the mask depending upon the transmitter output as defined in the 3GPP specification (TS 125.141). The mask varies depending upon the input signal. The Spectrum Master will indicate if the signal "PASSED" or "FAILED" according to the specified limits. For ease of analysis, the spectral emission mask is also displayed in a tabular format with different frequency ranges and a PASS or FAIL indication for each range.

ACLR

The Spectrum Master's ACLR screen shows measurements of main channel power as well as the power levels of the adjacent channels set at –10 MHz, –5 MHz, +5 MHz and +10 MHz according to the 3GPP standard (TS 125.141). The Spectrum Master can also make multichannel ACLR measurements with as many as four main channels and four adjacent channels. See the example with four main channels and two adjacent channels on both sides.

RF Summary

The RF Summary screen displays the transmitter performance parameters in a table format so technicians can quickly check details at a glance.

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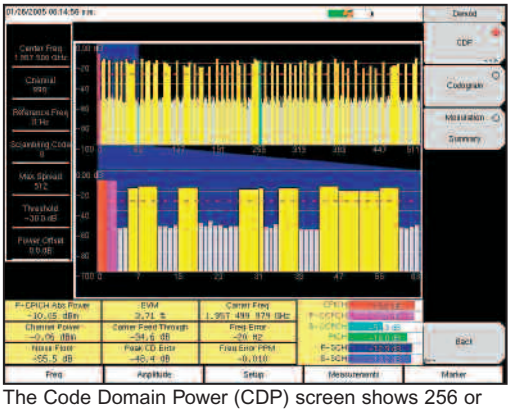
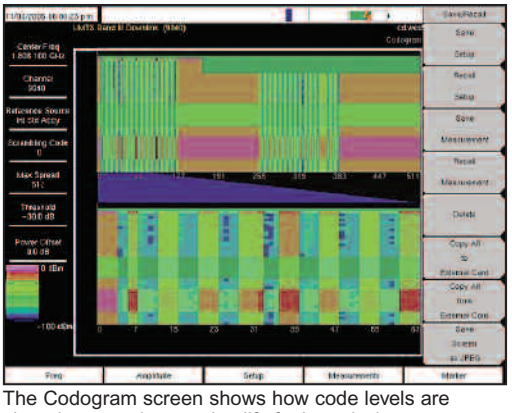
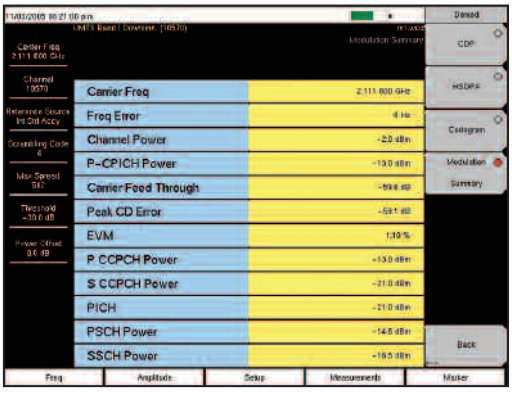


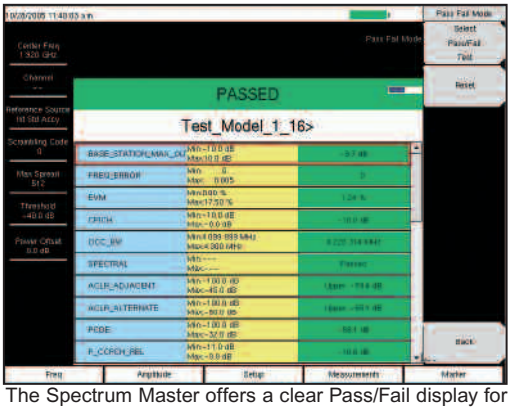
The Code Domain Power (CDP) screen shows 256 or 512 OVSF codes with flexible zoom capabilities.



The Codogram screen shows how code levels are changing over time to simplify fault analysis.



The Modulation Summary screen shows critical transmitter performance parameters in table format.



The Spectrum Master offers a clear Pass/Fail display for quick evaluation of a Node B base station.

W-CDMA Demodulator (Option 45)

The Spectrum Master with Option 45 demodulates W-CDMA signals and displays detailed measurements for evaluating transmitter modulation performance using Code Domain Power (CDP), Codogram, Modulation Summary and Pass/Fail screens.

Code Domain Power

The Code Domain Power (CDP) screen displays 256 or 512 OVSF codes with zoom capability, common pilot power (P-CPICH), channel power, error vector magnitude (EVM), carrier frequency, carrier feed through, frequency error (in Hz and ppm), Peak CD error, and noise floor. The MS2721/45 option can zoom to 32, 64, or 128 codes and the user can input the zoom code to zoom in on the OVSF codes.
The demodulator also displays CPICH, P-CCPCH, S-CCPCH, PICH, P-SCH and S-SCH power in a dedicated control channel view.

Codogram

The Codogram screen displays how code levels are changing over time, making it easier to monitor traffic, faults and hand-off activity. Showing 256 or 512 OVSF codes with zoom codes, the Spectrum Master can zoom to 32, 64 or 128 codes, or the user can directly zoom to particular OVSF codes of interest.

Modulation Summary

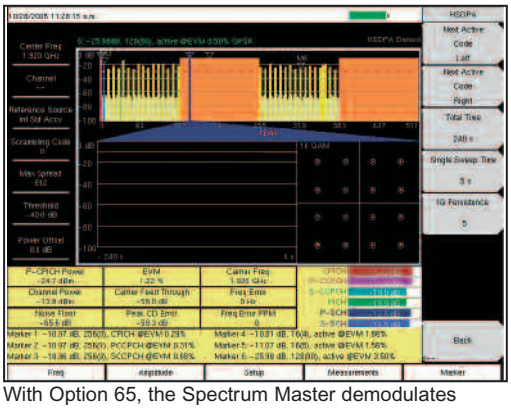
The Modulation Summary screen displays critical transmitter performance measurements in table format for easy viewing, showing carrier frequency, frequency error, channel power, primary common pilot channel (P-CPICH) absolute power, secondary common pilot channel (S-CCPCH) power and paging indicator channel (PICH) as well as physical shared channel (PSCH) absolute power.

Pass/Fail Mode

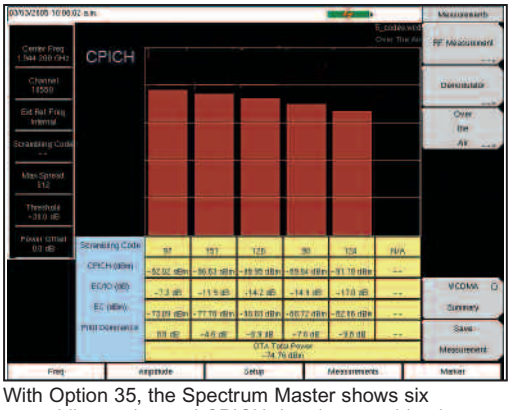
The Spectrum Master stores the five test models covering all eleven test scenarios specified in the 3GPP specification (TS 125.141) for testing base station performance and recalls these models for quick easy measurements. After an operator selects a test model, the Spectrum Master displays test results in table format with clear PASS or FAIL indications that include min/max thresholds and actual measured results.

Using Master Software Tools, additional custom tests can be easily created and uploaded into the Spectrum Master. All critical parameters can be selected for pass/fail testing including each individual code's power level, the spreading factor and symbol EVM.

Demodulate and Display HSDPA Signals with Ease



With Option 65, the Spectrum Master demodulates HSDPA and W-CDMA signals and displays selected code constellation. The selected code power versus time is also displayed.



With Option 35, the Spectrum Master shows six scrambling codes and CPICH data in a combination bar graph/table view.

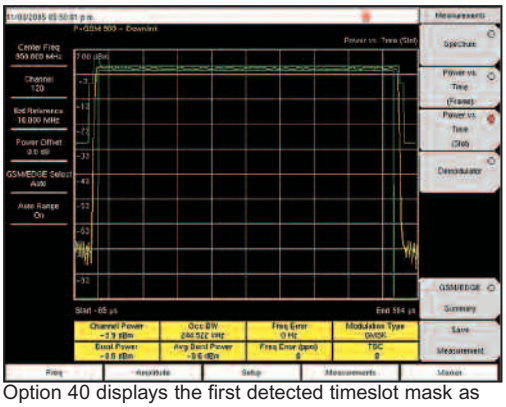
W-CDMA/HSDPA Demodulator (Option 65)

High Speed Downlink Packet Access (HSDPA) uses up to fifteen dedicated physical channels to provide high downlink data rates. The Spectrum Master with Option 65 allows demodulating HSDPA signals and displaying CDP, selected code power variation over time, and the constellation for the selected code, in addition to all the standard W-CDMA demodulator measurements.

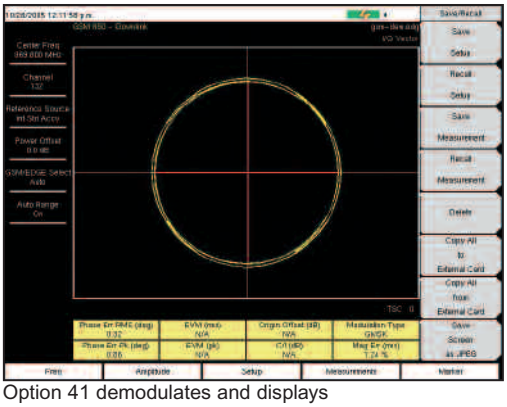
W-CDMA/HSDPA Over The Air (OTA) (Option 35)

OTA displays six scrambling codes in a bar graph format. For each scrambling code, CPICH in dBm, Ec/Io in dB, Ec in dBm, and pilot dominance in dB are displayed in table format. The user will also see OTA total power in dBm.

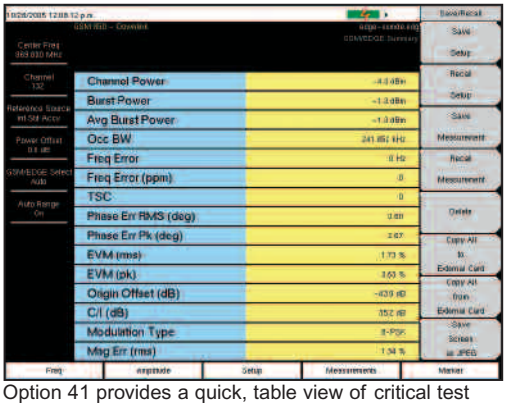
Demodulate GSM, GPRS and EDGE Signals



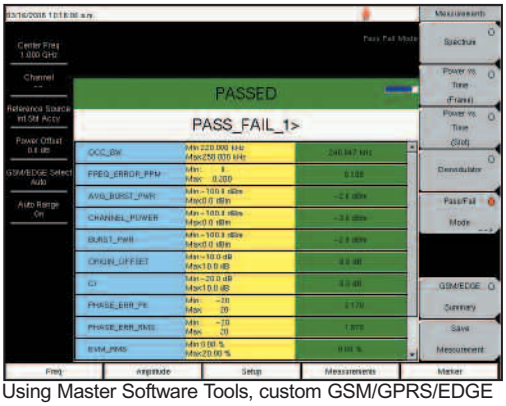
Option 40 displays the first detected timeslot mask as specified in 3GPP TS 05.05.



Option 41 demodulates and displays GSM/GPRS/EDGE signals, including vector diagrams.



Option 41 provides a quick, table view of critical test parameters, including channel power, occupied bandwidth, phase error and EVM.



Using Master Software Tools, custom GSM/GPRS/EDGE Pass/Fail test sets can be created and uploaded to the Spectrum Master.

GSM/GPRS/EDGE Measurements

For flexibility, the Spectrum Master features two GSM/GPRS/EDGE measurement modes: RF Meas and Demod. Technicians and RF engineers can connect the MS2721B to any GSM/GPRS/EDGE base station for accurate RF and demodulator measurements. When a physical connection is not required, the MS2721B can receive and demodulate GSM/GPRS/EDGE signals over the air.

GSM/GPRS/EDGE RF Measurements (Option 40)

GSM/GPRS/EDGE RF measurements provide views of single-channel spectrum, multichannel spectrum, power versus time (frame), power versus time (slot) with mask per 3GPP TS 05.05 specification and summary screens.

The spectrum view displays channel spectrum and multichannel spectrum. The channel spectrum screen includes channel power, burst power, average burst power, frequency error, modulation type and Training Sequence Code (TSC). The multichannel spectrum allows the user to show as many as ten channels with measurements displayed for the selected channel.

GSM/GPRS/EDGE Demodulator (Option 41)

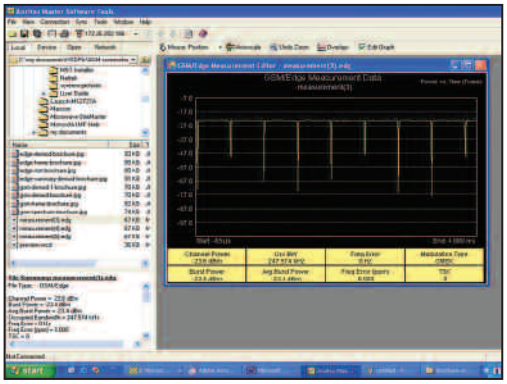
Option 41 demodulates GSM/GPRS/EDGE signals and displays the results of detailed measurements to analyze transmitter modulation performance. Results are shown for phase error (rms), phase error peak, EVM (rms), EVM (peak), origin offset, C/I, modulation type and magnitude error (rms) and a vector diagram of the signal.

Pass/Fail Mode

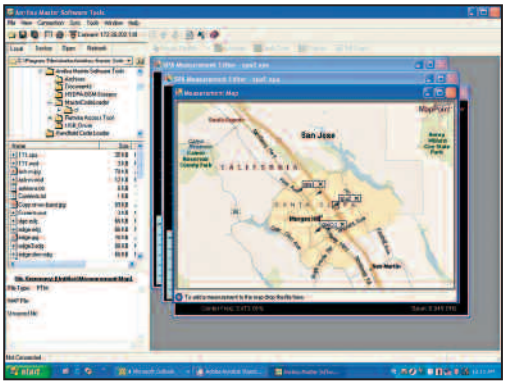
Using Master Software Tools, custom GSM/GPRS/EDGE Pass/Fail test sets can be easily created and uploaded into the Spectrum Master. The test results are displayed in table format with clear pass or fail indicators that include min/max thresholds and actual measured results.

Master Software Tools Augment the Power of Spectrum Master

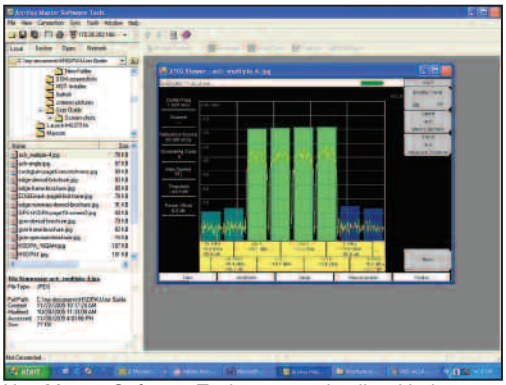
To further increase the convenience, each Spectrum Master comes with Master Software Tools—comprehensive data management and analysis software that provides simple and easy methods to manage, archive, analyze, print and report system performance. For the most current version of Anritsu Master Software Tools, please visit www.us.anritsu.com.



Windows-compatible Master Software Tools simplifies the process of formatting data and generating reports.



Master Software Tools integrated with Mappoint can display the geographic location of measurements with GPS data.



Use Master Software Tools to save details with the measurement and display for rapid analysis.

With Master Software Tools (Windows® 2000/XP/Vista compatible) the Spectrum Master can:

- Store an unlimited number of data traces to a PC easing the task of analyzing and monitoring historical performance
- Coordinate cell site locations using Microsoft Mappoint and GPS location mapping
- Automatically update the Spectrum Master with the latest firmware available from the Anritsu web site
- Create and upload new signal standards, Pass/Fail Mode custom lists and antenna factors to existing lists into the unit
- Modify existing languages or add two custom languages to the Spectrum Master
- Establish a connection to a PC using USB, Ethernet LAN, or Direct Ethernet
- Export plot data as text files for use in spreadsheets or graphic files (jpg format)
- View multiple Spectrum Analyzer measurements on the same screen using Trace Overlay
- Capture live traces from the instrument and view them on the PC
- Add or modify Limit Lines and Markers
- Handle long file names for easy, descriptive data labeling
- Create a spectrogram from a set of spectrum analyzer measurements
- Create a movie of a sequence of saved spectrum measurements
- Edit measurement labels

Specifications

Frequency

MS2721B

Frequency Range: 9 kHz to 7.1 GHz

Tuning Resolution: 1 Hz

Frequency Reference:

Aging: ±1.0 ppm per 10 years
Accuracy: ±0.3 ppm (25° C ±25° C) + long term drift

Frequency Span: 10 Hz to 7.1 GHz plus 0 Hz (zero span

Span Accuracy: ±0.3 ppm (25° C ±25° C) + long term drift

Sweep Time: Minimum 100 ms, 10 µs in zero span

Sweep Time Accuracy: ±2% in zero span

Sweep Trigger: Free run, Single, Video, External

Resolution Bandwidth:

(–3 dB width) 1 Hz to 3 MHz in 1-3 sequence ±10%, 8 MHz demodulation bandwidth. 200 Hz, 9 kHz and 120 kHz when quasi-peak detector is selected

Video Bandwidth:

(–3 dB) 1 Hz to 3 MHz in 1-3 sequence. 200 Hz, 9 kHz and 120 kHz when quasi-peak detector is selected

SSB Phase Noise:

Offset from carrier	Max
10, 20 and 30 kHz	–100 dBc/Hz
100 kHz	–102 dBc/Hz

MS2723B

Frequency Range: 9 kHz to 13 GHz

Tuning Resolution: 1 Hz

Frequency Reference:

Aging: ±1.0 ppm per 10 years
Accuracy: ±0.3 ppm (25° C ±25° C) + long term drift

Frequency Span: 10 Hz to 13 GHz plus 0 Hz (zero span)

Span Accuracy: ±0.3 ppm (25° C ±25° C) + long term drift

Sweep Time: Minimum 100 ms, 10 µs in zero span

Sweep Time Accuracy: ±2% in zero span

Sweep Trigger: Free run, Single, Video, External

Resolution Bandwidth:

(–3 dB width) 1 Hz to 3 MHz in 1-3 sequence ±10%, 8 MHz demodulation bandwidth. 200 Hz, 9 kHz and 120 kHz when quasi-peak detector is selected

Video Bandwidth:

(–3 dB) 1 Hz to 3 MHz in 1-3 sequence. 200 Hz, 9 kHz and 120 kHz when quasi-peak detector is selected

SSB Phase Noise:

Offset from carrier	Max
10, 20 and 30 kHz	–95 dBc/Hz
100 kHz	–97 dBc/Hz
1 MHz	–105 dBc/Hz
10 MHz	–120 dBc/Hz

MS2724B

Frequency Range: 9 kHz to 20 GHz

Tuning Resolution: 1 Hz

Frequency Reference:

Aging: ±1.0 ppm per 10 years
Accuracy: ±0.3 ppm (25° C ±25° C) + long term drift

Frequency Span: 10 Hz to 20 GHz plus 0 Hz (zero span)

Span Accuracy: ±0.3 ppm (25° C ±25° C) + long term drift

Sweep Time: Minimum 100 ms, 10 µs in zero span

Sweep Time Accuracy: ±2% in zero span

Sweep Trigger: Free run, Single, Video, External

Resolution Bandwidth:

(–3 dB width) 1 Hz to 3 MHz in 1-3 sequence ±10%, 8 MHz demodulation bandwidth. 200 Hz, 9 kHz and 120 kHz when quasi-peak detector is selected

Video Bandwidth:

(–3 dB) 1 Hz to 3 MHz in 1-3 sequence. 200 Hz, 9 kHz and 120 kHz when quasi-peak detector is selected

SSB Phase Noise:

Offset from carrier	Max 9 kHz-13 GHz	Max 13 GHz-20 GHz
10, 20 and 30 kHz	–95 dBc/Hz	–91 dBc/Hz
100 kHz	–97 dBc/Hz	–93 dBc/Hz
1 MHz	–105 dBc/Hz	–102 dBc/Hz
10 MHz	–120 dBc/Hz	–116 dBc/Hz

General (MS2721B/MS2723B/MS2724B)

RF Input VSWR: 2.0:1 maximum, 1.5:1 typical (≥10 dB attenuation)

Maximum Continuous Input: ≥10 dB attenuation, +30 dBm

Input Damage Level[1] (MS2721B):

≥10 dB attenuation, >+43 dBm, ±50 Vdc
<10 dB attenuation, >+23 dBm, ±50 Vdc[2]
[1]Input protection relay opens at >30 dBm with ≥10 dB input attenuation and at approximately 10 to 23 dBm with <10 dB attenuation.
[2]with limited vD/dt.

Input Damage Level (MS2723B):

≥10 dB attenuation, >+30 dBm, ±50 Vdc

Input Damage Level (MS2724B):

≥10 dB attenuation, >+30 dBm, ±50 Vdc

Reference Level: Adjustable over amplitude range

ESD Damage Level: >10 kV, ≥10 dB attenuation

Sweep Speed Range: 10 µs (zero span) to 600 seconds

Specifications

Amplitude

MS2721B
Measurement Range: DANL to +30 dBm
Display Range: 1 to 15 dB/div in 1 dB steps. Ten divisions displayed.
Attenuator Range: 0 to 65 dB
Attenuator Resolution: 5 dB steps
Amplitude Units:
Log Scale modes: dBm, dBV, dBmV, dBµV
Linear Scale modes: nV, µV mV, V, kV, nW, µW, mW, W, kW
Absolute Amplitude Accuracy:
Power levels:
≥–50 dBm, ≤35 dB input attenuation

9 kHz to ≤10 MHz	±1.5 dB
>10 MHz to 4 GHz	±1.25 dB
>4 GHz to 7.1 GHz	±1.75 dB

40 to 55 dB input attenation

9 kHz to ≤10 MHz	±1.5 dB
>10 MHz to 4 GHz	±1.25 dB
>4 GHz to 7.1 GHz	±1.75 dB
>6.5 GHz to 7.1 GHz	±2 dB

Second Harmonic Distortion
(0 dB input attenuation, –30 dBm input):

0.05 to 0.75 GHz	–50 dBc
>1.4 to 2 GHz	–70 dBc
>2 GHz	–80 dBc

Third Order Intercept (TOI): (–20 dBm tones 100 kHz apart, –20 dBm reference level 0 dB input attenuation, preamplifier off)

Frequency	**Min**
600 MHz	+7 dBm
3.5 GHz	+9 dBm

Frequency	**Typical**
50 MHz to 300 MHz	>8 dBm
>300 MHz to 2.2 GHz	>10 dBm
>2.2 GHz to 2.8 GHz	>15 dBm
>2.8 GHz to 4.0 GHz	>10 dBm
>4.0 GHz to 7.1 MHz	>13 dBm

Dynamic Range 2/3 (TOI-DANL) in 1 Hz RBW:

600 MHz	95 dB min
3.5 GHz	96 dB min

Displayed Average Noise Level DANL in 1 Hz RBW:

Frequency	**Preamp On (dBm)**		**Preamp Off (dBm)**	
	Typical	**Max**	**Typical**	**Max**
10 MHz to 1 GHz	–163	–161	–140	–137
>1 GHz to 2.2 GHz	–150	–159	–136	–133
>2.2 GHz to 2.8 GHz	–146	–143	–130	–126
>2.8 GHz to 4.0 GHz	–160	–159	–139	–136
>4.0 GHz to 7.1 GHz	–158	–154	–131	–127

(0 dB input attenuation, RMS detection, Reference level = –20 dBm for preamplifier off and –50 dBm for preamplifier on)
Note: Discrete spurious signals are not included in the measurement of DANL as they are covered by the residual spurious specification.
Equivalent Noise Figure, 23°C:
(Preamplifier on, 0 dB attenuation)

Frequency	**Typical**
10 MHz to 1.0 GHz	11 dB
>1 GHz to 2.2 GHz	14 dB
>2.2 GHz to 2.8 GHz	18 dB
>2.8 GHz to 4.0 GHz	14 dB
>4.0 GHz to 7.1 GHz	16 dB

Input-Related Spurious:
(–30 dBm input, 0 dB RF attenuation, Span <1.7 GHz)
–70 dBc typical –60 dBc max
Residual Spurious:
(Preampifier on, RF input terminated, 0 dB input attenuation)
–100 dBm max
(Preampifier off, RF input terminated, 0 dB input attenuation)
–90 dBm max*, 100 kHz to <3200 MHz
–84 dBm max*, 3200 MHz to 7100 MHz
***Exceptions:**

Frequency	**Max Spur Level Typical**
250, 300 and 350 MHz	–85 dBm max
~4010 MHz	–80 dBm max (–90 dBm)
~5084 MHz	–70 dBm max (–83 dBm)
~5894 MHz	–75 dBm max (–87 dBm)
~7028 MHz	–80 dBm max (–92 dBm)

Amplitude

MS2723B
Measurement Range: DANL to +30 dBm
Display Range: 1 to 15 dB/div in 1 dB steps. Ten divisions displayed.
Attenuator Range: 0 to 65 dB
Attenuator Resolution: 5 dB steps
Amplitude Units:
Log Scale Modes: dBm, dBV, dBmv, dBµV
Linear Scale Modes: nV, µV, mV, V, kV, nW, µW, mW, W, kW
Overall Amplitude Accuracy
(20º C to 30º C, 30 minute warmup):
±1.3 dB
Full Temperature Range: –10 to +55º C add ±1.2 dB
Frequency Flatness: >4 GHz add ±1.4 dB
Conditions: 50Ω source, single sinewave input ≤Reference Level, and ≥DANL, 60 minute warm-up, auto-attenuation
Second Harmonic Distortion:
(0 dB input attenuation, –30 dBm input)

50 to 500 MHz	–50 dBc
500 to 800 MHz	–45 dBc
800 to 3000 MHz	–60 dBc
>3 GHz	–80 dBc

Third Order Intercept (TOI): (–20 dBm tones 100 kHz apart, –20 dBm Ref level, 0 dB input attenuation, preamplifier off)

Frequency	**Min**
2.4 GHz	+12 dBm

Frequency	**Typical**
50 MHz to 500 MHz	>6 dBm
500 MHz to 2 GHz	>8 dBm
2 to 6 GHz	>10 dBm
6 to 13 GHz	>12 dBm

Dynamic Range 2/3 (TOI-DANL) in 1 Hz RBW:
2.4 GHz 101 dB min
Displayed Average Noise Level (DANL) in 1 Hz RBW:

Frequency	**Preamplifier On**	**Equivalent Noise Figure, 23º C**
10 MHz to 1 GHz	–159 dBm	15 dB
1 GHz to 3 GHz	–156 dBm	18 dB
3 to 4 GHz	–154 dBm	20 dB
Frequency	**Preamplifier Off**	**Equivalent Noise Figure, 23º C**
10 MHz to 4 GHz	–139 dBm	35 dB
4 GHz to 10 GHz	–136 dBm	38 dB
10 GHz to 13 GHz	–130 dBm	44 dB

(0 dB input attenuation, RMS detection, Reference level = –20 dBm for preamplifier off and –50 dBm for preamplifier on)
Note: Discrete spurious signals are not included in the measurement of DANL as they are covered by the residual spurious specification.
Input-Related Spurious:
(–30 dBm input, 0 dB input attenuation, Span <1.7 GHz)
–70 dBc typical –60 dBc max
except input frequency 3275 MHz, –50 dBc max
Residual Spurious:
(Preamplifier off, RF input terminated, 0 dB input attenuation)
–90 dBm max
(Preampifier on, RF input terminated, 0 dB input attenuation)
–100 dBm max

Specifications

Amplitude

MS2724B

Measurement Range: DANL to +30 dBm

Display Range: 1 to 15 dB/div in 1 dB steps. Ten divisions displayed.

Amplitude Units:

Log Scale Modes: dBm, dBV, dBmv, dBµV

Linear Scale Modes: nV, µV, mV, V, kV, nW, µW, mW, W, kW

Attenuator Range: 0 to 65 dB

Attenuator Resolution: 5 dB steps

Overall Amplitude Accuracy (20º C to 30º C, 30 minute warmup):

±1.3 dB

Full Temperature Range: –10 to +55º C add ±1.2 dB

Frequency Flatness: >4 GHz add ±1.5 dB

Conditions: 50 Ω source, single sinewave input ≤Reference Level, and ≥DANL, 60 minute warm-up, auto-attenuation

Second Harmonic Distortion (0 dB input attenuation, –30 dBm input):

50 to 500 MHz	–50 dBc
500 to 800 MHz	–45 dBc
800 to 3000 MHz	–60 dBc
>3 GHz	–80 dBc

Third Order Intercept (TOI): (–20 dBm tones 100 kHz apart, –20 dBm Ref level, 0 dB input attenuation, preamplifier off)

Frequency	**Min**
2.4 GHz	+12 dBm
Frequency	**Typical**
50 MHz to 500 MHz	>6 dBm
500 MHz to 2 GHz	>8 dBm
2 to 6 GHz	>10 dBm
6 to 20 GHz	>12 dBm

Dynamic Range 2/3 (TOI-DANL) in 1 Hz RBW:

2.4 GHz 101 dB min

Displayed Average Noise Level (DANL) in 1 Hz RBW:

Frequency	**Preamplifier On**	**Equivalent Noise Figure, 23º C**
10 MHz to 1 GHz	–159 dBm	15 dB
1 GHz to 3 GHz	–156 dBm	18 dB
3 to 4 GHz	–154 dBm	20 dB
Frequency	**Preamplifier Off**	**Equivalent Noise Figure, 23º C**
10 MHz to 4 GHz	–139 dBm	35 dB
4 GHz to 10 GHz	–136 dBm	38 dB
10 GHz to 13 GHz	–130 dBm	44 dB
13 GHz to 20 GHz	–136 dBm	38 dB

(0 dB input attenuation, RMS detection, Reference level = –20 dBm for preamplifier off and –50 dBm for preamplifier on)

Note: Discrete spurious signals are not included in the measurement of DANL as they are covered by the residual spurious specification.

Input-Related Spurious: (–30 dBm input, 0 dB input attenuation, Span <1.7 GHz)

–70 dBc typical –60 dBc max

except input frequency 3275 MHz, –50 dBc max

Residual Spurious: (Preamplifier off, RF input terminated, 0 dB input attenuation)

–90 dBm max

–85 dBm max, >13 GHz

(Preampifier on, RF input terminated, 0 dB input attenuation)

–100 dBm max

W-CDMA/HSDPA Specifications

W-CDMA/HSDPA RF Measurements (Option 44)

RF Channel Power (Temperature range 15º C to 35º C):

±0.7 dB typical (±1.25 dB max)

Occupied Bandwidth Accuracy: ±100 kHz

Residual Adjacent Channel Leakage Ratio (ACLR)[1]:

824–894 MHz, 1710–2170 MHz	**2300–2700 MHz**
–54 dB typical at 5 MHz offset	–54 dB typical at 5 MHz offset
–59 dB typical at 10 MHz offset	–57 dB typical at 10 MHz offset

ACLR Accuracy (Single Channel Archive):

824–894 MHz, 1710–2170 MHz	**2300–2700 MHz**
±0.8 dB for ACLR ≤–45 dB at 5 MHz offset	±1.0 dB for ACLR ≥–45 dB at 5 MHz offset
±0.8 dB for ACLR ≥–50 dB at 10 MHz offset	±1.0 dB for ACLR ≥–50 dB at 10 MHz offset

Frequency Error: ±10 Hz + Time Base Error, 99% confidence level

W-CDMA Demodulation and W-CDMA/HSDPA Demodulator (Option 45 and 65)

EVM Accuracy[1]:

824–894 MHz, 1710–2170 MHz	**2300–2700 MHz**
(3GPP Test Model 4) ±2.5%; 6% ≤EVM ≤25%	±2.5%; 6% ≤EVM ≤20%
±2.5% for 6 ≤EVM ≤20% (3GPP Test Model 5)	

Residual EVM: 2.5% typical

Code Domain Power:

±0.5 dB for code channel power >–25 dB
16, 32, 64 DCPH (test model 1)
16, 32 DCPH (test model 2, 3)

CPICH (dBm) Accuracy: ±0.8 dB typical

Scrambling Code: 3 seconds

W-CDMA/HSDPA OTA (Option 35)

Resolution: 0.1 dB

[1]Depends on reference level, input signal level and single channel conditions.

Option Specifications

IQ Demodulation (Option 9)
Hardware needed to run any of the demodulation options
Provides 10 MHz demodulation bandwidth

PSN50 High Accuracy Power Meter (Option 19)

PSN50 Sensor:
Measurement Range: –30 dBm to +20 dBm
Frequency Range: 50 MHz to 6 GHz
Input Connector: Type N, male, 50 Ω
Max Input Without Damage: +33 dBm, ±25 VDC
Input Return Loss: 50 MHz to 2 GHz: ≥26 dB
2 GHz to 6 GHz: ≥20 dB

PSN50 Accuracy:
Total RSS Measurement Uncertainty (0º C to 50º C): ±0.16 dB*
Noise: 20 nW max
Zero Set: 20 nW
Zero Drift: 10 nW max**
Sensor Linearity: ±0.13 dB max
Instrumentation Accuracy: 0.00 dB
Sensor Cal Factor Uncertainty: ±0.06 dB
Temperature Compensation: ±0.06 dB max
Continuous digital modulation uncertainty: ±0.06 dB (+17 to +20 dBm)

PSN50 System:
Measurement Resolution: 0.01 dB
Offset Range: ±60 dB
Power Requirements:
Supply Voltage: 8 to 18 Vdc (supplied by instrument via USB connector)
Supply Current: <100 mA

Tracking Generator (Option 20)
Frequency Range: 100 kHz to 7.1 GHz
Frequency Resolution: 1 Hz
Frequency Accuracy (25º C ±25º C): Same as Spectrum Analyzer
Output Power: 0 dBm to –40 dBm
Step Size: 0.1 dB nominal
Level Accuracy (15º C to 35º C): ±1.5 dB max, 450 kHz to 7.1 GHz, excluding SWR effects
Zero Span Behavior: CW Output
Output Connector: Type N female, 50 Ω
Damage Levels: +23 dBm
±50V DC (limited dv/dt)
2 kV ESD

Interference Analyzer (Option 25)
Signal Strength: Gives visual and aural indication of signal strength
RSSI: Collect data up to 72 hours
Spectrogram: Collect data up to 72 hours

Channel Scanner (Option 27)
Number of Channels: 1 to 20

GPS (Option 31)
GPS Location Indicator:
Latitude, Longitude and Altitude on display
Latitude, Longitude and Altitude with trace storage
GPS High Frequency Accuracy when GPS antenna is connected:
±25 ppb with GPS ON, 3 minutes after satellite lock in the selected operating mode
Internal High Accuracy, when GPS antenna is not connected:
Better than ±50 ppb for 3 days from a High Accuracy GPS Lock
and within 0º C to 50º C ambient temperature
Connector: Reverse polarity BNC

W-CDMA/HSDPA OTA (Option 35)
Occupied Bandwidth: Bandwidth within which 99% of the power transmitted on a single channel lies
Burst Power: ±1 dB typical for –50 dBm to +20 dBm (±1.5 dB max)
Frequency Error: ±10 Hz + time base error, 99% confidence level

GSM/GPRS/EDGE Demodulator (Option 41)
GSMK Modulation Quality
(RMS Phase) Measurement Accuracy: ±1º
Residual Error (GSMK): 1º
8PSK Modulation Quality
(EVM) Measurement Accuracy: ±1.5º
Residual Error (8PSK): 2.5%

W-CDMA/HSDPA RF Measurements (Option 44)
Frequency Ranges:
824 to 894 MHz, 1710 to 2170 MHz, 2300 to 2700 MHz
RF Channel Power (Temperature range 15º C to 35º C):
±0.7 dB typical ±1.25 dB max
Occupied Bandwidth Accuracy: ±100 kHz
Residual Adjacent Channel Leakage Ratio (ACLR)***
(824 to 894 MHz, 1710 to 2170):
–54 dB typical at 5 MHz offset
–59 dB typical at 10 MHz offset
Leakage Ratio (ACLR)***
(2300 to 2700 MHz):
–54 dB typical at 5 MHz offset
–57 dB typical at 10 MHz offset
ACLR Accuracy (Single Channel Active)
(824 to 894 MHz, 1710 to 2170 MHz):
±0.8 dB for ACLR ≥–45 dB at 5 MHz offset
±0.8 dB for ACLR ≥–50 dB at 10 MHz offset
ACLR Accuracy (Single Channel Active)
(2300 to 2700 MHz):
±1.0 dB for ACLR ≥–45 dB at 5 MHz offset
±1.0 dB for ACLR ≥–50 dB at 10 MHz offset
Frequency Error:
±10 Hz + time base error, 99% confidence level

W-CDMA Demodulation and W-CDMA/HSDPA Demodulator (Options 45 and 65)
EVM Accuracy* (824 to 894 MHz, 1710 to 2170 MHz):**
(3GPP Test Model 4) ±2.5%; 6 ≤EVM ≤25%
EVM Accuracy* (2300 MHz to 2700 MHz):**
(3GPP Test Model 5) ±2.5%; 6 ≤EVM ≤20%
Residual EVM: 2.5% typical
Code Domain Power:
±0.5 dB for code channel power >–25 dB
16, 32, 64 DCPH (test model 1)
16, 32 DCPH (test model 2, 3)
CPICH (dBm) Accuracy: ±0.8 dB typical
Scrambling Code: 3 seconds

* Excludes mismatch errors.
Excludes noise, zero set, zero drift for levels <–20 dBm.
Excludes digital modulation uncertainty between +17 and +20 dBm.
** After 30 min warm-up
*** Depends on reference level, input signal level and single channel conditions
**** Will vary with amount of data burst traffic

General Specifications

Display

Bright Color Transmissive LCD, Full SVGA, 8”

Data Points

551, normal display or 661 points, full screen

Languages

Built-in English, Spanish, French, German, Japanese, Chinese, Italian and Korean. The instrument also has the capability to have customized languages installed from Master Software Tools.

Marker Modes

6 Markers, 9 Modes: Standard, Delta, Marker to Peak, Marker to Center, Marker to Reference Level, Next Peak Left, Next Peak Right, All Markers Off, Noise Marker, Frequency Counter Marker (1 Hz resolution) Markers Tracking or Fixed, Marker 1 reference for all deltas.

Sweeps

Full span, Zero span, Span Up/Span Down

Detection

Peak, Negative, Sample, RMS, Quasi-peak

Memory

Trace and Setup storage is limited only by the capacity of the installed Compact Flash card. For a 256 MB card, storage is greater than 13000 traces and over 10000 setups.

Traces

Three traces with trace overlay. Trace A is always the live data; Traces B and C can be either stored data or traces which have been mathematically manipulated. Also Trace C can show max hold or min hold.

Interfaces

Type N female RF connector for Spectrum Analyzer input

Type N female RF connector for optional Tracking Generator (MS2721B)

Reverse polarity BNC jack for optional GPS antenna connector

BNC female connectors for ext. reference and ext. trigger

5-pin Mini-B USB 2.0 for data transfer to a PC

USB 2.0 Host connector used with PSN50 High Accuracy Power Meter and USB Flash Drives

RJ45 connector for Ethernet 10/100 Base T

2.5 mm 3-wire cellular phone headset connector

Size and Weight

Size: 313 x 211 x 77 mm (12 x 7 x 2.4 in.)
Weight: 3.1 kg (<6.9 lbs.) typical

Environmental

MIL-PRF-28800F Class 2
Operating: –10º C to 55º C, humidity 85% or less
Storage: –51º C to 71º C
Altitude: 4600 meters, operating and non-operating

Safety

Conforms to EN 61010-1 for Class 1 portable equipment

Electromagnetic Compatibility

Meets European Community requirements for CE marking

MS2721B Connector Panel

MS2723B and MS2724B Connector Panel

Option Comparison Tables

GSM/GPRS/EDGE Measurements	GSM/GPRS/EDGE RF Measurements Option 40	GSM/GPRS/EDGE Demodulator Option 41
Channel Spectrum	✓	
Multi-Channel Spectrum	✓	
Channel Power	✓	
Burst Power	✓	
Frequency Error	✓	
Occupied Bandwidth	✓	
Training Sequence Code	✓	✓
Power Versus Time	✓	
IQ Vector Display		✓
Phase Error RMS		✓
Phase Error Peak		✓
EVM (RMS)		✓
EVM (Peak)		✓
Origin Offset		✓
C/I		✓
Modulation Type	✓	✓
Magnitude Error		✓
Pass/Fail Mode	✓	✓

W-CDMA/HSDPA Measurements	W-CDMA/HSDPA RF Measurements Option 44	W-CDMA Demodulator Option 45	W-CDMA/HSDPA Demodulator Option 65	W-CDMA/HSDPA Over The Air Option 35
Band Spectrum	✓			
Channel Spectrum	✓			
Carrier Frequency	✓	✓	✓	✓
Frequency Error	✓	✓	✓	
Channel Power	✓	✓	✓	✓
Occupied Bandwidth	✓			
Peak to Average Power	✓			
Noise Floor	✓			✓
ACLR	✓			
Spectral Emission Mask	✓			
P-CPICH Abs Power		✓	✓	
EVM		✓	✓	
Symbol EVM		✓	✓	
Carrier Feed Through		✓	✓	
Peak CD Error		✓	✓	
CPICH		✓	✓	✓
P-CCPCH Power		✓	✓	
S-CCPCH Power		✓	✓	
PICH		✓	✓	
P-SCH Power		✓	✓	
S-SCH Power		✓	✓	
W-CDMA, HSDPA Color-Coded Codes			✓	
Code Power vs Time Display			✓	
OVSF Code Constellation Display			✓	
Pass/Fail Mode	✓	✓	✓	
Six Scrambling Codes				✓
Ec/Io				✓
Ec				✓
Pilot Dominance				✓

Ordering Information

Models

MS2721B Handheld Spectrum Analyzer

9 kHz to 7.1 GHz

Options

Option MS2721B-009	IQ Demodulation Hardware
Option MS2721B-019	High Accuracy Power Meter (PSN50 sensor not included)
Option MS2721B-020	Tracking Generator
Option MS2721B-025	Interference Analysis
Option MS2721B-027	Channel Scanner
Option MS2721B-031	GPS (includes GPS antenna)
Option MS2721B-033	cdmaOne and CDMA2000 1xRTT OTA (requires Opt. 031)
Option MS2721B-035	W-CDMA/HSDPA OTA (requires Opt. 009)
Option MS2721B-040	GSM/GPRS/EDGE RF Meas (requires Opt. 009)
Option MS2721B-041	GSM/GPRS/EDGE Demod (requires Opt. 009)
Option MS2721B-043	cdmaOne and CDMA2000 1xRTT Demod (requires Opt. 009)
Option MS2721B-044	W-CDMA/HSDPA RF Meas (requires Opt. 009)
Option MS2721B-045	W-CDMA Demod (requires Opt. 009)
Option MS2721B-046	Fixed WiMAX RF Meas (requires Opt. 009)
Option MS2721B-047	Fixed WiMAX Demod (requires Opt. 009)
Option MS2721B-065	W-CDMA/HSDPA Demod (requires Opt. 009)

MS2723B Handheld Spectrum Analyzer

9 kHz to 13 GHz

Option MS2723B-009	IQ Demodulation Hardware
Option MS2723B-019	High Accuracy Power Meter (PSN50 sensor not included)
Option MS2723B-025	Interference Analysis
Option MS2723B-027	Channel Scanner
Option MS2723B-031	GPS (includes GPS antenna)
Option MS2723B-033	cdmaOne and CDMA2000 1xRTT OTA (requires Opt. 031)
Option MS2723B-035	W-CDMA/HSDPA OTA (requires Opt. 009)
Option MS2723B-043	cdmaOne and CDMA2000 1xRTT Demod (requires Opt. 009)
Option MS2723B-044	W-CDMA/HSDPA RF Meas (requires Opt. 009)
Option MS2723B-045	W-CDMA Demod (requires Opt. 009)
Option MS2723B-065	W-CDMA/HSDPA Demod (requires Opt. 009)

MS2724B Handheld Spectrum Analyzer

9 kHz to 20 GHz

Option MS2724B-009	IQ Demodulation Hardware
Option MS2724B-019	High Accuracy Power Meter (PSN50 sensor not included)
Option MS2724B-025	Interference Analysis
Option MS2724B-027	Channel Scanner
Option MS2724B-031	GPS (includes GPS antenna)
Option MS2724B-033	cdmaOne and CDMA2000 1xRTT OTA (requires Opt. 031)
Option MS2724B-035	W-CDMA/HSDPA OTA (requires Opt. 009)
Option MS2724B-043	cdmaOne and CDMA2000 1xRTT Demod (requires Opt. 009)
Option MS2724B-044	W-CDMA/HSDPA RF Meas (requires Opt. 009)
Option MS2724B-045	W-CDMA Demod (requires Opt. 009)
Option MS2724B-065	W-CDMA/HSDPA Demod (requires Opt. 009)

Standard Accessories Include:

10580-00175	MS2721B/MS2723B/MS2724B User's Guide
65729	Soft Carrying Case
40-168	AC – DC Adapter
806-141	Automotive Cigarette Lighter/12 Volt DC Adapter
2300-498	CD ROM containing Master Software Tools
2000-1371	Ethernet Cable
3-806-152	Cross-over Ethernet Cable
633-44	Rechargeable battery, Li-Ion
1091-27	Type-N male to SMA female adapter
1091-172	Type-N male to BNC female adapter
64343	Tilt Bail Stand Accessory
2000-1501-R	256 MB USB Flash Drive
3-2000-1498	USB Type A to Mini-B Cable
	One Year Warranty

Optional Accessories:

PSN50	High Accuracy Power Sensor, 50 MHz to 6 GHz
3-2000-1500	256 MB Compact Flash
2000-1501-R	256 MB USB Flash Drive
42N50A-30	30 dB, 50 watt, Bi-directional, DC to 18 GHz, N(m) to N(f) Attenuator
34NN50A	Precision Adapter, DC to 18 GHz, 50 Ω, N(m) to N(m)
34NFNF50C	Precision Adapter, DC to 18 GHz, 50 Ω, N(f) to N(f)
15NNF50-1.5B	Test port cable, armored, 1.5 meter N(m) to N(f), 18 GHz
15NN50-1.5C	Test port cable armored, 1.5 meter, N(m) to N(m), 6 GHz
15NN50-3.0C	Test port cable armored, 3.0 meter, N(m) to N(m), 6 GHz
15NN50-5.0C	Test port cable armored, 5.0 meter, N(m) to N(m), 6 GHz
15NNF50-1.5C	Test port cable armored, 1.5 meter, N(m) to N(f), 6 GHz
15NNF50-3.0C	Test port cable armored, 3.0 meter, N(m) to N(f), 6 GHz
15NNF50-5.0C	Test port cable armored, 5.0 meter, N(m) to N(f), 6 GHz
15ND50-1.5C	Test port cable armored, 1.5 meter, N(m) to 7/16 DIN(m), 6.0 GHz
15NDF50-1.5C	Test port cable armored, 1.5 meter, N(m) to 7/16 DIN(f), 6.0 GHz
510-90	Adapter, 7/16 DIN (f) to N(m), DC to 7.5 GHz, 50 Ω
510-91	Adapter, 7/16 DIN (f) to N(f), DC to 7.5 GHz, 50 Ω
510-92	Adapter, 7/16 DIN(m) to N(m), DC to 7.5 GHz, 50 Ω
510-93	Adapter, 7/16 DIN(m) to N(f), DC to 7.5 GHz, 50 Ω
510-96	Adapter 7/16 DIN(m) to 7/16 DIN(m), DC to 7.5 GHz, 50 Ω
1030-105	Band Pass Filters, 890-915 MHz, N(m) to N(f), 50 Ω
1030-106	Band Pass Filters, 1710-1790 MHz, N(m) to N(f), 50 Ω
1030-107	Band Pass Filters, 1910-1990 MHz, N(m) to N(f), 50 Ω
1030-109	Band Pass Filters, 824-849 MHz, N(m) to SMA(f), 50 Ω
1030-110	Band Pass Filters, 880-915 MHz, N(m) to SMA(f), 50 Ω
1030-111	Band Pass Filters, 1850-1910 MHz, N(m) to SMA(f), 50 Ω
1030-112	Band Pass Filters, 2400-2484 MHz, N(m) to SMA(f), 50 Ω
1030-114	Band Pass Filters, 806-869 MHz, N(m) to SMA(f), 50 Ω
510-97	Adapter 7/16 DIN(f) to 7/16 DIN(f), 7.5 GHz
65729	Spare soft carrying case
64343	Spare Tilt Bail Stand Accessory
40-168	Spare AC/DC adapter
806-141	Spare automotive cigarette lighter/12 Volt DC adapter
760-243-R	Transit case with wheels and retractable handle for Anritsu Handheld Master products

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