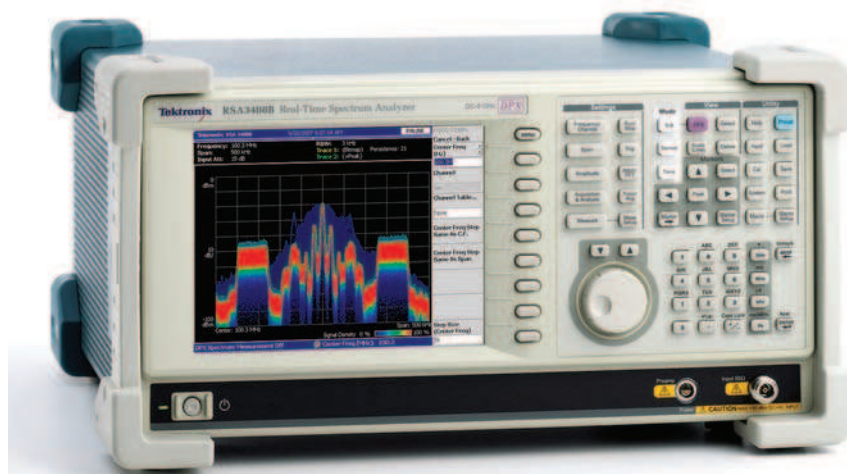


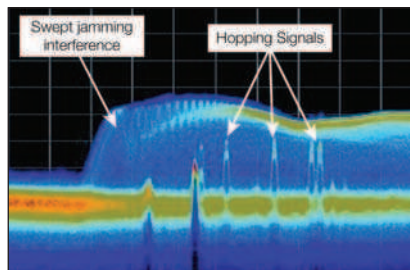
Real-Time Spectrum Analyzer

► RSA3408B



RSA3408B DC to 8 GHz Real-time Spectrum Analyzer with DPX™

The RSA3408B makes it easy for you to discover design issues that other signal analyzers miss. The revolutionary DPX spectrum display offers an intuitive live color view of signal transients changing over time in the frequency domain, giving you immediate confidence in the stability of your design or instantly displaying a fault when it occurs. This live display of transients is impossible with other signal analyzers. Once a problem is discovered with DPX, the RSA3408B Real-time Spectrum Analyzer (RTSA) can be set to trigger on the event in the frequency domain, capture a continuous time record of changing RF events and perform time-correlated analysis in all domains. You get the functionality of a high-performance vector signal analyzer, a spectrum analyzer and the unique discover-trigger-capture-analyze capability of a Real-time Spectrum Analyzer – all in a single package.



► Revolutionary DPX display discovers what other analyzers miss. This is an off-the-air capture of a frequency hopping signal jammed by large interference.

► Applications

RF debug of components, modules or systems

Find interference and unknown signals in spectrum monitoring and management

Analyze time-variant behavior of standards-based and other radio systems

Field tactical radio transceiver measurements

Characterize radar and pulsed RF signals

Powerful vector signal analyzer functionality and signal source analysis capability

Broad range of standard-specific options for analysis of RFID, 3GPP, 3GPP2, LTE (via RSALTE), WiMax (via RSA-IQWiMax) and WLAN systems

Comprehensive analog demodulation and audio distortion measurement for tactical radio and sonar systems

► Features & Benefits

Discover

DPX™ spectrum processing provides an intuitive understanding of time-varying RF signals with color graded displays based on frequency of occurrence

Revolutionary DPX displays transients with >48,000 spectrum measurements per second

Trigger

Tektronix exclusive frequency mask trigger (FMT) offers easy event-based capture of transient RF Signals by triggering on any change in the frequency domain

Capture

DC to 8 GHz frequency range

All signals in spans up to 36 MHz are captured into memory

Up to 1.28 s acquisition length at 36 MHz bandwidth provides complete analysis over time without making multiple acquisitions

Fully preselected and image-free at all times for full dynamic range at any capture bandwidth

Interfaces with TekConnect® probes for RF probing

Differential IQ input available

Analyze

Extensive time-correlated vector spectrum analysis. Multi-domain displays connect problems in Time, Frequency, Phase and Amplitude for quicker understanding of cause and effect when troubleshooting

Power measurements and signal statistics help you characterize components and systems: ACLR, Power vs. Time, CCDF, PDF and Real-time spectrum emission measurement with user-defined spectrum emission mask

Pulse measurements including Pulse Width, Duty Cycle and Pulse-to-Pulse Phase

Offline analysis available with RSAVu software

Analog demodulation analysis including Baseband, AM, FM, PM measurements

Audio distortion analysis of Baseband, AM and FM with Real-time spectrogram and graphical display of harmonics and spurious. Wide choices of low pass filters, high pass filters, band pass filters and de-emphasis settings

Real-Time Spectrum Analyzer

► RSA3408B

► Characteristics

Discover

The DPX™ spectrum processing engine brings live analysis of transient events to spectrum analyzers. Performing more than 48,000 frequency transforms per second, transients as brief as 31 μs are displayed in the frequency domain. This is orders of magnitude faster than conventional analysis techniques. Events are color-coded by rate of occurrence onto a bitmapped display, providing unparalleled insight into transient signal behavior.

Trigger

The Tektronix Frequency Mask Trigger (FMT, Opt. 02) makes it easy to trigger on signals in the frequency domain and capture transient signals in bandwidths up to 36 MHz. An FMT is simply configured to monitor all changes in frequency occupancy within the capture bandwidth. The Power Trigger, working in any capture bandwidth, fires at the instant in time when the RF input signal crosses a user-set power threshold. An external trigger is available for synchronization to test system events.

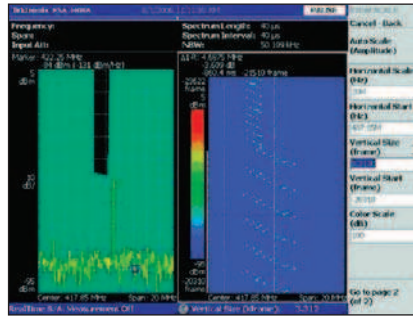
Capture

Unlike many SA/VSA combination instruments, the RSA3408B is fully preselected at all times for spurious and image rejection in any combination of capture bandwidth and frequency. Capture of small signals in the presence of large signals is enabled with 73 dB Spurious-Free Dynamic Range (SFDR) and class-leading image rejection in all capture bandwidths. Capture once with seamless acquisitions – make multiple measurements without recapturing. Record lengths vary depending upon the selected capture bandwidth-up to 1.28 seconds at 36 MHz, 51.2 seconds at 1 MHz or 1.42 hours at 10 kHz bandwidth with FMT/Deep Memory Option 02.

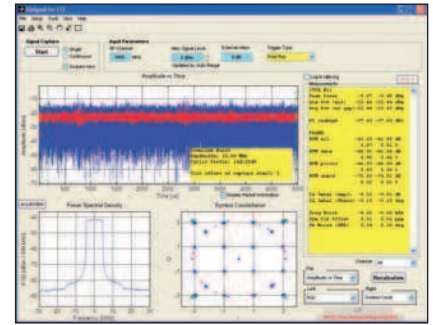
Analyze

The RSA3408B offers analysis capabilities that advance productivity for engineers working on components or in RF system design, integration and performance verification, or operations engineers working in network or spectrum management.

- Spectrograms display both frequency and amplitude changes over time. Measurements are time-correlated across the frequency, phase, amplitude and modulation domains
- Ability to analyze any captured acquisition
- Analog modulation analysis and pulse analysis are standard
- Analog demodulation analysis including baseband, AM, FM, PM measurements



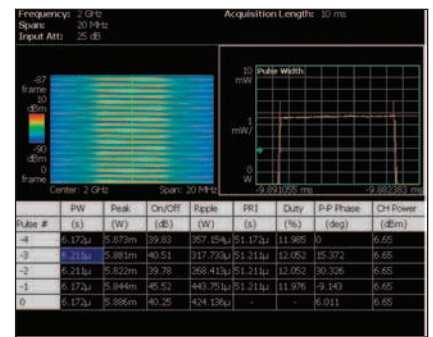
- FMT and Spectrogram of a fast hopped signal captured. The left side displays the user-defined Frequency Mask Trigger (FMT), while the right side spectrogram displays the captured signal hopping pattern.



- The RSA3408B is your best tool for both troubleshooting and conformance testing. Here, a LTE analysis is performed using RSALTE software.

- Audio distortion analysis of Baseband, AM and FM with real-time spectrogram and graphical display of harmonics and spurious. Wide choices of low pass filters, high pass filters, band pass filters and de-emphasis settings

- A wealth of modulation analysis options are available, including the UMTS W-CDMA Family (3GPP, HSPA and HSDPA), WiMax (Fixed and Mobile via RSA-IQWiMax) and WLAN (802.11a/b/g/n). General purpose modulation analysis includes support for M-QAMs, QPSKs, nFSK, CPM, SOQPSK and the latest RFID standards including ISO 18000-7 and 15963, plus signal source analysis including phase noise, jitter and frequency-settling time. See specifications for details on measurement options



- Powerful pulsed signal analysis for characterization of Radar and other pulsed systems. The RSA3408B automatically measures pulse width, rep rate, pulse power and 7 other pulse parameters.
- Import user-defined and reference filters for customer modulation types
- Save captured waveforms in .mat or .csv formats for post processing analysis

Accessories

A wide range of Tektronix active and passive probes are supported with the RTPA2A probe adapter for your RSA3408B in circuit-troubleshooting applications. Probe calibration factors are transferred via USB for calibrated measurements.

TekConnect® Probe Supported	Frequency Range	Type
P7225	2.5 GHz	Active
P7240	4 GHz	Active
P7260	6 GHz	Active
P7330	3.5 GHz	Differential
P7350	5 GHz	Differential
P7350SMA	5 GHz	Differential SMA
P7380	8 GHz	Z-Active Differential
P7380SMA	8 GHz	Differential SMA
P7313	>12.5 GHz	Z-Active Differential

RSA3408B: The mid-range member of the RTSA Family

Tektronix offers Real-time Spectrum Analyzer models to meet a range of needs for frequency coverage, real-time bandwidth and dynamic range. The table below summarizes the differences between the models. Full details of the RSA3300B and RSA6100A models are available in separate data sheets.

Specification or Feature	RSA3303/08B	RSA3408B	RSA6106/14A
Freq Range	DC to 3.0/8.0 GHz	DC to 8.0 GHz	9 kHz to 6.2/14.0 GHz
Max. Capture BW	15 MHz	36 MHz	40 MHz standard 110 MHz Option
Triggers, Standard	Level, Free Run, External	Level, Free Run, External	Level, Free Run, External(2), Line
Triggers, Optional	Frequency Mask 15 MHz BW	Frequency Mask 36 MHz BW	Frequency Mask 40/110 MHz BW
Digital Phosphor (DPX) Spectrum Update Rate, Max Span and Min. Signal Duration	>48,000 Spectrums/sec 15 MHz Max Span; Min. Sig. Duration: 41 us	>48,000 Spectrums/sec 36 MHz Max Span; Min. Sig. Duration: 31 us	>48,000 Spectrums/sec 40/110 MHz Max Span; Min. Sig. Duration: 31/24 us
Memory	64 M/256 MB	64 M/256 MB	256 M/1GB
Spurious-Free Dynamic Range at Max. Capture BW	-70 dBc/15 MHz	-73 dBc/36 MHz	-73 dBc/110 MHz
DANL, 1 GHz	-150 dBm/Hz	-151 dBm/Hz	-149 dBm/Hz
SSB Phase Noise at Specified Offsets at 1 GHz, dBc/Hz (Typical)	10 kHz: -108	10 kHz: -112	10 kHz: -110
	1 MHz: -133	1 MHz: -135	1 MHz: -134
	10 MHz: -136	10 MHz: -140	10 MHz: -142
Screen Size, User Interface	8.4 Inch Screen, Keyboard, Mouse, Front Panel	8.4 Inch Screen, Keyboard, Mouse, Front Panel	10.4 Inch Touch-Screen, Keyboard, Mouse, Front Panel
Interface Ports	GPIO, LAN, USB(2)	GPIO, LAN, USB(2)	GPIO, LAN, USB(4)
Storage Media	Internal HDD and FDD	Internal HDD and FDD; Optional Removable HDD	Internal HDD and DVD \pm RW; Optional Removable HDD
IQ Inputs Option	20 MHz BW Differential Inputs	40 MHz BW Differential Inputs	Not Available
IF Outputs	Not Available	Standard, 421 MHz, 40 MHz BW	Option, 500 MHz, 120 MHz BW
Digital I and Q Output Option Bandwidth	Not Available	Up to 36 MHz BW	Up to 110 MHz BW, fully corrected amplitude and phase
Preamplifier	Option, External, 0.1 to 3 GHz 20 dB Gain nominal	Option, External, 0.1 to 3 GHz 20 dB Gain nominal	Option, Internal, 0.01 to 3 GHz 30 dB Gain nominal

Trigger-related

Trigger Modes – Free run, Triggered (Single or Continuous).

Trigger Event Source – RF Input, External Trigger Input.

Trigger Types – Power Level; Frequency Mask (Opt. 02).

Trigger Position – Settable from 0 to 100% of total acquisition length.

Power Level Trigger

Level Range – 0 dBfs to -40 dBfs*1 from reference level.

Trigger Bandwidth Range – 100 Hz to 36 MHz (equal to selected span).

Trigger Position Display Timing Uncertainty (Power and External Trigger) – ± 2 sample points.

*1 dBfs: dB relative to full scale.

Frequency Mask Trigger (Option 02)

Mask Shape – User-defined.

Mask Point Horizontal Resolution – 1 bin.

Level Range – 0 to -60 dBfs at 10 dB/div vertical scale..

Level Accuracy – Equal to reference level accuracy + frequency response over 0 to -60 dBfs range.

Span Range –

Start Frequency \geq 40 MHz: 100 Hz to 36 MHz.

Start Frequency < 40 MHz: 100 Hz to 40 MHz.

Minimum Event Duration for 100% Probability of Trigger – 20 μ s (at maximum acquisition bandwidth)

Events lasting less than minimum event duration specification will result in degraded Frequency Mask Trigger level accuracy.

Trigger Position Uncertainty – ± 2 Frames (For Span = 36 MHz, uncertainty = $\pm 40 \mu$ s).

External Trigger

Level Range – -1.5 V to +1.5 V.

Level Setting Resolution – 0.1 V.

Trigger Position Timing Uncertainty – ± 2 samples.

Input Impedance – $> 2K \Omega$ (nominal).

Trigger Output

Voltage

HIGH – ≥ 2.0 V;

LOW – < 0.4 V (Output Current < 1 mA).

Capture-related

Real-time Acquisition Bandwidth, maximum –

Start Frequency \geq 40 MHz (RF) – 36 MHz.

Start Frequency < 40 MHz (Baseband) – 40 MHz.

IQ Inputs (Option 03) – 40 MHz.

A/D Converter – 102.4 MS/s, 14 bit.

Acquisition Memory Size – 64 MB (16.4 MSamples) Standard, 256 MB (65.6 MSamples), Opt. 02.

Minimum Acquisition Length – 1024 Samples.

Acquisition Length Setting Resolution – 1024 Samples.

► Memory Depth (time) and Maximum Time Resolution

Span	Sample Rate	Record Length	Record Length	Spectrum Frame	Time Resolution
	(For I and Q)	Standard	(Option 02)	(Time)	(I and Q)
40 MHz (baseband)	51.2 MS/s	0.32 s	1.28 s	20 µs	20 ns
36 MHz	51.2 MS/s	0.32 s	1.28 s	20 µs	20 ns
20 MHz	25.6 MS/s	0.64 s	2.56 s	40 µs	40 ns
10 MHz	12.8 MS/s	1.28 s	5.12 s	80 µs	80 ns
5 MHz	6.4 MS/s	2.56 s	10.24 s	160 µs	160 ns
2 MHz	2.56 MS/s	6.4 s	25.6 s	400 µs	400 ns
1 MHz	1.28 MS/s	12.8 s	51.2 s	800 µs	800 ns
500 kHz	640 kS/s	25.6 s	102.4 s	1.6 ms	1.6 µs
200 kHz	256 kS/s	64 s	256 s	4.0 ms	4.0 µs
100 kHz	128 kS/s	128 s	512 s	8.0 ms	8.0 µs
50 kHz	64 kS/s	256 s	1024 s	16 ms	16 µs
20 kHz	25.6 kS/s	640 s	2560 s	40 ms	40 µs
10 kHz	12.8 kS/s	1280 s	5120 s	80 ms	80 µs
5 kHz	6.4 kS/s	2560 s	10240 s	160 ms	160 µs
2 kHz	2.56 kS/s	6400 s	25600 s	400 ms	400 µs
1 kHz	1.28 kS/s	12800 s	51200 s	800 ms	800 µs
500 Hz	640 S/s	25600 s	102400 s	1.6 s	1.6 ms
200 Hz	256 S/s	64000 s	256000 s	4.0 s	4 ms
100 Hz	128 S/s	128000 s	512000 s	8.0 s	8 ms

Analysis-related

Standard Measurement Functions by Mode

Spectrum Analyzer Mode – Channel Power, Adjacent Channel Power, Occupied Bandwidth, Emission Bandwidth, Carrier-to-Noise Ratio, Carrier Frequency, Spurious Search, dBm/Hz Marker, dBc/Hz Marker, Spectrum Emission Mask.

RTSA Mode – Channel Power, Adjacent Channel Power, Occupied Bandwidth, Emission Bandwidth, Carrier-to-Noise Ratio, Carrier Frequency, Spurious Search, dBm/Hz Marker, dBc/Hz Marker, Real-time Spectrum Emission Mask.

RTSA with Zoom – dBm/Hz Marker, dBc/Hz Marker.

DPX – dBm/Hz Marker, dBc/Hz Marker.

Analog Mod. Analysis – IQ vs. Time, AM Depth, FM Deviation, PM Deviation, Pulse Spectrum.

Time – IQ vs. Time, Power vs. Time, Frequency vs. Time, CCDF, Crest Factor.

Pulse – Pulse Width, Peak Power, Ripple, Pulse Repetition Interval, Duty Cycle, Pulse-to-Pulse Phase, Frequency Deviation, Channel Power, OBW, EBW.

Optional Measurement Functions, Standards-based and Offline Analysis*1

General Purpose Digital Modulation Analysis (Option 21) Mod. Formats: BPSK, QPSK, $\pi/4$ DQPSK, OQPSK, SOQPSK, 8PSK, D8PSK, 16/32/64/128/256-QAM, GMSK, GFSK, C4FM, 2ASK, 2FSK, 4FSK, 8FSK, 16FSK, CPM (per MIL STD 188-181C) **Standard support:** Bluetooth, TETRA, P25, 802.15.4 – EVM (RMS, Peak, EVM vs. Time), Magnitude Error (RMS, Peak, Mag Error vs. Time), Phase Error (RMS, Peak, Phase Error vs. Time), Origin Offset, Frequency Error, Gain Imbalance, Quadrature Error, Rho, Constellation,

Symbol Table, Symbol Timing Error, FSK Deviations and Error, – PDF: Probability of Occurrence vs. Power Level – AM-AM, AM-PM, 1 dB Compression, Crest Factor.

Audio Distortion Analysis (Option 10) – S/N, SINAD, THD, TNHD, Audio Freq, AM modulation, FM deviation, Spectrum, Spectrogram, Hum and Noise Ratio, Harmonics, non-Harmonics.

RFID Analysis (Included in Option 21) ISO/IEC 18000 Part 4 Mode 1. ISO/IEC 18000 Part 6 Type A, B, C. ISO/IEC 18092 (424k). ISO/IEC 14443 Part 2 Type A, B. EPC Global Generation 1 Class 0, Class 1. ISO/IEC 18000-7ISA/IEC 15693 – Maximum ERP, Spurious, Power-on and Power-down Timing and Settling, RF Envelope On-width, Off-width and Period, Constellation, Modulation Depth, Modulation Index, Symbol Rate, Bit Rate, Tari Data - 0, Tari Data - 1, Eye Diagram, Symbol Table, OBW, EBW, FSK Envelope.

Signal Source Analysis(Included in Option 21) – Integrated Phase Noise, Random Jitter, Periodic Jitter, Settling Time, Spurious, Real-time Phase Noise vs. Time (Noise-o-Gram).

GSM/EDGE (Option 24) – Modulation Accuracy, Mean Power, Power vs. Time, Spectrum due to Modulation, Spectrum due to Switching.

CDMA2000-1X Forward/Reverse Link (Option 25) – Channel Power, ACPR, Spectrum Emission Mask, CCDF, Modulation Accuracy, Code Domain Power.

1XEV-DO Forward/Reverse Link (Option 26) – Channel Power, ACPR, Spectrum Emission Mask, CCDF, Modulation Accuracy, Code Domain Power.

TD-SCDMA (Option 28) – Channel Power, ACLR, CCDF, Modulation Accuracy, Code Domain Power.

802.11 a/b/g/n (Option 29) – Transmit Power, Spectrum Mask, Modulation Accuracy, OFDM Flatness and Linearity, 802.11n Transfer Function, Transfogram, Delay Profile, Delayogram, Transfer Efficiency.

3GPP W-CDMA Release 5 HSDPA (Option 30) – Channel Power, ACLR, Spectrum Emission Mask, CCDF, Modulation Accuracy, Code Domain Power, PRACH, ACK/NACK Analysis.

3GPP Release 6 HSUPA (Option 40) – Channel Power, ACLR, Spectrum Emission Mask, CCDF, Modulation Accuracy, Code Domain Power, Phase Discontinuity, E-RGCH, E-HICH, E-AGCH Analysis.

RSALTE Analysis Software – Spectrum Mask, Symbol Constellation Spectral Flatness and Delta Spectral Flatness, Phase Error, Frequency Error, CCDF, EVM vs. Carrier, EVM vs. Time, Power, Symbol Timing Error, Phase Noise and I/Q Imbalance.

RSA-IQWiMax Analysis Software – Spectrum Mask, Spectral Flatness, Symbol Constellation, Pilot Phase Error, Frequency Error, EVM vs. Carrier, EVM vs. Time.

Offline Analysis

RSaVu – All measurements that can be performed on a stored waveform can be performed with RSaVu offline analysis software (except TD-SCDMA, Option 28, RSALTE external software for LTE and RSA-IQWiMax external software for WiMax).

*1 See separate data sheets for specifications.

Spectrum Mode Display Traces, Detectors and Functions

Traces – Two traces.

Detector – Max, Min, Max-Min.

Trace Functions – Normal, Average, Max Hold, Min Hold.

Spectrum Trace Length – 801 points (Auto mode).

RF Performance

Frequency

Frequency Range – DC to 8 GHz.

Initial Center Frequency Setting Accuracy – within 10^{-7} after 10 minute warm-up.

Center Frequency Setting Resolution – 0.1 Hz.

Frequency Marker Readout Accuracy –

<40MHz \pm (RE x MF + 0.001 x Span + 0.2) Hz.

\geq 40MHz \pm (RE x MF + 0.001 x Span + 2) Hz.

Note: RE: Reference Frequency Error, MF: Marker Frequency (Hz).

Span Accuracy – $\pm 0.3\%$ (Auto mode).

Reference Frequency –

Aging per Day – 1×10^{-9} (after 30 days of operation).

Aging per Year – 1×10^{-7} (after 30 days of operation).

Temperature Drift – 1×10^{-7} (10 °C to 40 °C).

Total Frequency Error – 2×10^{-7} (within one year after calibration).

Reference Output Level – > 0 dBm.

External Reference Input Frequency – 10 MHz.

External Reference Input Level Range –

-10 dBm to + 6 dBm, Spurious level must be < -80 dBc within 100 kHz offset.

Resolution Bandwidth (Spectrum Analysis Mode)

Resolution Bandwidth Range – 1 Hz to 10 MHz (auto-coupled or user-selected (arbitrary)).

Resolution Bandwidth Shape – 1 Hz to 10 MHz – Approximately Gaussian, shape factor <5:1 (60:3 dB) typical. Rectangular, Nyquist and Root Nyquist shapes may also be selected.

Resolution Bandwidth Accuracy – Within 6% (referenced to -3 dB BW). $\pm 0.1\%$ (referenced to Noise BW).

Minimum Settable Spectrum Analysis RBW vs. Span Extended Resolution ON

Frequency Span	RBW
> 2 GHz	100 kHz
> 1 GHz to 2 GHz	50 kHz
>500 MHz to 1 GHz	20 kHz
>20 MHz to 500 MHz	10 kHz
>500 kHz to 20 MHz	1 kHz
>200 kHz to 500 kHz	500 Hz
>100 kHz to 200 kHz	200 Hz
>50 kHz to 100 kHz	100 Hz
>20 kHz to 50 kHz	50 Hz
>10 kHz to 20 kHz	20 Hz
>5 kHz to 10 kHz	10 Hz
>2 kHz to 5 kHz	5 Hz
>1 kHz to 2 kHz	2 Hz
>100 Hz to 1 kHz	1 Hz

Frequency Resolution (RTSA Mode and FFT Analysis in Spectrum Mode)

Noise Bandwidth Range, RTSA Mode – 0.250545 Hz to 100.218 kHz.

FFT Performance, Spectrum Mode – Number of samples per frame – 64 to 8192 (65,536 samples per frame, extended resolution).

Window types – Rectangular, Parzen, Welch, Sine-Lobe, Hanning, Sine-Cubed, Sine-to-the 4th, Hamming, Blackman, Rosenfield, Blackman-Harris 3A, Blackman-Harris 3B, Blackman-Harris 4A, Blackman-Harris 4B, FlatTop.

Stability

Residual FM – < 2 Hz_{p-p}, typical

Phase Noise Sidebands, dBc/Hz at Specified Center Frequency (CF)

Offset	CF = 1 GHz		CF = 2 GHz		CF = 6 GHz	
	Spec	Typical	Spec	Typical	Spec	Typical
1 kHz	-105	-107	-103	-105	-97	-99
10 kHz	-110	-112	-109	-111	-106	-108
100 kHz	-112	-115	-112	-115	-111	-113
1 MHz	-132	-135	-132	-135	-132	-134
5 MHz	-138	-140	-138	-140	-137	-139
10 MHz	-138	-140	-138	-140	-137	-139

DPX Digital Phosphor Spectrum Processing

Spectrum Processing Rate – 48,000/s, span-independent.

Number of Traces – 2.

Trace Types – Color-graded bit map, +Peak, Max Hold, -Peak, Min-Hold, Average.

Minimum Signal Duration for 100% Probability of Intercept – 31 μ s.

Span Range – 100 Hz to 36 MHz.

Resolution BW Accuracy –7%.

Resolution BW Range vs. Span (DPX)

Acquisition Bandwidth	RBW (Min)
36 MHz	300 kHz
20 MHz	200 kHz
10 MHz	100 kHz
5 MHz	30 kHz
2 MHz	20 kHz
1 MHz	10 kHz
500 kHz	5 kHz
200 kHz	2 kHz
100 kHz	1 kHz
50 kHz	500 Hz
20 kHz	200 Hz
10 kHz	100 Hz
5 kHz	30 Hz
2 kHz	20 Hz
1 kHz	10 Hz
500 Hz	3 Hz
200 Hz	2 Hz
100 Hz	1 Hz

Real-Time Spectrum Analyzer

► RSA3408B

Amplitude

(Specifications excluding mismatch error)

Measurement Range – Displayed Average Noise Level to Maximum Safe Input.

Input Attenuator Range

RF/Baseband input – 0 dB to 55 dB, 5 dB step.

IQ Input (Opt 03) – 0 dB to 35 dB, 5 dB step.

Maximum Safe Input Level –

Average Continuous (RF Band, RF ATT ≥ 10 dB) – +30 dBm.

MAX DC Voltage – RF Band, ± 0.2 V, Baseband, ± 5 V, IQ input, Opt. 03. ± 5 V.

Maximum Measurable Input Level – Average Continuous (RF ATT: Auto): +30 dBm.

Log Display Scale – 10 μ B/div to 10 dB/div.

Display Divisions – 10 divisions.

Display Units – dBm, dB μ V, Volts, Watts, Hz for Frequency Measurements and Degrees for Phase Measurements.

Marker Readout Resolution, dB units – 0.01 dB.

Marker Readout Resolution, Volts units – 0.001 μ V.

Reference Level Setting Range

RF – -50 dBm to +30 dBm, 1 dB step.

Baseband – -30 dBm to +20 dBm, 5 dB step.

IQ Inputs (Option 03) – -10 dBm to +20 dBm, 5 dB step.

Level Linearity over Display Range – ± 0.2 dB, spec; ± 0.12 dB, typical.

Frequency Response (20 °C to 30 °C, Att. ≥ 10 dB)

Frequency	Spec	Typical
100 kHz to 40 MHz	± 0.5 dB	± 0.3 dB
> 40 MHz to 3.5 GHz	± 1.2 dB	± 0.5 dB
> 3.5 GHz to 6.5 GHz	± 1.7 dB	± 1.0 dB
> 6.5 GHz to 8 GHz	± 1.7 dB	± 1.0 dB

Amplitude Accuracy (-20 dBm signal, 0 dB ATT, 20 °C to 30 °C)

Absolute Amplitude Accuracy at

Calibration Point –

RF (100 MHz) – ± 0.5 dB.

Baseband (25 MHz) – ± 0.3 dB.

Input Attenuator Setting Uncertainty – ± 0.2 dB.

Reference Level Accuracy – (-10 dBm to -50 dBm at 100 MHz) ± 0.2 dB.

VSWR – (Att ≥ 10 dB, Preamp OFF), typical,
 < 1.4:1 (300 kHz to 40 MHz),
 < 1.3:1 (40 MHz to 3 GHz),
 < 1.4:1 (3 GHz to 8 GHz).

Distortion

3rd Order Inter-modulation Distortion –

(Total Signal Power = -7 dBm, Ref Level +5 dBm, Attenuator adjusted for optimum performance).

Frequency – 3rd order IM.

2.0 GHz – < -78 dBc.

2nd Harmonic Distortion

(-30 dBm tone at input mixer) –

Frequency – 2nd Harmonic Distortion, Typical.

10 MHz to 1.4 GHz – < -65 dBc.

1.4 GHz to 1.75 GHz – < -70 dBc.

Displayed Average Noise Level (input terminated)

Frequency	Specification
1 kHz to 10 kHz	-144 dBm/Hz
> 10 kHz to 100 MHz	-151 dBm/Hz
> 100 MHz to 3 GHz	-150 dBm/Hz
> 3 GHz to 8 GHz	-142 dBm/Hz
Preamp (Opt. 01A) Performance (Typical)	
Frequency Range	100 MHz to 3 GHz
	20 dB gain, 6.5 dB Noise Figure at 2 GHz

Residual Response

(Input Terminated, Ref. Level=-30 dBm, RBW = 100 kHz)

Frequency and Span	Specification
1 MHz to 40 MHz, Span 20 MHz	-93 dBm
0.5 GHz to 3.5 GHz, Span 3 GHz	-90 dBm
3.5 GHz to 8 GHz, Span 3 GHz	-85 dBm

Spurious Response with Signal

(Signal at Center Frequency, Span=10 MHz, Ref Lvl=0 dBm, RBW=50 kHz, Signal Level= -5 dBm)

Signal Frequency	Spurious Response
25 MHz	-73 dBc
2 GHz	-73 dBc
5 GHz	-70 dBc
5 GHz	-70 dBc

Adjacent Channel Leakage Ratio Dynamic Range

(Typical, CF = 2.1425 GHz, with test signal amplitude adjusted for optimum performance).

Signal Type, Measurement Mode	ACLR
3GPP Downlink, 1 DPCH	Adjacent Alternate
Real-time (Spec.)	-66 dB -68 dB
Stepped (Typical)	-70 dB -72 dB

IF Frequency Response and IF Phase Linearity –

(400 MHz Center Frequency, 36.6 MHz BW, Typical)

Amplitude – ± 0.3 dB.

Phase – $\pm 2.5^\circ$.

Analog Modulation Analysis

Displays Amplitude vs. Time, Frequency vs. Time, Phase vs. Time

Measurements

AM	+AM, -AM, Total AM, Modulation Depth
FM	+peak, -peak, peak-to-peak, (peak-to-peak)/2, rms
PM	Phase at marker

Accuracy (-10 dBfs signal, input at CF, typical)

AM	$\pm 2\%$ (modulation depth 10% to 60 %)
FM	$\pm 1\%$ of span
PM	$\pm 3^\circ$

Audio Distortion Analysis

Demodulation Types – Baseband, AM and FM.

Measurement Range – 20 Hz to 100 kHz.

Displays – Spectrum and Spectrogram.

Measurements – S/N, SINAD, THD, TNHD, Hum and Noise Ratio, Audio Frequency.

Audio Filters –

De-Emphasis: 25 us, 50 us, 75 us, 750 us.
 Low Pass Filters: 3 kHz, 15 kHz, 30 kHz, 80 kHz.
 High Pass Filters: 50 Hz, 300 Hz, 400 Hz.
 CCITT.
 C-Message.

Accuracy –

Distortion – ± 1 dB (distortion products > -70 dB from fundamental tone).
 SINAD – ± 1 dB (SINAD levels < 70 dB).
 Residual Distortion and Noise – -80 dB or 15uV, 20 Hz to 20 kHz.
 Audio Frequency – $\pm 0.1\%$ when analyzer and source share common reference (signal duration under burst conditions > 1 second).

Pulse Measurements

Displays – Pulse Measurement Table, Pulse Trace.
Measurements – Pulse Width, Pulse Peak Power, On/Off Ratio, Pulse Ripple, Pulse Repetition Interval, Duty Cycle, Pulse-Pulse Phase, Channel Power, OBW, EBW, Frequency Deviation.
Minimum Pulse Width for Detection – 20 samples (400 ns@ maximum sample rate).
Maximum Pulse Length – 260,000 samples.

Inputs and Outputs

Front Panel

RF and Baseband Input Connector – N type, 50 Ω.
 I and Q Inputs (Option 03) – BNC Type.
Preamp Power Connector – Lemo, 6 poles:
 pin 1 = NC.
 pin 2 = ID1.
 pin 3 = ID2.
 pin 4 = –12 V.
 pin 5 = GND.
 pin 6 = +12 V.

Rear Panel

Analog IF Output – BNC Type, Frequency – 421 MHz.
10 MHz REF OUT – 50 Ω, BNC, > –3 dBm.
10 MHz REF IN – 50 Ω, BNC, –10 dBm to +6 dBm.
EXT TRIG IN – Ext Trig, BNC, High: 1.6 to 5.0 V, Low: 0 to 0.5 V.
 GPIB Interface – IEEE 488.2.
Trigger Out – 50 Ω, BNC, High >2.0 V, Low: <0.4 V (output current 1 mA).

Digital IQ Output (Option 05)

Connector Type – MDR (3M) 50 pin x 2.

Data Output

I data – 16 bit LVDS.
Q data – 16 bit LVDS.
Control Output – Clock: LVDS, MAX 51.2 MHz.
Control Input – IQ data output enabled, connecting GND enables output of IQ data.
Clock Rising Edge to Data Transition Time (hold time) – > 5 ns.
Data Transition to Clock Rising Edge (setup time) – > 5 ns.

Note: Data from Option 05 requires application of correction factors to IQ data to achieve similar RF performance to RSA3408B.

Side Panel

LAN Interface Ethernet – 10/100Base-T.
Serial Interface – USB 1.1, two ports.
VGA Output – VGA compatible, 15 DSUB.
Floppy Disk Drive – 3.5 inch, 1.44 MB.

General Characteristics

Temperature Range

Operating – +10° C to +40° C.
Storage – –20° C to +60° C.
Warm-up Time – 20 minutes.

Operating Altitude

Operating – up to 3000 m (Approximately 10,000 ft).
Non-operating – up to 12,190 m (40,000 ft).

Safety and Electromagnetic Compatibility – UL

61010-1; CSA C22.2 No. 61010-1-04.
 IEC61010, second edition (Self Declaration) – Low Voltage Directive 2006/95/EC; EN61010-1: 2001 Safety requirements for electrical equipment for Measurement control and laboratory use.
 EC Council EMC Directive 2004/108/EEC; EN61326:1997 Product Family Standard for Electrical Equipment for Measurement, Control and Laboratory Use-EMC Requirements.
 Radio communications Act:1992, EMC Regulatory Arrangements, AS/NZS CISPR 11 (Industrial, Scientific and Medical Equipment).

Power Requirements – 90 VAC to 264 VAC, 47 Hz to 63 Hz.

Power Consumption – 400 VA maximum.

Data Storage – Internal HDD, USB ports, FDD, Removable HDD (Opt. 06).

Calibration Interval – One year.

Warranty – One year.

GPIB – SCPI-compatible, IEEE488.2 compliant.

Physical Characteristics

	kg	lbs
Weight, with all options	20 kg	44 lbs
Dimensions	mm	
Without bumpers and feet	215 mm (H) x 425 mm (D) x 425 mm (W)	
With bumpers and feet	238 mm (H) x 470 mm (D) x 445 mm (W)	

▶ **Ordering Information**

RSA3408B

Real-time Spectrum Analyzer, DC - 8 GHz.

Includes: User Manual, Programmer's Manual (On CD), Power Cord, BNC-N Adapter, USB Keyboard, USB Mouse, Front Cover.

Options

- Opt 1A** – Preamp, External, 0.1 - 3 GHz, 20 dB Gain, 6.5 dB NF.
- Opt 02** – 65.5 M sample Deep Memory, Frequency Mask Trigger.
- Opt 03** – IQ, Differential IQ inputs.
- Opt 05** – Digital IQ Output.
- Opt 06** – Removable HDD (40 GB).
- Opt 10** – Audio Distortion Analysis.
- Opt 21** – Advanced Measurements Suite (GP Mod. Analysis, RFID, Sig. Source).
- Opt 24** – GSM/EDGE Analysis.
- Opt 25** – CDMA 1X Forward/Reverse Link Analysis.
- Opt 26** – 1X EVDO Forward/Reverse Link Analysis.
- Opt 28** – TD-SCDMA Analysis.
- Opt 29** – WLAN 802.11a/b/g/n Analysis.
- Opt 30** – 3GPP Release 99 (W-CDMA) and Release 5 UL/DL (HSDPA) Analysis.
- Opt 40** – 3GPP Release 6 (HSUPA UL/DL) Analysis (requires opt 30).

Application Software and Accessories

RSaVu – Offline Analysis Software for Real-time Spectrum Analyzers, Oscilloscopes and Logic Analyzers. Free demo version can be downloaded from <http://www.tek.com/rsa>. See RSaVu data sheet for more details.

RSALTE – LitePoint IQsignal LTE Analysis Software for Tektronix Real-time Spectrum Analyzers.

RSA-IQWIMAX – LitePoint IQsignal WiMax Analysis Software for Tektronix Real-time Spectrum Analyzers.

Extra Hard Drive – Extra 40 GB Removable Hard Drive for use with Opt. 06. Order part number 650-5150-00.

RSA3KR Rackmount – Rackmount RSA33/34B Series Real-time Spectrum Analyzers (customer installable).

RTPA2A – Adapter for use with TekConnect® Active and Passive Probes.

E and H Near-field probes – For EMI troubleshooting. Order part number 119-4146-00.

Preamp, External – 0.1 - 3 GHz, 20 dB Gain, 6.5 dB NF. Order part number 672-A900-00.

Real-Time Spectrum Analyzer

► RSA3408B

International Power Plugs

- Opt A0 – North America.
- Opt A1 – Universal EURO.
- Opt A2 – United Kingdom.
- Opt A3 – Australia.
- Opt A4 – 240 V North America.
- Opt A5 – Switzerland.
- Opt A6 – Japan.
- Opt A10 – China.
- Opt A11 – India.
- Opt A99 – No Power Cord or AC Adapter.

Manuals

- Additional User Manual, Paper.
- English – 071-2364-00.
- Japanese – 071-2365-00.
- Service Manual (Paper, English) – 071-2366-00.
- Operator Manual (Paper, Russian) – 071-2369-00.

Service

- Opt CA1 – Provides a single calibration event or coverage for the designated calibration interval, whichever comes first.
- Opt C3 – Calibration Service 3 Years.
- Opt C5 – Calibration Service 5 Years.
- Opt D1 – Calibration Data Report.
- Opt D3 – Calibration Data Report 3 Years (with Option C3).
- Opt D5 – Calibration Data Report 5 Years (with Option C5).
- Opt R3 – Repair Service 3 Years (including warranty).
- Opt R5 – Repair Service 5 Years (including warranty).

Upgrades

RSA34BUP

- Opt 1A – Preamp, External, 0.1 to 3 GHz, 20 dB Gain, 6.5 dB NF (customer-installable).
- Opt 02 – 65.5 M Sample Deep Memory, Frequency Mask Trigger (customer installable).
- Opt 03 – IQ, Differential IQ inputs (customer-installable).
- Opt 05 – Digital IQ Output (customer-installable).
- Opt 06 – Removable HDD.
- Opt 10 – Audio Distortion Analysis.
- Opt 21 – Advanced Measurements Suite (customer-installable).
- Opt 24 – GSM/EDGE Analysis (customer-installable).
- Opt 25 – CDMA 1X Forward/Reverse Link Analysis (customer-installable).
- Opt 26 – 1XEV-DO Forward/Reverse Link Analysis (customer-installable).
- Opt 28 – TD-SCDMA Analysis (customer-installable).
- Opt 29 – WLAN 802.11a/b/g/n Analysis (customer-installable).
- Opt 30 – 3GPP Release 99 (W-CDMA) and Release 5 (W-CDMA) UL/DL Analysis (customer-installable).
- Opt 40 – 3GPP Release 6 (HSUPA UL/DL) Analysis (requires opt 30, customer-installable).
- Opt IF – Installation labor for RSA34BUPxx (no calibration required).
- Opt IFC – Installation labor for RSA34BUPxx (with calibration).

Languages

- Users/ Programmers Manual.
- Opt L0 – English.
- Opt L5 – Japanese.
- Opt L10 – Russian.

Contact Tektronix:

- ASEAN / Australasia (65) 6356 3900
 - Austria +41 52 675 3777
 - Balkans, Israel, South Africa and other ISE Countries +41 52 675 3777
 - Belgium 07 81 60166
 - Brazil & South America (11) 40669400
 - Canada 1 (800) 661-5625
 - Central East Europe, Ukraine and the Baltics +41 52 675 3777
 - Central Europe & Greece +41 52 675 3777
 - Denmark +45 80 88 1401
 - Finland +41 52 675 3777
 - France +33 (0) 1 69 86 81 81
 - Germany +49 (221) 94 77 400
 - Hong Kong (852) 2585-6688
 - India (91) 80-22275577
 - Italy +39 (02) 25086 1
 - Japan 81 (3) 6714-3010
 - Luxembourg +44 (0) 1344 392400
 - Mexico, Central America & Caribbean 52 (55) 5424700
 - Middle East, Asia and North Africa +41 52 675 3777
 - The Netherlands 090 02 021797
 - Norway 800 16098
 - People's Republic of China 86 (10) 6235 1230
 - Poland +41 52 675 3777
 - Portugal 80 08 12370
 - Republic of Korea 82 (2) 6917-5000
 - Russia & CIS +7 (495) 7484900
 - South Africa +27 11 206 8360
 - Spain (+34) 901 988 054
 - Sweden 020 08 80371
 - Switzerland +41 52 675 3777
 - Taiwan 886 (2) 2722-9622
 - United Kingdom & Eire +44 (0) 1344 392400
 - USA 1 (800) 426-2200
- For other areas contact Tektronix, Inc. at: 1 (503) 627-7111
Updated 12 November 2007

For Further Information

Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit www.tektronix.com



Product(s) are manufactured in ISO registered facilities.

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C and with Tektronix Standard Codes and Formats.

Copyright © 2008, Tektronix. All rights reserved. Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specification and price change privileges reserved. TEKTRONIX and TEK are registered trademarks of Tektronix, Inc. All other trade names referenced are the service marks, trademarks or registered trademarks of their respective companies.

05/08 HB/WOW

37W-21129-1

Tektronix[®]