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Test & Measurement

- sales
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Complimentary Reference Material

This PDF has been made available as a complimentary service for you to assist in evaluating this model for your testing requirements.

TMG offers a wide range of test equipment solutions, from renting short to long term, buying refurbished and purchasing new. Financing options, such as Financial Rental, and Leasing are also available on application.

TMG will assist if you are unsure whether this model will suit your requirements.

Call TMG if you need to organise repair and/or calibrate your unit.

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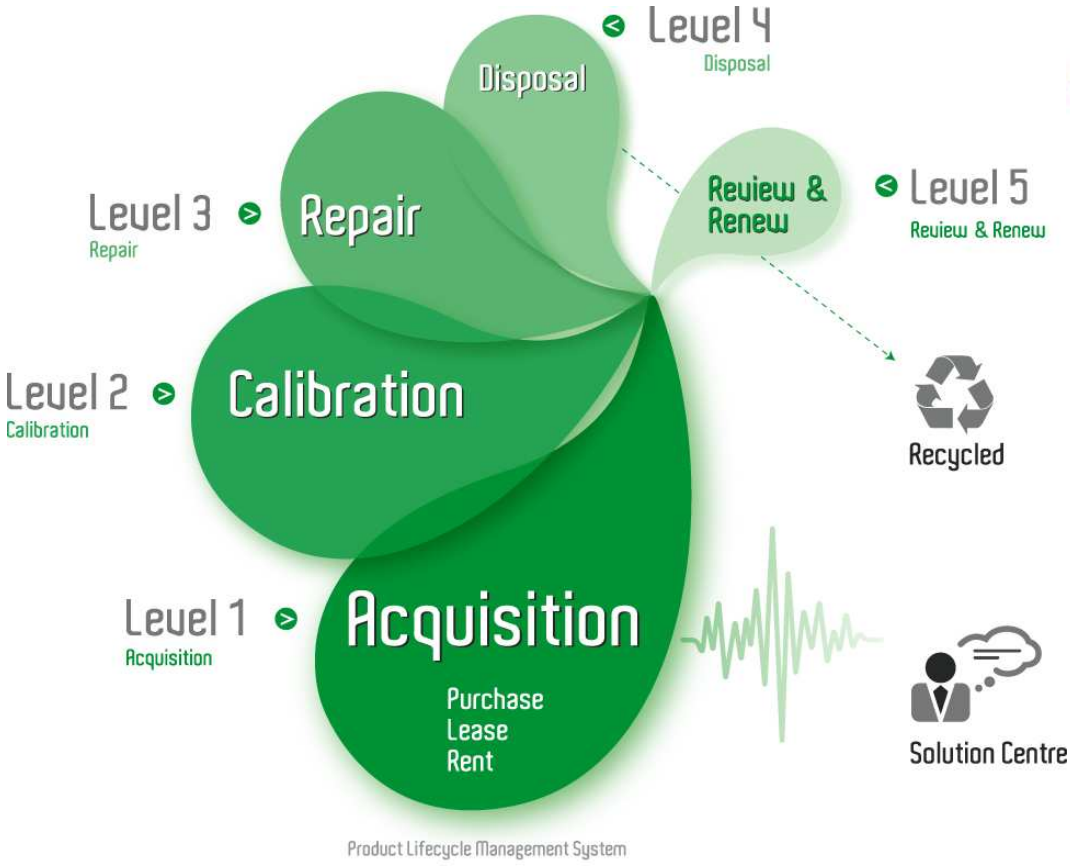
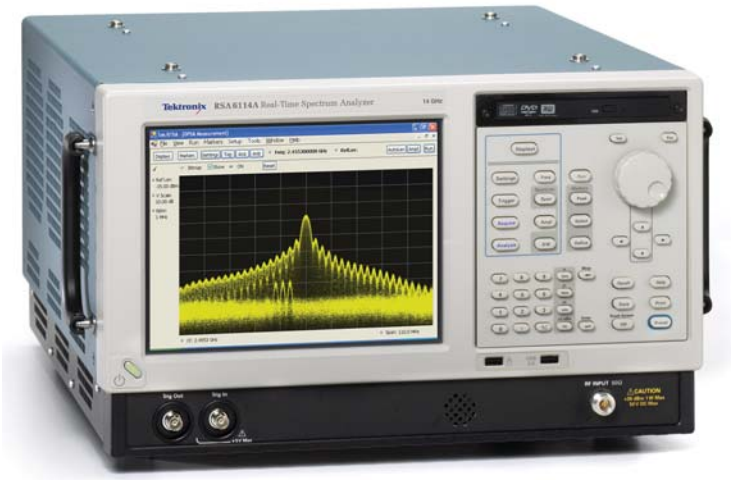


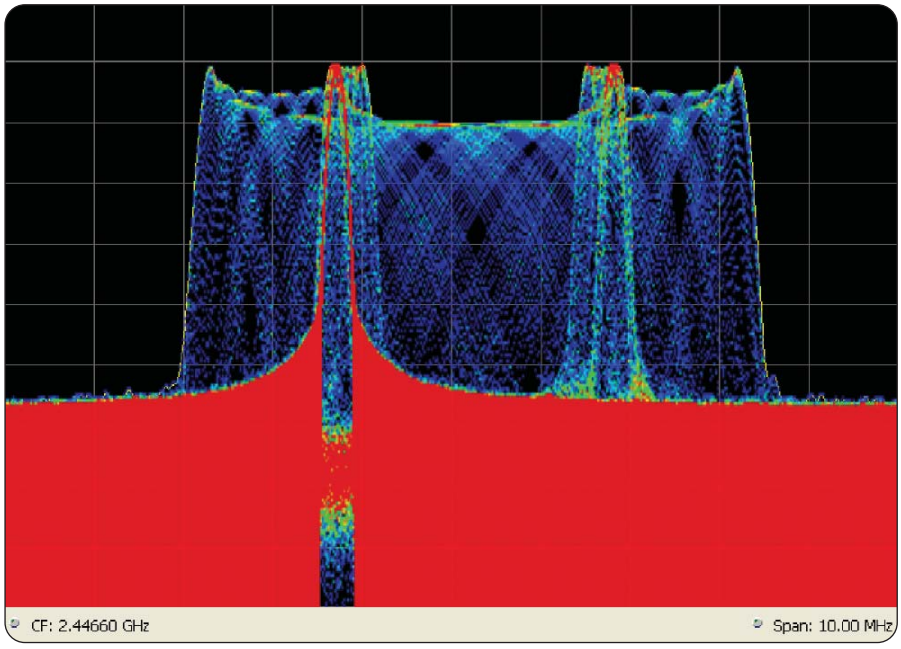
Real-time Spectrum Analyzers

▶ RSA6100A Series 6.2 GHz and 14 GHz Real-time Spectrum Analyzers



Completely Characterize Time-varying RF Signals

The RSA6100A Series will help you to easily discover design issues that other signal analyzers may 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 RSA6100A Series of Real-time Spectrum Analyzers (RTSA) can be set to trigger on the event, capture a continuous time record of changing RF events and perform time-correlated analysis in all domains. You get the functionality of a wide-band vector signal analyzer, a spectrum analyzer and the unique trigger-capture-analyze capability of a Real-Time Spectrum Analyzer — all in a single package.



▶ Revolutionary DPX spectrum display reveals transient signal behavior that helps you discover instability, glitches and interference. Here, an infrequently occurring transient is seen in detail. The frequency of occurrence is color-graded, indicating the infrequent transient event in blue and the noise background in red.

▶ Features & Benefits

Discover
- Revolutionary DPX® Displays Transients as Short as 24 µs with 100% probability of intercept
- DPX Spectrum Processing Provides an Intuitive Understanding of Time-varying RF Signals with Color-graded Displays Based on Frequency of Occurrence

Trigger
- Tektronix Exclusive 40 MHz and 110 MHz Frequency Mask Triggers (FMT) Offer Easy Event-based Capture of Transient RF Signals by Triggering on Any Change in the Frequency Domain

Capture
- All Signals in Up to 110 MHz Spans Are Captured into Memory
- Up to 1.7 s Acquisition Length at 110 MHz Bandwidth Provides Complete Analysis Over Time Without Making Multiple Acquisitions

Analyze
- Extensive Time-correlated Multi-domain Displays Connect Problems in Time, Frequency, Phase and Amplitude for Quicker Understanding of Cause and Effect when Troubleshooting
- Power Measurements and Signal Statistics Help You Characterize Components and Systems: ACLR, Multi-Carrier ACLR, Power vs. Time, CCDF
- Advanced Measurement Suite (Opt. 20) – Pulse Measurements Including Rise Time, Pulse Width and Pulse-to-Pulse Phase Provide Deep Insight into Pulse Train Behavior
- General Purpose Digital Modulation Analysis (Opt. 21) Provides Vector Signal Analyzer Functionality

▶ Applications

Characterize Radar and Pulsed RF Signals

Capture Vector Signal Parameters of Multi-Carrier 3G and 4G Systems for Offline Analysis

Analyze Time Variant Behavior of Cognitive Radio and Software Defined Radio Systems

Find Interference and Unknown Signals in Spectrum Monitoring and Surveillance

Troubleshoot RF Components, Modules or Systems

Tektronix
Enabling Innovation

Discover

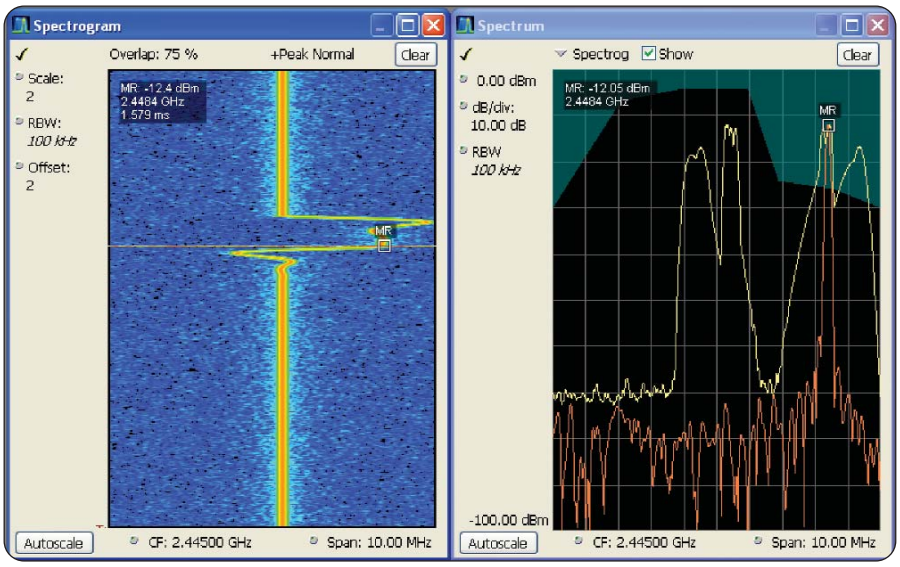
The patented DPX® spectrum processing engine brings live analysis of transient events to spectrum analyzers. Performing >48,000 frequency transforms per second, transients as brief as 24 µs in length are displayed in the frequency domain. This is a 1000-fold improvement over swept analysis techniques. Events can be color coded by rate of occurrence onto a bit-mapped display, providing unparalleled insight into transient signal behavior.

Trigger

The patented Tektronix Frequency Mask Trigger (FMT) Opt. 02 makes it easy to capture transient signals in up to a 110 MHz bandwidth. An FMT is simply configured to monitor all changes in frequency occupancy within the capture bandwidth. A Power Trigger, working in the time domain and in any capture bandwidth, can be armed to monitor for a user-set power threshold to be crossed during a moment in time. Resolution bandwidths may be used with the power trigger for band-limiting and noise reduction. Two external triggers are available for synchronization to test system events.

Capture

Capture once – make multiple measurements without recapturing. All signals in a capture bandwidth are recorded into the RSA6100A Series deep memory. Record lengths vary depending upon the selected capture bandwidth – up to 1.7 seconds at 110 MHz, 102 seconds at 1 MHz or 2.1 hours at 10 kHz bandwidth with FMT/Deep Memory Option 02. Real-time capture of small signals in the presence of large signals is enabled with 73 dB SFDR in all capture bandwidths, even up to 110 MHz (Opt. 110).



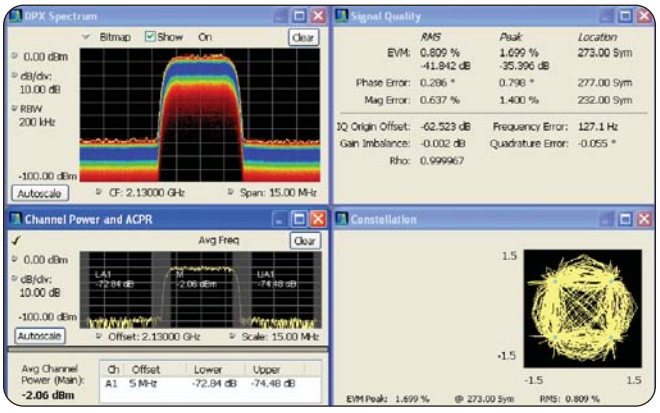
► Trigger and Capture: The frequency mask trigger monitors for changes in the frequency domain and captures any violations into memory. The spectrogram display (left panel) shows frequency and amplitude changing over time. By selecting the point in time in the spectrogram where the spectrum violation triggered the FMT, the frequency domain view (right panel) automatically updates to show the detailed spectrum view at that precise moment in time.

Analyze

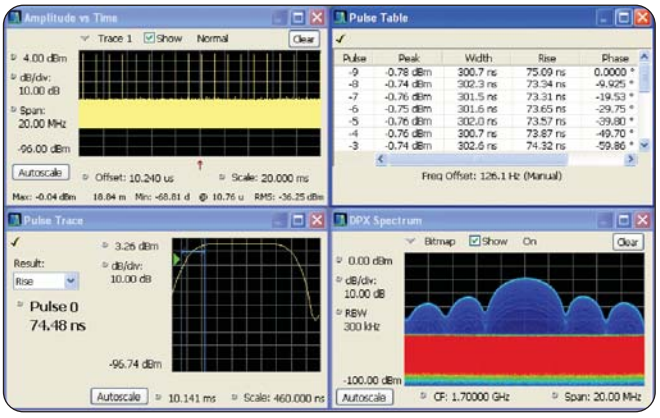
The RSA6100A Series introduces analysis capabilities that advance productivity for engineers working on components or in RF system design, integration and performance verification, or operations engineers working in networks, spectrum monitoring or surveillance. Spectrograms display both frequency and amplitude changes over time. Time-correlated measurements can be made across the frequency, phase, amplitude and modulation domains. This is ideal for signal analysis that includes frequency hopping, pulse characteristics, modulation switching, settling time, bandwidth changes and intermittent signals. The Windows XP environment makes this multi-domain analysis even easier with an unlimited number of analysis windows, all time-correlated, to provide deeper insight into signal behavior. A user interface that adapts to your preferences (keyboard, front-panel, touch-screen and mouse) makes learning the RSA6100A Series easy for both first-time users and experienced hands.

▸ Example Applications Benefiting from Key RSA6100A Series Standard Capabilities and Options

Analysis Feature	SDR and Cognitive Radio	Cellular, WLAN, General Comms	Radar, Pulsed Signals	Surveillance, Spectrum Monitoring
DPX® Spectrum Processing	X	X	X	X
Frequency Mask Trigger (Opt. 02)	X	X	X	X
110 MHz Capture Bandwidth (Opt. 110)	X	X	X	X
Spectrogram	X	X	X	X
Multi-domain Correlation	X	X	X	X
Internal Preamplifier (Opt. 01)	X	X	X	X
Digital IQ and Analog IF Output (Opt. 05)	X	X	X	X
Removable HDD (Opt. 06)			X	X
General Purpose Digital Modulation Analysis (Opt. 21)	X	X	X	X
Advanced (Pulsed) Signal Analysis (Opt. 20)			X	X



▶ Time-correlated, multi-domain view provides a new level of insight into design or operational problems not possible with conventional analysis solutions. Here, ACLR and Vector Modulation Quality (Opt. 21) are performed on a single acquisition, combined with the continuous monitoring of the DPX spectrum display.



▶ Pulse measurements, available in the Advanced Signal Analysis package (Opt. 20): A pulse train (upper left) is seen with measurements of peak power, pulse width, rise time and pulse-to-pulse phase (upper right). A detailed view of the pulse rise time is seen in the lower left, and a DPX display monitors the spectrum on the lower right.

▸ Characteristics

Trigger-related

Acquisition Mode –
Single or Continuous, Free Run or Triggered.
Trigger Event Source –
Trigger 1 (front), Trigger 2/Gate (rear), Line.
Trigger Types – Level or Frequency Mask.
Trigger Setting –
Trigger position settable from 0 to 100% of total acquisition length.
Trigger Combinational Logic –
Trig 1 AND Trig 2/Gate may be defined as a trigger event.
Trigger Delay –
Range: 20 ns to 60 s.
Resolution: 20 ns.
Uncertainty: ±20 ns.

Power Level Trigger

Level Range –
0 dB to –100 dB from reference level.
Accuracy –
(For trigger levels >30 dB above noise floor, 10% to 90% of signal level).
±0.5 dB (level ≥ –50 dB from reference level).
±1.5 dB (from <–50 dB to –70 dB from reference level).
Trigger Bandwidth Range –
(At maximum acquisition BW.)
4 kHz to 20 MHz + wide open (standard).
11 kHz to 60 MHz + wide open (Option 110).
Trigger Position Timing Uncertainty –
40 MHz Acquisition BW, 20 MHz BW:
Uncertainty = ±10 ns.
110 MHz Acquisition BW, 60 MHz BW (Opt. 110):
Uncertainty = ±3.3 ns.

Frequency Mask Trigger (Opt. 02)

Mask Shape – User-defined.
Mask Point Horizontal Resolution –
<0.2% of span.
Level Range – 0 dB to –80 dB from reference level.
Level Accuracy*1 –
0 to –50 dB from reference level:
±(IF Frequency Response + 1.0 dB).
–50 dB to –70 dB from reference level:
±(IF Frequency Response + 2.5 dB).
Span Range –
100 Hz to 40 MHz (Option 02).
100 Hz to 110 MHz (Option 02 + Option 110).
Minimum Event Duration for 100% Probability of Trigger –
(At maximum acquisition bandwidth.)
30.7 µSec (10.3 µSec, Opt. 02 + Opt. 110).
Events lasting less than minimum event duration specification will result in degraded Frequency Mask Trigger accuracy.
Trigger Position Uncertainty –
Span = 40 MHz – ±10.3 µs.
Span = 110 MHz – ±3.4 µs (Opt. 02 + Opt. 110).

External Trigger 1

Level Range – –2.5 V to +2.5 V.
Level Setting Resolution – 0.01 V.
Trigger Position Timing Uncertainty (50 Ω Input Impedance) –
40 MHz acquisition BW, 40 MHz Span:
Uncertainty = ±20 ns.
110 MHz acquisition BW, 110 MHz Span (Opt 110):
Uncertainty = ±12 ns.
Input Impedance –
Selectable 50 Ω/5 kΩ Impedance (nominal).

*1 For masks >30 dB above noise floor.

External Trigger 2

Threshold Voltage – Fixed, TTL.
Input Impedance – 10 kΩ (nominal).
Trigger State Select – High, low.

Trigger Output

Voltage (Output Current <1 mA) –
High: >2.0 V; Low: <0.4 V (LVTTL).

Capture-related

Real-time Capture Bandwidth –
40 MHz (110 MHz, Opt. 110).
A/D Converter –
100 MS/s 14-Bit (additional 300 MS/s, 12-Bit, Opt. 110).
Acquisition Memory Size – 256 MB (1 GB, Opt. 02).
Minimum Acquisition Length – 2 Samples.
Acquisition Length Setting Resolution –
1 Sample.

▸ Memory Depth (Time) and Minimum Time Domain Resolution

Acquisition BW	Sample Rate (For I and Q)	Acquisition Time	Acquisition Time (Option 02)	Min. Time Resolution
110 MHz (Opt. 110)	150 MS/s	0.426 s	1.706 s	6.6667 ns
60 MHz (Opt. 110)	75 MS/s	0.852 s	3.413 s	13.33 ns
40 MHz	50 MS/s	1.28 s	5.12 s	20 ns
20 MHz	25 MS/s	2.56 s	10.2 s	40 ns
10 MHz	12.5 MS/s	5.12 s	20.5 s	80 ns
5 MHz	6.25 MS/s	10.2 s	41.0 s	160 ns
2 MHz[*1]	3.125 MS/s	10.2 s	41.0 s	320 ns
1 MHz	1.56 MS/s	20.5 s	81.9 s	640 ns
500 kHz	781 kS/s	41.0 s	164 s	1.28 µs
200 kHz	390 kS/s	81.9 s	328 s	2.56 µs
100 kHz	195 kS/s	164 s	655 s	5.12 µs
50 kHz	97.6 kS/s	328 s	1310 s	10.24 µs
20 kHz	48.8 kS/s	655 s	2620 s	20.48 µs
10 kHz	24.4 kS/s	1310 s	5240 s	40.96 µs
5 kHz	12.2 kS/s	2620 s	10500 s	81.92 µs
2 kHz	3.05 kS/s	10500 s	41900 s	328 µs
1 kHz	1.52 kS/s	21000 s	83900 s	655 µs
500 Hz	762 S/s	41900 s	168000 s	1.31 ms
200 Hz	381 S/s	83900 s	336000 s	2.62 ms
100 Hz	190 S/s	168300 s	671000 s	5.24 ms

[*1] In spans ≤2 MHz, higher resolution data is stored, reducing acquisition time.

▸ Analysis-related

Measurement Functions	Measurements
Power and Frequency Measurements	Channel Power, Adjacent Channel Power, Multi Carrier Adjacent Channel Power/Leakage Ratio, dBm/Hz Marker, dBc/Hz Marker
Time Domain and Statistical Measurements	RF I/Q vs. Time, Power vs. Time, Frequency vs. Time, Phase vs. Time, CCDF, Peak-to-Average Ratio
Advanced Measurements Suite (Option 20)	Rise Time, Fall Time, Pulse Width, Pulse Peak Power, Average Power, Ripple, Pulse Repetition Interval, Duty Cycle, Pulse-Pulse Phase Frequency Error, Droop, Trend, FFT of Trend
General Purpose Digital Modulation Analysis (Option 21)	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

Displays by Domain	Views
Frequency	Spectrum (Amplitude vs. Frequency) DPX® Spectrum Display (Live RF Color-Graded Spectrum) Spectrogram (Amplitude vs. Frequency over Time)
Time and Statistics	Frequency vs. Time Amplitude vs. Time Phase vs. Time RF I and Q vs. Time Time Overview CCDF Peak-to-Average-Ratio
Advanced Measurements Suite (Option 20)	Pulse Results Table Pulse Trace (Selectable by pulse number) Pulse Statistics (Trend of Pulse Results and FFT of Trend)
Digital Demod (Option 21)	Constellation diagram EVM vs. Time Symbol Table (Binary or Hexadecimal)

Spectrum Display Traces, Detectors and Functions

Traces –
Three traces + 1 math waveform + 1 trace from spectrogram for spectrum display.
Detector – Peak, –peak, average.
Trace Functions –
Normal, Average, Max Hold, Min Hold.
Spectrum Trace Length –
801, 2401, 4001, 8001 or 10401 points.

RF Performance

Frequency

Frequency Range –
9 kHz to 6.2/14 GHz (RSA6106A/RSA6114A).
Initial Center Frequency Setting Accuracy –
Within 10^{-7} after 10-minute warm-up.
Center Frequency Setting Resolution – 0.1 Hz.
Frequency Marker Readout Accuracy –
±(RE x MF + 0.001 x Span + 2) Hz.
RE: Reference Frequency Error.
MF: Marker Frequency (Hz).
Span Accuracy – ±0.3% (Auto mode).
Reference Frequency –
Initial Accuracy at Cal – 1 x 10^{-7} (after 10-minute warmup).
Aging per Day – 1 x 10^{-9} (after 30 days of operation).
Aging per 10 Years – 3 x 10^{-7} (after 10 years of operation).
Temperature Drift – 2 x 10^{-8} (0 to 50 ºC).
Cumulative Error (Temperature + Aging) – 4 x 10^{-7} (within 10 years after calibration, typical).

Reference Output Level –
>0 dBm (internal reference selected).
Reference Output Level (Loopthrough) –
0 dB nominal gain from Ext Ref In to Ref Output, +15 dBm max. output.
External Reference Input Frequencies –
1 to 25 MHz (1 MHz steps) + 1.2288 MHz, 4.8 MHz and 19.6608 MHz.
External Reference Input Frequency Requirements –
Must be within ±3 x 10^{-7} of stated frequency input.
Spurious: <–80 dBc within 100 kHz offset.
Input Level Range: –10 dBm to +6 dBm.

Resolution Bandwidth

Resolution Bandwidth Range (Spectrum Analysis) –
1 Hz to 5 MHz (1, 2, 3, 5 sequence, auto-coupled) or user-selected (arbitrary).
Resolution Bandwidth Shape –
1 Hz to 5 MHz – Approximately Gaussian, shape factor 4.1:1 (60:3 dB) ±10%, typical.
Resolution Bandwidth Accuracy –
1 Hz to 5 MHz ±1% (auto-coupled RBW mode).

Time Domain Bandwidth

Time Domain Bandwidth Range –
At least 1/10 to 1/10,000 of Acquisition Bandwidth, 1 Hz Minimum.
Time Domain BW Shape – ≤10 MHz, approximately Gaussian, shape factor 4.1:1 (60:3 dB), ±10% typical. 20 MHz (60 MHz, Opt. 110), shape factor <2.5:1 (60:3 dB) typical.
Time Domain Bandwidth Accuracy –
1 Hz to 20 MHz and (>20 MHz to 60 MHz, Opt. 110), ±1%.

Minimum Settable Spectrum Analysis RBW vs. Span

Frequency Span	RBW
>10 MHz	100 Hz
>1 MHz to 10 MHz	10 Hz
≤1 MHz	1 Hz

DPX® Digital Phosphor Spectrum Processing

Spectrum Processing Rate – >48,828/s.
Trace Processing –
Color-graded bitmap, +Peak, –Peak, Average.
Minimum Signal Duration for 100% Probability of Detection (Max-hold On) – 31 µs (24 µs, Opt. 110).
Span Range –
100 Hz to 40 MHz (110 MHz with Opt. 110).
Resolution BW Accuracy – 7%.

▸ Resolution BW Range vs. Span (DPX)

Span	RBW (Min)
110 MHz	1 MHz
55 MHz	500 kHz
40 MHz	300 kHz
20 MHz	200 kHz
10 MHz	100 kHz
5 MHz	30 kHz
2 MHz	20 kHz
1 MHz	10 kHz
500 kHz	5 kHz
200 kHz	2 kHz
100 kHz	1 kHz
50 kHz	500 Hz
20 kHz	300 Hz
10 kHz	200 Hz
5 kHz	100 Hz
2 kHz	20 Hz
1 kHz	10 Hz
500 Hz	5 Hz
200 Hz	2 Hz
100 Hz	1 Hz

Real-time Spectrum Analyzers
► RSA6100A Series 6.2 GHz and 14 GHz Real-Time Spectrum Analyzers

Multiple correlated views in all domains (Frequency, Time, Modulation).

Revolutionary DPX® spectrum processing for unmatched troubleshooting and live transient analysis.

Touch screen, mouse and front panel controls directly adjust settings in the views.

Two external triggers to capture key event information (1 front, 1 rear).

Windows XP Operating System with Tek OpenChoice® for easy file operations, printing, Ethernet and GPIB control, remote connections and more.

Two frequency ranges: 9 kHz to 6.2 GHz (RSA6106A) or 9 kHz to 14 GHz (RSA6114A).

DVD ±RW (standard) for waveform storage. Removable HDD (optional) for data security.

Familiar spectrum analyzer controls plus fast access to all acquisition and measurement settings.

USB connections (2 front, 2 rear), for mouse, keyboard and memory.

DC-Protected Input ±40 V DC, over entire frequency range, ±30 dBm CW, 75W Pulse Maximum.

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

Offset	CF = 1 GHz		CF = 2 GHz	CF = 6 GHz	CF = 10 GHz (RSA6114A)
	Spec	Typical	Typical	Typical	Typical
100 Hz	–80	–86	–80	–70	–64
1 kHz	–100	–106	–106	–96	–91
10 kHz	–106	–110	–110	–107	–106
100 kHz	–107	–113	–111	–107	–106
1 MHz	–128	–134	–133	–132	–132
6 MHz	–134	–142	–142	–142	–142
10 MHz	–134	–142	–142	–142	–142

Stability

Residual FM –
<2 $Hz_{pk\text{-}pk}$ in 1 second (95% confidence, typical).

Amplitude

(Specifications excluding mismatch error.)

Measurement Range –
Displayed average noise level to maximum measurable input.

Input Attenuator Range – 0 dB to 75 dB, 5 dB step.

Maximum Safe Input Level –
Average Continuous (RF ATT ≥10 dB): +30 dBm.
Pulsed RF (RF ATT ≥ 30 dB, PW <10 µs, 1% Duty Cycle): 75 W.

Maximum Measurable Input Level –
Average Continuous (RF ATT: Auto): +30 dBm.
Pulsed RF (RF ATT: Auto, PW <10 µs, 1% Duty Cycle): 75 W.

MAX DC Voltage – ±40 V.

Log Display Range – 0.1 dB/div to 20 dB/div.

Display Divisions – 10 divisions.

Display Units –
dBm, Volts, Watts, Hz for Frequency measurements, Degrees for Phase measurements.

Marker Readout Resolution, dB units – 0.01 dB.

Marker Readout Resolution, Volts Units –
Reference level dependent, as small as 0.001 µV.

Reference Level Setting Range –
0.1 dB step, –170 dBm to +50 dBm (minimum ref. level –50 dBm at center frequency <80 MHz).

Level Linearity –
±0.1 dB (0 to –70 dB from Reference Level).

▸ Frequency Response

18 °C to 28 °C, Atten.= 10 dB, Preamp Off	
10 MHz to 3 GHz	±0.5 dB
>3 GHz to 6.2 GHz	±0.8 dB
>6.2 GHz to 14 GHz (RSA6114A)	±1.0 dB
5 °C to 50 °C, All Attenuator Settings (Typical)	
9 kHz to 3 GHz	±0.7 dB
>3 GHz to 6.2 GHz	±0.8 dB
>6.2 GHz to 14 GHz (RSA6114A)	±2.0 dB
Preamp (Opt. 01) On (Att.= 10 dB)	
10 MHz to 3 GHz	±0.7 dB

Absolute Amplitude Accuracy at Calibration Point (100 MHz, –20 dBm Signal, 10 dB ATT, 18 °C to 28 °C) – ±0.31 dB.
Input Attenuator Switching Uncertainty – ±0.2 dB.

Absolute Amplitude Accuracy, 95% Confidence[*1] (Typical) –
10 MHz to 3 GHz: ±0.5 dB.
3 GHz to 6.2 GHz: ±0.8 dB.
6.2 GHz to 14 GHz: ±1.5 dB.

[*1] 18 °C to 28 °C, Reference level ≤–15 dBm, Attenuator Auto-Coupled, signal level –15 dBm to –50 dBm. 10 Hz ≤RBW ≤1 MHz, after Alignment performed).

VSWR –
(Att = 10 dB, Preamp Off, CF set within 200 MHz of VSWR test frequency.)
10 MHz to 4 GHz: <1.6:1.
4 GHz to 6.2 GHz: <1.8:1.
6.2 GHz to 14 GHz (RSA6114A only): <1.9:1.

VSWR with Preamp –
(Att = 10 dB, Preamp On, CF set within 200 MHz of VSWR test frequency.
10 MHz to 3 GHz: <1.9:1.

Noise and Distortion

▸ 3rd Order Inter-modulation Distortion[*2]

Frequency	3rd order IM	3rd Order Intercept	3rd Order Intercept (Typical)
2.130 GHz	<–80 dBc	+15 dBm	+17 dBm

[*2] Each signal level –25 dBm, Ref Level –20 dBm, Attenuator =0 dB, 1 MHz tone separation.
3rd order intercept point is calculated from 3rd order intermodulation performance.

▸ 2nd Harmonic Distortion[*3]

Frequency	2nd Harmonic Distortion, Typical
10 MHz to 3.1 GHz	<–80 dBc
>3.1 GHz to 7 GHz (RSA6114 Only)	<–80 dBc

[*3] –40 dBm at RF input, Attenuator =0, Preamp Off, typical.

▶ Displayed Average Noise Level,*1 Preamp Off

Frequency	Specification	Typical
9 kHz to 10 MHz	–97 dBm/Hz	–100 dBm/Hz
>10 MHz to 100 MHz	–147 dBm/Hz	–149 dBm/Hz
>100 MHz to 2.3 GHz	–149 dBm/Hz	–151 dBm/Hz
>2.3 GHz to 4 GHz	–147 dBm/Hz	–149 dBm/Hz
>4 GHz to 6.2 GHz	–143 dBm/Hz	–145 dBm/Hz
RSA6114A Only		
4 GHz to 7 GHz	–143 dBm/Hz	–145 dBm/Hz
>7 GHz to 14 GHz	–135 dBm/Hz	–137 dBm/Hz

▶ Displayed Average Noise Level,*1 Preamp On (Opt. 01)

Frequency	Specification	Typical
10 MHz to 80 MHz	–160 dBm/Hz	–170 dBm/Hz
>80 MHz to 1 GHz	–165 dBm/Hz	–170 dBm/Hz
1 GHz to 2 GHz	–166 dBm/Hz	–170 dBm/Hz
2 GHz to 3 GHz	–164 dBm/Hz	–170 dBm/Hz

*1 Measured using 1 kHz RBW, 100 kHz Span, 100 Averages, Minimum Noise Mode, Input terminated.

▶ Residual Response*2

Frequency	Spec
40 MHz to 200 MHz	–90 dBm
>200 MHz to 6.2 GHz	–95 dBm
>6.2 GHz to 14 GHz (RSA6114A)	–95 dBm (typical)

*2 Input terminated, RBW = 1 kHz, Atten = 0 dB.

▶ Image Response*3

Frequency	Spec
9 kHz to 6.2 GHz	<–80 dBc
6.2 GHz to 8 GHz (RSA6114A)	<–80 dBc
>8 GHz to 14 GHz (RSA6114A)	<–76 dBc

*3 Ref = –30 dBm, Atten = 10 dB, RF input Level = –30 dBm, RBW = 10 Hz.

▸ Spurious Response with Signal*1

Frequency	Span ≤40 MHz, Swept Spans >40 MHz		Option 110 40 MHz <Span ≤110 MHz	
	Specification	Typical	Specification	Typical
10 MHz to 6.2 GHz	–73 dBc	–76 dBc	–73 dBc	–75 dBc
≥6.2 GHz to 14 GHz (RSA6114A)	–70 dBc	–75 dBc	–70 dBc	–75 dBc

*1 RF input level, –15 dBm, Atten = 10 dB, Offset ≥400 kHz, Mode: Auto.

Spurious Response with Signal at 4.75 GHz –
<–57 dBc (RF input level, –30 dBm).

▸ Adjacent Channel Leakage Ratio Dynamic Range*2

Signal Type, Measurement Mode	ACLR, Typical	
	Adjacent	Alternate
3GPP Downlink, 1 DPCH		
Uncorrected	–70 dB	–70 dB
Noise Corrected	–79 dB	–79 dB
3GPP TM1 64 Channel		
Uncorrected	–69 dB	–69 dB
Noise Corrected	–78 dB	–78 dB

*2 Measured with test signal amplitude adjusted for optimum performance. (CF = 2.13 GHz.)

▸ IF Frequency Response and Phase Linearity*3

Frequency Range	Specification		Typical (rms)
Freq (GHz)	Acq. Bandwidth	Specification	Amplitude/Phase
0.01 to 3.0*4	≤300 kHz	±0.20 dB	0.05 dB/0.5º
0.03 to 3.0	≤40 MHz	±0.50 dB	0.18 dB/1.0º
>3 to 6.2*4	≤300 kHz	±0.20 dB	0.05 dB/0.5º
>3 to 6.2	≤40 MHz	±0.50 dB	0.26 dB/1.0º
>6.2 to 14 (RSA6114A)	≤300 kHz	±0.20 dB	0.05 dB/1.0º
>6.2 to 14 (RSA6114A)	≤40 MHz	±0.80 dB	0.4 dB/1.0º
Option 110			
0.07 to 3.0	≤80 MHz	±0.90 dB	0.4 dB/1.5º
0.07 to 3.0	≤110 MHz	±0.90 dB	0.6 dB/1.5º
>3 to 6.2	≤80 MHz	±0.90 dB	0.6 dB/2.0º
>3 to 6.2	≤110 MHz	±0.90 dB	0.4 dB/2.0º
>6.2 to 14 (RSA6114A)	≤80 MHz	±1.5 dB	0.7 dB/1.5º
>6.2 to 14 (RSA6114A)	≤110 MHz	±1.5 dB	1.0 dB/2.0º

*3 Amplitude flatness and phase deviation over the capture BW, includes RF frequency response. Attenuator setting: 10 dB.

*4 High Dynamic Range Mode selected.

Advanced Measurement Suite (Opt. 20)

Measurements –
Rise Time, Fall Time, Pulse Width, Peak Power, Average Power, Ripple, Pulse Repetition Interval, Duty Cycle, Pulse-Pulse Phase, Frequency Error, Droop, Trend, FFT of Trend.

Minimum Pulse Width for Detection –
150 ns (standard), 50 ns (Opt. 110).

System Rise Time (Typical) –
<20 ns (standard), <8 ns (Opt. 110).

Pulse Measurement Accuracy –
Signal Conditions: Unless otherwise stated, Pulse Width >450 ns (150 ns, Opt. 110), S/N Ratio ≥30 dB, Duty Cycle 0.5 to 0.001, temperature 18 ºC to 28 ºC.

Measurement	Accuracy (Typical)
Average ON Power[*1]	±0.3 dB + Absolute Amplitude Accuracy
Average Transmitted Power[*1]	±0.3 dB + Absolute Amplitude Accuracy
Peak Power[*1]	±0.3 dB + Absolute Amplitude Accuracy
Pulse Width	±3% of reading
Duty Factor	±3% of reading

Pulse-to-Pulse Phase[*2] at Stated Frequency and Measurement Bandwidth	At 2 GHz	At 10 GHz
BW: 20 MHz	±1.7º	±3.2º
BW: 40 MHz	±1.7º	±3.7º
BW: 60 MHz (Opt 110)	±1.9º	±4º
BW: 110 MHz (Opt 110)	±2º	±5º

[*1] Pulse width >300 ns (100 ns, Opt. 110).

[*2] Pulse ON power ≥–20 dBm, signal peak at Reference Level, Attenuator = Auto, $t_{meas} - t_{reference} \leq 10$ ms, Frequency Estimation: Manual, CW (non-chirped) pulses. Measurement time position excludes the beginning and ending of the pulse extending for a time = (10/Measurement BW) as measured from 50% of the $t_{(rise)}$ or $t_{(fall)}$.

Digital Modulation Analysis (Option 21)

Modulation Formats –
BPSK, QPSK, 8 PSK, 16QAM, 64QAM, 256QAM, GMSK, π/4DQPSK DQPSK, D8PSK.

Analysis Period – Up to 80,000 Samples.

Filter Types –

Measurement Filters: Square root raised cosine, raised cosine, Gaussian, rectangular, IS-95, IS-95 EQ, none.

Reference Filters: Raised cosine, Gaussian, rectangular, IS-95, none.

Alpha/B*T Range – 0.001 to 1, 0.001 step.

Symbol Rate Range –
1 kSymbols/s to 100 MSymbols/s (Modulated signal must be contained entirely within acquisition BW of RSA6100A).

Demodulation Accuracy

Digital (Option 21)

QPSK Residual EVM (Typical)[*3]

Symbol Rate	Residual EVM
100 kSymbols/s	<0.6%
1 MSymbol/s	<0.7%
10 MSymbol/s	<1.0%
30 MSymbol/s	<3.0%
80 MSymbols/s (Opt. 110)	<3.0%

[*3] CF = 2 GHz, Measurement Filter = root raised cosine, reference filter = raised cosine, analysis length = 200 symbols.

256QAM Residual EVM (Typical)[*4]

Symbol Rate	Residual EVM
10 MSymbol/s	<1.0%
30 MSymbol/s	<3.0%
80 MSymbols/s (Opt. 110)	<4.0%

[*4] CF = 2 GHz, Measurement Filter = root raised cosine, reference filter = raised cosine, analysis length = 400 symbols.

Inputs And Outputs

Front Panel

RF Input Connector – N type, 50 Ω.
Trigger Out –
BNC, High >2.0 V, Low: <0.4 V,
output current 1 mA (LVTTL).
Trigger In –
BNC, 50 Ω/5 kΩ impedance (nominal), ±5 V Max Input, –2.5 V to +2.5 V trigger level.
USB Ports – 1 USB 2.0, 1 USB 1.1.
Audio – Speaker.

Rear Panel

Analog IF and Digital IQ Output (Opt. 05).
Analog IF Output (Opt. 05).
Frequency –
500 MHz (±1 MHz based on center frequency selection).
Output Level –
0 to –10 dBm for peak signal level of –20 dBm at RF mixer (typical).
Filter Control: Wide open (square top) or 60 MHz Gaussian.
Bandwidth (Wide Open): >150 MHz (typical).
Bandwidth (Gaussian): 60 MHz, Gaussian to –12 dB.

Digital IQ Output (Opt. 05)
Connector Type – MDR (3M) 50 pin x 2.
Data Output –
Data is corrected for amplitude and phase response in real time.
I data: 16-Bit LVDS; Q data: 16-Bit LVDS.
Control Output –
Clock: LVDS, MAX 50 MHz (150 MHz, Opt. 110)
DV (Data Valid), MSW (Most Significant Word) indicators, LVDS.
Control Input –
IQ data output enabled, connecting GND enables output of IQ data.
Clock Rising Edge to Data Transition Time (Hold Time) –
8.4 ns (typical, standard), 1.58 ns (typical, Opt. 110).
Data Transition to Clock Rising Edge (Setup Time) –
8.2 ns (typical, standard), 1.54 ns (typical, Opt. 110).
10 MHz REF OUT – 50 Ω, BNC, >0 dBm.
External REF IN –
50 Ω, BNC, –10 dBm – +6 dBm, 1 MHz to 25 MHz in 1 MHz steps, plus 1.2288 MHz, 4.8 MHz and 19.6608 MHz.
External REF IN Frequency Accuracy Required –
≤ ±0.3 ppm.
TRIG 2/Gate IN –
BNC, High: 1.6 to 5.0 V, Low: 0 to 0.5 V.
GPIB Interface – IEEE 488.2.
LAN Interface Ethernet – RJ45, 10/100/1000Base-T.
USB Ports – USB 2.0, two ports.
VGA Output – VGA compatible, 15 D-sub.
Audio out – 3.5 mm headphone jack.
Noise Source Drive – BNC, +28 V, 140 mA (nominal).

General Characteristics

Temperature Range –
Operating: +5 ºC to +50 ºC. (+5 ºC to +40 ºC when accessing DVD).
Storage: –20 ºC to +60 ºC.
Warm-up Time – 20 min.
Altitude –
Operating: Up to 3000 m (Approximately 10,000 ft.).
Non-operating: Up to 12,190 m (40,000 ft.).
Relative Humidity –
Operating and non-operating: 90% RH at 30 ºC (no condensation, maximum wet bulb, 29 ºC).
(80% RH max when accessing DVD.)
Vibration –
Operating: 0.22 G_{RMS}, 5 Hz to 500 Hz (except when accessing DVD and Opt. 06 Removable HDD).
Non-operating: 2.28 G_{RMS}, 5 Hz to 500 Hz.
Shock –
Operating: 15 G, half-sine, 11 ms duration. (1 G max when accessing DVD and Opt. 06 Removable HDD).
Non-operating: 30 G, half-sine, 11 ms duration.
Safety –
UL 61010-1:2004.
CSA C22.2 No.61010-1-04.
Electromagnetic Compatibility – Complies with –
EC Council EMC Directive 89/336/EEC, amended by 93/68/EEC.
EN61326, Class A.
AS/NZS CISPR 11, Class A (Australia).
Power Requirements –
90 VAC to 240 VAC, 50 Hz to 60 Hz.
90 VAC to 132 VAC, 400 Hz.
Power Consumption – 600 W max.
Data Storage –
Internal HDD, USB ports, DVD±RW (Opt. 07), Removable HDD (Opt. 06).
Calibration Interval – One year.
Warranty – One year.
GPIB – SCPI-compatible, IEEE 488.2 compliant.

Physical Characteristics

Weight	**kg**	**lb.**
With All Options	26.4	58
Dimensions	**mm**	**in.**
Height	267	10.5
Width	437	17.2
Depth	413	20.2

▸ Ordering Information

RSA6106A

Real-time Spectrum Analyzer, 9 kHz to 6.2 GHz.

RSA6114A

Real-time Spectrum Analyzer, 9 kHz to 14 GHz.

Both Include: Quick Start Manual (printed), User manual, Programmer's manual (on CD), power cord, BNC-N adapter, USB keyboard, USB mouse, pouch, front cover. Please specify power plug and language options when ordering.

Options

Opt. 01 – Internal Preamp, 10 MHz to 3 GHz, 30 dB gain, 4 dB Noise Figure at 2 GHz, typical.

Opt. 02 – 1 GB Memory, Frequency Mask Trigger.

Opt. 05 – Digital IQ Output and 500 MHz Analog IF output.

Opt. 06 – Removable HDD.

Opt. 07 – DVD-RW, Required option, no-cost (not compatible with Opt. 06).

Opt. 20 – Advanced Signal Analysis (including pulse measurements)

Opt. 21 – General Purpose Modulation Analysis.

Opt. 110 – 110 MHz Real-time Capture BW.

Opt. 1R – Rackmount.

Accessories

RSA61RHD – Additional Removable Hard Drive for use with Opt. 06 (Windows XP and instrument software pre-installed).

Transit Case – 016-1963-00.

Rackmount Retrofit – 016-1962-00.

Additional Quick Start Manual (Paper) – 071-1909-xx.

Additional User Manual (CD) – 063-3930-xx.

Service Manual (Paper) – 071-1914-xx.

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. A11 – India power.

Opt. A99 – No power cord or AC adapter.

Service

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.

Opt. CA1 – Single calibration or coverage for the designated calibration interval, whichever comes first.

Upgrades

RSA61UP

Opt. 01 – Internal Preamp, 10 MHz to 3 GHz, 30 dB gain, 4 dB Noise Figure at 2 GHz, typical.

Opt. 02 – 1 GB Memory, Frequency Mask Trigger.

Opt. 05 – Digital IQ Output and 500 MHz Analog IF Output.

Opt. 06 – Removable HDD.

Opt. 20 – Advanced Signal Analysis (including pulse measurements).

Opt. 21 – General Purpose Modulation Analysis.

Opt. 110 – 110 MHz Real-time Capture BW.

Opt. IF – Installation labor.

Opt. IFC – Installation labor plus calibration.

Languages

Opt. L0 – English manual.

Opt. L5 – Japanese manual.

Opt. L7 – Simplified Chinese manual.

Opt. L10 – Russian manual.

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

Product(s) are manufactured in ISO registered facilities.

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

7/06 HB/WOW 37W-19513-0

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