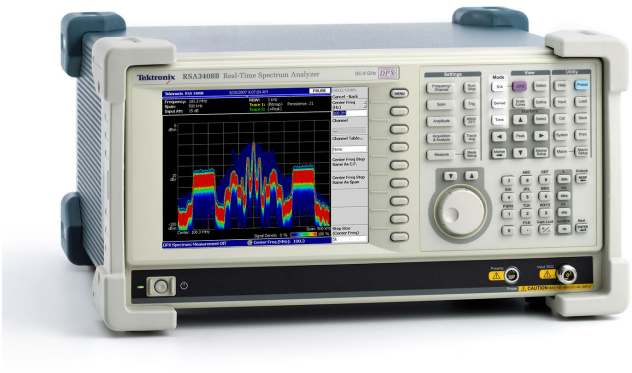
Spectrum Analyzers

RSA3000B Series Data Sheet



Features & Benefits

Discover

- DPX™ Live RF spectrum display 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

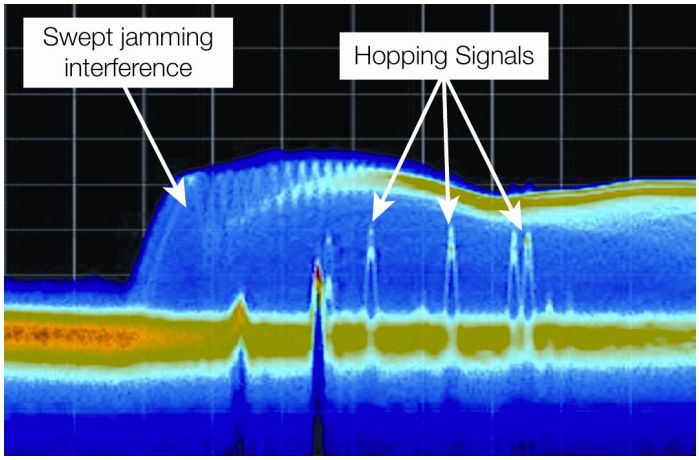
Analyze

- Extensive time-correlated vector spectrum analysis. Multidomain 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, and PM measurements
- Audio distortion analysis of Baseband, AM, and FM with real-time spectrogram and graphical display of harmonics and spurious. Wide choices of lowpass filters, highpass filters, bandpass filters, and de-emphasis settings.

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
- Software Defined Radio (SDR) and 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 (using RSALTE), WiMAX (using RSA-IQWIMAX), and WLAN systems
- Comprehensive analog demodulation and audio distortion measurement for tactical radio and sonar systems

Tektronix®



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

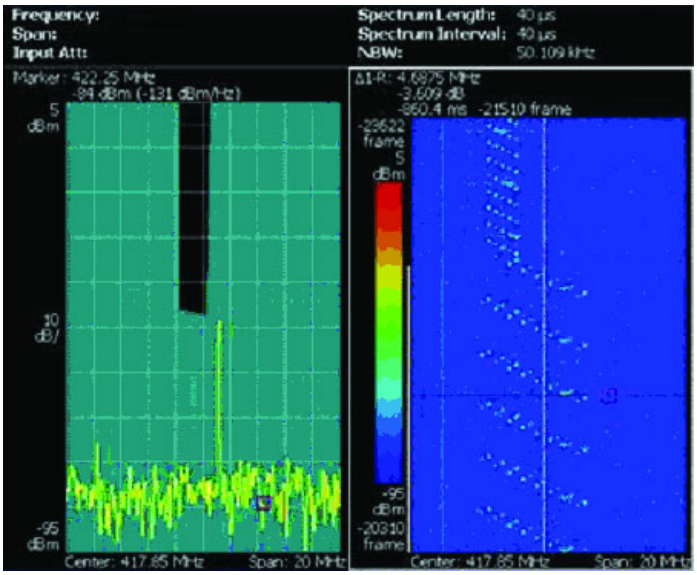
Discover and interpret complex behaviors of your time-variant signals

The RSA3000B Series makes it easy for you to discover design issues that other signal analyzers miss. The revolutionary DPX Live RF 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 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.

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.



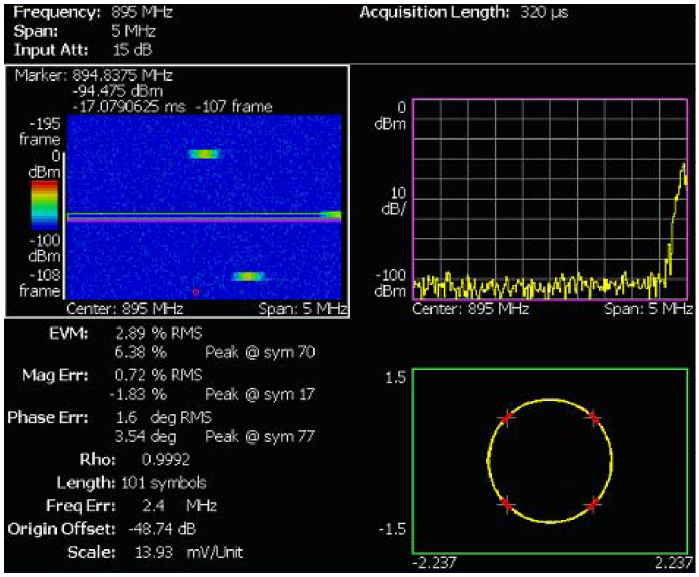
FMT and Spectrogram of a fast-hopped signal captured. The left side displays the user-defined Frequency Mask Trigger (FMT), while the right-side spectrogram displays the captured signal hopping pattern.

Trigger

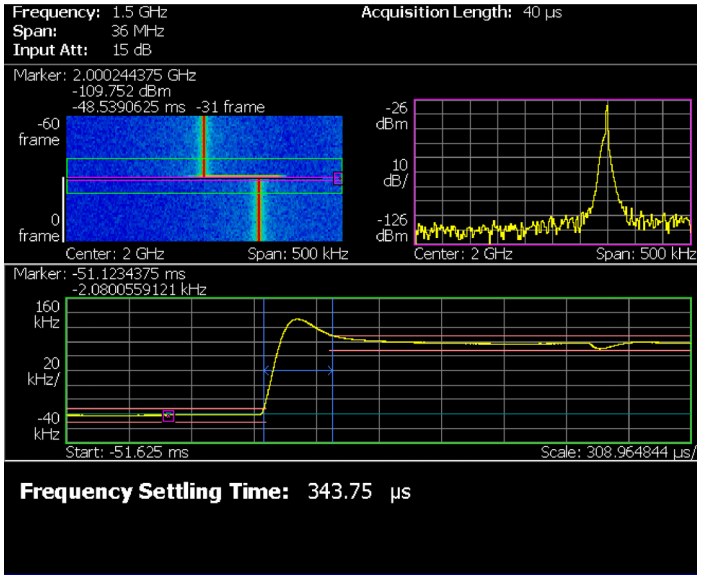
The optional Frequency Mask Trigger (FMT) makes it easy to trigger on signals in the frequency domain and capture transient signals in bandwidths up to 36 MHz. The FMT is simply configured to monitor all changes in frequency occupancy within the capture bandwidth. The Power Trigger, working in any capture 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

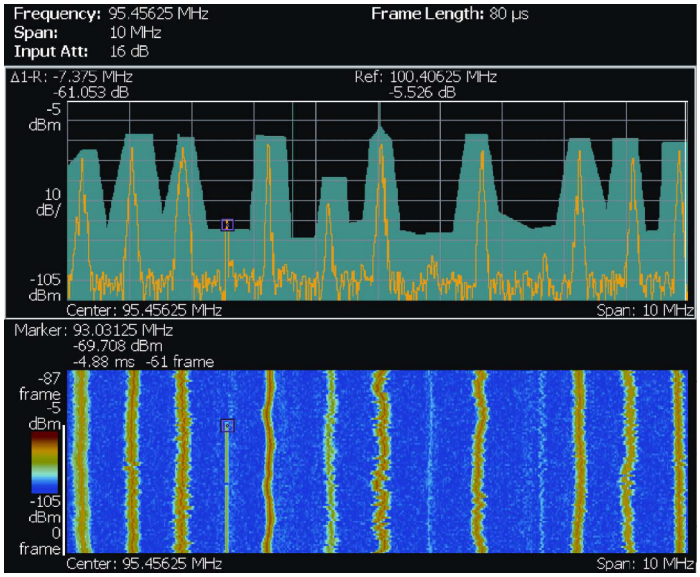
Unlike many SA/VSA combination instruments, the RTSA is fully preselected at all times for spurious and image rejection in any combination of capture bandwidth and frequency. Capture of small signals in the presence of large signals is enabled with up to 73 dB Spurious-Free Dynamic Range (SFDR) and class-leading image rejection in all capture bandwidths. Capture once with seamless acquisitions and make multiple measurements without recapturing. Record lengths vary depending upon the selected capture bandwidth: up to 1.28 seconds at 36 MHz, 2.56 seconds at 15 MHz, 51.2 seconds at 1 MHz, or 1.42 hours at 10 kHz bandwidth with optional FMT / Deep Memory.



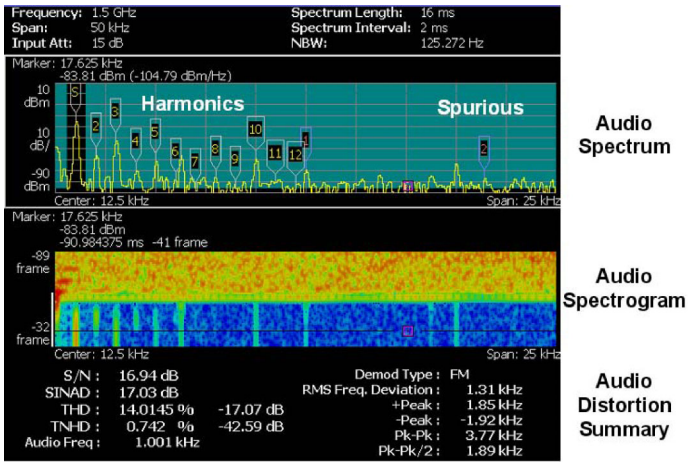
Unlike a conventional VSA's capability of quantifying the modulation quality only at the center frequency, the RSA3000B Series can demodulate a captured off-center hopped signal with view of the spectrogram (upper left), frequency versus amplitude (upper right), signal modulation quality (lower left) and Constellation (lower right).



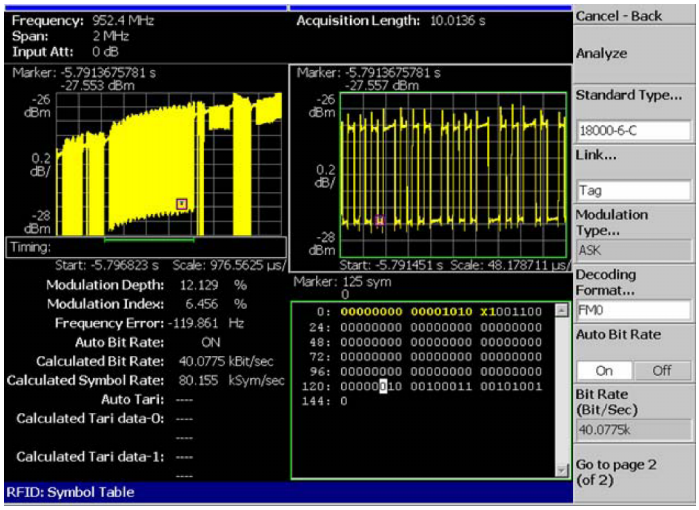
The RSA3000B Series also provides automatic measurement of the frequency settling time with the built-in Modulation Domain analyzer.



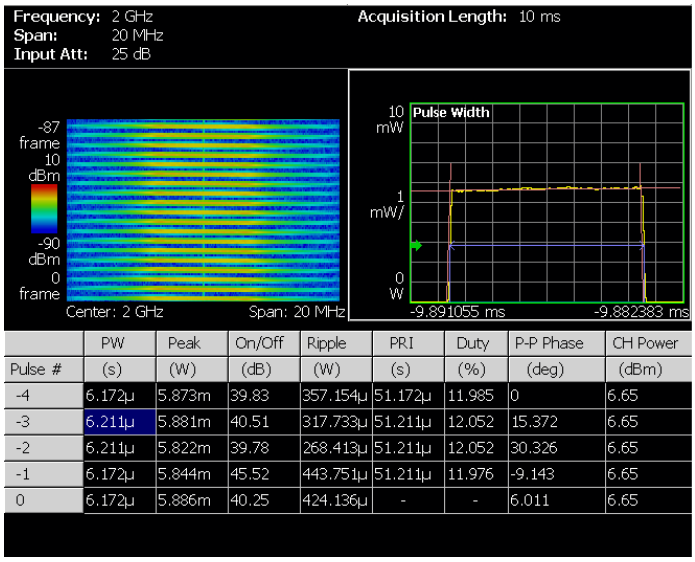
A Frequency Mask Trigger (FMT) was set to monitor the frequency domain for any changes in the spectrum, and it triggered on transient interference. The spectrogram (lower display) shows the time relationship between the desired good signal and the interfering transient signal. The spectrum display shows what was happening at the precise moment the interfering signal was present in the band. FMT is an essential tool for capturing interfering and unauthorized signals in the presence of desired emitters.



The Audio Spectrum and Spectrogram allow designers to understand the nature of distortion by viewing harmonics and nonharmonic components over time. Distortion parameters are calculated for each FFT frame in the Spectrogram display.



The RSA3000B Series supports all of the latest RFID standards including ISO 18000-6, 18000-7, and ISO 15693. As a leading RFID test solution, this delivers the confidence you need from standards-based RF conformance tests to RF troubleshooting in the prototype lab tests.



Pulse #	PW (s)	Peak (W)	On/Off (dB)	Ripple (W)	PRI (s)	Duty (%)	P-P Phase (deg)	CH Power (dBm)
-4	6.172µ	5.873m	39.83	357.154µ	51.172µ	11.985	0	6.65
-3	6.211µ	5.881m	40.51	317.733µ	51.211µ	12.052	15.372	6.65
-2	6.211µ	5.822m	39.78	268.413µ	51.211µ	12.052	30.326	6.65
-1	6.172µ	5.844m	45.52	443.751µ	51.211µ	11.976	-9.143	6.65
0	6.172µ	5.886m	40.25	424.136µ	-	-	6.011	6.65

Powerful pulsed-signal analysis for characterization of Radar and other pulsed systems. Automatically measure pulse width, rep rate, pulse power, and other pulse parameters.

Analyze

The RTSA 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. Time-correlated data analysis with automatic domain correlation and linked markers accelerates troubleshooting and analysis by pinpointing the root cause of problems in multiple domains.

RSA3000B Series Real-Time Spectrum Analyzer

Tektronix offers multiple models of RSA3000B Series Real-Time Spectrum Analyzer to meet a range of needs for frequency coverage, real-time bandwidth, and dynamic range. The table below summarizes the differences between the models.

Specification or Feature	RSA3300B Models	RSA3400B Models
Freq Range	DC up to 8.0 GHz	DC up to 8.0 GHz
Max. Capture BW	15 MHz	36 MHz
Triggers, Standard	Level, Free Run, External	Level, Free Run, External
Triggers, Optional	Frequency Mask 15 MHz BW	Frequency Mask 36 MHz BW
Digital Phosphor (DPX) Spectrum Update Rate, Max Span, and Min. Signal Duration	>48,000 Spectrums/sec	>48,000 Spectrums/sec
	15 MHz Max Span; Min. Sig. Duration: 41 µs	36 MHz Max Span; Min. Sig. Duration: 31 µs
Memory	64 MB / 256 MB	64 MB / 256 MB
Spurious-free Dynamic Range at Max. Capture BW	-70 dBc/15 MHz	-73 dBc/36 MHz
DANL, 1 GHz	-150 dBm/Hz	-151 dBm/Hz
SSB Phase Noise at Specified Offsets at 1 GHz, dBc/Hz (Typical)	10 kHz: -108	10 kHz: -112
	1 MHz: -133	1 MHz: -135
	10 MHz: -136	10 MHz: -140
Screen Size, User Interface	8.4 inch Screen, Keyboard, Mouse, Front Panel	8.4 inch Screen, Keyboard, Mouse, Front Panel
Interface Ports	GPIB, LAN, USB(2)	GPIB, LAN, USB(2)
Storage Media	Internal HDD and FDD	Internal HDD and FDD; Optional Removable HDD
IQ Inputs Option	20 MHz BW Differential Inputs	40 MHz BW Differential Inputs
IF Outputs	Not Available	Standard, 421 MHz, 40 MHz BW
Digital I and Q Output Option Bandwidth	Not Available	Up to 36 MHz BW

Memory Depth (Time) and Maximum Time Resolution (RSA3300B Models)

Span	Sample Rate (For I and Q)	Record Length (Standard)	Record Length (Option 02)	Spectrum Frame (Time)	Time Resolution (I and Q)
20 MHz (Baseband)	25.6 MS/s	0.64 s	2.56 s	40 µs	40 ns
15 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	3.2 MS/s	5.12 s	20.48 s	320 µs	320 ns
1 MHz	1.6 MS/s	10.24 s	40.96 s	640 µs	640 ns
500 kHz	800 kS/s	20.48 s	81.92 s	1.280 ms	1.280 µs
200 kHz	320 kS/s	51.20 s	200.48 s	3.2 ms	3.2 µs
100 kHz	160 kS/s	102.40 s	409.60 s	6.4 ms	6.4 µs
50 kHz	80 kS/s	204.80 s	819.20 s	12.8 ms	12.8 µs
20 kHz	32 kS/s	512 s	2048 s	32 ms	32 µs
10 kHz	16 kS/s	1024 s	4096 s	64 ms	64 µs
5 kHz	8 kS/s	2048 s	8192 s	128 ms	128 µs
2 kHz	3.2 kS/s	5120 s	20480 s	320 ms	320 µs
1 kHz	1.6 kS/s	10240 s	40960 s	640 ms	640 µs
500 Hz	800 S/s	20480 s	81920 s	1.28 s	1.28 ms
200 Hz	320 S/s	51200 s	204800 s	2.56 s	2.56 ms
100 Hz	160 S/s	102400 s	409600 s	5.12 s	5.12 ms

Memory Depth (Time) and Maximum Time Resolution (RSA3400B Models)

Span	Sample Rate (For I and Q)	Record Length (Standard)	Record Length (Option 02)	Spectrum Frame (Time)	Time Resolution (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

Frequency Mask Trigger (Option 02)

Characteristic	Description
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 ≥20 MHz	100 Hz to 15 MHz (RSA3300B Models)
Start Frequency <20 MHz	100 Hz to 20 MHz (RSA3300B Models)
Start Frequency ≥40 MHz	100 Hz to 36 MHz (RSA3400B Models)
Start Frequency <40 MHz	100 Hz to 40 MHz (RSA3400B Models)
Minimum Event Duration for 100% Probability of Trigger	40 µs (RSA3300B Models), 20 µs (RSA3400B Models) (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 = 15 MHz, uncertainty = ±80 µs, For Span = 36 MHz, uncertainty = ±40 µs)
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	>2 KΩ (nominal)
Trigger Output	
Voltage	
High	≥2.0 V
Low	<0.4 V (Output current <1 mA)

Trigger-related

Characteristic	Description
Trigger Modes	Free run, Triggered (Single or Continuous)
Trigger Event Source	RF Input, External Trigger Input
Trigger Types	Power Level: Frequency Mask (Option 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 (equal to selected span)	100 Hz to 15 MHz (RSA3300B Models)
	100 Hz to 36 MHz (RSA3400B Models)
Trigger Position Display Timing Uncertainty (Power and External Trigger)	±2 sample points

*1 dBfs: dB relative to full scale.

Capture-related

Characteristic	Description
Real-time Acquisition Bandwidth, maximum	
Start Frequency ≥20 MHz (RF)	15 MHz (RSA3300B Models)
Start Frequency <20 MHz (Baseband)	20 MHz (RSA3300B Models)
Start Frequency ≥40 MHz (RF)	36 MHz (RSA3400B Models)
Start Frequency <40 MHz (Baseband)	40 MHz (RSA3400B Models)
IQ Inputs (Option 03)	10 MHz (RSA3300B Models)
	40 MHz (RSA3400B Models)
A/D Converter	102.4 MS/s, 14 bit
Acquisition Memory Size	64 MB (16.4 MSamples) Standard
	256 MB (65.6 MSamples) Option 02
Minimum Acquisition Length	1024 Samples
Acquisition Length Setting Resolution	1024 Samples

Analysis-related

Optional Measurement Functions, Standards-based and Offline Analysis

Description	Measurements and Displays
General Purpose Digital Modulation Analysis (Option 21) Mod. Formats: BPSK, QPSK, π/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, IEEE 802.15.4 OQPSK (Zigbee)	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, Eye Diagram PDF: Probability of Occurrence vs. Power Level AM-AM, AM-PM, 1 dB Compression, Crest Factor

Demodulation Accuracy

Characteristic	RSA3300B Models	RSA3400B Models
16/64 QAM EVM CF = 2 GHz (typical)	0.9% (at 100 kS/s) 0.5% (at 1 MS/s) 1.2% (at 4 MS/s) 2.2% (at 10 MS/s)	0.5% (at 1 kS/s) 0.5% (at 1 MS/s) 0.5% (at 4 MS/s) 0.7% (at 10 MS/s)
QPSK EVM CF = 2 GHz (typical)	0.5% (at 100 kS/s) 0.5% (at 1 MS/s) 1.2% (at 4 MS/s) 2.7% (at 10 MS/s)	0.5% (at 100 kS/s) 0.5% (at 1 MS/s) 0.6% (at 4 MS/s) 0.9% (at 10 MS/s)

Modulation Accuracy (typical)

π/4DQPSK	Total EVM: 0.65% (95 percentile) Test Condition: Symbol Rate = 24.3 kHz Measurement Filter: Root Raised Cosine, alpha = 0.3 Reference Filter: Raised Cosine, alpha = 0.3 Signal Power = -25 dBm
GMSK	EVM: 0.94% (95 percentile) Test Conditions: Symbol Rate = 270.833 kHz Gaussian BT = 0.3 Signal Power = -25 dBm
GFSK	FSK Error (RMS): 1.01% (95 percentile) Test Conditions: Symbol Rate = 1.152 MHz Gaussian BT = 0.5 Deviation = 288 kHz Signal Power = -25 dBm

Description	Measurements and Displays
Maximum Symbol Rate	RSA3408B: 51.2 MS/s
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 18000-7 ISA/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)
Audio Distortion Analysis (Option 10)	S/N, SINAD, THD, TNHD, Audio Freq, AM modulation, FM deviation, Spectrum, Spectrogram, Hum and Noise Ratio, Harmonics, Nonharmonics
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
1X EVDO 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, I/Q Imbalance
RSA-IQWIMAX Analysis Software	Spectrum Mask, Spectral Flatness, Symbol Constellation, Pilot Phase Error, Frequency Error, EVM vs. Carrier, EVM vs. Time
Frequency Settling Time (typical, under conditions stated below)	
Input Power	-5 dBm
RF Attenuator	0 dB
Smoothing Factor	1
Span	≥10 MHz
Input Frequency	100 MHz to 101 MHz
Frequency Settling Threshold	100 kHz
Span	100 kHz
Input Frequency	10 MHz to 10.01 MHz

Frequency Settling Threshold – 1 kHz

Span		Error Frequency Settling Time		Error Frequency Settling Time From Trigger	
RSA3400B Models	RSA3300B Models	RSA3400B Models	RSA3300B Models	RSA3400B Models	RSA3300B Models
36 MHz	15 MHz	60 ns	160 ns	100 ns	40 ns
10 MHz	10 MHz	240 ns	240 ns	240 ns	80 ns
100 kHz	100 kHz	19 µs	19 µs	19 µs	13 µs

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)

Standard Measurement Functions by Mode

Measurement Mode	Measurements and Displays
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

Spectrum Mode Display Traces, Detectors, and Functions

Characteristic	Description
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

Characteristic	Description
Frequency Range	DC up 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	<20 MHz, ±(RE × MF + 0.001 × Span + 0.2) Hz (RSA3300B Models)
	≥20 MHz, ±(RE × MF + 0.001 × Span + 2) Hz (RSA3300B Models)
	<40 MHz, ±(RE × MF + 0.001 × Span + 0.2) Hz (RSA3400B Models)
	≥40 MHz, ±(RE × MF + 0.001 × Span + 2) Hz (RSA3400B Models)
	Note: **RE** = Reference Frequency Error, **MF** = Marker Frequency (Hz)
Span Accuracy	±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 to 40 ºC).
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)

Characteristic	Description
Range	1 Hz to 10 MHz (auto-coupled or user-selected (arbitrary))
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.
Accuracy	Within 6% (referenced to -3 dB BW). ±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 – 2 GHz	50 kHz
>500 MHz – 1 GHz	20 kHz
>20 MHz – 500 MHz	10 kHz
>500 kHz – 20 MHz	1 kHz
>200 kHz – 500 kHz	500 Hz
>100 kHz – 200 kHz	200 Hz
>50 kHz – 100 kHz	100 Hz
>20 kHz – 50 kHz	50 Hz
>10 kHz – 20 kHz	20 Hz
>5 kHz – 10 kHz	10 Hz
>2 kHz – 5 kHz	5 Hz
>1 kHz – 2 kHz	2 Hz
>100 Hz – 1 kHz	1 Hz

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

Characteristic	Description
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

DPX Digital Phosphor Spectrum Processing

Characteristic	Description
Spectrum Processing Rate	48,000/s, span-independent
Number of Traces	2
Trace Types	Color-graded bitmap, +Peak, Max Hold, -Peak, Min-Hold, Average
Minimum Signal Duration for 100% Probability of Intercept	41 µs (RSA3300B Models)
	31 µs (RSA3400B Models)
Span Range	100 Hz to 15 MHz (RSA3300B Models)
	100 Hz to 36 MHz (RSA3400B Models)
	Resolution BW Accuracy -7%

Resolution BW Range vs. Span (DPX)

Acquisition Bandwidth	RBW (Min)	
	RSA3300B Models	RSA3400B Models
36 MHz		300 kHz
20 MHz		200 kHz
15 MHz	200 kHz	
10 MHz	100 kHz	100 kHz
5 MHz	30 kHz	30 kHz
2 MHz	20 kHz	20 kHz
1 MHz	10 kHz	10 kHz
500 kHz	5 kHz	5 kHz
200 kHz	2 kHz	2 kHz
100 kHz	1 kHz	1 kHz
50 kHz	500 Hz	500 Hz
20 kHz	200 Hz	200 Hz
10 kHz	100 Hz	100 Hz
5 kHz	50 Hz	30 Hz
2 kHz	20 Hz	20 Hz
1 kHz	10 Hz	10 Hz
500 Hz	5 Hz	3 Hz
200 Hz	2 Hz	2 Hz
100 Hz	1 Hz	1 Hz

Stability

Residual FM – <2 Hz p-p, typical

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

Noise Sidebands, dBc/Hz (RSA3300B Models)

	RSA3303B, RSA3308B				RSA3308B	
	At 1 GHz CF		At 2 GHz CF		At 6 GHz CF	
Offset	Spec	Typical	Spec	Typical	Spec	Typical
1 kHz	≤ -100	≤ -103	≤ -96	≤ -99	≤ -87	≤ -90
10 kHz	≤ -105	≤ -108	≤ -104	≤ -107	≤ -104	≤ -107
20 kHz	≤ -105	≤ -108	≤ -105	≤ -108	≤ -105	≤ -108
30 kHz	≤ -105	≤ -108	≤ -105	≤ -108	≤ -105	≤ -108
100 kHz	≤ -112	≤ -115	≤ -112	≤ -115	≤ -112	≤ -115
1 MHz	≤ -132	≤ -135	≤ -132	≤ -135	≤ -128	≤ -131
5 MHz	≤ -135	≤ -138	≤ -135	≤ -138	≤ -130	≤ -133
7 MHz	≤ -135	≤ -138	≤ -135	≤ -138	≤ -130	≤ -133

Noise Sidebands, dBc/Hz (RSA3400B Models)

	At 1 GHz CF		At 2 GHz CF		At 6 GHz CF	
Offset	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

Amplitude (Specifications excluding mismatch error)

Characteristic	Description
Measurement Range	Displayed Average Noise Level to Maximum Safe Input
Input Attenuator Range	
RF/Baseband input	0 dB to 50 dB, 2 dB step at <3.5 GHz; 10 dB step at ≥3.5 GHz (RSA3300B Models)
	0 dB to 55 dB, 5 dB step (RSA3400B Models)
IQ Input (Option 03)	0 dB to 30 dB, 10 dB step (RSA3300B Models)
	0 dB to 35 dB, 5 dB step (RSA3400B Models)
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, Option 03. ±5 V
Maximum Measurable Input Level	Average Continuous (RF ATT: Auto): +30 dBm
Log Display Scale	10 µdB/div to 10 dB/div
Display Divisions	10 divisions
Display Units	dBm, dBµV, 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 µV
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 – 40 MHz	±0.5 dB	±0.3 dB
>40 MHz – 3.5 GHz	±1.2 dB	±0.5 dB
>3.5 GHz – 6.5 GHz	±1.7 dB	±1.0 dB
>6.5 GHz – 8 GHz	±1.7 dB	±1.0 dB

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

Characteristic	Description
Absolute Amplitude Accuracy at Calibration Point	
RF	±0.5 dB at 50 MHz (RSA3300B Models)
	±0.5 dB at 100 MHz (RSA3400B Models)
Baseband	±0.3 dB at 10 MHz (RSA3300B Models)
	±0.3 dB at 25 MHz (RSA3400B Models)
Input Attenuator Setting Uncertainty	±0.5 dB (RSA3300B Models)
	±0.2 dB (RSA3400B Models)
Reference Level Accuracy	±0.2 dB (-10 dBm to -50 dBm at 50 MHz) (RSA3300B Models)
	±0.2 dB (-10 dBm to -50 dBm at 100 MHz) (RSA3400B Models)
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) (RSA3308B and RSA3400B Models)

FeliCa™ RFID Test Conditions*[2, 3]

Characteristic	Description
Amplitude Accuracy (Variable Attenuator)	Absolute Accuracy: ±0.57 dB (99 percentile, 2.58σ) Relative Accuracy: ±0.15 dB (99 percentile, 2.58σ) Test Conditions: Center Frequency: 13.56 MHz Span: 5 MHz RF Attenuator Setting: 0 to 14 dB Input Power Range: 0 to -20 dB for Full Scale
Amplitude Accuracy (Fixed Attenuator)	Absolute Accuracy: ±0.45 dB (99 percentile, 2.58σ) Relative Accuracy: ±0.15 dB (99 percentile, 2.58σ) Test Conditions: Center Frequency: 13.56 MHz Span: 5 MHz RF Attenuator Setting: 0 dB Input Power Range: 0 to -20 dB for Full Scale
Repetitive Amplitude Accuracy	Repetitive Accuracy: ±0.04 dB (99 percentile, 2.58σ) Test Conditions: Center Frequency: 13.56 MHz Span: 5 MHz Reference Level: 0 dBm Input Power: -10 dBm Within 1 hour after Self Gain Calibration
AM Modulation Index Accuracy	Accuracy: ±0.17% (99 percentile, 2.58σ) Test Conditions: Center Frequency: 13.56 MHz Span: 5 MHz Carrier Level: +4 dBm AM Modulation Index Range: 1% to 10% AM Frequency: 212 kHz, Sinusoidal Wave
ASK Modulation Index Accuracy	Accuracy: ±0.21% (99 percentile, 2.58σ) Setting Conditions: Center Frequency: 13.56 MHz Span: 5 MHz Carrier Level: +4 dBm At RFID Analysis Mode on RSA: ASK Modulation Index Range: 1% to 10% ASK Frequency: 212 kHz, Square Wave

*[2] FeliCa is the contactless IC card technology developed by Sony Corporation.

*[3] FeliCa is a trademark of Sony Corporation.

Distortion

Characteristic	Description
3rd Order Intermodulation Distortion (Total Signal Power = -7 dBm, Ref Level +5 dBm, Attenuator adjusted for optimum performance)	
Frequency	3rd Order IM
100 MHz to 3 GHz	< -74 dBc (RSA3300B Models)
3 GHz to 8 GHz	< -72 dBc (RSA3308B only)
2.0 GHz	< -78 dBc (RSA3400B Models)
2nd Harmonic Distortion (-30 dBm tone at input mixer)	
Frequency	2nd Harmonic Distortion, Typical
10 MHz to 1.5 GHz	< -56 dBc (RSA3300B Models)
10 MHz to 1.75 GHz	< -56 dBc (RSA3308B only)
10 MHz to 1.4 GHz	< -65 dBc (RSA3400B Models)
1.4 GHz to 1.75 GHz	< -70 dBc (RSA3400B Models)

Displayed Average Noise Level (Input Terminated)

Frequency	Specification
1 kHz – 10 kHz	-144 dBm/Hz
>10 kHz – 100 MHz	-151 dBm/Hz
>100 MHz – 3 GHz	-150 dBm/Hz
>3 GHz – 8 GHz	-142 dBm/Hz

Residual Response

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

RSA3303B Model

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

RSA3308B Model

Frequency and Span	Specification
1 MHz to 20 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

RSA3408B Model

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)

	ACLR	
Signal Type, Measurement Mode	**RSA3300B Models**	**RSA3400B Models**
3GPP Downlink, 1 DPCH	Adjacent Alternate	Adjacent Alternate
Real-time (Spec.)	-60 dB -66 dB	-66 dB -68 dB
Stepped (Typical)	-63 dB -70 dB	-70 dB -72 dB

IF Frequency Response and IF Phase Linearity – (400 MHz Center Frequency, 36.6 MHz BW, Typical) (RSA3400B Models)
Amplitude – ±0.3 dB
Phase – ±2.5°

Analog Modulation Analysis

Characteristic	Description
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	±2% (modulation depth 10% to 60%)
FM	±1% of span
PM	±3°

Audio Distortion Analysis

Characteristic	Description
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 µs, 50 µs, 75 µs, 750 µs
Lowpass Filters	3 kHz, 15 kHz, 30 kHz, 80 kHz
Highpass 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 15 uV, 20 Hz to 20 kHz
Audio Frequency	±0.1% when analyzer and source share common reference (signal duration under bursted conditions > 1 second)

Pulse Measurements

Characteristic	Description
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 (RSA3300B Models = 800 ns at maximum sample rate, RSA3400B Models = 400 ns at maximum sample rate)
Maximum Pulse Length	260,000 samples

Inputs and Outputs

Characteristic	Description
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 (RSA3400B Models)
10 MHz REF OUT	50 Ω, BNC, > -3 dBm
10 MHz REF IN	50Ω, 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 (RSA3400B Models Option 05)	
Connector Type	MDR (3M) 50 pin × 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
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

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

General Characteristics

Characteristic	Description
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.)
Nonoperating	Up to 12,190 m (40,000 ft.)
Safety and Electromagnetic Compatibility	UL 61010-1; CSA C22.2 No. 61010-1-xx
	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 250 VAC, 47 Hz to 63 Hz (RSA3300B Models)
	90 VAC to 264 VAC, 47 Hz to 63 Hz (RSA3400B Models)
Power Consumption	400 VA maximum
Data Storage	Internal HDD, USB ports, FDD, Removable HDD (RSA3400B Models Option 06)
Calibration Interval	One year
Warranty	One year
GPIB	SCPI-compatible, IEEE488.2 compliant

Physical Characteristics

Dimensions	mm	in.
Without bumpers and feet	215 mm (H) × 425 mm (D) × 425 mm (W)	8.5 in. (H) × 16.7 in. (D) × 16.7 in. (W)
With bumpers and feet	238 mm (H) × 470 mm (D) × 445 mm (W)	9.4 in. (H) × 17.5 in. (D) × 18.5 in. (W)
Weight	**kg**	**lb.**
With all options	20 kg	44 lb.

Ordering Information

RSA3303B
Real-Time Spectrum Analyzer, DC - 3 GHz

RSA3308B
Real-Time Spectrum Analyzer, DC - 8 GHz

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

Option	Description
Opt. 02	65.5 MSample Deep Memory, Frequency Mask Trigger
Opt. 03	IQ, Differential IQ inputs
Opt. 05	Digital IQ Output (RSA3400B Models only)
Opt. 06	Removable HDD (40 GB) (RSA3400B Models only)
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 (RSA3400B Models only)
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

SW/Accessory	Description
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-xx (RSA3400B Models only)
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-xx

International Power Plugs

Option	Description
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

Option	Order Number
Additional User Manual, Paper	
English	071-2363-xx (RSA3300B Models)
	071-2364-xx (RSA3400B Models)
Japanese	071-2362-xx (RSA3300B Models)
	071-2365-xx (RSA3400B Models)
Service Manual (Paper, English)	071-2367-xx (RSA3300B Models)
	071-2366-xx (RSA3400B Models)
Operator Manual (Paper, Russian)	071-2369-xx (RSA3000 Series)

Service

Option	Description
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 Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. R3	Repair Service 3 Years (including warranty)
Opt. R5	Repair Service 5 Years (including warranty)

Upgrades

RSA3BUP (RSA3300B Models)

RSA34BUP (RSA3400B Models)

Option	Description
Opt. 02	65.5 MSample Deep Memory, Frequency Mask Trigger (customer installable)
Opt. 03	IQ, Differential IQ inputs (customer installable)
Opt. 05	Digital IQ Output (customer installable) (RSA3400B Models only)
Opt. 06	Removable HDD (RSA3400B Models only)
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	1X EVDO Forward/Reverse Link Analysis (customer installable)
Opt. 28	TD-SCDMA Analysis (customer installable)
Opt. 29	WLAN 802.11a/b/g/n Analysis (customer installable) (RSA3400B Models only)
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

Option	Description
User/Programmer Manual	
Opt. L0	English
Opt. L5	Japanese
Opt. L10	Russian

CE

ISO 9001

Product(s) are manufactured in ISO registered facilities.

GPIB IEEE-488

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

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