

# Spectrum Analyzers

3250 Series 1 kHz to 26.5 GHz Spectrum Analyzers

Data Sheet

**COBHAM**

The most important thing we build is trust



## The 3250 Series compact, digital spectrum analyzers...

### Performance and Accuracy

- Powerful RF performance, phase noise  
-115 dBc/Hz, DANL -145 dBm/Hz
- Vector analyzer with 30 MHz I/Q demodulation bandwidth
- Measurement personality options including GSM/EDGE, UMTS, cdma2000/1xEVDO, WLAN and WiMAX
- Remote control via LAN, GPIB, RS-232C
- S/W extension based on Windows® XP
- 7" wide touch panel display
- Standard removable hard disk
- Optional 3 GHz and 8 GHz tracking generator
- Optional EMI receiver and preselectors
- Portability based on light and compact design

The 3250 Series has been developed to provide market leading performance at a low cost. The innovative compact design of the 3250 spectrum analyzer employs the latest digital processing and RF technology, providing accomplished accuracy, stability and measurement speed.

To support the constantly evolving wireless communication market, the 3250 incorporates a standard 30 MHz bandwidth digitizer and digital modulation analysis S/W. The instrument has been optimized for various mobile and wireless communication measurements such as GSM/EDGE, UMTS, WiMAX and WiBRO.

With its powerful RF performance and advanced applications the 3250 Series is ideally suited for RF development, design analysis and testing. All models have a Windows® XP operating system, remote control capabilities via LAN, GPIB and RS-232C as well as a 7" touch panel screen, ensuring ease of operation and exceptional connectivity. The internal web server allows remote control from a web browser or tablet PC.

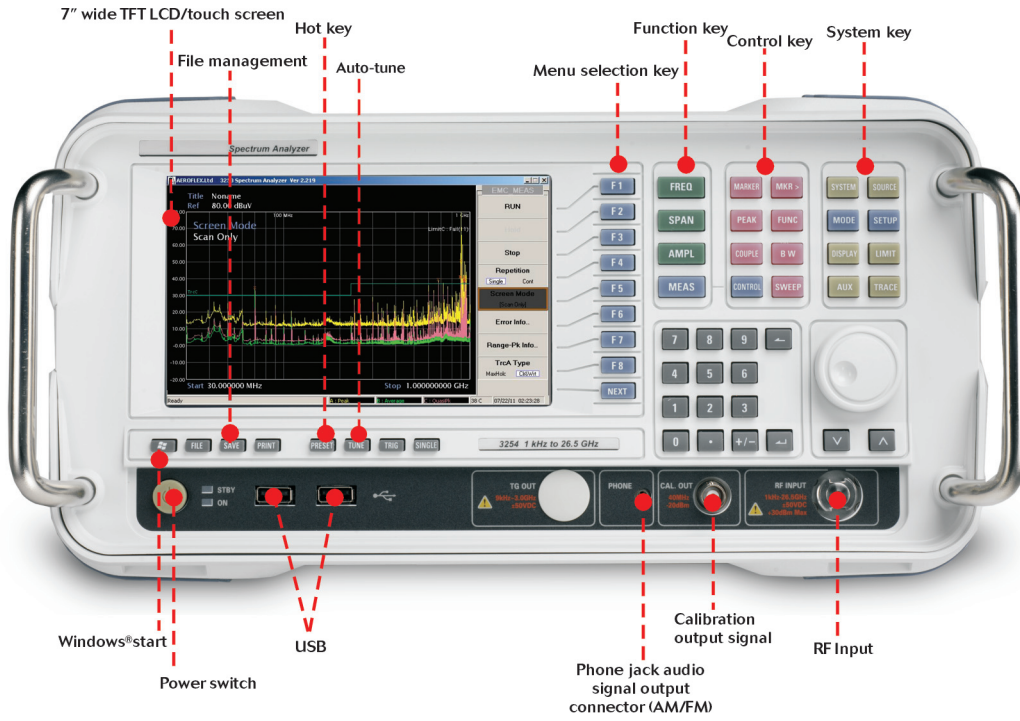
Optional measurement personality libraries for leading wireless communication technologies provide the 3250 Series exceptional measurement and demodulation capability for development and manufacturing engineers to optimize designs, improve throughput or examine signals.

Optional EMI Receiver and preselectors add comprehensive pre-compliance testing capability. Compatible with ETS-Lindgren TILE™ and Satimo INSITE Free.

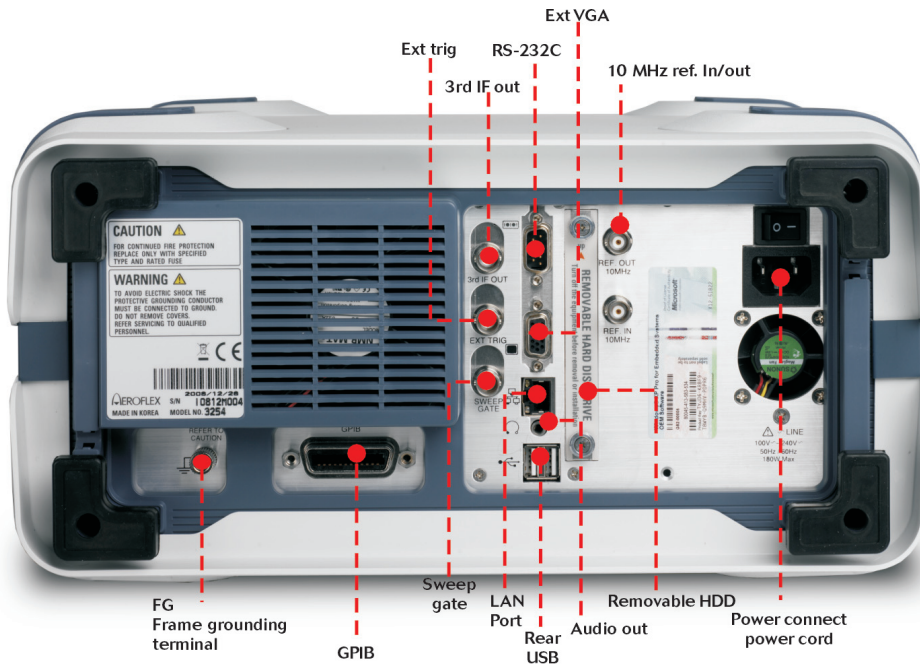
### Optional Tracking Generators

Tracking generator options are available for all frequency models. The tracking generator has a specified frequency range of 9 kHz to 3 GHz or 8 GHz and a level range from 0 dBm down to -30 dB. The tracking generator can be used to make high dynamic range measurements on components and devices, particularly filters. A normalize function is available to allow the markers to display relative flatness/frequency response.

3251	1 kHz to 3 GHz
3252	1 kHz to 8 GHz
3253	1 kHz to 13.2 GHz
3254	1 kHz to 26.5 GHz



Front of 3250 Series



Back of 3250 Series

# SPECIFICATION

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## FREQUENCY

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### FREQUENCY RANGE

1 kHz - 3 GHz / 8 GHz / 13.2 GHz / 26.5 GHz

### Resolution

1 Hz

### FREQUENCY REFERENCE PPM

Temperature Drift  $\pm 1 / \pm 0.01$  (option)

Aging per year\*  $\pm 1 / \pm 0.01$  (option)

\* Horizontal resolution is span / (sweep points - 1)

### FREQUENCY READOUT

Marker resolution depending on span (1 Hz minimum)

Accuracy  $\pm$  (marker frequency  $\times$  reference error + 3% span + 5% RBW)

### FREQUENCY COUNTER

Resolution 1 Hz / 10 Hz / 100 Hz / 1 kHz

Accuracy  $\pm$  (reference frequency accuracy  $\times$  marker frequency)  $\pm$  (counter resolution + 1 LSB)

Sensitivity -45 dBm @ 13.2 GHz > f > 2 MHz, span < 3 MHz  
-40 dBm @ 26.5 GHz > f > 13.2 GHz, span < 3 MHz

### FREQUENCY SPAN

Range 0 Hz, 10 Hz ~ 3 GHz / 8 GHz / 13.2 GHz / 26.5 GHz

Resolution 1 Hz

Accuracy  $\pm 1\%$

### SWEEP

Zero Span 1  $\mu$ s to 2000 sec,  $\pm 0.5\%$

Span  $\geq 10$  Hz 10 ms to 2000 sec,  $\pm 0.5\%$  nominal

### Sweep Points

3 to 8192 (span = 0 Hz)

101 to 8192 (span  $\geq 10$  Hz)

### TRIGGER

Source External, video, free run, burst

Offset Span  $\geq 10$  Hz 1  $\mu$ s to 500 ms

Span = 0 Hz -150 ms to +500 ms

## SPECTRAL PURITY

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Phase Noise [dBc/Hz] @ F=1 GHz

1 kHz offset -92 (-95 typical)

10 kHz offset -112 (-118 typical)

100 kHz offset -112 (-115 typical)

1 MHz offset (-134 typical)

10 MHz offset (-138 typical)

### RESIDUAL FM

< 100 x N Hz-p in 1 sec N : LO Harmonic order

Frequency	Band	N
0 Hz ~ 3 GHz	0	1
2.9 GHz ~ 6.4 GHz	1	1
6.3 GHz ~ 13.2 GHz	2	2
13.1 GHz ~ 26.5 GHz	3	4

## RESOLUTION BANDWIDTHS

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3 dB bandwidths 1 Hz to 5 MHz (1-2-3-5 Sequence)

### Bandwidth Accuracy

	20-30°C	0-55°C
500 Hz~500 kHz Filter	±3%	±5%
1 MHz~5 MHz Filter	±10%	±12%

### Shape Factor -60 dB: -3 dB

<5 (@ 500 Hz-5 MHz)

### Bandwidth Switching Uncertainty

±0.05 dB nominal @ 5 kHz RBW reference, CF=100 MHz

### VBW

#### 3 dB Bandwidths

1 Hz to 3 MHz, none (1-2-3-5 sequence)

### FFT FILTERS

3 dB Bandwidths	1 Hz to 300 Hz (1-2-3-5 sequence)
Bandwidth Accuracy	<1%, Nominal
Shape Factor (-60 dB: -3 dB)	<4.5, Nominal

## AMPLITUDE

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### DISPLAY RANGE

DANL to +30 dBm

### MAXIMUM INPUT LEVEL

DC (AC coupled)	±50 VDC
CW RF Power	+30 dBm
Peak Power	+50 dBm, 5 µs pulse width; 0.5% duty cycle
Preamp on	+20 dBm

### RF Input Attenuator

Range	0 to 55 dB
Steps	5 dB
Switching Accuracy	±0.5 dB @ 100 MHz ±0.5 dB @ <13.2 GHz ±0.8 dB @ 13.2 GHz ~ 26.5 GHz

### 1 dB CP [dBm]

0 dB RF attenuation	-10 dBm @ 10 MHz to 3 GHz 0 dBm @ 3 GHz to 26.5 GHz
Preamp on	-32 dBm @ 1 GHz

### THIRD-ORDER INTERMODULATION DISTORTION (TOI) [dBm]

Two -30 dBm tones at input mixer with tone separation >100 kHz	+8 dBm @ 10 MHz to 200 MHz +12 dBm (15 typical) @ 200 MHz to 26.5 GHz
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### SECOND HARMONIC INTERCEPT (SHI)

+40 dBm typical @ -1.5 GHz, -30 dBm input
+80 dBm @ 1.5 GHz to 26.5 GHz, -30 dBm input

## DISPLAYED AVERAGE NOISE LEVEL (DANL) [dBm/Hz]

0 dB RF attenuation, 50  $\Omega$  termination

RBW 1 Hz, VBW 1 Hz, preamp OFF

	20-30°C	0-55°C
100 kHz to 10 MHz	-135	-132
10 MHz to 2 GHz	-143, -145 typical	-140, -142 typical
2 GHz to 2.9 GHz	-141, -145 typical	-138, -142 typical
2.9 GHz to 3 GHz	-139, -141 typical	-136, -140 typical
3 GHz to 13.2 GHz	-141, -145 typical	-138, -142 typical
13.2 GHz to 18 GHz	-138, -142 typical	-135, -139 typical
18 GHz to 26.5 GHz	-133, -138 typical	-130, -135 typical

## IMMUNITY TO INTERFERENCE

Residual Responses -90 dBm (0 dB RF attenuation, 50  $\Omega$  termination)

-85 dBm above 23 GHz (3254 only)

Other Input Related -55 @ -30 dBm input

Spurious [dBc]

## DISPLAY RANGE

Log Scale	0.1 to 1 dB / div in 0.1 dB steps 1 to 20 dB / div in 1 dB steps
Linear Scale	10 Divisions
Units of Level Axis	dBm, dBmV, dB $\mu$ V, V, W (log level display) mV, $\mu$ V, dBmV (linear level display)

## REFERENCE LEVEL

Logarithmic Range	-170 dBm to +30 dBm, 0.1 dB steps
Linear Range	7.07 nV to 7.07 V in 1% steps
Accuracy	0 dB

## TRACES

Number	3 traces
Trace Detectors	Normal, peak, sample, negative peak, log power average, RMS average, and voltage average
Trace Functions	Clear/write, max hold, min hold, view, blank, average

## FREQUENCY RESPONSE

10 dB input attenuation, preselector centering applied

	20-30°C	0-55°C
1 MHz to 3.0 GHz	$\pm 0.5$ dB	$\pm 1.0$ dB
3.0 GHz to 8 GHz	$\pm 1.0$ dB	$\pm 3.0$ dB
8 GHz to 13.2 GHz	$\pm 1.5$ dB	$\pm 4.0$ dB
13.2 GHz to 22 GHz	$\pm 2.0$ dB	$\pm 5.0$ dB
22 GHz to 26.5 GHz	$\pm 2.5$ dB	$\pm 5.0$ dB
1 MHz to 3.0 GHz	Preamp ON	$\pm 1.0$ dB

## DISPLAY LINEARITY [dB]

Linear and Log Switching Error	0
Log Scale Switching Error	0
Linearity	$\pm 0.1$ total @ input mixer level $\leq -20$ dBm $\pm 0.13$ total @ -20 dBm < mixer level $\leq -10$ dBm

## VECTOR ANALYSIS

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Maximum Digitizer Analysis Bandwidth	30 MHz
Digitizer ADC Resolution	14 bits
Dynamic Range	85 dB
Residual FM	<1% (nominal)
Capture Memory	128 Mbytes (32 Msamples)
Modulation Formats	PSK 8, 16, 32, 64 BPSK, QPSK, OQPSK Differential, shifted
	QAM 4, 8, 16, 32, 64, 128, 256
Maximum Symbol Rate	13 MHz
Filters	Raised cos Root raised cos

## AM/FM DEMODULATION

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Input Power Range	-60 dBm to +30 dBm, preamp OFF -80 dBm to +30 dBm, preamp ON
Modulation Rate Range	1 Hz to 10 kHz @ RBW 10 kHz to 100 kHz 1 Hz to 30 kHz @ RBW 200 kHz to 500 kHz
Peak FM Deviation	200 Hz - 500 kHz
FM Deviation Accuracy	±5%
AM Depth Range	5% - 99%
AM Depth Accuracy	±5%
Audio Output Port	Loudspeaker, phone jack

## INPUTS AND OUTPUTS

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### RF INPUT

Type Front APC 2.92 mm, 50  $\Omega$  (26.5 GHz)

VSWR>10 dB input attenuation

<1.5 nominal @10 MHz to 3 GHz

<1.8 nominal @ 3 GHz to 13.2 GHz

<2.0 nominal @ 13.2 GHz to 26.5 GHz

### 3RD IF OUTPUT

Type Rear BNC female, 50 W

Frequency 21.4 MHz

Bandwidth 16 MHz Max, different as prefilter

Level +2 dBm nominal, at top of screen

### Audio Output

Type Front Phone jack

### Ext Trigger Input

Type Rear BNC female, 10 k $\Omega$  nominal

Trigger level TTL nominal

### Sweep Gate Output

Type Rear BNC female

Trigger level TTL nominal

### Reference Frequency Output

Type Rear BNC female, the same as reference input port

Frequency	10 MHz
Level	+5 dBm, nominal

#### Reference Frequency Input

Type	Rear	BNC female, the same as reference output port
Frequency		10 MHz
Required level		-5 to +15 dBm nominal

#### GPIB

Type	Rear	IEEE 488.2, 24 - pin female
Command set		SCPI 1997.0
Interface functions		SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, E2, LE0, TE0

#### Serial Interface

Rear	RS - 232 - C (COM), 9 - pin D - SUB female
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#### LAN Interface

Rear	10 / 100 / 1000 Base T, Connector RJ 45
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#### USB

Front/Rear USB 2.0, Front: 2 EA, Rear: 2 EA  
Supports mouse, keyboard and printer.

#### Monitor Output (VGA)

Rear	15-pin mini D-SUB
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#### Cal. Out

Frequency	Front	40 MHz
Level		-20 dBm + 1.0

## GENERAL SPECIFICATIONS

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### DISPLAY

#### Size

7" Wide color TFT LCD (Touch-Screen)

#### Resolution

800 x 480 pixels

### MASS MEMORY

Hard Disk, Removable, 80 GB

### ENVIRONMENTAL CONDITIONS

MIL - PRF - 28800 F, Class 3

#### Temperature

Operating	0°C to + 50°C
Permissible	0°C to + 55°C
Storage	-20°C to + 71°C

Permissible temperature has slightly wider range as compared to the normal operating temperature. We guarantee the specification of the equipment when operating within the Operating Temperature range. We guarantee that the equipment is functional when operating within the Permissible Temperature.

#### Humidity

5% to 95% (5 ~ 75% above 30°C, 5 ~ 45% above 40°C)

#### Altitude

Up to 4600 metres

### MECHANICAL RESISTANCE

MIL-PRF-28800F, Class 3

#### Vibration, Random

5 Hz to 500 Hz

#### Vibration, Sinusoidal

5 Hz to 55 Hz

**Shock**

30 G, Half-sine shock

**EMC**

EN 61326-1

EN 55022

EN 55024

EN 61000 - 3 - 2

EN 61000 - 3 - 3

**SAFETY**

EN 61010 - 1 (2nd Edition)

**AC POWER SUPPLY**

100 V AC to 240 V AC

(Limit 90 V AC to 264 V AC)

50 Hz to 60 Hz

**Power Consumption**

140 Watt max

**DIMENSIONS****(WxHxD) [mm]**

373 (W) x 194 (H) x 401 (D) without handles and feet down

384 (W) x 203 (H) x 437 (D) with handles and feet down

**(WxHxD) [inches]**

14.7 (W) x 7.6 (H) x 15.8 (D) without handles and feet down

15.1 (W) x 8 (H) x 17.2 (D) with handles and feet down

**WEIGHT****Model**

	3251	3252	3253	3254
[kg]	11.0	12.8	13.0	13.4

**RECOMMENDED CALIBRATION INTERVAL**

1 - year

**STANDARD WARRANTY**

2 - year

**3 GHz TRACKING GENERATOR- 325X/1**

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**Frequency Range**

9 kHz to 3 GHz

**Output Level**

-30 dBm to 0 dBm

**Output Level Resolution**

0.1 dB

**Absolute Level Accuracy**

±2.0 dB

**Flatness [dB] at -10 dBm**

9 kHz to 100 kHz, ±4.0, Before Normalization

100 kHz to 3 GHz ±2.5 Before Normalization

9 kHz to 3 GHz ±1.0 After Normalization

**Spurious**

Harmonics, <-15 dBc from 5 MHz to 3 GHz

Non harmonics, <-30 dBc



**Leakage**

-90 dBm

**VSWR**

<1.5 @ 0 dBm Output Level

**Connector**

N female, 50  $\Omega$

**8 GHz TRACKING GENERATOR- 325X/2**

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**Frequency Range**

100 kHz to 8 GHz

**Output Level**

0 dBm to -20 dBm (in 0.5 dB steps)

**Attenuator Steps**

0.5 dB

**Absolute Level Accuracy**

100 kHz to 3 GHz  $\pm 3$  dB

3 GHz to 8 GHz  $\pm 4.5$  dB

**Flatness [dB] @ -10 dBm**

100 kHz to 3 GHz  $\pm 3$  dB, before normalization

3 GHz to 8 GHz  $\pm 4.5$  dB, before normalization

100 kHz to 8 GHz  $\pm 1.0$  dB, after normalization

**Spurious**

Harmonics, <-15 dBc

Non-harmonics, <-20 dBc

**Leakage at TG Output Level 0 dBm**

100 kHz to 3 GHz -90 dBm

3 GHz to 8 GHz -80 dBm

**VSWR**

100 kHz to 3 GHz <1.5:1 @-10 dBm output level

3 GHz to 8 GHz <2:1 all output levels

**Connector**

N Female, 50  $\Omega$

**PRE-SELECTOR- OPTION 5**

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When selected, all specifications remain the same except for the following:

**Frequency Range- AC Coupled**

9 kHz to 30 MHz

**Preselection**

7 preselection filters

9 kHz to 150 kHz, fixed LPF

150 kHz to 600 kHz, fixed BPF

600 kHz to 1.2 MHz, fixed BPF

1.2 MHz to 2.5 MHz, fixed BPF

2.5 MHz to 5 MHz, fixed BPF

5 MHz to 10 MHz, fixed BPF

10 MHz to 30 MHz, fixed BPF

### **Third order intercept point (IP3) (dBm)**

Two -30 dBm tones at input mixer with tone separation >100 kHz

Preselector OFF, preamp OFF

+8 @ 10 MHz to 200 MHz

+12, +15 typical @ 200 MHz, to 8 GHz

Preselector ON, preamp OFF

+8 @ 10 MHz to 30 MHz

Preselector ON, preamp ON

-10 typical @ <100 MHz

-10, -8 typical @ 100 MHz to 1 GHz

-8, -5 typical @ 1 GHz to 3 GHz

### **Second order intercept point (IP2) (dBm) -30 dBm input**

Preselector OFF, preamp OFF

+40 typical @ 10 MHz to 4 GHz

Preselector ON, preamp OFF

+40 typical @ 10 MHz to 4 GHz

Preselector ON, preamp ON

+25 typical @ 10 MHz to 1.5 GHz

### **Displayed Average Noise Level (DANL) (dBm)**

0 dB RF attenuation, 50 termination, zero span, sweep time 100 msec, RBW 1 kHz, VBW 10 Hz, Average detector, trace average 10, normalize to RBW 1 Hz

Preselector OFF, preamp OFF

-130 @ 9 kHz to 1 MHz

-140, -150 typical @ 1 MHz to 10 MHz

-145, -149 typical @ 10 MHz to 1 GHz

-143, -147 typical @ 1 GHz to 1.5 GHz

-141, -145 typical @ 1.5 GHz to 2.5 GHz

-139, -142 typical @ 2.5 GHz to 3 GHz

-142, -147 typical @ 3 GHz to 6.4 GHz

-140, -145 typical @ 6.4 GHz to 8 GHz

Preselector ON, preamp OFF

-130 @ 9 kHz to 1 MHz

-142, -147 typical @ 1 MHz to 30 MHz

Preselector ON, preamp ON

-140 @ 9 kHz to 1 MHz

-158, -165 typical @ 1 MHz to 30 MHz

-162, -165 typical @ 30 MHz to 1 GHz

-160, -163 typical @ 1 GHz to 1.5 GHz

-157, -160 typical @ 1.5 GHz to 2.3 GHz

-155, -158 typical @ 2.3 GHz to 3 GHz

### **Frequency Response**

10 dB input attenuation, preselector centering applied, reference to 100 MHz

Preselector OFF, preamp OFF

±0.5 dB @ 9 kHz to 3.0 GHz

±1.0 dB @ 3.0 GHz to 8 GHz

Preselector OFF, preamp ON

±0.7 dB @ 9 kHz to 3.0 GHz

Preselector ON, preamp ON

±1.0 dB @ 9 kHz to 1.0 GHz

±1.5 dB @ 1 GHz to 3.0 GHz

## SOFTWARE OPTIONS

Measurement Function	2G Cellular	3G Cellular		Wireless Data	
	GSM/EDGE	UMTS (ULS) HSUPA	cdma2000r 1xEV-DO	WLAN (802.11a,b,g)	WIMAX (802.16e OFDMA)
3250 option	8	9	10	11	12
Power	4	4	4	4	4
Power Template				4 (ramp time 802.11b)	4
Occupied BW		4		4 (802.11a,g only)	4
Code Domain Power		4	4		
Peak Code Domain Error		4	4 (RC3, 4)		
Magnitude Error		4	4		
Phase Error	4 (GSM)	4	4		
IQ Skew		4		4	4
Gain Imbalance		4		4	4
EVM	4 (EDGE)	4 (QPSK & composite)	4 (QPSK & composite)	4 single/all carriers- data or pilot	4 single/all carriers- data or pilot
Constellation Error				4 (a only)	4
Rho			4 (composite)		
Symbol/Chip Timing				4	4
Carrier Suppression (Origin Offset)	4 (EDGE)		4 (QPSK)		
Frequency Error	4	4	4	4	4
Spectral Emissions	4 (ORFS)		4 (Spectral Mask)	4 (Spectral Mask)	4 (Spectral mask)
Spectral Flatness				4 (a, g only)	4
Adjacent Channel Power		4 (ACLR)	4 (ACPR)	4 (ACP)	
CCDF		4	4	4	4
BER	4 (GSM)	4			

## VERSIONS, OPTIONS AND ACCESSORIES

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When ordering please quote the full ordering number information.

### Ordering

#### Numbers

#### Versions

#### Standard units

3251/0	Spectrum Analyzer (1 kHz - 3 GHz)
3251/1	Spectrum Analyzer (1 kHz - 3 GHz) incl. 3 GHz Tracking Gen
3252/0	Spectrum Analyzer (1 kHz - 8 GHz)
3252/1	Spectrum Analyzer (1 kHz - 8 GHz) incl. 3 GHz Tracking Gen
3252/2	Spectrum Analyzer (1 kHz - 8 GHz) incl. 8 GHz Tracking Gen
3253/0	Spectrum Analyzer (1 kHz - 13.2 GHz)
3253/1	Spectrum Analyzer (1 kHz - 13.2 GHz) incl. 3 GHz Tracking Gen
3253/2	Spectrum Analyzer (1 kHz - 13.2 GHz) incl. 8 GHz Tracking Gen
3254/0	Spectrum Analyzer (1 kHz - 26.5 GHz)
3254/1	Spectrum Analyzer (1 kHz - 26.5 GHz) incl. 3 GHz Tracking Gen
3254/2	Spectrum Analyzer (1 kHz - 26.5 GHz) incl. 8 GHz Tracking Gen

### Hardware

Opt.03	High Stability Oscillator
Opt.05	Pre-Selector (A, B band)

### Software

Opt.08	GSM/EDGE Measurement Suite
Opt.09	UMTS UL Measurement Suite
Opt.10	cdma2000/1xEVDO Measurement Suite
Opt.11	WLAN Measurement Suite
Opt.12	WiMAX Measurement Suite
Opt.13	EMI Measurement Suite

### Supplied Accessories

Operating Manual on CD-ROM
Mains lead
R5-232 lead
N-type/PC 3.5 Adaptors (3254 only)

### Optional Accessories

80027	Soft Carrying Case
80039	Connector and Cable Assembly
80040	Hard Carrying Case
80041	Rack Mounting Kit
47090/006	Service Manual

