

Real-Time Spectrum Analyzer

RSA3300B Series

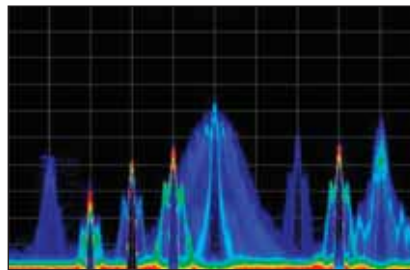


RSA3300B Series DC to 3/8 GHz Real-Time Spectrum Analyzers with DPXTM

The RSA3300B's make 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 RSA3300B Real-Time Spectrum Analyzers (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.

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 41 μ s are displayed in the frequency domain. This



► Revolutionary DPX display discovers transients, instability and glitches that other analyzers miss. Here, an RFID interrogator and tags are seen transmitting at different power levels and frequencies.

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 15 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

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 15 MHz are captured into memory
- Up to 2.56 s acquisition length at 15 MHz bandwidth provides complete analysis over time without making multiple acquisitions
- Fully pre-selected 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 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
- Pulse measurements including pulse width, duty cycle and pulse-to-pulse phase
- Offline analysis available with RSAVu software
- Analog demodulation analysis
- Audio distortion analysis

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-support for analysis of RFID, 3GPP, 3GPP2, LTE (via RSALTE) and WiMax systems (via RSA-IQWiMax)

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

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external trigger is available for synchronization to test system events.

Capture

Unlike many SA/VSA combination instruments, the RSA3300Bs are fully pre-selected 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 70 dB Spurious-Free Dynamic Range (SFDR) and class-leading image rejection in all capture bandwidths. Capture once - make multiple measurements without recapturing. Record lengths vary depending upon the selected capture bandwidth-up to 2.56 seconds at 15 MHz, 40.96 seconds at 1 MHz or 1.14 hours at 10 kHz bandwidth with FMT/Deep Memory Option 02.

Analyze

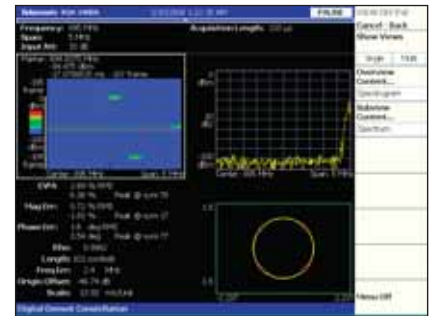
The RSA3300Bs offer analysis capabilities that advance productivity for engineers working on components or in RF system design, integration and performance verification, or operations engineers working in network or spectrum management.

- Spectrograms display both frequency and amplitude changes over time. Measurements are time-correlated across the frequency, phase, amplitude and modulation domains
- Analog modulation analysis and pulse analysis are standard
- 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

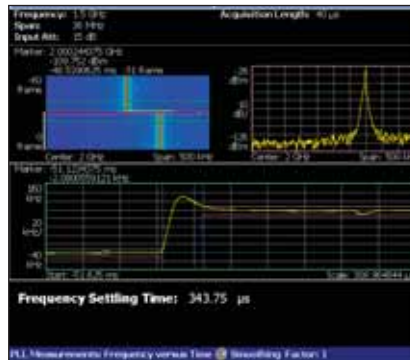
RFID Demodulation



As the RFID test leader, RSA3300B supports all latest RFID standards including ISO 18000-7 and ISO 15693. It provides the ideal RFID test solution from standard based RF conformance test to RF troubleshooting in the prototype lab tests.



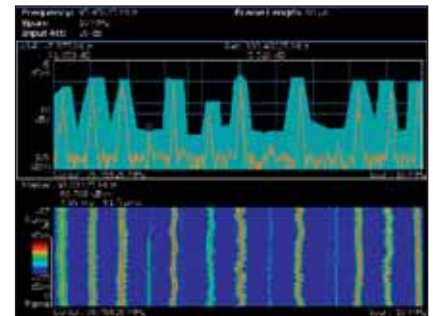
Unlike a conventional VSA's capability of only quantifying the modulation quality of the center frequency, the RSA3300B can verify the whole system performance by measuring PLL and modulation quality at any hopped frequencies.



Software-Defined Radio (Frequency Hopping)

RTSA can fully analyze the PLL and Demodulation performance of Frequency Hopping Radios. RSA3300Bs also provide one-touch automatic measurement of the frequency settling time with the built-in Modulation Domain analyzer.

- A wealth of modulation analysis supports are available, including the UMTS Family (3GPP HSUPA and HSDPA) and WiMax (Fixed and Mobile). General purpose modulation analysis includes support for CPM, M-QAMs, QPSKs, SOQPSK, nFSK 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
- Import user-defined and reference filters for customer modulation types
- Save captured waveforms in .mat or .csv formats for post processing analysis



Here, a Frequency Mask Trigger was set to monitor the frequency domain any changes in the spectrum and it triggered on transient interference. The spectrogram shows the time relationship between the wanted good signal and the interference transient signals and 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 separating known signals from unwanted interference.

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/1 GB
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	–112	–110
1 MHz	–133	–135	–134
10 MHz	–136	–140	–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 ±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

Characteristics

Trigger-related

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

Trigger Event Source – RF Input, External Trigger Input.

Trigger Types – Power Level or 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 15 MHz (equal to selected span).

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

Frequency Mask Trigger (Option 02)

Mask Shape – User-defined.

Mask Point Horizontal Resolution – 1 bin.

Level Range – 0 to –60 dBfs*1 at 10 dB/div vertical scale.

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

Span Range –

Start Frequency ≥ 20 MHz: 100 Hz to 15 MHz.

Start Frequency < 20 MHz: 100 Hz to 20 MHz.

Minimum Event Duration for 100% Probability of Trigger

– 40 μs (at maximum acquisition bandwidth)

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

Trigger Position Uncertainty – ± 2 Frames

(For Span = 15 MHz, uncertainty= ±80 μs).

*1 dBfs: dB relative to full scale.

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 – > 2KΩ (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 ≥ 20 MHz (RF): 15 MHz.

Start Frequency <20 MHz (Baseband): 20 MHz.

IQ Inputs (Option 03): 10 MHz.

A/D Converter – 51.2 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.

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Memory Depth (time) - RSA3303B and RSA3308B

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

Analysis-related

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.

DPXTM – dBm/Hz Marker, dBc/Hz Marker.

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

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

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

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 – <20MHz, $\pm (RE \times MF + 0.001 \times \text{Span} + 0.2)$ Hz.

$\geq 20\text{MHz}$, $\pm (RE \times MF + 0.001 \times \text{Span} + 2)$ Hz.

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.

Optional Measurement Functions, Standards-based and Offline Analysis

Description	Measurements and Displays
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, 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, Audio Level, 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.ISO/IEC 14443 Part 2 Type A, B.EPC Global Generation 1 Class 0, Class 1.ISO/IEC 18000-7/ISO/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
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
3GPP 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	Measurements and Displays
RSAVu	All measurements that can be performed on a stored waveform can be performed with RSAVu offline analysis software (except TD-SCDMA, Option 28 and RSA-IQWiMax external software for WiMax)

Note: See separate data sheets for specifications

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

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 –
0.250545Hz 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.

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

Number of Traces – 2.

Trace Type – Color-graded bit map, +Peak, –Peak, Average.

Trace Functions – +Peak Hold, –Peak Hold, Normal.

Minimum Signal Duration for 100% Probability of Intercept – 41 μ s.

Span Range – 100 Hz to 15 MHz.

Resolution BW Accuracy – 7%.

Resolution BW Range vs. Span (DPX)

Acquisition Bandwidth	RBW (Min)
15 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	50 Hz
2 kHz	20 Hz
1 kHz	10 Hz
500 Hz	5 Hz
200 Hz	2 Hz
100 Hz	1 Hz

STABILITY

Residual FM – < 2 Hz p-p, typical, Phase Noise Sidebands, dBc/Hz at Specified Center Frequency (CF).

Amplitude (specifications excluding mismatch error)

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; 10dB step at >=3.5 GHz.

IQ Input (Opt 03): 0 dB to 30 dB, 10 dB step.

Maximum Safe Input Level –

Average Continuous (RF Band, RF ATT \geq 10 dB): +30 dBm.

MAX DC Voltage: RF Band, \pm 0.2 V, Baseband, \pm 5 V, IQ input, Opt. 03. \pm 5 V.

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

Log Display Scale – 10 μ dB/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: 20 MHz \leq f < 3.5 GHz, –51 dBm to +30 dBm, 1 dB step; f \geq 3.5 GHz, –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, 10 dB step.

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

Absolute Amplitude Accuracy at Calibration Point

RF: (50 MHz, –10 dBm signal, 0 dB ATT, 20 $^{\circ}$ C to 30 $^{\circ}$ C) – \pm 0.5 dB.

Baseband: (10 MHz, –10 dBm signal, 0 dB ATT, 20 $^{\circ}$ C to 30 $^{\circ}$ C) – \pm 0.3 dB.

Input Attenuator Setting Uncertainty – (50 MHz, 10 dB ATT, 20 $^{\circ}$ C to 30 $^{\circ}$ C) – \pm 0.5 dB.

Reference Level Accuracy – (–10 dBm to 50 dBm at 50 MHz, 10 dB ATT, 20 $^{\circ}$ C to 30 $^{\circ}$ C) \pm 0.2 dB.

VSWR – (Att \geq 10 dB, Preamp OFF), Typical.

< 1.4:1 (300 kHz to 10 MHz).

< 1.3:1 (>10 MHz to 3 GHz).

< 1.4:1 (3 GHz to 8 GHz, RSA3308B only).

Distortion

3rd Order Inter-modulation Distortion – (Total Signal Power = –7 dBm, Ref Level +5 dBm, signal separation 300 kHz, Attenuator adjusted for optimum performance).

Frequency – 3rd order IM.

100MHz: 3 GHz – <–74dBc.

3 GHz: 8 GHz (RSA3308B Only) – < –72 dBc.

2nd Harmonic Distortion – (0 dBm tone at RF input, 30 dB attenuation).

Frequency – 2nd Harmonic Distortion, Typical.

10MHz to 1.5 GHz: <–56 dBc.

10 MHz to 1.75 GHz (RSA3308B Only): < –56 dBc.

Displayed Average Noise Level (input terminated)

Frequency	Specification
1 kHz – 10 kHz	–144 dBm/Hz
> 10 kHz – 1 GHz	–151 dBm/Hz
> 1 GHz – 3 GHz	–150 dBm/Hz
>3 GHz – 8 GHz (RSA3308B Only)	–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 20 MHz, Span 20 MHz	–93 dBm
0.5 GHz to 3 GHz, Span 3 GHz (RSA3303B Only)	–90 dBm
0.5 GHz to 3.5 GHz, Span 3 GHz (RSA3308B Only)	–90 dBm
3.5 GHz to 8 GHz, Span 3 GHz (RSA3308B Only)	–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
10 MHz	–73 dBc
2 GHz	–73 dBc
5 GHz (RSA3308B Only)	–70 dBc
7 GHz (RSA3308B Only)	–70 dBc

Noise Sidebands, dBc/Hz

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

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 (RSA3308B Only)	±1.7 dB	± 1.0 dB
>6.5 GHz to 8 GHz (RSA3308B Only)	±1.7 dB	± 1.0 dB

Adjacent Channel Leakage Ratio Dynamic Range

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

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

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

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-to-Pulse Phase, Frequency Deviation, Channel Power, OBW, EBW.

Minimum Pulse Width for Detection –

20 samples (800ns @ maximum sample rate)

Maximum Pulse Length – 260,000 samples.

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: ± 0.1% when analyzer and source share common reference (signal duration under bursted conditions > 1 second).

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

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.

GPIO Interface – IEEE 488.2.

TRIGGER OUT – 50 Ω, BNC, High >2.0 V, Low: <0.4 V (output current 1 mA).

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 73/23/EEC, amended by 93/68/EEC; EN61010-1: 2001 safety requirements for electrical equipment for measurement control and laboratory use. EC Council EMC Directive 89/336/EEC, amended by 93/68/EEC; EN61326-1: 1997 Product Family Standard for Electrical Equipment for Measurement, Control and Laboratory Use-EMC Requirements. Electromagnetic Compatibility Framework: 1992 AS/NZS 2064.1/2 (Industrial, Scientific and Medical Equipment).

Power Requirements – 90 VAC to 250 VAC, 47 Hz to 63 Hz.

Power Consumption – 400 VA maximum.

Data Storage – Internal HDD, USB ports, FDD.

Calibration Interval – One year.

Warranty – One year.

GPIO – SCPI-compatible, IEEE488.2 compliant.

Ordering Information

RSA3303B Real-Time Spectrum Analyzer, DC - 3 GHz

RSA3308B 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 to 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 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 30 – 3GPP Release 99 and Release 5 UL/DL 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 datasheet for more details.

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

RSA-IQWIMAX – LitePoint IQsignal™ Software for Tektronix Real-Time Spectrum Analyzers (for WiMax signals up to 10 MHz bandwidth).

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 Close-field probes for EMI

Troubleshooting – Order part number 119-4146-00.

Manuals

Additional User Manual (Paper, English) – 071-2363-00.

Additional User Manual (Paper, Japanese) – 071-2362-00.

Service Manual (Paper, English) – 071-2367-00.

Operator Manual (Paper, Russian) – 071-2369-00.

Real-Time Spectrum Analyzer

RSA3300B Series

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Physical Characteristics

Weight, with all options	kg		lbs.	
	19 kg		43 lbs.	
Dimensions	mm		in.	
	Without bumpers and feet	With bumpers and feet	Without bumpers and feet	With bumpers and feet
Height	215 mm	238 mm	8.5 in	9.4 in
Width	425 mm	445 mm	16.7 in	18.5 in
Depth	425 mm	470 mm	16.7 in	17.5 in

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.

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

RSA3BUP

- Opt 1A – Preamp, External, 0.1 - 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.
- 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 30 – 3GPP Release 99 and Release 5 UL/DL Analysis (customer-installable).
- Opt 40 – 3GPP Release 6 (HSUPA UL/DL) Analysis (requires opt 30, customer-installable).
- Opt IF – Installation labor for RSA33BUPxx (no calibration required).
- Opt IFC – Installation labor for RSA33BUPxx (with calibration).

Languages

Users/ Programmers Manual

- Opt L0 – English.
- Opt L5 – Japanese.
- Opt L10 – Russian.

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

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