Real-Time Spectrum Analyzers

▶ RSA2200A Series

Trigger, Capture, Analyze Your RF Signal
See Frequency and Amplitude Change Over Time

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 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. 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.

▶ Features & Benefits

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

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

Spectrum Analyzer Mode for Very Wide Span Analyses

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

▶ Applications

Analog 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, Spectrum Monitoring and Radar Measurements

Tektronix
Enabling Innovation

Real-Time Spectrum Analyzers
▶ RSA2200A Series

▶ RSA Series Spectrogram uniquely shows time-varying signal behavior in frequency change/stability, spectrum occupancy, pulsed signal timing, power change and more! The sample on this page shows the frequency settling characteristic of a transmitting device.
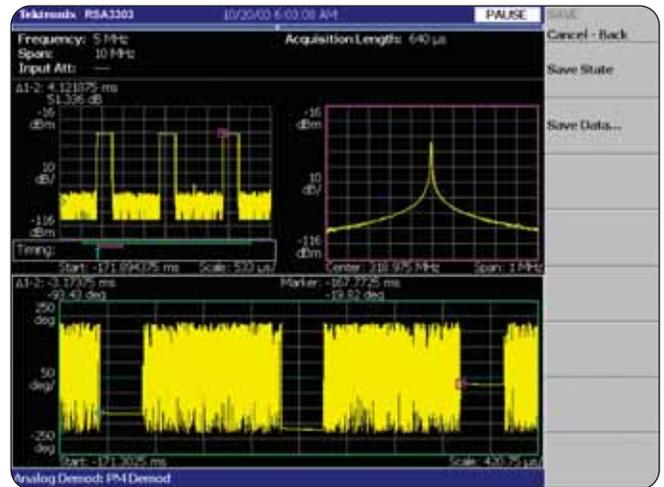
▶ Time-correlated multi-domain view provides a new level of insight about design or operational problems and possible solutions. The example on this page includes frequency, time and modulation domain views of an AM-modulated pulsed signal with pulse-to-pulse phase variation measured in the modulation domain.

▶ Performance Choice: RSA2200A Series Real-Time Spectrum Analyzers

RSA Model	Frequency Range	Memory Depth	Modulation Analysis	Real-Time Capture Bandwidth	Triggering Modes
2203A	10 MHz to 3 GHz, DC to 3 GHz (Opt. 05)	512 ksamples	AM, FM (ASK, FSK), PM	10 MHz	IF Level
2208A	10 MHz to 8 GHz, DC to 8 GHz (Opt. 05)	512 ksamples	AM, FM (ASK, FSK), PM	10 MHz	IF Level

▶ Characteristics

▶ Frequency

	RSA2203A	RSA2208A
Frequency Range	10 MHz to 3 GHz Opt. 05: DC to 3 GHz	10 MHz to 8 GHz Opt. 05: DC to 8 GHz
Frequency Aging	$\pm 2 \times 10^{-6}$/year Opt.10: $\pm 1 \times 10^{-7}$/year	$\pm 2 \times 10^{-6}$/year Opt.10: $\pm 1 \times 10^{-7}$/year
Frequency Stability	2×10^{-6} (10 ºC to 40 ºC) Opt.10: 1×10^{-7} (10 ºC to 40 ºC)	2×10^{-6} (10 ºC to 40 ºC) Opt.10: 1×10^{-7} (10 ºC to 40 ºC)
Total Reference Frequency Error	4×10^{-6} Opt.10: 2×10^{-7}	4×10^{-6} Opt.10: 2×10^{-7}

Marker Frequency Readout Accuracy –
± (RE[*1] x MF[*2] + 0.001 x Span + RFM[*3]) Hz.

Carrier Frequency Measurement Accuracy –
RSA2203A and RSA2208A

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

Accuracy: RE[*1] x CF[*4] + RFM.[*3] Resolution Setting = 1 mHz to 1 MHz.
  At 2 GHz ±4.01 kHz.
  At 5 GHz ±10.01 kHz.
  At 7 GHz ±14.01 kHz.

[*1] Reference Frequency Error.

[*2] Marker Frequency (Hz).

[*3] Residual FM (Hz).

[*4] CF= Carrier Frequency.

RSA2203A Opt. 10, RSA2208A Opt. 10

At spans ≤10 MHz for RSA2200A Opt. 10, all frequency components of the signal must be contained in the analysis period and span.

Accuracy: RE x CF + RFM. Resolution Setting = 1 mHz to 1 MHz.
  At 2 GHz ±202 Hz.
  At 5 GHz ±502 Hz.
  At 7 GHz ±702 Hz.

Carrier Frequency Measurement Sensitivity –
Carrier Power >−40 dbfs[*5] (typical).

[*5] dB relative to full screen reference.

Frequency Span
Range –
RSA2203A and RSA2208A

Spectrum Analyzer Mode:
  50 Hz to 3 GHz, (Start Frequency ≥20 MHz).
  50 Hz to 20 MHz, (Stop Frequency <20 MHz, Opt. 05).

Real-Time Spectrum Analyzer Mode:
  100 Hz to 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).

Resolution –
<0.2% of Span (Span =100 Hz to 10 MHz RSA2203A and RSA2208A).

Accuracy – ±0.1% of Span.

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

Accuracy – Within 6.0% ±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 – ±0.1%

Stability

▶ Noise Sidebands, dBc/Hz

At 1 GHz CF	RSA2203A, RSA2208A	
Offset	Spec	Typical
1 kHz	≤−99	≤−102
10 kHz	≤−105	≤−108
20 kHz	≤−105	≤−108
30 kHz	≤−105	−108
100 kHz	≤−112	≤−115
1 MHz	≤−130	≤−133
5 MHz	≤−132	≤−135
7 MHz	≤−133	≤−136

At 2 GHz CF	RSA2203A, RSA2208A	
Offset	Spec	Typical
1 kHz	≤−95	≤−98
10 kHz	≤−104	≤−107
20 kHz	≤−105	≤−108
30 kHz	≤−105	≤−108
100 kHz	≤−112	≤−115
1 MHz	≤−130	≤−133
5 MHz	≤−132	≤−135
7 MHz	≤−132	≤−135

At 6 GHz CF	RSA2208A	
Offset	Spec	Typical
1 kHz	≤−87	≤−90
10 kHz	≤−103	≤−106
20 kHz	≤−105	≤−108
30 kHz	≤−105	≤−108
100 kHz	≤−111	≤−114
1 MHz	≤−128	≤−131
5 MHz	≤−129	≤−132
7 MHz	≤−130	≤−133

Residual FM at 1 kHz RBW –
RSA2203A and RSA2208A – 10 Hz$_{pk-pk}$; 2 Hz$_{pk-pk}$ (Opt. 10).

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, FlatTop.

Time Domain
Trace Point Range –
Span >50 Hz, 64 to 240001 (RBW mode), 18 to 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.

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

Real-Time Spectrum Analyzers

▶ RSA2200A Series

Amplitude Specifications

Measurement Range –
Displayed average noise level to max safe input.

Input Attenuator Range –
RSA2203A, RSA2208A – 0 to 50 dB, 10 dB steps.

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 to 20 MHz (Opt. 05).

Spurious Responses

Third-order Intermodulation Distortion –
100 MHz to 3 GHz:
  RSA2203A, RSA2208A: <−73 dBc (Ref Level =
  +5 dBm, RF Att. = 20 dB, total signal power =
  −7 dBm, signal separation 300 kHz).
3 GHz to 8 GHz:
  RSA2208A: <−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 to 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 to 20 MHz (Opt. 05): −93 dBm.
  20 MHz to 3 GHz: −90 dBm.
RSA2208A:
  1 MHz to 20 MHz (Opt. 05): −93 dBm.
  20 MHz to 3.5 GHz: −90 dBm.
  3.5 GHz to 8 GHz: −85 dBm.

1 dB Gain Compression –
RSA2203A, RSA2208A – +0 dBm
(RF ATT = 0 dB, 2 GHz).

▶ Displayed Average Noise Level (DANL)

Frequency	RSA2203A, RSA2208A Spec, dBm/Hz	RSA2203A, RSA2208A Typical, dBm/Hz, with Preamp
1 kHz to 10 kHz	−144[*1]	N/A
10 kHz to 10 MHz	−150[*1]	N/A
10 MHz to 100 MHz	−148	N/A
100 MHz to 1 GHz	−148	−164
1 GHz to 2 GHz	−148	−164
2 GHz to 3 GHz	−147	−153
3 GHz to 5 GHz	−142[*2]	N/A
5 GHz to 8 GHz	−142[*2]	N/A

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 to 20 MHz[*1]	± 0.5	± 0.3
10 MHz to 3 GHz	± 1.2	± 0.5
3.0 GHz to 3.5 GHz[*2]	± 1.7	± 0.5
3.5 GHz to 6.5 GHz[*2]	± 1.7	± 1.0
5 GHz to 8 GHz[*2]	± 1.7	± 1.0

**Input Attenuation Switching Uncertainty (at
50 MHz) –** < 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 ºC to 30 ºC; ±0.3
(baseband) (Opt. 05) at 10 MHz CF, −20 dBm signal,
0 dB ATT, 20 ºC to 30 ºC.

Overall Amplitude Accuracy –
±0.7 dB (RF) + Frequency Response.

▶ RF Input VSWR

Frequency Range	VSWR, at 10 dB RF Attenuation Typical, dB
300 kHz to 10 MHz[*1]	<1.4
10 MHz to 3 GHz	<1.3
3 GHz to 8 GHz	<1.4

[*1] RSA2203A or RSA2208A Opt. 05 only.

[*2] RSA2208A only.

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 to 50 dB –
<±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.
Real-Time Capture Bandwidth
(Seamless Data Capture) –
RSA2203A and RSA2208A: 10 MHz (RF);
20 MHz, DC to 20 MHz (Baseband (Opt.05)).
Data Samples per Frame (Real-time
S/A Mode) – 1024.
Block Size (Number of Frames) –
RSA2203A and RSA2208A: 1 to 500.
Maximum A/D Sampling Rate and Resolution –
51.2 MS/s, 14 bits.

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

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

Measurement Speed

Screen Update Rate –
38/s, (SA Mode, 2 MHz span, 128 point FFT).
35/s, (SA Mode, 2 MHz span, 1024 point FFT).
**Remote Measurement Rate and
GPIB Transfer rate –**
7000 Samples/s at 2 MHz span Auto
RBW Spectrum data.
Ethernet Transfer Rate –
2.6 Mb/s (256 Mb .IQT 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 three time-correlated, user-selected displays
from the following: Spectrum, Spectrogram,
Amplitude vs. Time, Frequency vs. Time, Phase
vs. Time, IQ vs. Time.
Detector – RMS.
Trace Types –
Normal (RMS), Average, Max Hold, Min Hold.
Display Detection – Max, Min, Max/Min.

Inputs and Outputs

Front Panel
Input – 50 Ω, type N.
Preamp Power Connector –
RSA2203A and RSA2208A: LEMO 6 pin connector –
Pin 1: NC; Pin 2: ID1; Pin 3: ID2; Pin 4: –12 V;
Pin 5: GND; Pin 6: +12V.

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.
GPIB 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) –
10/100 Base-T (standard).
Serial Interface – USB 1.1, 2 ports.
VGA Output – VGA compatible, 15-Pin D-sub.

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 External)

Frequency Range – 100 MHz to 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,[*1] typical.
Range – 0.8 Hz to 12.8 MHz.
Accuracy –
± 1% of span (Signal at center screen,
input level –10 dBfs).

AM (may be used to evaluate ASK signals)
Minimum Input Level – –40 dBfs, typical.
Accuracy –
±2 % (Signal at center screen, input level
–10 dBfs, 10% to 60% modulation depth).

PM
Minimum Input Level – –40 dBfs, typical.
Accuracy –
±3º, (Signal at center screen, input level –10 dBfs).
PM Scale, Max, Min – ± 180º.

[*1] dB relative to full screen reference.

General Specifications

Temperature –
Operating: +10 ºC to +40 ºC.
Storage: –20 ºC to +60 ºC.

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.

▶ Ordering Information

RSA2203A

Real-Time Spectrum Analyzer, 10 MHz to 3 GHz.

RSA2208A

Real-Time Spectrum Analyzer, 10 MHz to 8 GHz.

Includes: User manual, programmers manual, power cord, BNC-N adapter.

Options

Opt. 1R – Rackmount.

Opt. 2A – Preamp, external, 20 dB gain to 3 GHz.

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

Opt. 10 – OXCO High-stability Reference Oscillator, $1x10^{-7}$/day.

Opt. 12 – USB keyboard and mouse.

International Power Plugs

Opt. A0 – North America power.

Opt. A1 – Universal Euro power.

Opt. A2 – United Kingdom power.

Opt. A3 – Australia power.

Opt. A4 – North America power, 240 V.

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 Opt. C3).

Opt. D5 – Calibration Data Report 5 years (with Opt. C5).

Opt. R3 – Repair Service 3 years.

Opt. R5 – Repair Service 5 years.

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Our most up-to-date product information is available at:
www.tektronix.com

CE ISO 9001 GPIB

Product(s) are manufactured in ISO registered facilities.

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

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