RSA7100A

RSA7100A Spectrum Analyzer Datasheet

* Monitor not included.

The RSA7100A wideband signal analyzer offers real time spectrum analysis up to 800 MHz bandwidth, simultaneous streaming to multiple interfaces for record (up to 2 hours) and playback of seamless data at full bandwidth.

Key features

- 16 kHz to 14/26.5 GHz frequency range covers a broad range of analysis needs
- High performance spectrum analysis for advanced design verification with -134 dBc/Hz phase noise at 1 GHz, 10 kHz offset and typical amplitude accuracy of 0.5 dB at 10 GHz
- Standard 320 MHz real time bandwidth; standard internal preamplifier to 3.6 GHz
- Industry's best real time performance: 419 nsec for 100% Probability of Intercept at full signal level
- Available 800 MHz acquisition bandwidth at frequencies > 3.6 GHz for advanced Radar, communications and spectrum management requirements
- Real time triggers on events of 4 ns in time domain, 700 ns in frequency domain ensures you catch the signals of interest first time, every time
- IQFlow™ provides continuous streaming of IQ data from the device to one or more clients, including RAID and 40 GbE, and an API that provides the speed and flexibility needed to perform real-time DSP algorithms and record/analyze long event sequences
- Streaming capture to internal RAID of over 2 hours (maximum of 2.75 hours) at full 800 MHz bandwidth enables environment recording and analysis of long event sequences
- DataVu-PC software for analysis of recorded events of any length includes ability to mark events of interest, export waveforms to other formats and perform pulse analysis with export of Pulse Descriptor Word (PDW) information
- Simultaneous streaming and real time analysis for live monitoring of recording events ensures you are getting the data you need
- Efficient fast-frame capture with dead-time eliminated optimizes memory and analysis so you can analyze longer test sequences
- Standard real time spectrum analysis with DPX spectrum/spectrogram minimizes time finding transients and interference
- Standard measurements including channel power, ACLR, CCDF, OBW/EBW, spurious search and amplitude/frequency/phase versus time provide a complete tool set for development work
- Application licenses for SignalVu-PC are available to provide a wide variety of analysis including modulation, pulse, WLAN, phase noise, and frequency/phase settling measurements
- Internal GPS receiver available for precise time stamping of events; timing reference sources include GPS, IRIG-B AM, IRIG-B DC, and 1PPS

Applications

- Advanced radar/EW design evaluation
- Environment evaluation, monitoring, and recording
- Wideband communications design
- Spectrum management

The RSA7100A gives you the power to imagine new solutions

The RSA7100A is a high performance spectrum analyzer focused on wideband analysis and signal recording. By separating the RF acquisitions from the compute engine, a graphics processor can be used in place of previously required FPGA designs for real time processing. As processor capabilities advance, new performance can be easily maintained for the system with PC upgrades instead of RF hardware replacement, making the RSA7100A a smart choice for minimizing long term costs. You can also harness the power of this CPU/GPU combination in your own simulations and designs, using the instrument as a powerful workstation.

The RSA7100A is designed for engineers working on the latest wideband designs in communications, radar and electronic warfare and for spectrum managers who need to see the effects of new wideband systems when fielded and operational.

Analysis of signals is enabled with two software packages. SignalVu-PC for real time, spectrum and vector signal analysis, and DataVu-PC for analysis of the very large file sets produced when recording wideband signals.

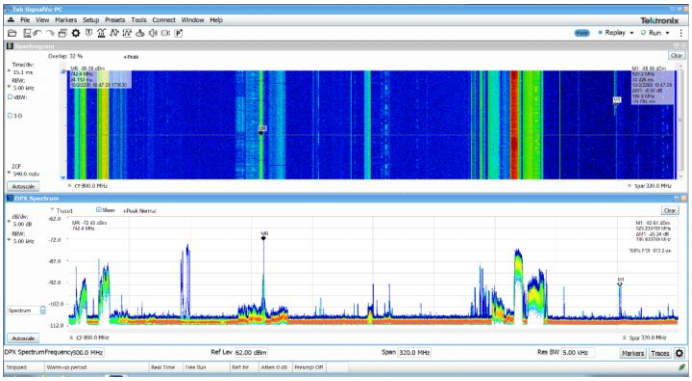
SignalVu-PC software offers rich analysis capability

The RSA7100 operates with SignalVu-PC, a powerful program used as the basis of Tek's traditional spectrum analyzers. SignalVu-PC offers a deep analysis capability including real time spectrum analysis and a wide variety of application packages. Real-time processing of the DPX® spectrum/spectrogram is enabled in your PC, further reducing the cost of hardware. A programmatic interface to SignalVu-PC is provided, offering all measurements and settings to external programs. Basic functionality of the free SignalVu-PC program is far from basic and includes the measurements shown below.

Measurements and functions included in SignalVu-PC base version

General signal analysis	Description
Spectrum analyzer	Spans from 100 Hz to full range of the instrument, 3 traces + math and spectrogram trace, 5 markers with power, relative power, integrated power, power density and dBc/Hz functions
DPX spectrum/spectrogram	Real time display of spectrum with 100% probability of intercept of up to 419 nsec signals in up to 800 MHz span
Amplitude, frequency, phase vs. time, RF I and Q vs. time	Basic vector analysis functions
Time Overview/Navigator	Enables easy setting of acquisition and analysis times for deep analysis in multiple domains
Spectrogram	Analyze and re-analyze your signal in 2-D or 3-D waterfall display
Analog modulation analysis	**Description**
AM, FM, PM analysis	Measures key AM, FM, PM parameters
RF measurements	**Description**
Spurious measurement	User-defined limit lines and regions provide automatic spectrum violation testing across the entire range of the instrument.
Spectrum emission mask	User-set or standards-specific masks.
Occupied bandwidth	Measures 99% power, -xdB down points.
Channel power and ACLR	Variable channel and adjacent/alternate channel parameters.
MCPR	Sophisticated, flexible multi-channel power measurements.
CCDF	Complementary Cumulative Distribution Function plots the statistical variations in signal level.
Signal strength	Measures signal strength and displays a spectrum and signal strength bar for interference hunting and signal quality evaluations.

The illustration below demonstrates the power of wide-band continuous monitoring for determining spectrum occupancy and interference over time. The spectrogram and real-time spectrum displays off-air spectral activity over time from 640 MHz to 960 MHz, showing TV, narrow-band communications, cellular base stations and the unregulated 900 MHz ISM band, all time-correlated. The resolution bandwidth of the analysis is 25 kHz to assure a low noise floor, and the minimum signal duration for 100% probability of intercept is a remarkable 98 microseconds.



The RSA7100A combined with SignalVu-PC application licenses offers advanced analysis, 800 MHz bandwidth, streaming to internal RAID, and simultaneous streaming to multiple interfaces for record and playback

SignalVu-PC offers a wealth of application-oriented options, including:

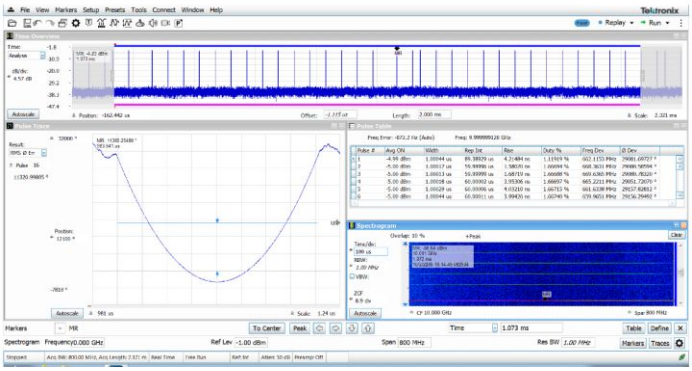
- Pulse analysis including exclusive Pulse-Ogram™ displays
- General-purpose modulation analysis (27 modulation types including 16/32/64/128/256 QAM, QPSK, O-QPSK, GMSK, FSK, APSK)
- EMC/EMI analysis with CISPR peak, quasi-peak, and average detectors
- Streaming data to internal RAID
- IQFlow™ provides simultaneous, continuous streaming of IQ data from the device to one or more clients through API and 40 GbE
- WLAN analysis of 802.11a/b/g/j/p, 802.11n, 802.11ac
- P25 analysis of phase I and phase 2 signals
- LTE™ FDD and TDD Base Station (eNB) Cell ID & RF measurements
- Bluetooth® analysis of Basic Rate, Low Energy, and Bluetooth 5. Some support of Enhanced Data Rate
- Mapping
- AM/FM/PM/Direct Audio Measurement including SINAD, THD
- Signal Classification and Survey
- Automated phase noise / jitter measurements

See the separate SignalVu-PC data sheet for complete details and ordering information. Selected applications are illustrated below.

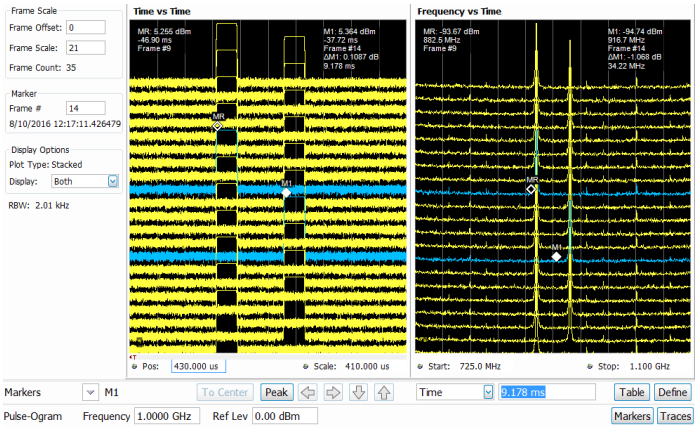
Pulse analysis

The Pulse Analysis package (SVPH) provides 29 individual measurements plus cumulative statistics, opening a world of characterization for wideband pulsed system designers and evaluators. The fast-frame acquisition mode of SignalVu-PC with the RSA7100A allows you to acquire just the time of interest during your pulse, making the most efficient use of memory. Cumulative statistics displays analyze data over multiple acquisitions, further extending the analysis to millions of pulses. Displays and measurements include:

Displays	Available measurements
Cumulative histograms of any measurement Cumulative measurements table with statistics (min, max, mean, standard deviation) Cumulative histograms of any measurement Pulse-Ogram waterfall display of amplitude vs. time of multiple pulses Spectrum of any pulse from the Pulse-Ogram Measurement display of any selected pulse vs. time Trend of selected measurement vs. pulse number FFT of selected measurement vs. pulse number	Pulse frequency Power (Average on, Peak, Average transmitted) Pulse width Rise time Fall time Repetition interval (seconds and Hz) Duty factor (% and ratio) Ripple (dB and %) Droop (dB and %) Overshoot (dB and %) Pulse-to-Pulse and Pulse-to-Reference frequency difference Pulse-to-Pulse and Pulse-to-Reference phase difference Frequency error (RMS and Maximum) Phase error (RMS and Maximum) Deviation (Frequency and Phase) Impulse response (dB and time) Time stamp



Shown above is a 700 MHz wide chirped signal. A time overview is presented at the top of the display that shows the pulses in the current acquisition. Phase deviation is displayed on the left, showing the characteristic parabolic shape of a frequency chirp. The signal has variations in repetition interval, shown in both the pulse table and the spectrogram on the right.



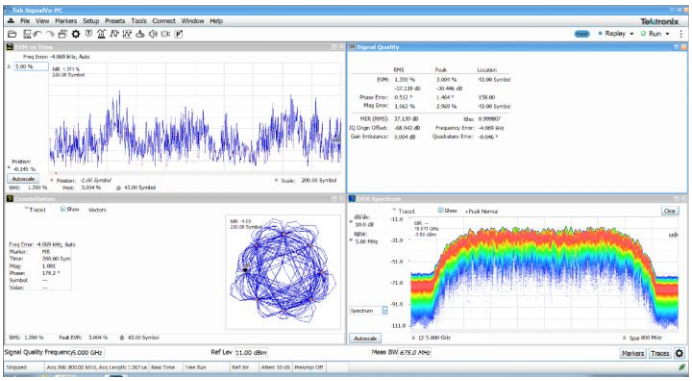
The illustration above is the unique Pulse-Ogram display in SignalVu-PC application license SVPH. This is a waterfall of triggered pulses showing their relationship to the trigger in time domain. Variations are immediately seen as changes in timing vs. trigger. Each time domain trace is represented as a spectrum on the right side of the display for immediate correlation of time and frequency domain effects.

General purpose modulation analysis

SignalVu-PC application SV21 bundles 27 different modulation types into a single analysis package that includes:

Displays	Measurements
Constellation I and Q vs. Time EVM vs. Time Frequency deviation vs. Time Magnitude error vs. Time Phase error vs. Time Eye diagram Trellis diagram Signal quality Symbol table	Error vector magnitude (RMS, Peak, EVM vs Time) Modulation error ratio (MER) 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 FSK only: Frequency deviation, Symbol timing error

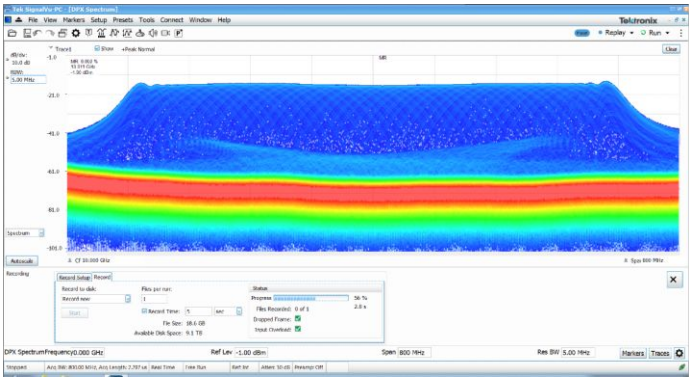
Modulation types
π/2DBPSK, BPSK, SBPSK, QPSK, DQPSK, π/4DQPSK, D8PSK, 8PSK, OQPSK, SOQPSK, CPM, 16/32/64/128/256QAM, MSK, GMSK, GFSK, 2-FSK, 4-FSK, 8-FSK, 16-FSK, C4FM, D16PSK, 16APSK, and 32APSK



In the illustration above, a 5 GHz carrier modulated with 500 MSymbols/sec pi/4-QPSK is analyzed with the RSA7100A Option B800 and SignalVu-PC application license SVMH. A measurement summary, EVM vs. Time, and constellation display are shown along with the continuous monitoring of the DPX spectrum.

Streaming recording to RAID

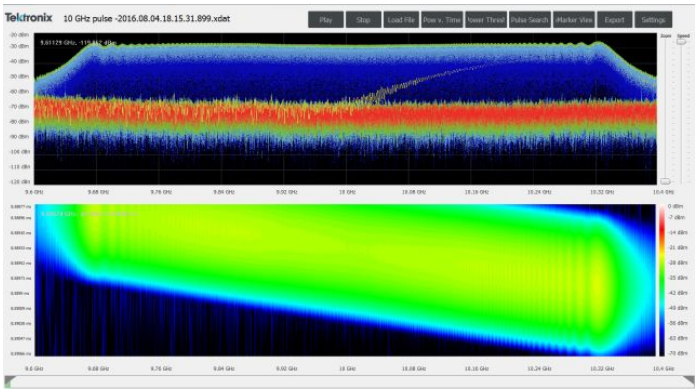
With option STREAMxx-SVPC, you can stream the full real time bandwidth of the RSA7100A to the available RAID system in the controller. All other analysis (real time spectrum analysis, modulation analysis, etc.) is available simultaneous with streaming. This ability to analyze while streaming ensures the quality of your data collection, avoiding re-runs and saving time. Two options for RAID are offered, with over 2 hours storage available at 800 MHz bandwidth. Longer recording times are available at reduced bandwidths.



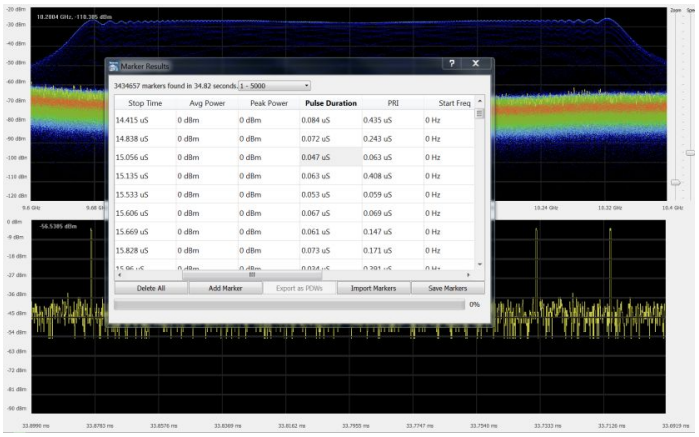
Easy recordings are available at the touch of a button or when a trigger is received. Anticipated file size is reported and indications of skipped frames or overload conditions are provided to ensure high quality recording. Above we see a 5 second recording being made. DPX spectrum is providing real time monitoring of the 800 MHz acquisition. The file size, available disk space, recording progress, number of files recorded are all reported. Indicators of dropped frames and input overload are presented all in the same control screen.

DataVu-PC for analysis of long recordings

SignalVu-PC can open files up to 16 GB in size, and perform analysis on any 1 GB of the opened file. But 16 GB is just a few seconds of data in 800 MHz bandwidth, not enough for analysis of streamed recordings that can reach 30 TB in size. DataVu-PC is the solution for analysis of large files. With DataVu-PC you can view color-graded spectrums, spectrograms and amplitude vs. time of files of unlimited length. Search-and-mark testing is available to quickly identify signals of interest. Searches can be amplitude qualified, and a marker is placed on up to 2,000,000 events found. Replay of user-selected sections is offered for review of signals of interest, and selected areas can be exported to SignalVu-PC for further analysis. Pulse analysis is available within DataVu-PC, with results start/stop time, average/peak power, pulse duration, Pulse Repetition Interval (PRI) and start/stop frequencies on up to 2,000,000 pulses, all exportable in Pulse Descriptor Word (PDW) format. See the separate DataVu-PC data sheet for further details.



Above is a color-graded spectrum display combined with a 99% overlap spectrogram display as shown on DataVu-PC. You have full overlap/skip control to vary rate and detail of the streaming file for complete visualization of the data.

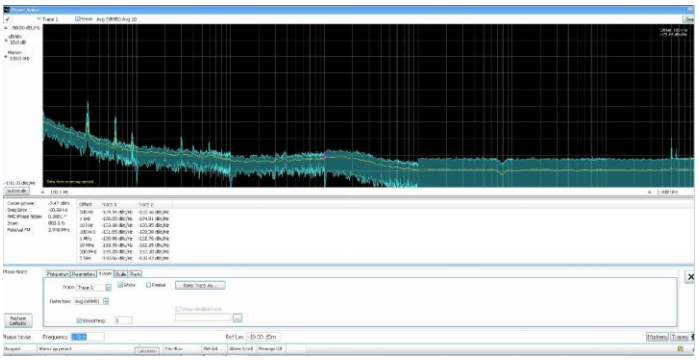


DataVu-PC pulse option provides fast marking of pulses and measurements on large data sets. Above, the results of a pulse search are presented with the pulse measurements of start/stop time, average/peak power, pulse duration, Pulse Repetition Interval (PRI) and start/stop frequencies on up to 2,000,000 pulses. Pulse results can be exported in PDW format for use by other tools.

Automated phase noise and jitter measurements

Phase noise degrades the ability to process Doppler information in radar systems and degrades error vector magnitude in digitally modulation communication systems. Automated phase noise and jitter measurements with a spectrum analyzer (PHAS) may reduce the cost of your measurements by reducing the need for a dedicated phase noise analyzer.

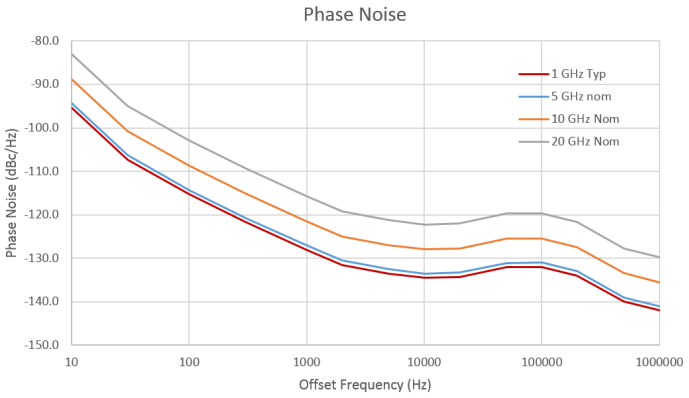
Shown below, the phase noise of a 1 GHz carrier is measured at -133 dBc/Hz at 10 kHz offset. Single-sideband phase noise is displayed in dBc/Hz versus offset frequencies from carrier, shown in trace or tabular form: one ±Peak trace (in blue) and one average trace (in yellow). Trace smoothing and averaging is supported.



The RSA7100A's intrinsic phase noise of -134 dBc/Hz, at this frequency and across its operating range, provides ample measurement margin for a vast majority of applications.

Applications include testing VCO phase noise, oscillator phase noise, clock source jitter, signal generator phase noise, and more. The Tektronix phase noise / jitter application, when combined with DPX® signal processing, provides a powerful solution for designing and troubleshooting momentarily unstable signal sources.

The phase noise application performs automated carrier tracking, averaging, and dynamic measurement bandwidth adjustment, providing the accuracy and speed of measurement needed at all carrier offsets - ranging from 10 Hz to 1 GHz. Results are available in log-frequency trace or tabular form with pass/fail limits on-screen or via programmatic control. Integration limits are programmable for RMS phase noise, jitter, and residual FM. The low instrument phase noise of the RSA7100A together with this measurement application allows for high-performance phase noise measurements at frequencies up to 26.5 GHz.



The previous figure shows the RSA7100A typical and nominal phase noise performance.

CTRL7100A controller included with the RSA7100A

Tektronix has designed the CTRL7100A controller to meet the specified performance of real time DPX operation with simultaneous streaming to RAID. You can also harness the power of this CPU/GPU combination in your own simulations and designs, using the instrument as a powerful workstation.

CTRL7100A key specifications

The CTRL7100A is offered in the following configuration. See the CTRL7100A datasheet for full specifications of the controller.

- Dual Intel® Xeon® Processor E5-2623 v4 (10M Cache, 2.6 GHz)
- 64 GB DDR4 2133 MHz RAM
- 512 GB SSD (removable)
- Optional RAID controller and front-panel removable drives supports 4 GB/s and up to 32 TB
- Windows 7 (Win8 Pro COA) operating system
- AMD FirePro W9100 16GB 512-bit GDDR5 PCIe 3.0 Workstation Video Card
  - 16 GB GDDR5 memory
  - 6 Mini Display Port 1.2 outputs
  - 320 GB/s memory bandwidth
  - 4K display resolution (up to 4096 x 2160)
  - 5.24 TFLOPS single precision performance
- 40 GbE card
- Streaming to RAID options (20 minutes; or 165 minutes at full 800 MHz bandwidth)

Specifications

All specifications are guaranteed unless noted otherwise. All specifications apply to all models unless noted otherwise.

Frequency range

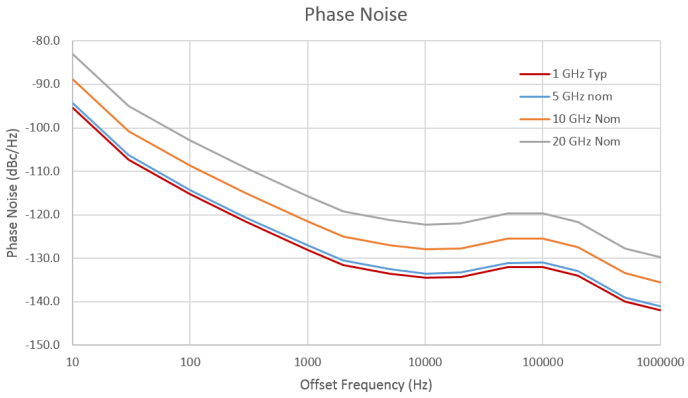
Frequency range	Preamp OFF: 16 kHz to 14 GHz (RSA7100A Option 14) 16 kHz to 26.5 GHz (RSA7100A Option 26) Preamp ON: 10 MHz to 3.6 GHz
Tuning resolution	1×10^{-3} Hz
Frequency marker readout accuracy	± (RE × MF + 0.001 × Span) Hz RE: Reference Frequency Error MF: Marker Frequency [Hz]

Frequency reference

Frequency	10 MHz
Initial accuracy at Cal (10 min warm-up)	$\pm 50 \times 10^{-9}$ (23 °C to 28 °C)
Aging after 30 days of continuous operation, typical	$\pm 0.5 \times 10^{-9}$ per day $\pm 100 \times 10^{-9}$ first year
Cumulative error (Initial + Temperature + Aging), typical	200×10^{-9} (1 year)
Temperature drift	10×10^{-9} (23 °C to 28 °C) 50×10^{-9} (0 °C to 55 °C)
External reference output	BNC connector, 50 Ω, nominal
External reference output level	0.71 Vpp to 2 Vpp into 50 Ω
External reference output level, typical	1.2 Vpp into 50 Ω
External reference input	BNC connector, 50 Ω, nominal
External reference input frequency	10 MHz $\pm 0.2 \times 10^{-6}$
External reference input level	0.5 Vpp to 2 Vpp into 50 Ω

Phase noise

Frequency = 1 GHz, typical mean	-115 dBc/Hz at 100 Hz offset
	-128 dBc/Hz at 1 kHz offset
	-134 dBc/Hz at 10 kHz offset
	-132 dBc/Hz at 100 kHz offset
	-142 dBc/Hz at 1 MHz offset
Frequency = 5 GHz, nominal	-114 dBc/Hz at 100 Hz offset
	-127 dBc/Hz at 1 kHz offset
	-133 dBc/Hz at 10 kHz offset
	-131 dBc/Hz at 100 kHz offset
	-141 dBc/Hz at 1 MHz offset
Frequency = 10 GHz, nominal	-109 dBc/Hz at 100 Hz offset
	-122 dBc/Hz at 1 kHz offset
	-128 dBc/Hz at 10 kHz offset
	-125 dBc/Hz at 100 kHz offset
	-136 dBc/Hz at 1 MHz offset
Frequency = 20 GHz, nominal	-103 dBc/Hz at 100 Hz offset
	-116 dBc/Hz at 1 kHz offset
	-122 dBc/Hz at 10 kHz offset
	-120 dBc/Hz at 100 kHz offset
	-130 dBc/Hz at 1 MHz offset



RF input

RF input impedance	50 Ω
RF VSWR (RF attn ≥10 dB), typical	< 1.5 (10 MHz to 14 GHz)
	< 1.7 (> 14 GHz to 26.5 GHz)

Maximum RF input level

Maximum DC voltage	±40 V (RF Input)
Maximum Safe input power	+ 30 dBm
Maximum Measurable input power	+ 30 dBm

ADC and IF overload are detected and the user is informed and streaming data is flagged, but not stopped. Furthermore, an IF overload will initiate a protection event that will switch out the input signal. If SignalVu-PC is acquiring samples when this occurs, SignalVu-PC will automatically reset the switch periodically so that if the overload condition goes away, the input will continue to be sampled normally.

If the overload occurs while SignalVu-PC is not acquiring, then before SignalVu-PC starts acquiring it will automatically set an appropriate reference level then begin acquiring. When Center Frequency (CF) is < 80 MHz and reference level is < -40 dBm with pre-amp on, LO-to-IF leakage can cause ADC overload due to the 0 Hz spur. In this case, increasing reference level will correct the overload condition.

Input attenuator

RF attenuator

0 dB to 100 dB in 1dB steps, 16kHz to 3.6 GHz

0 dB to 75 dB in 5dB steps, 3.6 GHz to 26.5 GHz

0 dB to 75 dB in 5dB steps, 3.2 GHz to 3.6 GHz [1]

Input preselector

The preselector is input filters used for image suppression when the span of the instrument allows for its use. Two methods of preselection are used in the RSA7100A: a fixed low-pass filter (LPF) and a tunable bandpass filter (BPF).

Acquisition mode	Preselector Auto	Preselector On	Preselector Off
Swept, 50 MHz steps	On	On	Step CF ≤ 3.6 GHz: On Step CF > 3.6 GHz: Off
Swept, 320 MHz steps	NA	NA	Step CF ≤ 3.41 GHz: On Step CF > 3.41 GHz: Off
Real-time span ≤ 50 MHz	On	On	CF ≤ 3.6 GHz: On CF > 3.6 GHz: Off
Real-time span > 50 MHz	CF ≤ 3.41 GHz: On CF > 3.41 GHz: Off CF > 3.2 GHz: Off [2]	NA	CF ≤ 3.41 GHz: On CF > 3.41 GHz: Off CF > 3.2 GHz: Off

Sweep time

Full-span sweep time, typical mean

(RBW: Auto, Span = 26.5 GHz)

Preselector Auto: 14.75 sec

Preselector Off: 1.93 sec

1 Wideband extended tuning mode.

2 Wideband tuning mode.

Amplitude and RF flatness

Reference level setting range

-130 dBm to +40 dBm, 0.1 dB step

Frequency response at 18℃ to 28℃ (At 10 dB RF attenuator setting)

Span ≤ 100 MHz.

For CF < 100 MHz, specifications apply for Ref Level ≥ - 40 dBm.

Verified with input level of -20 to -15 dBm, Ref level = -15 dBm, 10 dB RF attenuation, all settings auto-coupled.

Signal to noise ratios > 40 dB.

Amplitude accuracy – preamp OFF

Center frequency range	18 ºC to 28 ºC	18 ºC to 28 ºC, typical	0 ºC to 55 ºC, typical
10 MHz to < 100 MHz	---	±0.11 dB	---
100 MHz to < 2.8 GHz	±0.16 dB	±0.13 dB	±0.18 dB
2.8 GHz to 3.6 GHz	±0.16 dB	±0.13 dB	±0.38 dB

Amplitude accuracy – preamp ON

Center frequency range	18 ºC to 28 ºC	18 ºC to 28 ºC, typical	0 ºC to 55 ºC, typical
10 MHz to < 100 MHz	---	±0.2 dB	---
100 MHz to < 2.8 GHz	±0.20 dB	±0.14 dB	±0.10 dB
2.8 GHz to 3.6 GHz	±0.20 dB	±0.14 dB	±0.26 dB

Absolute amplitude accuracy

Span ≤ 100 MHz.

For CF < 100 MHz, specifications apply for Ref Level ≥ - 40 dBm.

Verified with input level of 0 to 10 dB below Ref level, 10 dB RF attenuation, all settings auto-coupled.

Signal to noise ratios > 40 dB.

Preamp OFF, Preselector Bypassed, 100 MHz Span, -10 dBm Ref Level

Center frequency range	18 ºC to 28 ºC	18 ºC to 28 ºC, typical	0 ºC to 55 ºC, typical
10 MHz to < 100 MHz	---	±0.3 dB	---
100 MHz to 3.6GHz	±0.8 dB	±0.4 dB	±0.8 dB
> 3.6 GHz to < 8.5 GHz	±0.9 dB	±0.4 dB	±1.1 dB
8.5 GHz to < 14 GHz	±1.0 dB	±0.5 dB	±1.4 dB
14 GHz to < 20 GHz	±1.7 dB	±1.0 dB	±1.7 dB
20 GHz to 26.5 GHz	±2.0 dB	±1.2 dB	±2.2 dB

Preamp ON, 100 MHz Span, -30 dBm Ref Level

Center frequency range	18 ºC to 28 ºC	18 ºC to 28 ºC, typical	0 ºC to 55 ºC, typical
10 MHz to < 100 MHz	---	±0.4 dB	---
100 MHz to 3.6GHz	±1.2 dB	±0.6 dB	±1.2 dB

Preselector Enabled, 50 MHz Span, -10 dBm Ref Level

Center frequency range	18 ºC to 28 ºC	18 ºC to 28 ºC, typical	0 ºC to 55 ºC, typical
> 3.6 GHz to 8.5 GHz	±1.6 dB	±0.8 dB	±1.7 dB
8.5 GHz to 14 GHz	±1.5 dB	±0.7 dB	±1.5 dB
> 14 GHz to 20 GHz	±2.6 dB	±1.3 dB	±2.2 dB
20 GHz to 26.5 GHz	±2.8 dB	±1.5 dB	±2.2 dB

Channel response (amplitude and phase deviation), typical

For these specifications, set Preselector as Off, Attenuator to 10 dB, 18 °C to 28 °C.

Channel response, typical

Characteristic		Description			
Measurement center frequency	Span (MHz)	Amplitude flatness (dBrms)	Amplitude flatness (dB)	Phase linearity (degrees rms)	Phase linearity (degrees)
10 MHz to 3.6 GHz (CF ≥ Span)	10	0.06	±0.8	0.08	±0.1
	25	0.15	±0.2	0.4	±0.5
	50	0.2	±0.3	1.0	±1.3
	100	0.4	±0.6	2.5	±3.5
	320	1.0	±1.4	10	±13
3.6 GHz to 26.5 GHz	10	0.07	±0.1	0.08	±0.1
	25	0.1	±0.12	0.3	±0.5
	50	0.1	±0.15	0.8	±1.1
	100	0.17	±0.24	1.2	±1.8
	320	0.6	±0.86	5	±8
	800	0.9	±1.27	11	±16

Noise and distortion

3rd Order IM intercept (TOI)

+24 dBm at 3.3 GHz, Preamp OFF

(2-tone signal level -20 dBm per tone at the RF input. 1 MHz tone separation. Attenuator = 0 dB, Ref Level = -10 dBm. 5 MHz span, RBW set so noise is 10 dB below the IM3 tone level or lower. Production tested in a verification mode not part of normal operation.)

3rd Order IM intercept (TOI), typical

-12 dBm (10 MHz to 3.6 GHz, Preamp ON)

+19 dBm (10 MHz to 100 MHz, Preamp OFF)

+24 dBm (100 MHz to 3.6 GHz, Preamp OFF)

+20 dBm (3.6 GHz to 7 GHz)

+27 dBm (7.5 GHz to 14 GHz)

+21 dBm (14 GHz to 26.5 GHz)

(2-tone signal level -20 dBm per tone at the RF input. 1 MHz tone separation. Attenuator = 0 dB, Ref Level = -10 dBm. 5 MHz span, RBW set so noise is 10 dB below the IM3 tone level or lower.)

3rd Order Intermod Distortion (Preamp OFF, Preselector bypassed, 320 MHz acquisition bandwidth), typical

-85 dBc (100 MHz to 3.4 GHz)

-65 dBc (3.4 GHz to 6 GHz)

-80 dBc (6 GHz to 26.5 GHz)

(2-tone signal level -20 dBm per tone at the RF input. 50 MHz tone separation. Attenuator = 0 dB, Ref Level = -10 dBm)

2nd Harmonic Intercept (Preselector Enabled, Preamp OFF), typical

+40 dBm (50 MHz to 300 MHz input signal)

+74 dBm (300 MHz to 1.8 GHz input signal)

+68 dBm (1.8 GHz to 13.25 GHz input signal)

(0 dBm CW at the RF input. Attenuator = 10 dB, Ref Level = 0 dBm. Span 50 ≤ MHz.)

Displayed Average Noise Level (DANL) (Preamp OFF, Preselector bypassed, 18 ◦C to 28 ◦C)	-153 dBm/Hz (>10 MHz to 1.7 GHz) -150 dBm/Hz (>1.7 GHz to 2.8 GHz) -148 dBm/Hz (>2.8 GHz to 3.6 GHz) -152 dBm/Hz (>3.6 GHz to 14 GHz) -145 dBm/Hz (>14 GHz to 17 GHz) -150 dBm/Hz (>17 GHz to 24 GHz) -146 dBm/Hz (>24 GHz to 26.5 GHz) (Normalized to 1 Hz RBW, with log-average detector, 0 dB attenuation, ref level -50 dBm.)
Displayed Average Noise Level (DANL) (Preamp OFF, Preselector bypassed), typical	-153 dBm/Hz (200 kHz to 10 MHz) -155 dBm/Hz (10 MHz to 100 MHz) -156 dBm/Hz (100 MHz to 1.7 GHz) -154 dBm/Hz (1.7 GHz to 2.8 GHz) -151 dBm/Hz (2.8 GHz to 3.6 GHz) -156 dBm/Hz (3.6 GHz to 14 GHz) -152 dBm/Hz (14 GHz to 24 GHz) -150 dBm/Hz (24 GHz to 26.5 GHz) (Normalized to 1 Hz RBW, with log-average detector, 0 dB attenuation.)
Displayed Average Noise Level (DANL) (Preamp ON, 18 ◦C to 28 ◦C)	-163 dBm/Hz (10 MHz to 50 MHz) -164 dBm/Hz (50 MHz to 1.7 GHz) -162 dBm/Hz (>1.7 GHz to 3.6 GHz) (Normalized to 1 Hz RBW, with log-average detector, 0 dB attenuation, ref level -50 dBm.)
Displayed Average Noise Level (DANL) (Preamp ON), typical	-168 dBm/Hz (10 MHz to 100 MHz) -167 dBm/Hz (100 MHz to 1.7 GHz) -165 dBm/Hz (1.7 GHz to 3.6 GHz) (Normalized to 1 Hz RBW, with log-average detector, 0 dB attenuation.)
Displayed Average Noise Level (DANL) (Preselector enabled), typical	-152 dBm/Hz (3.6 GHz to 14 GHz) -147 dBm/Hz (14 GHz to 26.5 GHz) (Normalized to 1 Hz RBW, with log-average detector, 0 dB attenuation, ref level -50 dBm.)

Residual spurious response

Residual response, typical (Ref = -60 dBm, Span = 5 MHz)	< -115 dBm (100 MHz to 3.6 GHz)
	< -115 dBm (3.6 GHz to 11 GHz)
	< -105 dBm (11 GHz to 14 GHz)
	< -105 dBm (14 GHz to 24 GHz)
	< -95 dBm (24 GHz to 26.5 GHz)
	(Measured with input terminated, 0 dB attenuation, preamp off.)
Residual response, typical (Ref = -60 dBm, Span = 100 MHz, 18 ℃ to 28 ℃)	< -98 dBm (100 MHz to 3.6 GHz)
	< -102 dBm (>3.6 GHz to 11 GHz)
	< -86 dBm (>11 GHz to 14 GHz)
	< -86 dBm (>14 GHz to 24 GHz, Option 26)
	< -84 dBm (>24 GHz to 26.5 GHz, Option 26)
	(Measured with input terminated, 0 dB attenuation, preamp off, preselector off.)
Residual response, typical (Ref = -60 dBm, Span = 320 MHz)	< -110 dBm (100 MHz to 3.6 GHz)
	< -105 dBm (3.6 GHz to 11 GHz)
	< -85 dBm (11 GHz to 14 GHz)
	< -85 dBm (14 GHz to 26.5 GHz)
	(Measured with input terminated, 0 dB attenuation, preamp off, preselector off.)
Residual response, typical (Ref = -60 dBm, Span = 800 MHz)	< -85 dBm (3.6 GHz to 14 GHz)
	< -85 dBm (14 GHz to 20 GHz)
	< -75 dBm (20 GHz to 26.5 GHz)
	(Measured with input terminated, 0 dB attenuation, preamp off, preselector off.)

Spurious response with signal

Spurious response with image signal (18 ℃ to 28 ℃)	-98 dBc (CF = 100 MHz to 3.6 GHz, input at CF +9.225 GHz)
	-81 dBc (CF > 3.6 GHz to 14 GHz, input at CF + 1.225 GHz)
	-74 dBc (CF > 14 GHz to 26.5 GHz, input at CF + 1.225 GHz)
	(Input level = 0 dBm. Ref Level = 0 dBm. RF atten = 10 dB. 50 MHz span.)
Spurious response with signal at CF, span = 320 MHz (Spur offset > 2.5 MHz), typical	<-80 dBc (CF = 100 MHz to 3.6 GHz, except 3.2 to 3.55 GHz)
	<-65 dBc (CF = 3.2 GHz to 3.55 GHz)
	<-85 dBc (CF = 3.6 to 14 GHz)
	<-80 dBc (CF = 14 GHz to 26.5 GHz)
	<-65 dBc (CF = 3.6 GHz to 14 GHz, span = 800 MHz)
	<-65 dBc (CF = 14 GHz to 26.5 GHz, span = 800 MHz)
	(Input level = -10 dBm. Ref Level = -10 dBm. RF atten = 10 dB. Preselector off.)
Spurious response with signal at CF (50 kHz ≤ spur offset < 2.5 MHz), typical	-80 dBc (CF = 100 MHz to 3.6 GHz, except 3.38 to 3.39 GHz)
	-70 dBc (CF = 3.38 GHz to 3.39 GHz)
	-75 dBc (CF = 3.6 GHz to 14 GHz)
	-65 dBc (CF = 14 GHz to 26.5 GHz)
	(Input level = -10 dBm. Ref Level = -10 dBm. RF atten = 10 dB. Preselector on, span = 5 MHz.)

Spurious response with signal within capture BW at other than CF, span = 320 MHz, typical	<-80 dBc (CF = 100 MHz to 3.6 GHz, except Signal at 3.2 to 3.55 GHz) < -65dBc (Signal at 3.2 to 3.55 GHz, CF = 3.04 GHz to 3.6 GHz) -85 dBc (CF 3.6 GHz to 14 GHz) -80 dBc (CF 14 GHz to 26.5 GHz) (Input level = -10 dBm. Ref Level = -10 dBm. RF atten = 10 dB.)
Spurious response with signal within capture BW at other than CF, span = 800 MHz, typical mean	-65 dBc (CF = 3.6 GHz to 26.5 GHz) (Ref Level = -10 dBm. RF atten = 10 dB, Input Level = -20 dBm.) The mean is taken from the largest spur within the span at each CF step and each input frequency stepped across the span. The input signal is stepped at 80 MHz/step across the span and the CF is stepped at 800 MHz/step across the specified frequency range. If a particular span and input combination has no spurs > -70 dBc it is not included in the mean so it does not contribute to reducing the mean.
Spurious response with signal outside span, except for signal frequencies specified here, typical	-80 dBc (Input level = -30 dBm. Ref Level = -30 dBm. RF atten = 10 dB. Span ≤ 50 MHz.)
Spurious Response due to signal applied at CF+1225 MHz to CF+1250 MHz and 2290 MHz to 2320 MHz, typical	-55 dBc (CF 100 MHz to 2.5 GHz) (Input level = -10 dBm. Ref Level = -10 dBm. RF atten = 10 dB, span ≤ 50 MHz.)
Spurious Response due to signal applied at 160 MHz to 215 MHz and 3360 MHz to 3415 MHz, typical	-65 dBc (CF 100 MHz to 3.6 GHz) (Input level = -10 dBm. Ref Level = -10 dBm. RF atten = 10 dB, span ≤ 50 MHz.)
Spurious Response due to signal applied at 585 MHz to 640 MHz and 4585 MHz to 4640 MHz, typical	-70 dBc (CF 100 MHz to 3.6 GHz) (Input level = -10 dBm. Ref Level = -10 dBm. RF atten = 10 dB, span ≤ 50 MHz.)
Local oscillator feed-through to input connector (Attenuator = 10 dB), typical	< - 110 dBm (CF ≤ 3.6 GHz, preamp off) < -60 dBm (CF >3.6 GHz, preselector on)

Wideband extended tuning

Frequency response (18 ℃ to 28 ℃), Preamp OFF, typical	±4.0 dB (CF = 3.2 GHz to 3.6 GHz) (Input level = -20 to -15 dBm. Ref level = -15 dBm. RF atten = 10 dB, all setting auto-coupled. Span > 320 MHz. Signal to noise ratio >40 dB.)
Channel response (18 ℃ to 28 ℃), preselector bypassed, typical	Measurement CF: 3.2 GHz to 3.6 GHz Span: 800 MHz Amplitude flatness: 1.0 dBrms Amplitude flatness: ±4.0 dB
Residual response (18 ℃ to 28 ℃), Preamp OFF, typical	< -105 dBm (3.2 GHz to 3.6 GHz) (Ref level = -60 dBm. RF atten = 0 dB. Span = 800 MHz. Measured with input terminated.) (These are not related to input signals.)

Internal trigger

Trigger mode, type, and source	Modes: **Free run** (triggered by the end the preceding acquisition), **Triggered** (triggered by event) Types: **Single** (one acquisition from one trigger), **Continuous** (repeated acquisitions from repeating triggers) Sources: **RF Input** (downconverted to IF), **Trigger Input**, **Host** (trigger initiated by host)
Trigger events	Power Level within Span (RF Input) Frequency Mask, (Host) Host Request (Host) DPX Density (Host)
Trigger GPS time stamp, typical	<15 ns relative to GPS time (GPS satellites may have error up to ±90 ns relative to UTC.)
Pre- and post-trigger setting	Trigger position is settable within 1 % to 99 % of total data length

Power trigger

Power trigger level range	30 dBm to -170 dBm
Power trigger level resolution	0.1 dB
Power trigger level accuracy (This specification is in addition to the overall amplitude accuracy uncertainty for SA mode.)	±1 dB (level ≥ -50 dB from reference level) for trigger levels >30 dB above the noise floor at the center frequency. Instrument Center Frequency ≥ 100 MHz This applies when the Trigger Level is between 10% and 90% of the signal amplitude
Power trigger position timing uncertainty, typical	±8 ns
Power trigger bandwidth setting	This is not an independent setting. It is set by the "Time-Domain Bandwidth" control. Power Trigger Bandwidth is determined by Acquisition bandwidth.
Power trigger minimum event duration	4 ns

External trigger

External trigger threshold voltage	3.3V TTL, VIL 0.8V, VIH 2.0V
External trigger input impedance	10 kΩ
External trigger minimum pulse width	>10 ns
External trigger timing uncertainty	±8 ns

Frequency mask and DPX density trigger (Option TRIGH)

Frequency mask trigger mask point horizontal resolution	< 0.13 % of span
Frequency mask trigger level range	0 to -80 dB from reference level
Frequency mask trigger level resolution	0.1 dB
Frequency mask trigger level accuracy (with respect to reference level)	±(Channel Response Flatness + 2.5 dB) for mask levels ≥ -50 dB and >30 dB above the noise floor

Frequency mask trigger timing uncertainty	±(0.5*Spectrum time)
DPX density trigger area of interest range	2 to 801 pixels (horizontal) x 2 to 201 pixels (vertical)

Real-time event minimum duration for 100% probability of intercept/ trigger, typical

Span (MHz)	RBW (kHz)	FFT length (points)	Minimum signal duration for 100% POI at 100% amplitude (µsec)			
			DPX Spectrum	DPXogram	Freq. mask trigger	Density trigger
800	50,000	38/ 256	0.419	0.844	0.419	0.946
	20,000	95/ 256	0.516	0.947	0.572	1.025
	10,000	190/ 256	0.686	1.115	0.768	1.164
	1,000	1,900/ 2,048	3.006	4.071	3.483	3.377
	300	6,333/ 8,192	11.836	15.412	12.654	12.008
	100	19,000/ 32,768	45.031	60.086	52.755	46.581
	30	63,333/ 65,536	131.352	166.418	140.185	130.031
	25	76,000/ 131,072	212.109	268.897	227.644	212.050
	1	1,900,000/ 2,097,152	3824	3831	4154	3733
	0.12	15,833,333/ 16,777,216	42120	42269	44721	41520
320	32,000	60/ 256	0.431	0.860	0.469	0.678
	20,000	94/ 256	0.476	0.908	0.517	0.684
	10,000	190/ 256	0.600	1.042	0.651	0.813
	1,000	1,900/ 1,024	2.685	3.229	2.870	2.754
	300	6,334/ 4,096	9.156	10.962	10.208	9.778
	100	19,000/ 16,384	32.464	40.156	37.425	33.908
	30	63,334/ 32,768	92.512	106.968	101.865	94.935
	25	76,000/ 65,536	134.919	161.777	159.406	148.456
	1	1,900,000/ 1,048,576	2760	2890	2890	2696
	0.1	19,000,000/ 16,777,216	39754	41804	41804	39170
100	8,000	240/ 256	0.611	1.041	0.648	0.905
	1,000	1,900/ 512	2.703	3.207	2.974	2.929
	300	6,334/ 1,024	7.816	8.884	8.286	7.989
	100	19,000/ 4,096	24.838	29.005	26.615	25.888
	30	63,334/ 16,384	88.503	99.438	95.286	94.922
	25	76,000/ 16,384	101.230	112.169	108.048	107.388
	1	1,900,000/ 524,288	2670	2780	2980	2461
	0.1	19,000,000/ 4,194,304	25641	26434	28128	24989

Span (MHz)	RBW (kHz)	FFT length (points)	Minimum signal duration for 100% POI at 100% amplitude (µsec)			
			DPX Spectrum	DPXogram	Freq. mask trigger	Density trigger
50	4,000	480/ 256	0.850	1.227	0.888	1.181
	1,000	1,894/ 256	2.476	2.970	2.575	2.910
	300	6,334/ 512	7.835	9.017	8.345	8.232
	100	19,000/ 2,048	24.559	29.195	26.484	25.697
	30	63,334/ 8,192	85.654	96.715	93.143	92.642
	25	76,000/ 8,192	98.364	109.275	105.853	105.263
	1	1,900,00/ 262,144	2730	2778	2991	2322
	0.1	19,000,000/ 2,097,152	23430	24048	25055	22247

Real time transforms per second, typical

Span (MHz)	RBW (kHz)	Transforms per second			
		DPX Spectrum	DPXogram	Freq. mask trigger	Density trigger
800	50,000	2,627,562	1,241,584	2,365,733	1,243,943
	20,000	2,376,594	1,174,142	2,094,919	1,196,807
	10,000	2,018,280	1,081,222	1,731,537	1,140,029
	1,000	906,043	460,681	638,292	710,374
	300	181,750	110,150	158,214	176,353
	100	37,417	24,338	29,850	36,480
	30	14,701	9,700	13,023	14,995
	25	7,346	5,183	6,594	7,350
	1	519	517	443	544
	0.12	37	37	34	38
320	32,000	2,696,885	1,250,776	2,444,144	1,676,513
	20,000	2,616,606	1,229,611	2,366,207	1,709,864
	10,000	2,436,340	1,174,661	2,167,808	1,605,154
	1,000	1,273,703	753,106	1,030,598	1,181,032
	300	354,423	216,078	258,150	301,316
	100	74,336	47,270	54,275	69,560
	30	34,275	22,918	25,954	32,883
	25	16,974	11,658	11,994	14,032
	1	1,161	1,137	1,009	1,255
	0.1	48	47	43	49
100	8,000	2,699,036	1,248,489	2,448,673	1,556,652
	1,000	1,245,859	765,075	931,228	999,302
	300	674,595	392,013	512,214	625,691
	100	171,305	27,702	31,299	33,285
	30	39,639	27,655	31,205	33,452
	25	36,639	27,655	31,205	33,452
	1	1,297	1,134	925	1,781
	0.1	150	134	109	166
50	4,000	2,703,955	1,254,739	2,452,569	1,472,428
	1,000	1,717,706	928,828	1,467,931	1,017,554
	300	658,103	372,705	497,315	553,161
	100	178,889	98,097	133,639	161,150
	30	44,806	29,969	33,554	36,719
	25	44,717	30,064	33,501	36,828
	1	1,204	1,137	916	2,369
	0.1	225	197	164	307

Acquisition

Real-time capture bandwidth

320 MHz (Standard)

800 MHz (Option B800)

Sampling rate and available memory time in RTSA/Time/ Demodulation mode

Acquisition bandwidth	Sample rate (for I and Q)	Significant bits (I and Q each)	Record length	Maximum record time (sec)
800 MHz	1,000 MS/s	12	2G samples	2.1
320 MHz	500 MS/s	12	2G samples	4.2
160 MHz	250 MS/s	13	2G samples	8.5
100 MHz	150 MS/s	13	2G samples	14.3
50 MHz	75 MS/s	13	2G samples	28.6
40 MHz	62.5 MS/s	14	2G samples	34.3
20 MHz	31.25 MS/s	15	2G samples	68.7
10 MHz	15.625 MS/s	15	2G samples	137.4

Minimum acquisition length in RTSA/Time/ Demod Mode

64 samples

Acquisition length setting resolution in RTSA/Time/ Demod Mode

1 sample

Amplitude vs Time

Time scale zero span

1 µs min to 2000 s max

Time accuracy

± 0.5% of total time

Time resolution

0.1% of total time

Time linearity

±0.5% of total time

Recording to RAID

Sampling rate and maximum record length

Acquisition bandwidth	Streaming sample rate (for I and Q)	Maximum record length (Option B)	Maximum record length (Option C)
>320 to 800 MHz	1000 MS/s, packed	20 min	165 min
>320 to 800 MHz	1000 MS/s, unpacked	20 min	120 min
>160 to 320 MHz	500 MS/s	40 min	4 hr
> 50 to 160 MHz	250 MS/s	80 min	8 hr
> 50 to 100 MHz	150 MS/s	130 min	13 hr
> 40 to 50 MHz	75 MS/s	256 min	26 hr
> 40 to 50 MHz	125 MS/s	160 min	16 hr
> 20 to 40 MHz	65.2 MS/s	320 min	32 hr
> 10 to 20 MHz	31.25 MS/s	10 hr	64 hr
≤10 MHz	15.625 MS/s	20 hr	128 hr

Disk size and lifetime, 800 MHz bandwidth

RAID option	Total time of all records	Expected lifetime of disk
Option B at 1000 MS/s	55 min	290 hr
Option B at 1000 MS/s, stored unpacked	40 min	226 hr
Option C at 1000 MS/s	165 min	900 hr
Option C at 1000 MS/s, stored unpacked	120 min	680 hr

Unpacked data

At >320 to 800 MHz acquisition bandwidth, data can be packed in 12-bit samples. This is done to reduce the data transfer rate requirement and to guarantee gap-free recordings. At 320 MHz acquisition bandwidth and below, packing is not necessary and data is always stored as 16-bit samples.

GPS location and timing

Format GPS (L1: 1575.42 MHz)

GPS antenna power 5 V, 60 mA max

GPS active antenna power auto-detect threshold 7.9 mA, max

Maximum RF power at GPS input +3 dBm

Horizontal position accuracy 2.5 m CEP

3.5 m SEP

(Test conditions: 24 hours static, -130 dBm received signal strength.)

GPS timestamp accuracy to UTC, typical ±100 ns

IRIG-B timing

Format IRIG-B DC (IRIG-B 00X), IRIG-B AM (IRIG-B 12X)

IRIG-B DC signal level 0 to 3.3 V, +5 V tolerant

1 kΩ input resistance

IRIG-B AM signal level	-5 V, to +5 V 1.5 V to 10 Vp-p mark, 3:1 mark-space ratio 1 kHz input carrier frequency 5 kΩ input resistance
IRIG-B AM timing accuracy (typical)	±1150 nS ± 260 nS standard deviation

SignalVu-PC standard measurements

Measurements included.

General signal analysis	
Spectrum analyzer	Spans from 100 Hz to full span of instrument Three traces plus math and spectrogram trace Five markers with power, relative power, integrated power, power density and dBc/Hz functions
DPX Spectrum/Spectrogram	Real time display of spectrum with 100% probability of intercept of up to 419 nsec signals in up to 800 MHz span. Swept DPX with DPX Spectrum to perform stepped DPX spectrum measurements over the full frequency range of the instrument.
Amplitude, frequency, phase vs. time, RF I and Q vs. time	Basic vector analysis functions
Time Overview/Navigator	Enables easy setting of acquisition and analysis times for deep analysis in multiple domains
Spectrogram	Analyze and re-analyze your signal with a 2-D or 3-D waterfall display
Analog modulation analysis	
AM, FM, PM analysis	Measures key AM, FM, PM parameters
RF measurements	
Spurious measurement	User-defined limit lines and regions provide automatic spectrum violation testing across the entire range of the instrument. Four traces can be saved and recalled; CISPR Quasi-Peak and Average detectors available with option SVQP.
Spectrum emission mask	User-defined or standards-specific masks
Occupied Bandwidth	Measures 99% power, -xdB down points
Channel Power and ACLR	Variable channel and adjacent/alternate channel parameters
MCPR	Sophisticated, flexible multi-channel power measurements
CCDF	Complementary Cumulative Distribution Function plots the statistical variations in signal level

Measurement functions

Measurement functions	Description
Frequency domain	Channel Power, Multi-Carrier Adjacent Channel Power / Leakage Ratio, Adjacent Channel Power, dBm/Hz Marker, dBc/Hz Marker
Time domain and statistical	RF I/Q vs. Time, Power vs. Time, Frequency vs. Time, Phase vs. Time, CCDF, Peak-to-Average Ratio

DPX Spectrogram processing

DPX Spectrogram trace detection	+Peak, -Peak, Avg (Vrms)
DPX Spectrogram trace length	800 to 10401 points
DPX Spectrogram memory depth	Trace Length = 801: 1,005,376 traces Trace Length = 10401: 77,336 traces

SignalVu-PC standard measurements

Time resolution per line

5 µs to 6400 s (user-settable)

(Minimum time resolution specified at 800 MHz RT BW, 1 MHz RBW, 801 trace points)

DPXogram maximum number of lines

Trace points	Number of lines
801	921,594
2,401	307,198
4,000	184,318
10,401	70,891

SignalVu-PC applications performance summary

General Purpose Analog Modulation Analysis Accuracy, typical

(0 dBm input at center; 0 dBm Input Power Level, Reference Level 10 dBm, Attenuation = Auto)

AM demodulation accuracy

±2%

(Carrier Frequency 1 GHz, 10 to 60 % Modulation Depth)

(1 kHz / 5 kHz Input/Modulated Frequency)

PM demodulation accuracy

±3°

(Carrier Frequency 1 GHz, 400 Hz / 1 kHz Input/Modulated Frequency)

FM demodulation accuracy

±1% of span

(Carrier Frequency 1 GHz, 1 kHz / 5 kHz Input/Modulated Frequency)

General purpose digital modulation analysis (SVMxx-SVPC)

Carrier type

Continuous, Burst (5 µs minimum on-time)

Modulation formats

BPSK, QPSK, 8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, π/2DBPSK, DQPSK, π/4DQPSK, D8PSK, D16PSK, SBPSK, OQPSK, SOQPSK, 16-APSK, 32-APSK, MSK, GFSK, CPM, 2FSK, 4FSK, 8FSK, 16FSK, C4FM

Analysis period

Up to 164,840 samples

Measurement filter

Root Raised Cosine, Raised Cosine, Gaussian, Rectangular, IS-95 Base EQ, User, None

Reference Filter

Gaussian, Raised Cosine, Rectangular, IS-95 baseband, User, None

Filter rolloff factor

α : 0.001 to 1, in 0.001 steps

Measurement functions

Constellation, Error Vector Magnitude (EVM) vs. Time, Symbol Table

Vector diagram display format

Symbol/locus display, Frequency Error measurement, Origin Offset measurement

Constellation diagram display format

Symbol display, Frequency Error measurement, Origin Offset measurement

Error vector diagram display format

EVM, Magnitude Error, Phase Error, Waveform Quality (ρ) measurement, Frequency Error measurement, Origin Offset measurement

Symbol table display format

Binary, hexadecimal

QPSK Residual EVM (center frequency = 2 GHz), typical mean

0.35 % (100 kHz symbol rate)

0.35 % (1 MHz symbol rate)

0.35 % (10 MHz symbol rate)

0.75 % (30 MHz symbol rate)

0.75 % (60 MHz symbol rate)

1.5 % (120 MHz symbol rate)

2.0 % (240 MHz symbol rate)

400 symbols measurement length, 20 Averages, normalization reference = maximum symbol magnitude

SignalVu-PC applications performance summary

256 QAM Residual EVM (center frequency = 2 GHz), typical mean	0.4 % (10 MHz symbol rate) 0.6 % (30 MHz symbol rate) 0.6 % (60 MHz symbol rate) 1.0 % (120 MHz symbol rate) 1.5 % (240 MHz symbol rate) 400 symbols measurement length, 20 Averages, normalization reference = maximum symbol magnitude
OQPSK Residual EVM (center frequency = 2 GHz), typical mean	0.6% (100 kHz symbol rate, 200 kHz measurement bandwidth) 0.6% (1 MHz symbol rate, 2 MHz measurement bandwidth) 1.0% (10 MHz symbol rate, 20 MHz measurement bandwidth) Reference filter: raised-cosine, Measurement filter: root raised cosine, Filter parameter: Alpha = 0.3
SOQPSK (MIL) Residual EVM (center frequency = 250 MHz), typical mean	0.4% (4 kHz symbol rate, 64 kHz measurement bandwidth) Reference filter: MIL STD, Measurement filter: none
SOQPSK (MIL) Residual EVM (center frequency = 2 GHz), typical mean	0.5% (20 kHz symbol rate, 320 kHz measurement bandwidth) 0.5% (100 kHz symbol rate, 1.6 MHz measurement bandwidth) 0.5% (1 MHz symbol rate, 16 MHz measurement bandwidth) Reference filter: MIL STD, Measurement filter: none
SOQPSK (ARTM) Residual EVM (center frequency = 250 MHz), typical mean	0.3% (4 kHz symbol rate, 64 kHz measurement bandwidth) Reference filter: ARTM STD, Measurement filter: none
SOQPSK (ARTM) Residual EVM (center frequency = 2 GHz), typical mean	0.5% (20 kHz symbol rate, 320 kHz measurement bandwidth) 0.5% (100 kHz symbol rate, 1.6 MHz measurement bandwidth) 0.5% (1 MHz symbol rate, 16 MHz measurement bandwidth) Reference filter: ATRM STD, Measurement filter: none
SBPSK (MIL) Residual EVM (center frequency = 250 MHz), typical mean	0.3% (4 kHz symbol rate, 64 kHz measurement bandwidth) Reference filter: MIL STD, Measurement filter: none
SBPSK (MIL) Residual EVM (center frequency = 2 GHz), typical mean	0.5% (20 kHz symbol rate, 320 kHz measurement bandwidth) 0.5% (100 kHz symbol rate, 1.6 MHz measurement bandwidth) 0.5% (1 MHz symbol rate, 16 MHz measurement bandwidth) Reference filter: MIL STD, Measurement filter: none
CPM (MIL) Residual EVM (center frequency = 250 MHz), typical mean	0.3% (4 kHz symbol rate, 64 kHz measurement bandwidth) Reference filter: MIL STD, Measurement filter: none
CPM (MIL) Residual EVM (center frequency = 2 GHz), typical mean	0.5% (20 kHz symbol rate, 320 kHz measurement bandwidth) 0.5% (100 kHz symbol rate, 1.6 MHz measurement bandwidth) 0.5% (1 MHz symbol rate, 16 MHz measurement bandwidth) Reference filter: MIL STD, Measurement filter: none
2/4/8/16FSK Residual RMS FSK Error (center frequency = 2 GHz), typical mean	0.5% (2/4FSK, 10 kHz symbol rate, 10 kHz frequency deviation) 0.4% (8/16FSK, 10 kHz symbol rate, 10 kHz frequency deviation) Reference filter: none, Measurement filter: none

Adaptive equalizer

Type	Linear, Decision-Directed, Feed-Forward (FIR) equalizer with coefficient adaptation and adjustable convergence rate.
Supported modulation types	BPSK, QPSK, OQPSK, DQPSK, π/2DBPSK, π/4DQPSK, 8PSK, D8SPK, D16PSK, 16/32/64/128/256-QAM, 16/32-APSK

SignalVu-PC applications performance summary

Reference filters	Raised cosine, rectangular, none
Reference filters (OQPSK)	Raised cosine, half sine
Adaptive filter length	1 to 128 taps
Adaptive filter taps/symbol	1, 2, 4, or 8 (Raised cosine, half sine, or none
Adaptive filter taps/symbol (Rectangular filter)	1
Equalizer controls	Off, Train, Hold, Reset
Flexible OFDM Measurements application (SVOxx-SVPC)	
802.11a/g/j/p OFDM and 802.16-2004 maximum residual EVM (RMS), typical mean	-52 dB at 2.4 GHz (802.11a/g/j and 802.16-2004) -50 dB at 2.4 GHz and 5.8 GHz
802.11b Maximum Residual EVM (RMS), typical mean	1.0% at 2.4 GHz
WLAN 802.11n Measurement application (SV24xx-SVPC)	
OFDM Maximum Residual EVM (RMS), typical mean	-49 dB at 2.4 GHz -49 dB at 5.8 GHz (40 MHz bandwidth)
WLAN 802 11ac measurement application (SV25Hxx-SVPC)	(802.11ac OFDM)
OFDM Maximum Residual EVM (RMS), CF = 5.8 GHz, typical mean	-50 dB at 40 MHz BW -48 dB at 80 MHz BW -43 dB at 160 MHz BW
APCO P25 Measurements Application (SV26xx-SVPC)	
Measurements	RF output power, operating frequency accuracy, modulation emission spectrum, unwanted emissions spurious, adjacent channel power ratio, frequency deviation, modulation fidelity, frequency error, eye diagram, symbol table, symbol rate accuracy, transmitter power and encoder attack time, transmitter throughput delay, frequency deviation vs. time, power vs. time, transient frequency behavior, HCPM transmitter logical channel peak adjacent channel power ratio, HCPM transmitter logical channel off slot power, HCPM transmitter logical channel power envelope, HCPM transmitter logical channel time alignment, cross-correlated markers
Modulation fidelity, typical mean	C4FM = ≤ 1.0% HCMP = ≤ 0.5% HDQPSK = ≤ 0.25% Input signal level is optimized for best modulation fidelity.
Bluetooth Measurements Application (SV27xx-SVPC and SV31xx-SVPC)	
Supported standards	Bluetooth® 4.2 Basic Rate, Bluetooth® 4.2 Low Energy, Bluetooth® 4.2 Enhanced Data Rate. Bluetooth® 5 when SV31 is enabled.
Measurements	Peak Power, Average Power, Adjacent Channel Power or InBand Emission mask, -20 dB Bandwidth, Frequency Error, Modulation Characteristics including ΔF1avg (11110000), ΔF2avg (10101010), ΔF2 > 115 kHz, ΔF2/ΔF1 ratio, frequency deviation vs. time with packet and octet level measurement information, Carrier Frequency f0, Frequency Offset (Preamble and Payload), Max Frequency Offset, Frequency Drift f_1-f_0, Max Drift Rate f_n-f_0 and f_n-f_{n-5}, Center Frequency Offset Table and Frequency Drift table, color-coded Symbol table, Packet header decoding information, eye diagram, constellation diagram

SignalVu-PC applications performance summary

Output power (BR and LE), typical mean	Supported measurements: Average power, peak power Level uncertainty: refer to instrument amplitude and flatness specification Measurement range: signal level > –70 dBm
Modulation characteristics, typical mean (CF = 2400 MHz to 2500 MHz)	Supported measurements: ΔF_1avg, ΔF_2avg, ΔF_2avg/ ΔF_1avg, ΔF_2max%>=115kHz (basic rate), ΔF_2max%>=115kHz (low energy) Deviation range: ±280 kHz Deviation uncertainty (at 0 dBm): <2 kHz [3] + instrument frequency uncertainty (basic rate) <3 kHz + instrument frequency uncertainty (low energy) Measurement resolution: 10 Hz Measurement range: Nominal channel frequency ±100 kHz RF signal power range: > –70 dBm
Initial Carrier Frequency Tolerance (ICFT) (BR and LE), typical mean	Measurement uncertainty (at 0 dBm): <1 kHz [4] + instrument frequency uncertainty Measurement resolution: 10 Hz Measurement range: Nominal channel frequency ±100 kHz RF signal power range: > –70 dBm
Carrier Frequency Drift (BR and LE), typical mean	Supported measurements: Max freq. offset, drift f_1- f_0, max drift fn-f_0, max drift fn-f_{n-5} (BR and LE 50 µs) Measurement uncertainty: <1 kHz [5] + instrument frequency uncertainty Measurement resolution: 10 Hz Measurement range: Nominal channel frequency ±100 kHz RF signal power range: > –70 dBm
In-band emissions (ACPR) (BR and LE)	Level uncertainty: refer to instrument amplitude and flatness specification

LTE Downlink RF measurements (SV28xx-SVPC)	
Standard Supported	3GPP TS 36.141 Version 12.5
Frame Format supported	FDD and TDD
Measurements and Displays Supported	Adjacent Channel Leakage Ratio (ACLR), Spectrum Emission Mask (SEM), Channel Power, Occupied Bandwidth, Power vs. Time showing Transmitter OFF power for TDD signals and LTE constellation diagram for Primary Synchronization Signal and Secondary Synchronization Signal with Cell ID, Group ID, Sector ID, RS (Reference Signal) Power and Frequency Error.
Channel power measurement accuracy	Level uncertainty: refer to instrument amplitude and flatness specification

3 At nominal power level of 0 dBm

4 At nominal power level of 0 dBm

5 At nominal power level of 0 dBm

SignalVu-PC applications performance summary

Pulse measurements (SVPxx-SVPC)

Measurements (nominal)

Pulse-Ogram™ waterfall display of multiple segmented captures, with amplitude vs time and spectrum of each pulse. Pulse frequency, Delta Frequency, Average on power, Peak power, Average transmitted power, Pulse width, Rise time, Fall time, Repetition interval (seconds), Repetition interval (Hz), Duty factor (%), Duty factor (ratio), Ripple (dB), Ripple (%), Droop (dB), Droop (%), Overshoot (dB), Overshoot (%), Pulse- Ref Pulse frequency difference, Pulse- Ref Pulse phase difference, Pulse- Pulse frequency difference, Pulse- Pulse phase difference, RMS frequency error, Max frequency error, RMS phase error, Max phase error, Frequency deviation, Phase deviation, Impulse response (dB),Impulse response (time), Time stamp.

Pulse measurement characteristics

Characteristic	For 40 MHz bandwidth	For 320 and 800 MHz bandwidth
Minimum Pulse Width for detection, typical	150 ns	50 ns
Average ON Power (at 18 to 28 °C), typical	±0.4 dB + absolute Amplitude Accuracy For pulses of 300 ns width or greater, and signal levels above 70 dB below reference level.	±0.4 dB + absolute Amplitude Accuracy For pulses of 100 ns width or greater, duty cycles of .5 to .001, and S/N ratio ≥ 30 dB.
Duty factor, typical	±0.2% of reading For pulses of 450 ns width or greater, duty cycles of .5 to .001, and S/N ratio ≥ 30 dB.	±0.2% of reading For pulses of 150 ns width or greater, duty cycles of .5 to .001, and S/N ratio ≥ 30 dB.
Average transmitted power, typical	±0.4 dB + absolute Amplitude Accuracy For pulses of 300 ns width or greater, duty cycles of .5 to .001, and S/N ratio ≥ 30 dB.	±0.4 dB + absolute Amplitude Accuracy For pulses of 100 ns width or greater, duty cycles of .5 to .001, and S/N ratio ≥ 30 dB.
Peak pulse power, typical	±0.4 dB + absolute Amplitude Accuracy For pulses of 300 ns width or greater, duty cycles of .5 to .001, and S/N ratio ≥ 30 dB.	±0.4 dB + absolute Amplitude Accuracy For pulses of 100 ns width or greater, duty cycles of .5 to .001, and S/N ratio ≥ 30 dB.
Pulse width, typical	±0.25% of reading For pulses of 450 ns width or greater, duty cycles of .5 to .001, and S/N ratio ≥ 30 dB.	±0.25% of reading For pulses of 150 ns width or greater, duty cycles of .5 to .001, and S/N ratio ≥ 30 dB.

Pulse measurement characteristics (continued)

Characteristic	Center frequency	40 MHz bandwidth	320 MHz bandwidth	800 MHz bandwidth
Pulse-to-pulse carrier phase (non-chirped pulse), typical	2 GHz	±0.4°	±0.5°	NA
	4 GHz	NA	NA	±0.5°
	10 GHz	±0.4°	±0.5°	±0.5°
	20 GHz	±0.4°	±0.5°	±0.5°
Pulse-to-Pulse carrier phase (linear-chirped pulse), typical	2 GHz	±0.3°	±0.5°	NA
	4 GHz	NA	NA	±0.75°
	10 GHz	±0.3°	±0.5°	±0.75°
	20 GHz	±0.5°	±0.5°	±0.75°
Pulse-to-Pulse carrier frequency (non-chirped pulse), typical	2 GHz	±40 kHz	±400 kHz	NA
	4 GHz	NA	NA	±800 kHz
	10 GHz	±40 kHz	±400 kHz	±800 kHz
	20 GHa	±40 kHz	±400 kHz	±800 kHz
Pulse-to-Pulse carrier frequency (linear-chirped pulse), typical	2 GHz	±25 kHz	±400 kHz	NA
	4 GHz	NA	NA	±800 kHz
	10 GHz	±25 kHz	±400 kHz	±800 kHz
	20 GHz	±25 kHz	±400 kHz	±800 kHz

SignalVu-PC applications performance summary

Characteristic	Center frequency	40 MHz bandwidth	320 MHz bandwidth	800 MHz bandwidth
Pulse-to-Pulse delta frequency (non-chirped pulse), typical	2 GHz	±1 kHz	±20 kHz	NA
	4 GHz	NA	NA	±60 kHz
	10 GHz	±1 kHz	±20 kHz	±60 kHz
	20 GHz	±5 kHz	±25 kHz	±75 kHz
Pulse frequency linearity (Absolute Frequency Error RMS), typical	2 GHz	±10 kHz	±100 kHz	NA
	4 GHz	NA	NA	±200 kHz
	10 GHz	±10 kHz	±100 kHz	±200 kHz
	20 GHz	±10 kHz	±100 kHz	±200 kHz
Chirp frequency linearity (Absolute Frequency Error RMS), typical	2 GHz	±10 kHz	±150 kHz	NA
	4 GHz	NA	NA	±300 kHz
	10 GHz	±10 kHz	±150 kHz	±300 kHz
	20 GHz	±10 kHz	±150 kHz	±300 kHz

ACLR for 3GPP Down Link, 1 DPCH (2130 MHz), typical mean

-67 dB (Adjacent Channel)

-67 dB (First Alternate Channel)

ACLR LTE, typical mean

-68 dB (Adjacent Channel)

-70 dB w/Noise Correction (Adjacent Channel)

-70 dB (First Alternate Channel)

-73 dB w/Noise Correction (First Adjacent Channel)

ACLR P25 C4FM, HCPM, HDQPSK modulation (not noise corrected), typical mean

-85 dB, CF = 460 MHz, 815 MHz

(Measured at 25 kHz offset, 6 kHz measurement bandwidth)

OBW measurement accuracy, typical mean

±0.35%

xdB Bandwidth measurement, typical mean

±3%, 0 to -18 dB below carrier

SignalVu-PC applications performance summary

Frequency and Phase Settling Time Measurement (Opt. SVT)

Measured input signal >-20 dBm. Attenuator: Auto.

Settled frequency uncertainty, typical mean

Measurement frequency	Averages	Bandwidth					
		800 MHz	320 MHz	50 MHz	10 MHz	1 MHz	100 kHz
1 GHz	Single measurement	NA	1 kHz	100 Hz	10 Hz	5 Hz	1 Hz
	100 averages	NA	200 Hz	25 Hz	5 Hz	0.5 Hz	0.1 Hz
	1000 averages	NA	100 Hz	10 Hz	1 Hz	0.25 Hz	0.05 Hz
10 GHz	Single measurement	2 kHz	1 kHz	100 Hz	10 Hz	5 Hz	1 Hz
	100 averages	500 Hz	200 Hz	25 Hz	5 Hz	0.5 Hz	0.1 Hz
	1000 averages	250 Hz	100 Hz	10 Hz	1 Hz	0.25 Hz	0.05 Hz
20 GHz	Single measurement	3 kHz	1 kHz	100 Hz	25 Hz	5 Hz	1 Hz
	100 averages	1 kHz	200 Hz	25 Hz	10 Hz	1 Hz	0.5 Hz
	1000 averages	500 Hz	100 Hz	10 Hz	5 Hz	0.5 Hz	0.1 Hz

Settled phase uncertainty, typical mean

Measurement frequency	Averages	Phase uncertainty (degrees)				
		800 MHz	320 MHz	50 MHz	10 MHz	1 MHz
1 GHz	Single measurement	NA	0.50	0.50	0.50	0.50
	100 averages	NA	0.1	0.05	0.05	0.05
	1000 averages	NA	0.02	0.01	0.01	0.01
10 GHz	Single measurement	0.50	0.50	0.50	0.50	0.50
	100 averages	0.1	0.1	0.05	0.05	0.05
	1000 averages	0.05	0.02	0.01	0.01	0.01
20 GHz	Single measurement	0.50	0.50	0.50	0.50	0.50
	100 averages	0.1	0.1	0.05	0.05	0.05
	1000 averages	0.05	0.02	0.01	0.01	0.01

AM/FM/PM measurement application (SVAxx-SVPC)

Carrier frequency range (analog demodulation)

(16 kHz or 1/2 × (audio analysis bandwidth) to maximum input frequency

Maximum audio frequency span (analog demodulation)

10 MHz

Global conditions for audio measurements

Input frequency: <2 GHz

RBW: Auto

Averaging: Off

Filters: Off

FM measurements (Mod. index >0.1)

Carrier Power, Carrier Frequency Error, Audio Frequency, Deviation (+Peak, -Peak, Peak-Peak/2, RMS), SINAD, Modulation Distortion, S/N, Total Harmonic Distortion, Total Non-harmonic Distortion, Hum and Noise

FM carrier power accuracy, typical mean

±0.85 dB

Carrier frequency: 10 MHz to 2 GHz

Input power: -20 to 0 dB

FM carrier frequency accuracy, typical mean

±0.5 Hz + (transmitter freq * reference freq error)

Deviation: 1 to 10 kHz

SignalVu-PC applications performance summary

FM deviation accuracy, typical mean	± (1% of (rate + deviation) + 50 Hz) Rate: 1 kHz to 1 MHz
FM rate accuracy, typical mean	±0.2 Hz
FM residual THD, typical mean	
AM measurements	Carrier Power, Audio Frequency, Modulation Depth (+Peak, -Peak, Peak-Peak/2, RMS), SINAD, Modulation Distortion, S/N, Total Harmonic Distortion, Total Non-harmonic Distortion, Hum and Noise
PM measurements	Carrier Power, Carrier Frequency Error, Audio Frequency, Deviation (+Peak, -Peak, Peak-Peak/2, RMS), SINAD, Modulation Distortion, S/N, Total Harmonic Distortion, Total Non-harmonic Distortion, Hum and Noise
Audio filters	Low pass: 300 Hz, 3 kHz, 15 kHz, 30 kHz, 80 kHz, 300 kHz and user-entered up to 0.9*(audio bandwidth) High pass: 20 Hz, 50 Hz, 300 Hz, 400 Hz, and user-entered up to 0.9*(audio bandwidth) Standards-based: CCITT, C-Message De-emphasis (µs): 25, 50, 75, 750, and user-entered User defined audio file format: User-supplied .TXT or .CSV file of amplitude/frequency pairs. Maximum 1000 pairs

Mapping (MAPxx-SVPC)

Supported map types	Pitney Bowes MapInfo (*.mif), Bitmap (*.bmp), Open Street Maps (.osm)
Saved measurement results	Measurement data files (exported results)
Map file used for the measurements	Google Earth KMZ file
Recallable results files (trace and setup files)	MapInfo-compatible MIF/MID files

Environmental specifications

Atmospherics

Temperature	**RF Converter:** Operating: 0 ° C to + 40 ° C Non-operating: - 20 °C to +60 °C **Controller:** Operating: +10 ° C to + 35 ° C Non-operating: -20 °C to +60 °C
Relative humidity non-condensing, typical	**RF Converter** Operating: 10% to 90%, up to 40 °C **Controller** Operating: 40 to 70 %
Altitude	**RF Converter:** Operating: Up to 2000 m Non-Operating: Up to 12000 m **Controller:** Operating: Up to 3000 m Non-operating: Up to 12000 m

Installation requirements

Heat dissipation

RSA7100A Maximum Power Dissipation (fully loaded)	400 W maximum. Maximum line current is 4.5 Amps at 90 V line. 300 W typical
CTRL7100A maximum power dissipation (fully loaded)	500 W maximum. Maximum line current is 5.5 Amps at 90 V line. 400 W typical

Cooling (RSA7100A)

Bottom/Top	44.45 mm (1.75 in)
Both sides	44.45 mm (1.75 in)
Rear	76.2 mm (3.0 in)

Cooling (CTRL7100A)

Bottom/Top/Both sides	6.4 mm (0.25 in)
Front/Rear	76.2 mm (3.00 in)

Primary line voltage

Voltage	100 to 240 V at 50/60 Hz
Voltage range limits	90 to 264 V at 47 to 63 Hz

Physical specifications

RSA7100A physical dimensions

Width	445.5 mm (17.54 in)
Height	177.1 mm (6.79 in)
Length	577.9 mm (22.75 in)
Weight	24.2 kg (53.2 lbs)

CTRL7100A I/O	PCIe 2x USB 3.0 on front panel 2x USB 3.0 on rear panel 2x USB 2.0 on rear panel 17 removable drive bays (1 for OS, 16 for RAID) 6 Mini-Display ports 2x 10 Gbit Ethernet 1x 40 Gbit Ethernet (Mellanox ConnectX-3 Ethernet Adapter) with QSFP connector type

Physical specifications

CTRL7100A RAID

Disk size and lifetime, 800 MHz bandwidth

RAID option	Total time of all records	Expected lifetime of disk
Option B at 1000 MS/s	55 min	290 hr
Option B at 1000 MS/s, stored unpacked	40 min	226 hr
Option C at 1000 MS/s	165 min	900 hr
Option C at 1000 MS/s, stored unpacked	120 min	680 hr

CTRL7100A internal characteristics

GPU: AMD W9100

Dual Intel® Xeon® Processor E5-2623 v4 (10M Cache, 2.6 GHz)

Clock 2.6 GHZ

Internal Cache 10MB

64GB DDR4 2133 MHz RAM

Optional RAID controller and front-panel removable drives supports 4 GB/s streaming and up to 32 TB memory

OS: Windows 7

RSA7100A interfaces, inputs, and output ports

Connectors

RF input	40 GHz Planar Crown bulkhead with 3.5mm female coax adapter
External frequency reference input	BNC, female
External frequency reference output	BNC, female
Trigger/Sync input	BNC, female
Noise source control	BNC, female
GPS antenna	SMA, female
IRIG-B input	BNC, female
1PPS input/output	SMA, female

Status indicators

Power LED	LED, red

Dynamics

Random vibration	RF Converter, Operating: 5-500 Hz, 0.3 G rms
	Controller, Operating: 5-500 Hz, 1.0 G rms
Shock operating	RF Converter, Operating: 30 G, half-sine, 11ms duration
	RF Converter, Non-operating: 5-500 Hz, 2.45 G rms
	Controller, Operating: 15 G, half-sine, 11ms duration
	Controller, Non-operating: 5-500 Hz, 2.28 G rms
	(Converter RF attenuator may change states during horizontal shock. To reset, change to any other state and back to desired state.)
Shock non-operating	RF Converter: 30 G, half-sine, 11ms duration
	Controller: 25 G, half-sine, 11ms duration

Ordering information

RSA7100A

Real-Time Spectrum Analyzer, up to 800 MHz acquisition bandwidth. The RSA7100A includes the RF acquisition unit and the CTRL-7100A controller together as a single orderable item. The CTRL-7100A controller is also available as a separate item if additional or replacement controllers are needed.

Includes: Installation and safety manual, 3.5mm Crown Connector-Female, PCIe cable, mouse, keyboard, adapter: Mini-Display Port to HDMI, Mini-Display Port to DVI. Power cables, rack mount kits for acquisition unit and controller. Controller rack-mount is a 'telecom-style'. A server-style rackmount can also be used with the controller, available from third parties.

Note: A PC monitor is not included with the RSA7100A. Tektronix recommends the Dell UltraSharp U2414H 23.8 inch Widescreen IPS LCD Monitor, or any monitor that supports Display port, DVI or HDMI input and has a minimum 1920 x 1080 display resolution.

How to order

When ordering the RSA7100A, the CTRL-7100A controller is included. The CTRL7100A is available in three configurations depending on the RAID configuration. You can select no RAID, or a RAID with 20 minutes or 120 minutes recording time. You also select between two frequency ranges and whether you would like to have an internal GPS receiver and/or an ISO17025 calibration data report.

SignalVu-PC licenses can be ordered as options to the RSA7100A and are installed on the included controller during manufacturing, minimizing order complexity and saving you time in configuration upon receiving your instrument. These licenses are node-locked to the controller and can be moved twice over the lifetime of the license. Standalone licenses, either node-locked or floating, can be ordered and customer-installed on the controller if greater flexibility is needed.

RSA7100A hardware options

RSA7100A options	Description	Ordering instructions
RSA7100A	Real-time spectrum analyzer, 320 MHz bandwidth	
Opt. 14	Frequency range 16 kHz-14 GHz	Select one
Opt. 26	Frequency range 16 kHz-26.5 GHz	
Opt. GPS	GPS receiver, 1PPS, and IRIG-B	Select one
Opt. NO GPS	No GPS receiver, 1PPS, or IRIG-B	
Opt. CAL	Calibration report with data (ISO 17025)	
Opt. GPS CAL	GPS receiver, 1PPS, IRIG-B, and calibration report with data (ISO17025)	
Opt. C7100-A	Controller, no RAID storage	Select one
Opt. C7100-B	Controller, RAID storage, 20 minutes recording time at 800 MHz bandwidth (requires STREAMNL-SVPC)	
Opt. C7100-C	Controller, RAID storage, > 120 minutes recording time at 800 MHz bandwidth (requires STREAMNL-SVPC)	
Opt. SV09	High performance real time (export class 3A002), node-locked license	Mandatory option

RSA7100A license options

The application licenses below can be added to the controller of your RSA7100A at the time of manufacture, saving you time in managing the installation of the licenses.

All licenses installed in the factory are node-locked to the controller. Floating licenses are also available, managed with the Tektronix Asset Management System (Tek AMS). For a complete list of separately purchased floating and node-locked license, see the SignalVu-PC datasheet for ordering information.

SignalVu-PC licenses ordered as options to RSA7100A and installed on the included controller (Factory installed on unit)	Description	License type
Opt. B800NL-SVPC	800 MHz acquisition bandwidth (for frequencies > 3.6 GHz)	Node locked
Opt. CUSTOM-APINL-SVPC	Streaming API for customer-defined access of RSA7100A analyzer	Node locked

SignalVu-PC licenses ordered as options to RSA7100A and installed on the included controller (Factory installed on unit)	Description	License type
Opt. STREAMNL-SVPC	IQFlow™ streaming data to RAID (requires option C7100-B or C7100-C) and 40 GbE	Node locked
Opt. SVMHNL-SVPC	General Purpose Modulation Analysis to work with analyzer of any acquisition bandwidth and MDO	Node locked
Opt. SVPHNL-SVPC	Pulse Analysis to work with analyzer of any acquisition bandwidth and MDO	Node locked
Opt. TRIGHNL-SVPC	Advanced triggers (Frequency Mask, Density) to work with RSA7100A	Node locked
Opt. MAPNL-SVPC	Mapping and signal strength	Node locked
Opt. SV54NL-SVPC	Signal survey and classification	Node locked
Opt. PHASNL-SVPC	Phse noise / jitter measurements	Node locked
Opt. SVTNL-SVPC	Settling Time (frequency and phase) measurements	Node locked
Opt. SV23NL-SVPC	WLAN 802.11a/b/g/j/p measurement	Node locked
Opt. SV24NL-SVPC	WLAN 802.11n measurement (requires SV23)	Node locked
Opt. SV25HNL-SVPC	WLAN 802.11ac measurement to work with analyzer of acquisition bandwidth ≤40 MHz and MDO4000B/C (requires SV23 and SV24)	Node locked
Opt. SV26NL-SVPC	APCO P25 measurement	Node locked
Opt. SV27NL-SVPC	Bluetooth measurement to work with analyzer of acquisition bandwidth ≤40 MHz and MDO4000B/C	Node locked
Opt. SV28NL-SVPC	LTE Downlink RF measurement to work with analyzer of acquisition bandwidth ≤40 MHz and MDO4000B/C	Node locked
Opt. SV31NL-SVPC	Bluetooth 5 measurements (requires SV27)	Node locked
Opt. SVANL-SVPC	AM/FM/PM/Direct Audio Analysis	Node locked
Opt. SVONL-SVPC	Flexible OFDM Analysis	Node locked
Opt. SVQPNL-SVPC	EMI CISPR Detectors	Node locked
Opt. CONNL-SVPC	SignalVu-PC connection to the MDO4000B/C series mixed-domain oscilloscopes	Node locked

Recommended accessories

174-6990-00	Additional PCIe cable, PCIE X8, Straight connector on both ends, Molex
650-5991-00	Additional 512 GB solid-state drive with Windows 7, SignalVu-PC installed
131-9062-xx	Additional 3.5 mm Crown Connector-Female
RSA7100RAID-B	Replacement solid-state drives for RSA7100A option C7100-B, or CTRL7100A Option B. 10 1-TB drives included, customer-installable
RSA7100RAID-C	Replacement solid-state drives for RSA7100A option C7100-C, or CTRL7100A Option C. 16 2-TB drives included, customer installable

Language options for the RSA7100A

Opt. L0	English manual
Opt. L5	Japanese manual
Opt. L7	Simplified Chinese manual
Opt. L99	No manual

Power plug options

Opt. A0	North America power plug (115 V, 60 Hz)
Opt. A1	Universal Euro power plug (220 V, 50 Hz)
Opt. A2	United Kingdom power plug (240 V, 50 Hz)
Opt. A3	Australia power plug (240 V, 50 Hz)
Opt. A4	North America power plug (240 V, 50 Hz)
Opt. A5	Switzerland power plug (220 V, 50 Hz)
Opt. A6	Japan power plug (100 V, 50/60 Hz)
Opt. A10	China power plug (50 Hz)
Opt. A11	India power plug (50 Hz)
Opt. A12	Brazil power plug (60 Hz)
Opt. A99	No power cord

Service options

Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. G3	Complete Care 3 Years (includes loaner, scheduled calibration, and more)
Opt. G5	Complete Care 5 Years (includes loaner, scheduled calibration, and more)

Complimentary products

DataVu-PC is recommended for users who record data using the RSA7100A streaming and RAID options. Ordering information for DataVu-PC is shown below. See the separate DataVu-PC datasheet for details on licensing, minimum PC requirements, features, and functions.

DataVu-PC ordering information

When purchasing DataVu-PC, you choose any one of the three base version DVPC-SPAN licenses (50 MHz, 200 MHz or 1000 MHz). The only difference between span licenses is the bandwidth of the allowed analysis. Choose the bandwidth that covers the maximum bandwidth of your acquisition/recording system. For example, all USB-based analyzers are accommodated with the DVPC-SPAN50 license, and all RSA7100A recordings at full bandwidth require DVPC-SPAN1000.

DVPC-SMARK, DVPC-MREC, and DVPC-PULSE work with any DVPC-SPAN bandwidth license chosen for analysis. The DVPC-SMARK license requires a DVPC-SPAN license of any bandwidth, and the DVPC-MREC and DVPC-PULSE licenses require a DVPC-SMARK license.

Nomenclature	License type	Description
DVPC-SPAN50NL	Node locked	Base version, DataVu-PC operation on acquisitions to 50 MHz bandwidth, plus LiveVu operation of one USB instrument
DVPC-SPAN50FL	Floating	
DVPC-SPAN200NL [6]	Node locked	Base version, DataVu-PC operation on acquisitions to 200 MHz bandwidth, plus LiveVu operation of one USB instrument
DVPC-SPAN200FL [6]	Floating	
DVPC-SPAN1000NL	Node locked	Base version, DataVu-PC operation on acquisitions to 1000 MHz bandwidth, plus LiveVu operation of one USB instrument
DVPC-SPAN1000FL	Floating	
DVPC-SMARKNL	Node locked	DataVu-PC Smart Markers, Time Overview, and Frequency Mask Search (requires base version)
DVPC-SMARKFL	Floating	

6 If you have a data source that operates at 50 MHz to 200 MHz bandwidth, such as a Tektronix RSA5000 or RSA6000 series spectrum analyzer with a third-party recording solution, choose DVPC-SPAN200.

Nomenclature	License type	Description
DVPC-MRECNL	Node locked	Multi-unit recording for USB spectrum analyzers (requires DVPC-SMARK)
DVPC-MRECFL	Floating	
DVPC-PULSENL	Node locked	DataVu-PC pulse analysis (requires DVPC-SMARK)
DVPC-PULSEFL	Floating	

CTRL7100A: Additional controllers for the RSA7100A

Additional controllers are available for the RSA7100A should you need to have controllers in multiple locations. The CTRL7100A is identical to the unit included with the RSA7100A. For detailed ordering information, see the CTRL7100A datashee

Additional spare RAID drive set for the controller

The following replacement or spare RAID drive sets are also available from Tektronix. These are drop-in replacements for when a spare is needed or when the original drive wears out. You will need to have a CTRL7100A with Option STREAMNL-SVPC installed in order to use the replacement and spare RAID sets.

Nomenclature	Description
CTRL7100UP Opt X-RAID-B	Additional solid-state drives for RSA7100A option C7100-B, or CTRL7100A Option B. 10 1-TB drives included, customer-installable. 20 Minutes recording capacity at 800 MHz bandwidth.
CTRL7100UP Opt X-RAID-C	Additional solid-state drives for RSA7100A option C7100-C, or CTRL7100A Option C.16 2-TB drives included, customer installable. 120 Minutes recording capacity at 800 MHz bandwidth.

CE

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

GPIB IEEE-488

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