

# Real-time Spectrum Analyzers

► RSA2200A Series • RSA3300A Series



## Trigger, Capture, Analyze Your RF Signal

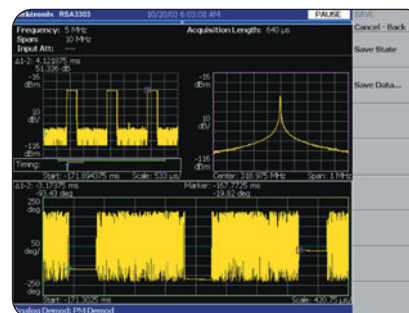
### Quickly Solve Design, Production or Operational Problems With Comprehensive Characterization of Time-varying and Transient RF Signals

Define issues and solve problems faster by characterizing your device, system or signal more completely and rapidly than previously possible with swept spectrum analyzers. Tektronix RSA2200A and RSA3300A Series Real-time Spectrum Analyzers capture many signals not viewable on swept spectrum analyzers by seamlessly capturing and storing a span of RF frequencies all at one time.\*<sup>1</sup> Once a signal is captured, it can be viewed simultaneously and analyzed in time-correlated frequency, time and modulation domains. RSA Series instruments include not only Real-time Spectrum Analyzer fast-signal capture, internal memory and modulation analysis but also functionality and operation of a swept spectrum analyzer for looking at very wide spans, all in an integrated, transportable package.

\*<sup>1</sup> See Tektronix Real-time Spectrum Analysis Technical Brief (lit # 37W-17252-0) for an explanation of how RTSA works and its unique capabilities.



► *RSA Series Spectrogram uniquely shows time-varying signal behavior in frequency change/stability, spectrum occupancy, pulsed signal timing, power change and more! The sample above shows the frequency settling characteristic of a transmitting device.*



► *Time-correlated multi-domain view provides a new level of insight about design or operational problems and possible solutions. This example includes frequency, time, and modulation domain views of an AM-modulated pulsed signal with pulse-to-pulse phase variation measured in the modulation domain.*

## ► Features & Benefits

Real-time Spectrum Analysis Provides Seamless Capture of Time-varying, Transient or Periodic RF Signals not Possible with Swept Spectrum Analyzers

Up to 65.536 Ms (256 MB) of Internal Memory Provides for Complete Analysis of Signals Over Time Without Making Multiple Measurements

Time-correlated, Simultaneous Views of Time, Frequency, and Modulation Domains Provide Greater and Unique Understanding of Signal Behavior

Spectrogram Provides a Revealing Picture of RF Signal Frequency and Amplitude Behavior Over Time – Not Possible with a Swept Spectrum Analyzer

Frequency Mask Trigger in RSA3300A Series – Available only from Tektronix – Makes it Easy to Capture Fast, Transient, or Intermittent Signals that Swept Spectrum Analyzers Would Miss

Spectrum Analyzer Mode for Very Wide Span Analyses

Built-in Demodulators Enhance Analysis of AM, ASK, FM, FSK, and PM Signals

Digital Demodulator in RSA3300A Series Offers Affordable Vector Signal Analysis

Outstanding DC – 20 MHz Dynamic Range and Low Phase Noise Mean You Can Make High-Performance Weak Signal and Phase Noise Measurements

## ► Applications

Analog and Digital Modulation Signal Quality Analysis

Understanding Frequency and Spectral Occupancy Behavior Over Time

Capture and Characterization of Undesired, Unknown, or Interfering Signals

Device/System Design or Operational Diagnostic Measurement

Getting Answers to Elusive EMI Problems

VCO/Synthesizer Design, RFID Device Characterization, General Purpose Digital Modulation Vector Signal Analysis, Spectrum Monitoring, Radar Measurements

COMPUTING

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VIDEO

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## Trigger, Capture, Analyze

**You can easily catch an elusive RF signal and analyze it at your convenience**

Sensitive and fast, RSA Series Real-time Spectrum Analyzer triggering easily captures unknown, periodic or intermittent signals. Using the Tektronix exclusive

Frequency Mask Trigger, you can configure a custom frequency domain mask including signal guard bands and levels then trigger on events isolated to a specific frequency or frequency range. As signals are captured, they are automatically saved to RSA internal memory, making it easy to perform in-depth, time-correlated analysis across the frequency, time and modulation domains with no external computer required! Quick-to-set-up

IF Level and Power (Span Bandwidth) triggers provide very convenient capture of signals in applications such as incident carrier-and-response interaction between two devices or burst signal carrier ramp up. Continuous Trigger Mode ensures a sequence of events are automatically captured into memory; you capture only the events and not time in between, maximizing memory efficiency and minimizing analysis time.

## ► Price/Performance Choice: RSA2200A and RSA3300A Series Real-time Spectrum Analyzers

RSA Model	Frequency Range	Memory Depth	Modulation Analysis	Real-time Capture Bandwidth	Triggering Modes
2203A	10 MHz – 3 GHz DC to 3 GHz (Opt. 05)	512 ksamples	AM, FM (ASK, FSK), PM	10 MHz	IF Level
2208A	10 MHz – 8 GHz DC to 8 GHz (Opt. 05)	512 ksamples	AM, FM (ASK, FSK), PM	10 MHz	IF Level
3303A	DC – 3 GHz	16.384 Msamples 65.536 Msamples (Opt. 02)	AM, FM (ASK, FSK), PM; general purpose digital mod analysis (Opt. 21)	15 MHz	IF Level; Frequency Mask Trigger and Power (Span BW) (Opt. 02)
3308A	DC – 8 GHz	16.384 Msamples, 65.536 Msamples (Opt. 02)	AM, FM (ASK, FSK), PM; general purpose digital mod analysis (Opt. 21)	15 MHz	IF Level; Frequency Mask Trigger and Power (Span BW) (Opt. 02)

## ► Characteristics

### ► Frequency

#### Frequency Range

RSA2203A	RSA2208A	RSA3303A	RSA3308A
10 MHz – 3 GHz	10 MHz – 8 GHz	DC – 3 GHz	DC – 8 GHz
Opt. 05: DC – 3 GHz	Opt. 05: DC – 8 GHz		

#### Frequency Aging

RSA2203A	RSA2208A	RSA3303A	RSA3308A
$\pm 2 \times 10^{-6}$ /year	$\pm 2 \times 10^{-6}$ /year	$\pm 1 \times 10^{-7}$ /year	$\pm 1 \times 10^{-7}$ /year
Opt. 10: $\pm 1 \times 10^{-7}$ /year	Opt. 10: $\pm 1 \times 10^{-7}$ /year		

#### Frequency Stability

RSA2203A	RSA2208A	RSA3303A	RSA3308A
$2 \times 10^{-6}$ (10 °C to 40 °C)	$2 \times 10^{-6}$ (10 °C to 40 °C)	$1 \times 10^{-7}$ (10 °C to 40 °C)	$1 \times 10^{-7}$ (10 °C to 40 °C)
Opt. 10: $1 \times 10^{-7}$ (10 °C to 40 °C)	Opt. 10: $1 \times 10^{-7}$ (10 °C to 40 °C)		

#### Total Reference Frequency Error

RSA2203A	RSA2208A	RSA3303A	RSA3308A
$4 \times 10^{-6}$	$4 \times 10^{-6}$	$2 \times 10^{-7}$	$2 \times 10^{-7}$
Opt. 10: $2 \times 10^{-7}$	Opt. 10: $2 \times 10^{-7}$		

**Marker Frequency Readout Accuracy –**

$\pm (RE \times MF + 0.001 \times \text{Span} + RFM) \text{ Hz}$ .  
 RE = Reference Frequency Error.  
 MF = Marker Frequency [Hz].  
 RFM = Residual FM [Hz].

**Carrier Frequency Measurement Accuracy –  
 RSA2203A and RSA2208A**

At spans  $\leq 10$  MHz, all frequency components of the signal must be contained in the analysis period and span.

Accuracy:  $RE \times CF + RFM$ . Resolution Setting =  
 1 mHz to 1 MHz.  
 At 2 GHz  $\pm 4.01$  kHz.  
 At 5 GHz  $\pm 10.01$  kHz.  
 At 7 GHz  $\pm 14.01$  kHz.

RSA2203A Opt. 10, RSA2208A Opt. 10,  
 RSA3303A and RSA3308A –

At spans  $\leq 10$  MHz for RSA2200A Opt. 10, and spans  $\leq 15$  MHz for RSA3300A, all frequency components of the signal must be contained in the analysis period and span.

Accuracy:  $RE \times CF + RFM$ . Resolution Setting =  
 1 mHz to 1 MHz.  
 At 2 GHz  $\pm 202$  Hz.  
 At 5 GHz  $\pm 502$  Hz.  
 At 7 GHz  $\pm 702$  Hz.

**Carrier Frequency Measurement Sensitivity –**

Carrier Power,  $> -40$  dbfs (typical) (dbfs = dB below full screen reference).

**Frequency Span**

**Range –**

RSA2203A and RSA2208A

Spectrum Analyzer Mode:

50 Hz to 3 GHz, (Start Frequency  $\geq 20$  MHz).  
 50 Hz to 20 MHz, (Stop Frequency  $< 20$  MHz, Opt.05).

Real-Time Spectrum Analyzer Mode:

100 Hz – 10 MHz, 1-2-5 sequence (RF);  
 20 MHz (Baseband).

Time Domain and Demodulation Modes:

Span = 0 Hz (Simultaneous with 50 Hz to 10 MHz Span in second analysis window).

RSA3303A and RSA3308A

Spectrum Analyzer Mode:

50 Hz to 3 GHz, (Start Frequency  $\geq 20$  MHz).  
 50 Hz to 20 MHz, (Stop Frequency  $< 20$  MHz).

Real-Time Spectrum Analyzer Mode:

100 Hz – 10 MHz, 15 MHz (RF);  
 20 MHz (Baseband).

Time Domain and Demodulation Modes:

Span = 0 Hz (Simultaneous with 50 Hz to 15 MHz Span in second analysis window).

**Resolution** –  $< 0.2\%$  of Span (Span = 100 Hz to 10 MHz RSA2203A and RSA2208A; 100 Hz to 10 MHz, 15 MHz, RSA3303A and RSA3308A).

**Accuracy** –  $\pm 0.1\%$  of Span.

**Resolution Bandwidth**

**Range** – 1 Hz to 10 MHz, automatically selected or user defined.

**Accuracy** – Within  $6.0\% \pm 0.1\%$ .

**Shape Characteristic** – Gaussian,  $< 5:1$  Shape Factor (3:60 dB); Rectangular, Nyquist, Root Nyquist shapes may also be selected.

**Noise Bandwidth –**

Range: 313.18 mHz to 400.87 kHz

Accuracy:  $\pm 0.1\%$

**FFT Performance**

**Number of Samples Per Frame** – 64 to 8192 (65536 samples / 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, FlatTopn.

**Stability**

▶ **Noise Sidebands, dBc/Hz**

At 1 GHz CF

RSA2203A,  
 RSA2208A

RSA3303A,  
 RSA3308A

Offset	Spec	Typical	Spec	Typical
1 kHz	$\leq -99$	$\leq -102$	$\leq -100$	$\leq -103$
10 kHz	$\leq -105$	$\leq -108$	$\leq -105$	$\leq -108$
20 kHz	$\leq -105$	$\leq -108$	$\leq -105$	$\leq -108$
30 kHz	$\leq -105$	$\leq -108$	$\leq -105$	$\leq -108$
100 kHz	$\leq -112$	$\leq -115$	$\leq -112$	$\leq -115$
1 MHz	$\leq -130$	$\leq -133$	$\leq -132$	$\leq -135$
5 MHz	$\leq -132$	$\leq -135$	$\leq -135$	$\leq -138$
7 MHz	$\leq -133$	$\leq -136$	$\leq -135$	$\leq -138$

At 2 GHz CF

RSA2203A,  
 RSA2208A

RSA3303A,  
 RSA3308A

Offset	Spec	Typical	Spec	Typical
1 kHz	$\leq -95$	$\leq -98$	$\leq -96$	$\leq -99$
10 kHz	$\leq -104$	$\leq -107$	$\leq -104$	$\leq -107$
20 kHz	$\leq -105$	$\leq -108$	$\leq -105$	$\leq -108$
30 kHz	$\leq -105$	$\leq -108$	$\leq -105$	$\leq -108$
100 kHz	$\leq -112$	$\leq -115$	$\leq -112$	$\leq -115$
1 MHz	$\leq -130$	$\leq -133$	$\leq -132$	$\leq -135$
5 MHz	$\leq -132$	$\leq -135$	$\leq -135$	$\leq -138$
7 MHz	$\leq -132$	$\leq -135$	$\leq -135$	$\leq -138$

At 6 GHz CF

RSA2208A

RSA3308A

Offset	Spec	Typical	Spec	Typical
1 kHz	$\leq -87$	$\leq -90$	$\leq -87$	$\leq -90$
10 kHz	$\leq -103$	$\leq -106$	$\leq -104$	$\leq -107$
20 kHz	$\leq -105$	$\leq -108$	$\leq -105$	$\leq -108$
30 kHz	$\leq -105$	$\leq -108$	$\leq -105$	$\leq -108$
100 kHz	$\leq -111$	$\leq -114$	$\leq -112$	$\leq -115$
1 MHz	$\leq -128$	$\leq -131$	$\leq -128$	$\leq -131$
5 MHz	$\leq -129$	$\leq -132$	$\leq -130$	$\leq -133$
7 MHz	$\leq -130$	$\leq -133$	$\leq -130$	$\leq -133$

**Residual FM at 1 kHz RBW –**

RSA2203A and RSA2208A:  $10 \text{ Hz}_{p-p}$ ;  $2 \text{ Hz}_{p-p}$  (Opt. 10).

RSA3303A and RSA3308A:  $2 \text{ Hz}_{p-p}$ .

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## Time Domain

### Trace Point Range –

Span >50 Hz, 64 – 240001 (RBW mode),  
18 – 240001 (FFT mode).

Span = 0 Hz (Time and Demodulation Modes).

RSA2203A and RSA2208A – IQ Data Pairs: 1024 to 512000; Power vs. Time: 1 to 512000.

RSA3303A and RSA3308A – IQ Data Pairs: 1024 to 16384000, 1 to 65536000 (Option 02) Power vs. Time: 1 to 512000.

### Triggers –

RSA2203A and RSA2208A: Free run, single, external, IF level (10 MHz BW).

RSA3303A and RSA3308A: Free run, single, external, IF level (15 MHz BW).

Option 02: adds Power (Span BW, Span <15 MHz) and Frequency Mask.

### Frequency Mask Trigger (Real-Time SA Mode), RSA3303A and RSA3308A with Opt. 02 Bandwidth –

Up to 15 MHz: Start Frequency ≥ 20 MHz.

Up to 20 MHz: Start Frequency < 20 MHz, and on IQ inputs.

### Event Detection Bandwidth –

≤5 MHz (100% probability of intercept), signal occupying at least one complete ≥160 μs frame).

10 MHz (50% probability of intercept, signal occupying at least one complete 80 μs frame (typical).

15/20 MHz (25% probability of intercept, signal occupying at least one complete 40 μs frame (typical).

### Frequency Mask Range –

0 to –6 divisions from Reference Level at 10 dB/div.

Mask Shape – User Defined.

### Minimum Horizontal Mask Setting Resolution –

< 0.2% of Span.

### Minimum Frequency Width –

< 0.2% of Span.

### Uncertainty –

±2 frames.

## Amplitude Specifications

### Measurement Range –

Displayed average noise level to MAX safe input.

### Input Attenuator Range –

RSA2203A, RSA2208A – 0 – 50 dB, 10 dB steps.

RSA3303A – 0 – 50 dB, 2 dB steps, DC to 3.0 GHz.

RSA3308A –

0 – 50 dB, 2 dB steps, DC to 3.5 GHz.

0 – 50 dB, 10 dB steps, 3.5 to 8.0 GHz.

### Maximum Safe Input Level –

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

Peak Pulse Power – +30 dBm (RF ATT ≥ 10 dB).

DC –

RSA2203A, RSA2208A: ±0.2 V (CF ≥ 20 MHz);

±5 V DC – 20 MHz (Opt. 05).

RSA3303A, RSA3308A: ±0.2 V (CF ≥ 20 MHz);

±5 V DC – 20 MHz.

## ► Displayed Average Noise Level (DANL)

Frequency	RSA2203A, RSA2208A Spec, dBm/Hz	RSA2203A, RSA2208A Typical, dBm/Hz, with Preamp	RSA3303A, RSA3308A Spec, dBm/Hz	RSA3303A, RSA3308A Typical, dBm/Hz, with Preamp
1 kHz – 10 kHz	–144*1	N/A	–144	N/A
10 kHz – 10 MHz	–150*1	N/A	–151	N/A
10 MHz – 100 MHz	–148	N/A	–151	N/A
100 MHz – 1 GHz	–148	–164	–151	–164
1 GHz – 2 GHz	–148	–164	–150	–164
2 GHz – 3 GHz	–147	–153	–150	–158
3 GHz – 5 GHz	–142*2	N/A	–142*3	N/A
5 GHz – 8 GHz	–142*2	N/A	–142*3	N/A

\*1 RSA2203A or RSA2208A Opt. 05 only.

\*2 RSA2208A only.

\*3 RSA3308A only.

Log Display Range – 10 μdB/div to 10 dB/div.

Linear Display Scale – 10 divisions.

Linear Display Units – dBm, dBμV, V, Watts + Hz for FM Demod, Degrees for PM Demod.

Marker Readout Resolution, Log – 0.01 dB.

Marker Readout Resolution, Linear – 0.001 μV.

## Frequency Response

### ► RSA2203A, RSA2208A

Frequency Range	Specification, dB	Typical, dB
100 Hz – 20 MHz*1	±0.5	±0.3
10 MHz – 3 GHz	±1.2	±0.5
3 GHz – 3.5 GHz*2	±1.7	±0.5
3.5 GHz – 6.5 GHz*2	±1.7	±1.0
5 GHz – 8 GHz*2	±1.7	±1.0

\*1 Opt. 05 only.

\*2 RSA2208A only.

### ► RSA3303A, RSA3308A

Frequency Range	Specification, dB	Typical, dB
100Hz – 20 MHz	±0.5	±0.3
15 MHz – 3 GHz	±1.2	±0.5
3 GHz – 3.5 GHz*3	±1.7	±0.5
3.5 GHz – 6.5 GHz*3	±1.7	±1.0
5 GHz – 8 GHz*3	±1.7	±1.0

\*3 RSA3308A only.

### Input Attenuation Switching Uncertainty –

(at 50 MHz) < 0.5 dB for all values of attenuation.

### IQ Input Attenuator Range –

RSA3303A Opt. 03 and RSA3308A Opt. 03:

0–30 dB, 10 dB steps.

### IQ Input Attenuator Switching Uncertainty –

RSA3303A Opt. 03 and RSA3308A Opt. 03:

< 0.5 dB for all values of attenuation.

### Absolute Amplitude Uncertainty –

At Reference Setting – ±0.5 dB (RF) at 50 MHz

CF, –20 dBm signal, 0 dB ATT, 20 °C to 30 °C;

±0.3 (baseband) (Opt. 05) at 10 MHz CF, –20

dBm signal, 0 dB ATT, 20 °C to 30 °C.

Overall Amplitude Accuracy –

±0.7 dB (RF) + Frequency Response.

▶ **RF Input VSWR**

Frequency Range	VSWR, at 10 dB RF Attenuation Typical, dB
300 kHz – 10 MHz*4	<1.4
10 MHz – 3 GHz	<1.3
3 GHz – 8 GHz*5	<1.4

\*4 RSA2203A and RSA2208A Opt. 05 only, RSA3303A, RSA3308A.

\*5 RSA3308A and RSA3308A.

**Spurious Responses**

**Third-order Intermodulation Distortion –**

100 MHz – 3 GHz:

RSA2203A, RSA2208A: < -73 dBc (Ref Level = +5 dBm, RF Att. = 20 dB, total signal power = -7 dBm, signal separation 300 kHz).

RSA3303A, RSA3308A: < -74 dBc (Ref Level = +5 dBm, RF Att. = 20 dB, total signal power = -7 dBm, signal separation 300 kHz).

3 GHz – 8 GHz:

RSA2208A and RSA3308A: < -72 dBc (Ref Level = +5 dBm, RF Att. = 20 dB, total signal power = -7 dBm, signal separation 300 kHz).

**Other Input-related Spurious –**

> 30 kHz offset – 70 dBc (Span = 2 MHz, Ref Level = 0 dBm, RBW=50 kHz, Signal Level = -5 dBm, any center frequency).

**Non-input-Related Spurious –**

(Ref = -30 dBm, RBW = 100 kHz, Span 3 GHz)

RSA2203A:

1 MHz – 20 MHz (Opt. 05): -93 dBm

20 MHz – 3 GHz: -90 dBm.

RSA3303A:

1 MHz – 20 MHz: -93 dBm.

20 MHz – 3 GHz: -90 dBm.

RSA2208A:

1 MHz – 20 MHz (Opt. 05): -93 dBm.

20 MHz – 3.5 GHz: -90 dBm.

3.5 GHz – 8 GHz: -85 dBm.

RSA3308A:

1 MHz – 20 MHz: -93 dBm.

20 MHz – 3.5 GHz: -90 dBm.

3.5 GHz – 8 GHz: -85 dBm.

**1 dB Gain Compression –**

RSA2203A, RSA2208A – +0 dBm

(RF ATT = 0 dB, 2 GHz).

RSA3303A, RSA3308A – +2 dBm

(RF ATT = 0 dB, 2 GHz).

**Resolution Bandwidth Switching Uncertainty –**

1 Hz to 10 MHz: ± 0.05 dB.

**Reference Level –**

Range – -51 to +30 dBm.

Resolution – 1 dB.

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

**Display Scale Fidelity –**

Log scale (max. cumulative), > 0 dB – 50dB – < ±0.2 dB; < ±0.12 dB, typical at 0 dBm reference level.

Linear scale – ±2% of Reference Level.

Linear to Log scale Switching Uncertainty – 0.05%.

Amplitude Reference Output –

-20 dBm, 50 MHz, internally switched to input.

**Seamless Capture and Processing**

**Memory Depth (samples) –**

RSA2203A and RSA2208A: 512 ksamples.

RSA3303A and RSA3308A: 16.384 Msamples;

65.536 Msamples (Opt. 02).

▶ **Memory Depth (Time) - RSA2203A and RSA2208A**

Span	Sample Rate	Record Length	Spectrum Frame Time
20MHz (Baseband)	25.6 Msps	0.02 s	40 µs
10 MHz	12.8 Msps	0.04 s	80 µs
5 MHz	6.4 Msps	0.08 s	160 µs
2 MHz	3.2 Msps	0.16 s	320 µs
1 MHz	1.6 ksps	0.32 s	640 µs
500 kHz	800 ksps	0.64 s	1.280 ms
200 kHz	320 ksps	1.6 s	3.2 ms
100 kHz	160 ksps	3.2 s	6.4 ms
50 kHz	80 ksps	6.4 s	12.8 ms
20 kHz	32 ksps	16 s	32 ms
10 kHz	16 ksps	32 s	64 ms
5 kHz	8 ksps	64 s	128 ms
2 kHz	3.2 ksps	160 s	320 ms
1 kHz	1.6 ksps	320 s	640 ms
500 Hz	800 sps	640 s	1.28 s
200 Hz	320 sps	1600 s	3.2 s
100 Hz	160 sps	3200 s	6.4 s



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## ► Memory Depth (Time) - RSA3303A and RSA3308A

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

### Real-Time Capture Bandwidth (seamless data capture) –

RSA2203A and RSA2208A: 10 MHz (rf); 20 MHz, DC – 20 MHz (Baseband (Opt.05)).  
RSA3303A and RSA3308A: 15 MHz (rf); 20 MHz, DC – 20 MHz (Baseband); 20 MHz, IQ Inputs (Opt.03).

### Data Samples per Frame (Real-time S/A Mode) – 1024.

### Block Size (number of frames) –

RSA2203A and RSA2208A: 1 to 500.  
RSA3303A and RSA3308A: 1 to 16000;  
1 to 64000 (Opt. 02).

### Maximum A/D Sampling Rate and Resolution –

51.2 Msamples/sec, 14 bits.

### Measurement Speed

#### Screen Update Rate –

38/Sec, (SA Mode, 2 MHz span, 128 point FFT).  
35/Sec, (SA Mode, 2 MHz span, 1024 point FFT).

### Remote Measurement Rate and GPIB Transfer

rate – 7000 Samples/Sec at 2 MHz span Auto RBW Spectrum data.

### Ethernet Transfer Rate – Mbyte/Sec

(256 Mbyte .JQT file transfer).

### RF Center Frequency Switching Time – <10 ms

for 10 MHz frequency change; <500 ms for 3 GHz frequency change.

### Traces, Displays, Detectors

**Traces** – 2 traces, Spectrum Analyzer Mode.

**Displays** – Up to 3 time-correlated, user-selected displays from the following: Spectrum, Spectrogram, Amplitude vs. Time, Frequency vs. Time, Phase vs. Time, IQ vs. time; RSA3303A Opt. 21 and RSA3308A Opt. 21 add: Constellation, EVM vs. time, Symbol Table, Eye Diagram.

### Detector – RMS.

**Trace Types** – Normal (RMS), Average, Max Hold, Min Hold.

**Display Detection** – Max, Min, Max/Min.

### Inputs and Outputs

#### Front Panel

Input – 50  $\Omega$ , type N.

Preamp Power – Standard RSA3303A and RSA3308A, Opt. 2A, RSA2203A and RSA2208A: LEMO 6 pin connector – Pin 1, NC; Pin 2, ID1; Pin 3, ID2; Pin 4, -12V; Pin 5, GND; Pin 6, +12V.

#### Rear Panel

10 MHz REF OUT – 50  $\Omega$ , BNC, >-3 dBm.

10 MHz REF IN – 50  $\Omega$ , BNC, -10 dBm - +6 dBm.

-I, +I, -Q, +Q inputs – RSA3303A with Opt. 03, and RSA3308A with Opt. 03.

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  $\Omega$ , BNC, High >2.0 V, Low: < 0.4 V (output current 1 mA).

#### Side Panel

LAN Interface (Ethernet) – 10/100 Base-T (std.).

Serial Interface – USB 1.1, 2 ports.

VGA Output – VGA compatible, 15 pin DSUB.

### Automated Measurements

#### Automated Measurements –

Channel Power, ACPR, Carrier to Noise, Occupied BW, Carrier Frequency, Emission BW, Spurious Search, CCDF, dB/Hz Mkr, dBc/Hz Mkr.

**Preamplifier (RSA2200A Series Opt. 2A, RSA3300A Series Opt. 1A, external)**

Frequency Range – 100 MHz - 3 GHz.  
 Gain – 20 dB.  
 Noise Figure – 6.5 dB at 2 GHz.

**Modulation Analysis**

**FM (may be used to evaluate FSK signals)**

Minimum Input Level – -40 dBfs\*<sup>2</sup>, typical.  
 Range – 0.8 Hz to 12.8 MHz.  
 Accuracy – ± 1% of span (Signal at center screen, input level -10 dBfs\*<sup>2</sup>).

**AM (may be used to evaluate ASK signals)**

Minimum Input Level – -40 dBfs\*<sup>2</sup>, typical  
 Accuracy – ±2 % (Signal at center screen, input level -10 dBfs\*<sup>2</sup>, 10% to 60% modulation depth).

**PM**

Minimum Input Level – -40 dBfs\*<sup>2</sup>, typical.  
 Accuracy – ±3°, (Signal at center screen, input level -10 dBfs\*<sup>2</sup>).  
 PM Scale, Max, Min – ± 180°.

**Digital Modulation (RSA3303A with Opt. 21, RSA3308A with Opt. 21)**

Modulation Format – BPSK, QPSK, π/4 DQPSK, 8PSK, 16QAM, 32QAM, 64QAM, 256QAM, GMSK, GFSK.

Analysis Period – Up to 7680 sample points.  
 Filter Types – Measurement Filters: Square Root Raised Cosine, none.

Reference Filters: Raised Cosine, Gaussian, none.  
 Alpha / B\*T range – 0.0001 to 1, 0.0001 step.

Maximum Symbol Rate – 12.8 Msymbols/sec.  
 Minimum Symbol Rate – 100 Symbols/sec (Typical).

**Vector Display Formats –**

Polar:  
 Constellation – data displayed at symbol times.  
 Vector – X to Y Points displayed between symbols.

IQ Versus Time:  
 I, Q – Continuous versus time over analysis window.  
 Trellis – Adjustable, 1 to 16 symbols.

Eye Diagram – Adjustable, 1 to 16 symbols.  
 Error Measurements Versus Time: EVM, Magnitude Error, Phase Error.

Error Measurements: Waveform Quality (p), Frequency Error Measurement, Origin Offset Measurement.

Symbol Table: Binary, Octal, Hexadecimal.

\*<sup>2</sup> dBfs = dB relative to full screen reference.

▶ **Digital Demodulation Accuracy** - The following tables are examples of typical digital demodulation accuracy:

QPSK EVM (%), typical

Symbol Rate, per second	100k	1M	4M	10M
CF = 1 GHz	0.5	0.5	1.2	2.7
CF = 2 GHz	0.5	0.5	1.2	2.7
CF = 3 GHz	0.7	0.7	1.5	2.9
CF = 5 GHz* <sup>3</sup>	0.7	0.7	1.5	3.0

π/4 DQPSK EVM (%), typical

Symbol Rate, per second	100k	1M	4M	10M
CF = 1 GHz	0.6	0.6	1.2	2.7
CF = 2 GHz	0.6	0.6	1.2	2.7
CF = 3 GHz	0.7	0.7	1.5	2.9
CF = 5 GHz* <sup>3</sup>	0.7	0.7	1.5	3.0

16 QAM EVM (%), typical

Symbol Rate, per second	100k	1M	4M	10M
CF = 1 GHz	0.9	0.5	1.2	2.2
CF = 2 GHz	0.9	0.5	1.2	2.2
CF = 3 GHz	0.9	0.5	1.2	2.5
CF = 5 GHz* <sup>3</sup>	0.9	0.5	1.2	2.5

\*<sup>3</sup>RSA3308A only.

**General Specifications**

Temperature Range – Operating: +10 °C to +40 °C.  
 Storage: -20 °C to +60 °C.

Warm-up Time – 20 min.

**Safety and EMI Compatibility –**

UL 61010B-1; CSA C22.2 No.1010.1.  
 EC Council Low Voltage Directive (LVD) 73/23/EEC, amended by 93/68/EEC.  
 EC Council EMC Directive 89/336/EEC, amended by 93/68/EEC.

**Power Requirements –**

100 VAC to 240 VAC, 47 Hz to 63 Hz.

Power Consumption – 350 VA max.

Data Storage – Internal HDD (20 GB) + USB port + Floppy Disk Drive.

Weight, without options – 19 kg.

**Dimensions –**

215 mm (H) x 425 mm (D) x 425 mm (W) without bumpers and feet.  
 238 mm (H) x 470 mm (D) x 445 mm (W) with bumpers and feet.

Calibration Interval – 1 year.

Warranty – 1 year.

# Real-time Spectrum Analyzers

► RSA2200A Series • RSA3300A Series

## ► Ordering Information

### **RSA2203A**

Real-time Spectrum Analyzer, 10 MHz – 3 GHz.

### **RSA2208A**

Real-time Spectrum Analyzer, 10 MHz – 8 GHz.

### **Standard Accessories**

User Manual, Programmers manual, power cord, BNC-N adapter.

### **Options**

**Opt. 1R** – Rackmount.

**Opt. 2A** – Preamp, external, 20 dB gain to 3 GHz, + factory-installed Power Supply, internal.

**Opt. 05** – DC – 20 MHz Baseband Frequency Extension.

**Opt. 10** – OXCO Hi-stability Reference Oscillator, 1x10<sup>-7</sup>/day.

**Opt. 12** – USB Keyboard and Mouse.

### **RSA3303A**

Real-time Spectrum Analyzer, DC – 3 GHz.

### **RSA3308A**

Real-time Spectrum Analyzer, DC – 8 GHz.

### **Standard Accessories**

User Manual, Programmers Manual, power cord, USB keyboard, USB mouse, BNC-N adapter.

### **Options**

**Opt. 1R** – Rackmount.

**Opt. 1A** – External preamp, 20 dB gain to 3 GHz.

**Opt. 02** – 256 MB Data Memory with Frequency Mask Trigger and Power (Span BW) Trigger.

**Opt. 03** – Differential IQ Inputs.

**Opt. 21** – General Purpose Digital Modulation Analysis.

## **Upgrades**

**RSA3UP 21** – General Purpose Digital Modulation Analysis Upgrade (customer-installable).

**RSA3UP IF** – Installation for RSA3UP 21.

## **International Power Plugs**

**Opt. A0** – North America power.

**Opt. A1** – Universal EURO power.

**Opt. A2** – United Kingdom power.

**Opt. A3** – Australia power.

**Opt. A4** – 240 V, North America power.

**Opt. A5** – Switzerland power.

**Opt. A6** – Japan power.

**Opt. A10** – China power.

**Opt. A99** – No power cord or AC adapter.

## **Language Option**

**Option L0** – English User/Programmers Manual.

**Option L5** – Japanese User/Programmers Manual.

## **Service Options**

**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.

**Opt. R5** – Repair Service 5 Years.

## **Contact Tektronix:**

**ASEAN / Australasia / Pakistan** (65) 6356 3900

**Austria** +43 2236 8092 262

**Belgium** +32 (2) 715 89 70

**Brazil & South America** 55 (11) 3741-8360

**Canada** 1 (800) 661-5625

**Central Europe & Greece** +43 2236 8092 301

**Denmark** +45 44 850 700

**Finland** +358 (9) 4783 400

**France & North Africa** +33 (0) 1 69 86 80 34

**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

**Mexico, Central America & Caribbean** 52 (55) 56666-333

**The Netherlands** +31 (0) 23 569 5555

**Norway** +47 22 07 07 00

**People's Republic of China** 86 (10) 6235 1230

**Poland** +48 (0) 22 521 53 40

**Republic of Korea** 82 (2) 528-5299

**Russia, CIS & The Baltics** +358 (9) 4783 400

**South Africa** +27 11 254 8360

**Spain** +34 (91) 372 6055

**Sweden** +46 8 477 6503/4

**Taiwan** 886 (2) 2722-9622

**United Kingdom & Eire** +44 (0) 1344 392400

**USA** 1 (800) 426-2200

**USA** (Export Sales) 1 (503) 627-1916

For other areas contact Tektronix, Inc. at: 1 (503) 627-7111

Last Update March 01, 2004

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37W-17118-1



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