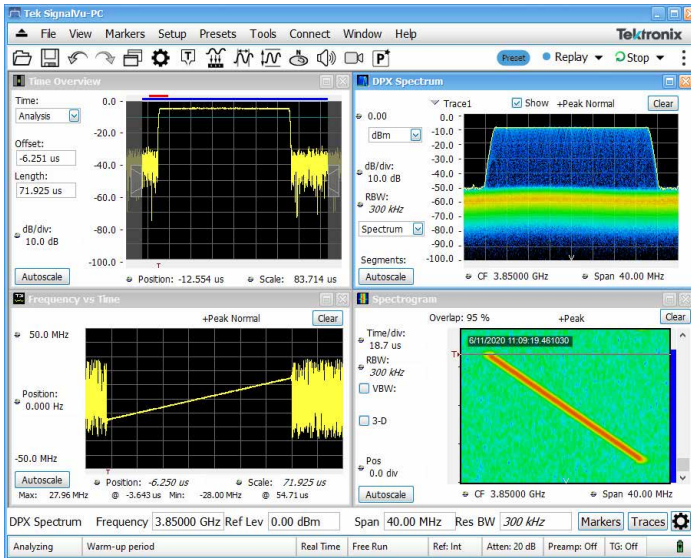


# Vector and RF Suite of Signal Analysis Software for PC

## SignalVu-PC Applications Datasheet



SignalVu-PC is the foundation of RF and vector signal analysis software that helps you easily validate RF designs. It is based on the signal analysis engine of the RSA5000 Series real-time signal analyzers and runs on your computer or Windows tablet. You can now move your analysis of acquisitions off the instrument and anywhere. SignalVu-PC is also the companion software that runs the analysis for the Tektronix USB real-time spectrum analyzers and Tektronix MDO/MSO/DPO Series oscilloscopes. Whether your design validation needs include wideband radar, high data rate satellite links, wireless LAN or frequency-hopping communications, the SignalVu-PC comprehensive suite of tools and application software can speed your time-to-insight by showing you the time-variant behavior of these signals.

### Key features

- Multi-domain tool set for spectrum analysis, vector signal analysis, demodulation, and more including:
  - Offline analysis of waveforms captured by all Tektronix spectrum analyzers and oscilloscopes standard
  - Real-time recording and analysis with Tektronix RSA signal analyzers (RSA7100, RSA600, RSA500, and RSA306 Series) standard
  - Options to turn the 5 Series/6 Series/6 Series B MSO, 6 Series LPD, or MDO4000B/C Series Oscilloscopes into wide-band vector signal analyzers (VSAs) with up to 2 GHz analysis bandwidth using Connect (CON-SVPC).
- Analyze without acquisition hardware present
- Analyze wideband designs
- Free up instruments for further use while analysis occurs offline
- Use your Windows tablet or your powerful PC workstation
- Node Locked and Floating License available for each SignalVu-PC optional application
- Analyze
  - 5G New Radio (NR) uplink/downlink RF power, Power dynamics, Signal quality, and Emissions measurements based on the 3GPP release 15/16 Standard
  - 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, Multicarrier ACLR, Power vs. Time, CCDF, and OBW/EBW
  - EMC/EMI pre-compliance and troubleshooting with RSA signal analyzers - CISPR detectors, predefined standards, limit lines, easy accessory setup, ambient capture, failure analysis, and report generation
  - WLAN spectrum and modulation transmitter measurements based on IEEE 802.11 a/b/g/j/p/n/ac/ad/ay standards
  - Bluetooth® Transmitter Measurements based on Bluetooth SIG RF specifications for Basic Rate, Low Energy, and Bluetooth 5. Some support of Enhanced Data Rate
  - Settling time measurements, frequency, and phase for characterization of wideband frequency-agile oscillators
  - Advanced Pulse analysis suite - automated pulse measurements provide deep insight into pulse train behavior. Measurement pulse statistics over many acquisitions (millions of pulses).
  - General purpose digital modulation analysis (SVM) provides modulation analysis of 25 modulation types
  - Flexible OFDM analysis of custom OFDM signals
  - Frequency offset control for analyzing baseband signals with near-zero intermediate frequencies (IF)
  - AM/FM/PM modulation and audio measurements for characterization of analog transmitters and audio signals
  - Simple and complete APCO Project 25 transmitter compliance testing and analysis for Phase 1 (C4FM) and Phase 2 (TDMA)
  - Playback of recorded files from the USB spectrum analyzers (RSA306, RSA500, and RSA600)
  - LTE™ FDD and TDD Base Station (eNB) Transmitter RF measurements
  - Automated Phase Noise / Jitter measurements

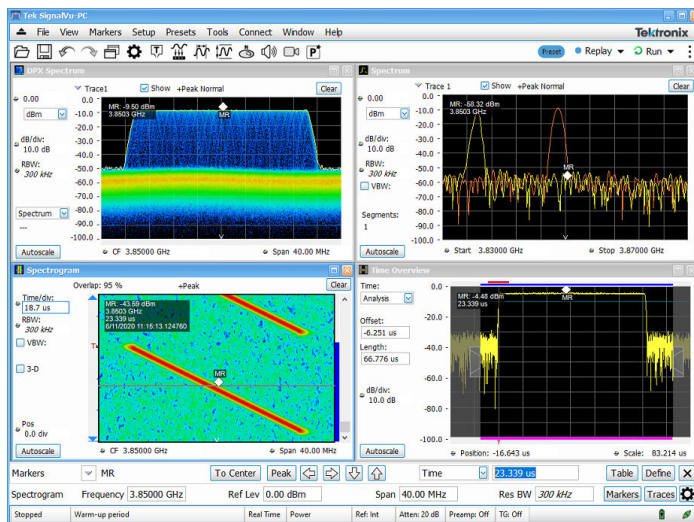
- Signal Classification and Survey
- Mapping

## Applications

- Wideband radar and pulsed RF signals
- Frequency agile communications
- Broadband satellite and microwave backhaul links
- Wireless LAN, Bluetooth, Commercial Wireless
- Land Mobile Radio (LMR), APCO P25
- Education
- Long Term Evolution (LTE), Cellular
- 5G NR Cellular base station or user equipment transmitter test
- EMC/EMI pre-compliance and troubleshooting

## Capture with a variety of tools

Capture once - make multiple measurements without recapturing. Using performance oscilloscopes (MSO Series), up to four channels can be captured simultaneously; each of which can be independently analyzed by SignalVu-PC software. Channels can be RF, I and Q, or differential inputs. You can also apply math functions to the acquisition before analysis by SignalVu-PC. Acquisition lengths vary depending upon the selected capture bandwidth: full-bandwidth acquisitions can range from 1 ms to 25 ms depending upon model and option selections. Real-time signal analyzer captures range from up to 7.15 seconds at maximum acquisition bandwidth to several hours at reduced bandwidths.



Once captured into memory, SignalVu-PC provides detailed analysis in multiple domains. The spectrogram display (bottom left panel) shows the frequency of an LFM pulse changing over time. By selecting the point in time in the spectrogram during the On time of the pulse, the chirp behavior can be seen as it sweeps from low to high (upper right panel).

## Connect with 5 Series/6 Series/6 Series B MSO or 6 Series LPD or MDO4000 Series oscilloscopes

When the Connect (CON-SVPC) option is installed, SignalVu-PC extends the functionality of either the 5 Series/6 Series/6 Series B MSO or 6 Series LPD or MDO4000 Series oscilloscopes (with hardware option SV-RFVT). The combination of hardware and software transforms the 6 Series/6 Series B MSO or 6 Series LPD oscilloscope into a wide-band vector signal analyzer (VSA) with up to 2 GHz capture bandwidth on up to 4 independent user-selectable channels; or up to 500 MHz and 8 channels using a 5 Series MSO; or up to 1 GHz on a single channel using the MDO4000B/C Oscilloscope. To support acquisition length of more than 10 ms for a span of 2 GHz, RL-1 (125 Mpoints record length) or more license needs to be installed on 6 Series/6 Series B MSO or 6 Series LPD.

SignalVu-PC controls the MSO or MDO RF front-end, acquires the vector-calibrated I/Q data, and makes wide-band, time-correlated, multi-domain measurements. You can analyze, correlate, and troubleshoot issues in time, frequency, phase, amplitude, and even modulation.

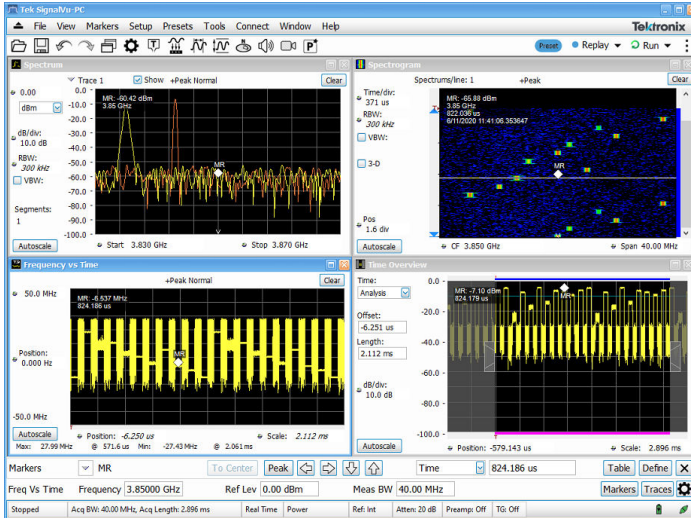
You can leverage the MSO or MDO triggering capability and extend your debugging work into system-level troubleshooting of your embedded RF devices.

## Analyze

SignalVu-PC vector signal analysis software uses the same analysis capabilities found in the RSA6000 Series real-time signal analyzers.

Time-correlated measurements can be made of frequency, phase, amplitude, and modulation versus time. This is ideal for signal analysis that includes frequency hopping, pulse characteristics, modulation switching, settling time, bandwidth changes, and intermittent signals.

Acquisitions from the USB Spectrum Analyzers and all Tektronix MDO/MSO/DPO Series oscilloscopes, including the spectrum analyzer in the Mixed Domain Oscilloscope can be analyzed with SignalVu-PC, adding deep analysis capabilities to these broadband acquisition systems.

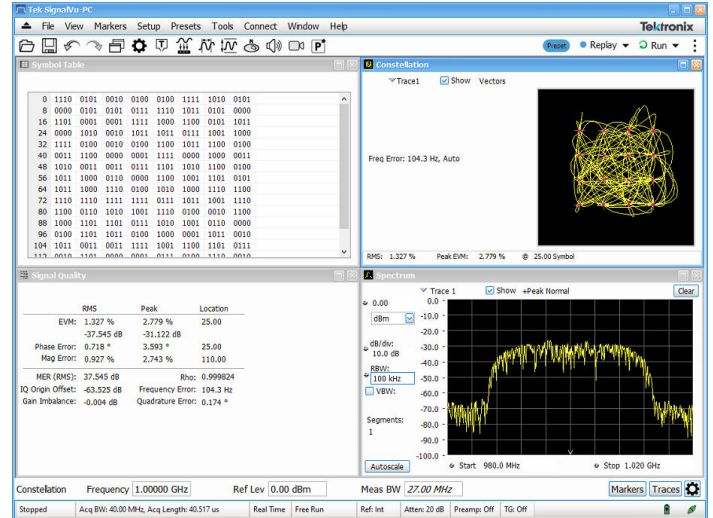


Time-correlated, multi-domain view provides a new level of insight into design or operational problems not possible with conventional analysis solutions. Here, the hop patterns of a narrowband signal can be observed using Spectrogram (upper right) and its hop characteristics can be precisely measured with Frequency vs Time display (bottom left). The time and frequency responses can be observed in the two views right as the signal hops from one frequency to the next. All of the analysis shown above is available in the free base version of SignalVu-PC.

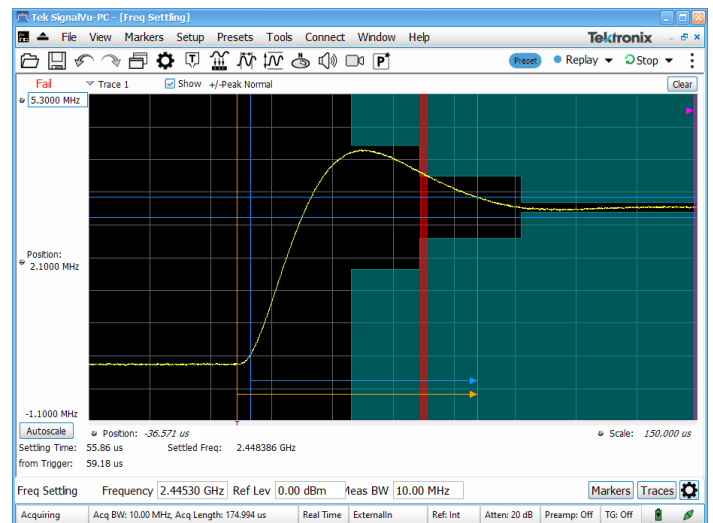
SignalVu-PC also supports real time analysis of the 5 Series/6 Series/6 Series B MSO waveforms from the spectrum view.

## Optional applications tailored for your RF applications

The base SignalVu-PC version ships free and enables real-time spectrum analysis, RF power and statistics, spectrograms, amplitude, frequency and phase vs. time, and analog modulation measurements. Field-upgradeable software options may be added, including pulse and OFDM analysis, general purpose modulation analysis, settling time, automated phase noise measurements, EMI pre-compliance, commercial standard analysis (WLAN, Bluetooth, LTE, 5G NR), playback of recorded files, and more.



Wideband satellite and point-to-point microwave links can be directly observed with SignalVu-PC analysis software. Here, general purpose Digital Modulation Analysis (SVM) is demodulating a 16QAM backhaul link running at 312.5 MS/s.



Settling time measurements (SVT) are easy and automated. The user can select measurement bandwidth, tolerance bands, reference frequency (auto or manual), and establish up to 3 tolerance bands vs. time for Pass/Fail testing. Settling time may be referenced to external or internal trigger, and from the last settled frequency or phase. In the illustration, frequency settling time for a hopped oscillator is measured from an external trigger point from the device under test.

## WLAN sub 6 GHz Wi-Fi transmitter testing

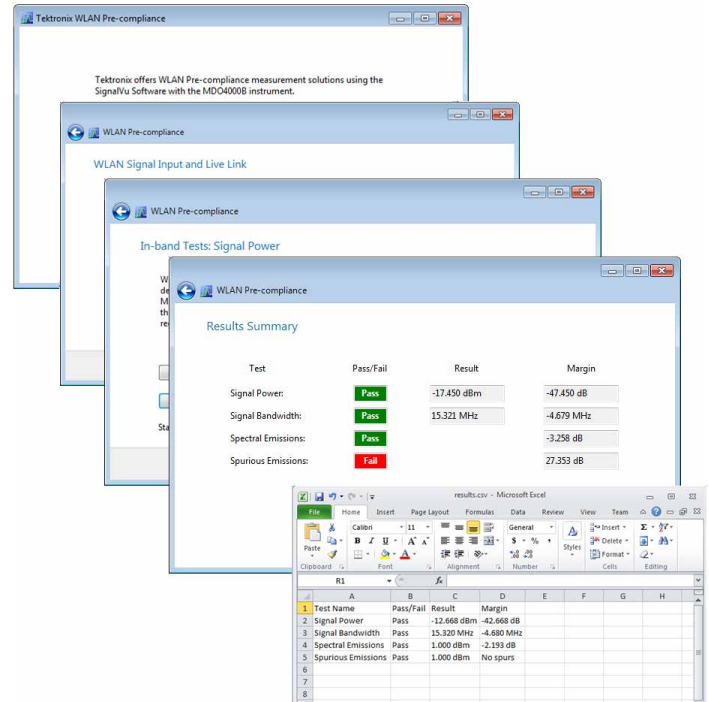
With the WLAN measurement applications, you can perform standards-based transmitter measurements in the time, frequency, and modulation domains.

- SV23 supports IEEE 802.11a, b, g, j and p signals
- SV24 supports 802.11n 20 MHz and 40 MHz SISO signals

- SV25 802.11ac 20/40/80/160 MHz SISO signals
- SV2C is a bundle of Connect (CON) to MDO4000C Series and all the WLAN measurement applications described above (SV23, SV24 and SV25)

All modulation formats, as shown in the following table can be measured.

Standard	Std PHY	Freq band(s)	Signal	Modulation formats	Bandwidth (max)	802.11-2012 section
802.11b	DSSS HR/DSSS	2.4 GHz	DSSS/CK 1 - 11 Mbps	DBSK, DQPSK  CCK5.5 M, CCK11 M	20 MHz	16 & 17
802.11g	ERP	2.4 GHz	DSSS/CK/PBCC 1 - 33 Mbps	BPSK DQPSK	20 MHz	17
802.11a	OFDM	5 GHz	OFDM 64  <54 Mbps	BPSK	20 MHz	18
802.11g		2.4 GHz		QPSK	20 MHz	19
802.11j/p		5 GHz		16QAM 64QAM	5, 10, 20 MHz	18
802.11n	HT	2.4 GHz & 5 GHz	OFDM 64, 128  ≤ 150 Mbps	BPSK QPSK  16QAM 64QAM	20, 40 MHz	20
802.11ac	VHT	5 GHz	OFDM 64, 128, 256, 512  ≤ 867 Mbps	BPSK QPSK  16QAM 64QAM  256QAM	20, 40, 80, 160 MHz	22

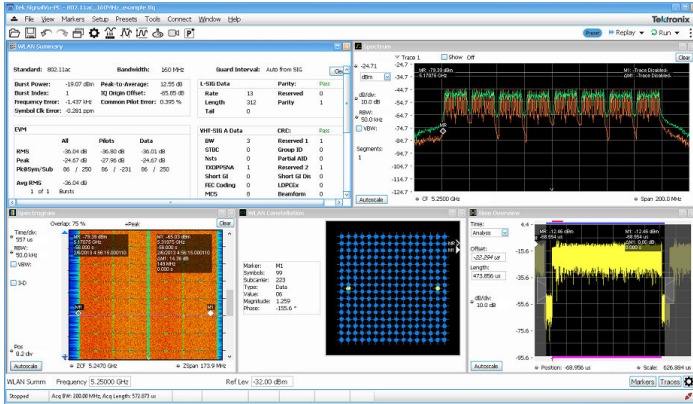


The WLAN presets make the Error Vector Magnitude (EVM), Constellation, and Spectral Emission Mask (SEM) measurements push-button. In addition, you can download the WLAN pre-compliance wizard to easily and quickly prepare for compliance regulatory tests. The Wizard automatically measures Transmit Power, Occupied Bandwidth, Spectral Power Density, Spectral Emission Mask and Spurious Emission Mask.

The WLAN RF transmitter measurements are defined by the IEEE 802.11-2012 revision of the standard. Analysis of 1024-QAM 802.11ac signals is also possible.

IEEE 802.11 RF layer test	IEEE reference 802.11-2012	Limit tested
Transmit power	16.4.7.2 (DSSS)	country dependent
	17.4.7.2 ("b")	country dependent
	18.3.9.2("a")	country dependent
	19.4.8.2 ("g")	country dependent
Transmit Power On/Off Ramp	20.3.20.3 ("n")	country dependent
	16.4.7.8 (DSSS)	(10%-90%) 2 usec
	17.4.7.7 ("b")	(10%-90%) 2 usec
	16.4.7.5 (DSSS)	Std mask
Transmit Spectrum mask	17.4.7.4 ("b")	Std mask
	18.3.9.3 ("a")	Std mask
	19.5.5 ("g")	Std mask
	20.3.20.1 ("n")	Std mask
	22.3.18.1 ("ac")	Std mask
	16.4.7.9 ("DSSS")	-15dB
RF Carrier suppression	17.4.7.8 ("b")	-15dB
	18.3.9.7.2 ("a")	-15 dBc or +2 dB w.r.t. average subcarrier power
Center frequency leakage	20.3.20.7.2 ("n")	20 MHz: follow 18.3.9.7.2 40 MHz: -20 dBc or 0 dB w.r.t. average subcarrier power
	18.3.9.7.3 ("a")	+/- 4 dB (SC = -16...16), +/-6 dB (other)
Transmit Spectral flatness	20.3.20.2 ("n")	+/- 4 dB, +/-6 dB
	22.3.18.2 ("ac")	+/- 4 dB, +/-6 dB (various BWs, 20-160 MHz)
	18.3.9.4 ("a")	country dependent
Transmission spurious	18.3.9.4 ("a")	country dependent
Transmit Center frequency tolerance	16.4.7.6 ("DSSS")	+/-25 ppm
	17.4.7.5 ("b")	+/-25 ppm
	18.3.9.5 ("a")	+/-20 ppm (20 MHz and 10 MHz), +/-10 ppm (5 MHz)
	19.4.8.3 ("g")	+/-25 ppm
	20.3.20.4 ("n")	+/-20 ppm (5 GHz band), +/-25 ppm (2.4 GHz band)
	22.3.18.3 ("ac")	+/-20 ppm
Symbol clock frequency tolerance	16.4.7.7 ("DSSS")	+/-25 ppm
	17.4.7.6 ("b")	+/-25 ppm
	18.3.9.6 ("a")	+/-20 ppm (20 MHz and 10 MHz), +/-10 ppm (5 MHz)
	19.4.8.4 ("g")	+/-25 ppm
	20.3.20.6 ("n")	+/-20 ppm (5 GHz band), +/-25 ppm (2.4 GHz band)
22.3.18.3 ("ac")	+/-20 ppm	
Transmit Modulation accuracy	16.4.7.10 ("DSSS")	Peak EVM < 0.35
	17.4.7.9 ("b")	Peak EVM < 0.36

IEEE 802.11 WLAN transmitter test summary					
IEEE 802.11 RF layer test	IEEE reference 802.11-2012	Limit tested			
Transmitter Constellation Error	18.3.9.7.4 ("a")	Modulation	Coding rate (R)	Relative constellation error (dB)	
		BPSK	1/2	-5	
		BPSK	3/4	-8	
		QPSK	1/2	-10	
		QPSK	3/4	-13	
		16-QAM	1/2	-16	
		16-QAM	3/4	-19	
		64-QAM	2/3	-22	
		64-QAM	3/4	-25	
		20.3.20.7.3 ("n")	BPSK	1/2	-5
			QPSK	1/2	-10
			QPSK	3/4	-13
	16-QAM		1/2	-16	
	16-QAM		3/4	-19	
	64-QAM		2/3	-22	
	64-QAM		3/4	-25	
	64-QAM		5/6	-27	
	22.3.18.4.3 ("ac")		BPSK	1/2	-5
			QPSK	1/2	-10
			QPSK	3/4	-13
			16-QAM	1/2	-16
		16-QAM	3/4	-19	
		64-QAM	2/3	-22	
		64-QAM	3/4	-25	
64-QAM		5/6	-27		
Out-of-band spurious emission	16.4.6.6 ("DSSS")	country dependent			
	17.4.6.9 ("b")	country dependent			
	18.3.8.5 ("a")	country dependent			
	19.4.4 ("g")	country dependent			



Easy analysis of WLAN 802.11ac transmitter with a WLAN preset that provides spectral emission mask, constellation diagram, and decoded burst information.

## Bluetooth transmitter testing

Two options have been added to help with Bluetooth SIG standard base transmitter RF measurements in the time, frequency and modulation domains. Option SV27 supports Basic Rate and Low Energy Transmitter measurements defined by RF.TS.4.2.0 and RF-PHY.TS. 4.2.0 Test Specification. It also demodulates and provides symbol information for Enhanced Data Rate (EDR) packets. Option SV31 supports Bluetooth 5 standards (LE 1M, LE 2M, LE Coded) and measurements defined in the Core Specification. Both options also decode the physical layer data that is transmitted and color-encode the fields of packet in the Symbol Table for clear identification.

Pass/Fail results are provided with customizable limits and the Bluetooth presets make the different test set-ups push-button.

Below is a summary of the measurements that are automated with option SV27 and SV31 (unless noted):

- Bluetooth Low Energy (BLE) Transmitter Measurements
  - Output power at NOC TRM-LE/CA/01/C and at EOC TRM-LE/CA/02/C
  - In-band emission at NOC TRM-LE/CA/03/C and at EOC TRM-LE/CA/04/C
  - Modulation characteristics TRM-LE/CA/05/C
  - Carrier frequency offset and drift at NOC TRM-LE/CA/06/C and at EOC TRM-LE/CA/07/C
- Basic Rate Transmitter Measurements
  - Output power TRM/CA/01/C
  - Power Density TRM/CA/02/C (no preset)
  - Power Control TRM/CA/03/C (no preset)
  - Tx output Spectrum – Frequency Range TRM/CA/04/C (no preset)
  - Tx output spectrum - 20 dB Bandwidth TRM/CA/05/C
  - Tx output spectrum - Adjacent Channel Power TRM/CA/06/C

- Modulation characteristics TRM/CA/07/C
- Initial carrier frequency tolerance TRM/CA/08/C
- Carrier frequency-drift TRM/CA/09/C

The following additional information is also available with SV27 and SV31: symbol table with color coded field information, constellation, eye diagram, frequency deviation vs time with highlighted packet and octet, frequency offset and drift detailed table, as well as packet header field decoding. Markers can be used to cross-correlate the time, vector and frequency information.

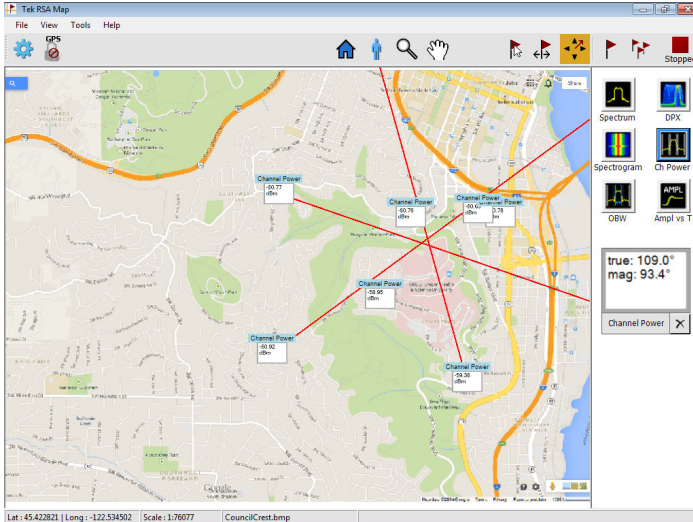


Easy validation of Bluetooth transmitter with push button preset, pass/fail information and clear correlation between displays.

## Mapping

When paired with the Alaris Smart Antenna with electronic compass, and battery-powered RSA500 Series (with built-in GPS transceiver) or RSA306B (with third party GPS dongle), the Mapping (MAP) application enables interference hunting, spectrum clearing, coverage mapping, surveying, and triangulation on signal sources.

Locate interference with an azimuth function that lets you draw a line or an arrow on a mapped measurement to indicate the direction your antenna was pointing when you took a measurement. You can also create and display measurement results and labels.



Mapped channel power readings using the azimuth function.

## LTE FDD and TDD base station transmitter RF testing

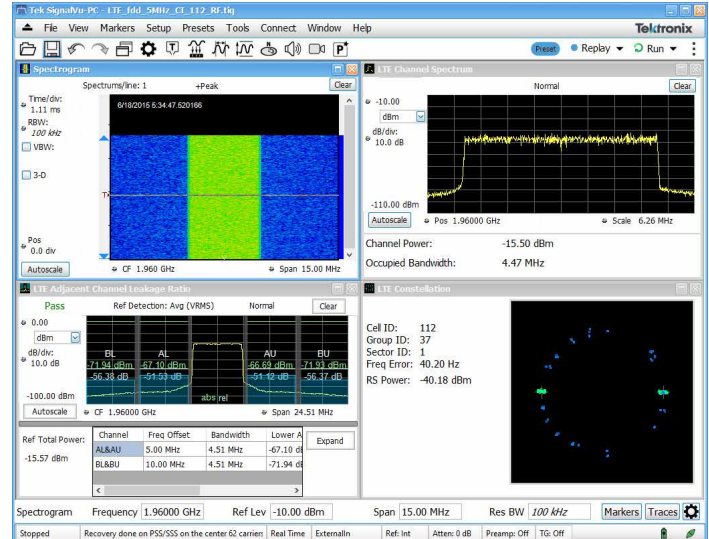
Option SV28 enables the following LTE measurements:

- Cell ID
- Channel Power
- Occupied Bandwidth (OBW)
- Adjacent Channel Leakage Ratio (ACLR)
- Spectrum Emission Mask (SEM)
- Transmitter Off Power for TDD
- Reference Signal Power

There are four presets to accelerate pre-compliance testing and determine the Cell ID. These presets are defined as Cell ID, ACLR, SEM, Channel Power and TDD Toff Power. The measurements follow the definition in 3GPP TS Version 12.5 and support all base station categories, including picocells and femtocells. Pass/Fail information is reported and all channel bandwidths are supported.

The Cell ID preset displays the Primary Synchronization Signal (PSS) and the Secondary Synchronization Signal (SSS) in a Constellation diagram. It also provides Frequency Error and Reference Signal (RS) Power.

The ACLR preset measures the E-UTRA and the UTRA adjacent channels, with different chip rates for UTRA. ACLR also supports Noise Correction based on the noise measured when there is no input. Both ACLR and SEM will operate in swept mode (default) or in faster single acquisition if the instrument has enough acquisition bandwidth.



Fast validation of LTE base station transmitter with push button preset, and pass/fail information

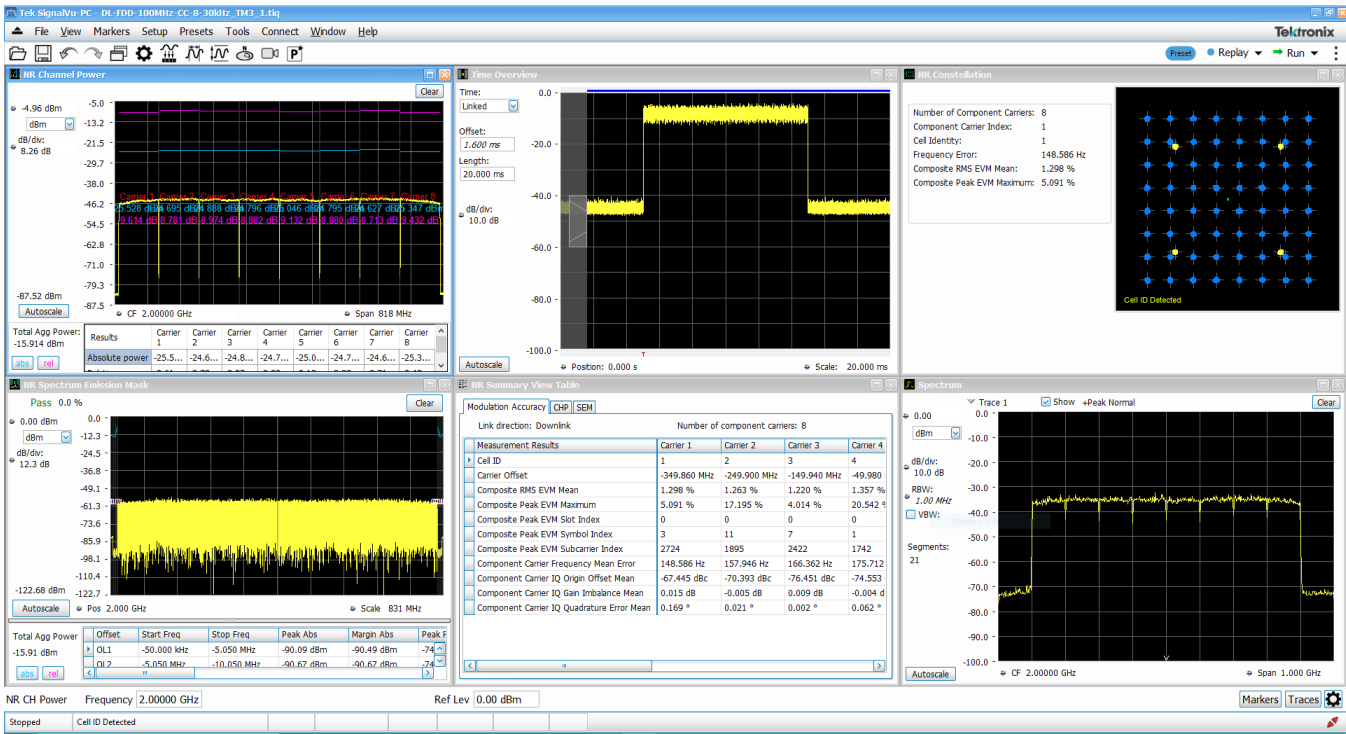
## 5G NR modulation analysis and measurements option

5G NR is among the growing set of signal standards, applications, and modulation types supported by SignalVu-PC Vector Signal Analysis (VSA) software. The SignalVu-PC VSA 5G NR analysis option provides comprehensive analysis capabilities in the frequency, time, and modulation domains for signals based on the 3GPP's 5G NR specification.

By configuring result traces of spectrum, acquisition time, and NR specific modulation quality (e.g. EVM, frequency error, I/Q error) traces and tables, engineers can identify overall signal characteristics and troubleshoot intermittent error peaks or repeated synchronization failures.

Error Vector Magnitude (EVM) is a figure of merit used to describe signal quality. It does this by measuring the difference on the I/Q plane between the ideal constellation point of the given symbol versus the actual measured point. It can be measured in dB or % of the ideal sub-symbol, normalized to the average QAM power received, and display constellation of symbols vs ideal symbol. The EVM vs Symbol or EVM vs Time gives the EVM of OFDM symbols present in the number of symbols considered or the time within a slot.

For automated testing, SCPI remote interfaces are available to accelerate design, which enables the quick transition to the design verification and manufacturing phases.



Constellation, Summary View, CHP, and SEM displays supported in option 5G NR

## 5G NR transmitter measurements core supported features

5G NR option (5GNRNL-SVPC)<sup>1</sup> supports 5G NR modulation analysis measurements according to Release 15 and Release 16 of 3GPP's TS38 specification, including:

- Analysis of uplink and downlink frame structures
- 5G NR measurements and displays including
  - Modulation Accuracy (ModAcc)
  - Channel Power (CHP)
  - Adjacent Channel Power (ACP)
  - Spectrum Emission Mask (SEM)
  - Occupied Bandwidth (OBW)
  - Power Vs Time (PVT)<sup>2</sup>
  - Error Vector Magnitude (EVM)
  - Summary table with all scalar results for ModAcc, SEM, CHP, ACP, OBW, PVT, and EVM measurements
- In-depth analysis and troubleshooting with coupled measurements across domains, use multiple markers to correlate results to find root-cause.
- Saves reports in CSV format with configuration parameters and measurement results

- Configurable parameters of PDSCH or PUSCH for each component carrier
- For downlink, supported test models for FDD and TDD per 3GPP specifications

## WiGig IEEE802.11ad/ay 60 GHz Wi-Fi transmitter testing (offline analysis)

Options SV30NL-SVPC and SV30FL-SVPC provide offline analysis for WiGig IEEE802.11ad/ay IC characterization. However, Tektronix DPO70000SX Series oscilloscope with option SV30 installed can be used for full online 60 GHz measurements and analysis using SignalVu. For more details, refer to *SignalVu-PC vs. SignalVu* section of this document.

SV30 installed on an oscilloscope provides significant margin in EVM performance compared to what is required by the standard. Both Control PHY (802.11ad) and Single Carrier PHY (802.11ad and 802.11ay) are supported and provides analysis of 802.11ay 2.16 GHz packets or 4.23 GHz adjacent 2-channel bonded packets.

Testing and verification can be done on IF and RF setups. RF power, Received Power Indicator (RCPI), Frequency error (Max, Average, Std. Deviation), DC Offset, IQ DC origin offset, IQ Gain and Phase imbalance, Signal Quality, and estimated SNR measurements are

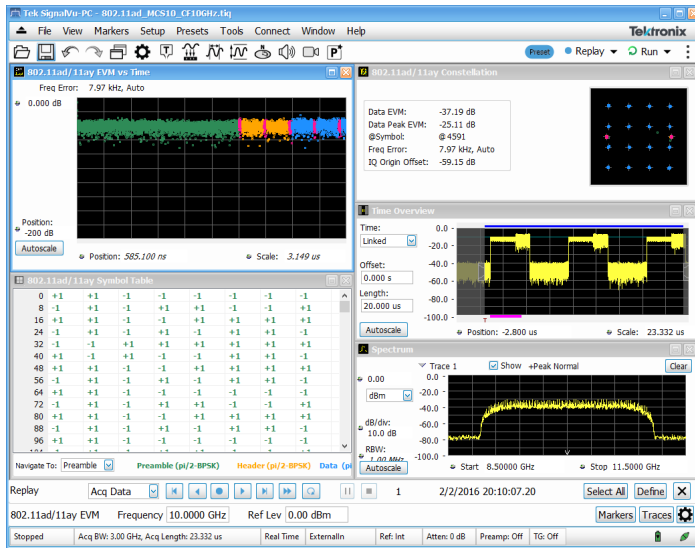
<sup>1</sup> Requires Windows 10 and has been qualified for use with Tektronix MSO68B, RSA5126B, RSA518A, and DPO70000SX models.

<sup>2</sup> PVT supports Uplink frame structure only.



reported in the Summary display. Pass/Fail results are reported using customizable limits and the presets make the test set-up push-button.

For further insight into the signal, color coding is available in the user interface, allowing you to visualize the EVM spread across the analyzed packet with color codes differentiating regions. You can also view the demodulated symbols in tabular form with different color codes and with an option to traverse to the start of each region for easier navigation.



WiGig IEEE802.11ad/ay transmitter testing (offline analysis)

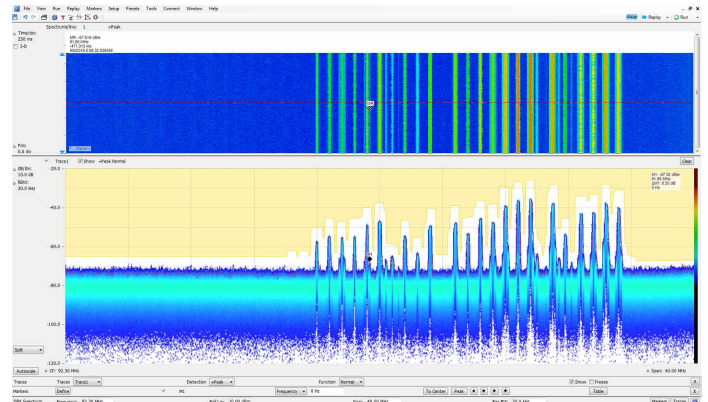
<p>Modulation formats</p>	<p><b>802.11ad:</b> MCS0-12.6  <b>802.11ay:</b> MCS1-21  <b>802.11ad/ay Single carrier:</b> <math>\pi/2</math> BPSK, <math>\pi/2</math> QPSK, <math>\pi/2</math> 16QAM, <math>\pi/2</math> 64QAM  <b>802.11ad Control PHY:</b> <math>\pi/2</math> DBPSK</p>
<p>Measurements</p>	<p>RF output power, Received Channel Power Indicator (RCPI), Estimated SNR, Frequency Error, Symbol Rate Error, IQ Origin Offset, IQ Phase Imbalance, IQ Gain Imbalance, IQ Quadrature Error, EVM results for each packet region (STF, CEF, Header and Data). Packet information includes the Packet type, Preamble, Synchronization Word or Access Code, Packet Header, Payload length, and CRC details.</p>

Table continued...

<p>Displays</p>	<p>Constellation, EVM vs Time, Symbol Table, Summary</p>
-----------------	--

### Playback of recorded files

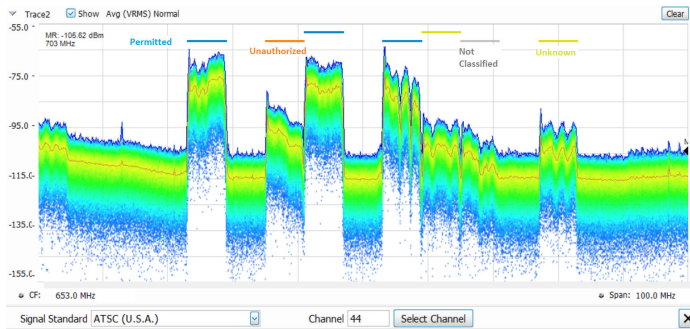
With SV56, playback of recorded files from one of the USB spectrum analyzers is possible. Playback of recorded signals can reduce hours of watching and waiting for a spectral violation to minutes at your desk reviewing recorded data. Recording length is limited only by storage media size and recording is a basic feature included in SignalVu-PC. SignalVu-PC SV56 Playback allows for complete analysis by all SignalVu-PC measurements, including DPX Spectrogram. Minimum signal duration specifications are maintained during playback. AM/FM audio demodulation can be performed. Variable span, resolution bandwidth, analysis length, and bandwidth are all available. Frequency mask testing can be performed on recorded signals up to 40 MHz in span, with actions on mask violation including beep, stop, save trace, save picture, and save data. Portions of the playback can be selected and looped for repeat examination of signals of interest. Playback can be gap-free, or time gaps can be inserted to reduce review time. A Live Rate playback ensures fidelity of AM/FM demodulation and provides a 1:1 playback vs. actual time. Clock time of the recording is displayed in the spectrogram markers for correlation to real world events. In the illustration below, the FM band is being replayed, with a mask applied to detect spectral violations, simultaneous with listening to the FM signal at the center frequency of 92.3 MHz.



### Signal survey

The signal classification application (SV54) enables expert systems guidance to aid the user in classifying signals. It provides graphical tools that allow you to quickly create a spectral region of interest, enabling you to classify and sort signals efficiently. The spectral profile mask, when overlaid on top of a trace, provides signal shape guidance, while frequency, bandwidth, channel number, and location are displayed allowing for quick checks. WLAN, GSM, W-CDMA, CDMA, Bluetooth standard and enhanced data rate, LTE FDD and TDD, and ATSC signals can be quickly and simply classified.

Databases can be imported from your H500/RSA2500 signal database library for easy transition to the new software base.



Above is a typical signal survey. This survey is of a portion of the TV broadcast band, and 7 regions have been declared as either Permitted, Unknown, or Unauthorized, as indicated by the color bars for each region.



In this illustration, a single region has been selected. Since we have declared this to be an ATSC video signal, the spectrum mask for the ATSC signal is shown overlaid in the region. The signal is a close match to the spectrum mask, including the vestigial carrier at the lower side of the signal, characteristic of ATSC broadcasts.

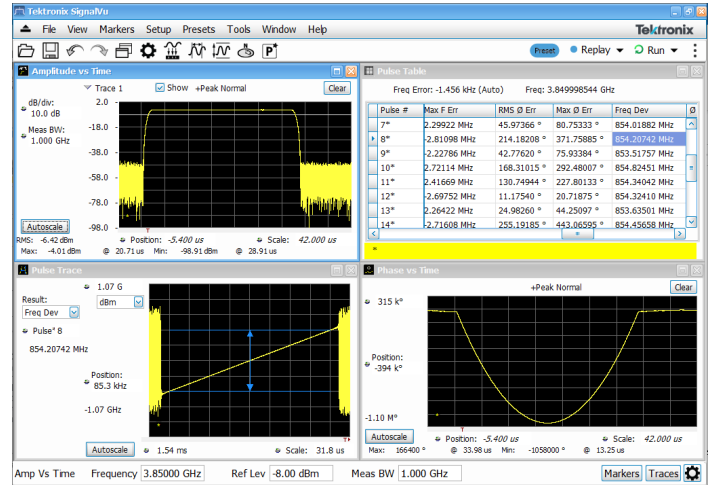
### Smart antenna for interference hunting

SignalVu-PC with mapping can be used to manually indicate the azimuth of a measurement made in the field, greatly aiding in triangulation efforts. The addition of a smart antenna able to report its direction to SignalVu-PC automates this process. Automatically plotting the azimuth/bearing of a measurement during interference hunting can greatly speed the time spent searching for the source of interference. Tektronix mapping capability provides support for the third-party **Alaris DF-A0047** handheld direction finding antenna with frequency coverage from 20 MHz -8.5 GHz (optional 9 kHz-20 MHz) as part of a complete interference hunting solution. All SignalVu-PC data streams include time-stamp information for effective data logging and coherent signal analysis applications. Full specifications for the DF-A0047 antenna are available at [www.alarisantennas.com/products/df-a0047-handheld-wideband-direction-finding-antenna/](http://www.alarisantennas.com/products/df-a0047-handheld-wideband-direction-finding-antenna/).

### Advanced Pulse analysis

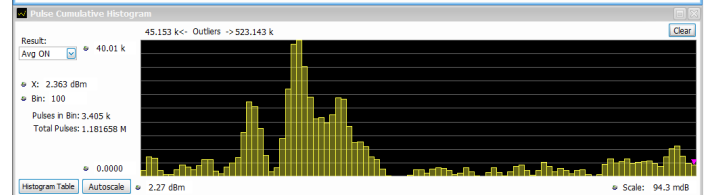
The Advanced Pulse Analysis package (SVP) provides 31 individual measurements to automatically characterize long pulse trains. An 850 MHz wide LFM chirp centered at 3.85 GHz is seen here with measurements for pulses 7 through 14 (top right). The shape of the pulse can be seen in the Amplitude vs. Time plot shown in the upper

left. Detailed views of pulse #8's frequency deviation and parabolic phase trajectory are shown in the lower two views.

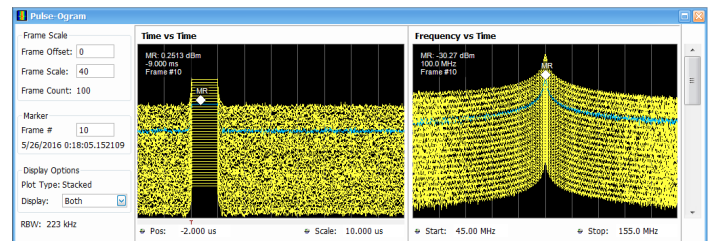


Pulse Cumulative Statistics Table

Statistics	Avg On	Width	Rep Int	P-P F Diff	Rise	Drop	Duty	F Abs	Peak	Rep Rate	Delta Freq
<b>Total Pulses</b>	<b>1181658</b>	<b>1181658</b>	<b>1181521</b>	<b>1181521</b>	<b>1181658</b>	<b>1181658</b>	<b>1181521</b>	<b>1181658</b>	<b>1181658</b>	<b>1181521</b>	<b>1181658</b>
Max	2.45 dBm	30.01176 us	1.77533 ms	20.36901 ...	1.01467 us	0.26321 %W	0.05374	1.01022 MHz	2.53 dBm	1.79071 kHz	9.99894
Max Time...	8/29/2016 ...	8/30/2016 ...	8/29/2016 ...	8/29/2016 ...	8/29/2016 ...	8/30/2016 ...	8/30/2016 ...	8/30/2016 ...	8/30/2016 ...	8/29/2016 ...	8/30/2016 ...
Min	2.23 dBm	29.99061 us	558.43807 us	-20.32668 ...	984.47219 ns	-0.27166 ...	0.01690	989.74842 ...	2.28 dBm	563.27563 ...	-10.001
Min Time...	8/30/2016 ...	8/30/2016 ...	8/29/2016 ...	8/29/2016 ...	8/30/2016 ...	8/30/2016 ...	8/30/2016 ...	8/29/2016 ...	8/30/2016 ...	8/30/2016 ...	8/29/2016 ...
Peak to Peak	0.22 dBm	21.15848 ns	1.21689 ms	40.69569 ...	30.20034 ns	0.53489 %W	0.03684	20.47200 ...	0.25 dBm	1.22743 kHz	-20.0005
Avg	2.34 dBm	29.99873 us	608.44426 us	51.40560 Hz	1.00143 us	-0.06549 ...	0.04964	999.97997 ...	2.39 dBm	1.65471 kHz	-1.3556
Std Dev	0.05 dBm	2.38950 us	50.00660 us	-30.04282 ...	3.80457 ns	-0.06423 %W	0.00408	-10.07349 ...	-0.05 dBm	1.265962 ...	-0.0002



Cumulative statistics provides timestamps for Min, Max values as well as Peak to Peak, Average and Standard deviation over multiple acquisitions, further extending the analysis. Histogram shows you outliers on the right and left.

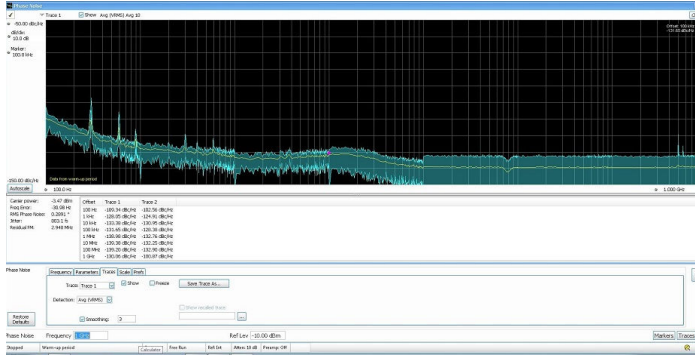


Pulse-Ogram displays a waterfall of multiple segmented captures, with correlated amplitude vs time and spectrum of each pulse. Can be used with an external trigger to show target range and speed.

### 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.

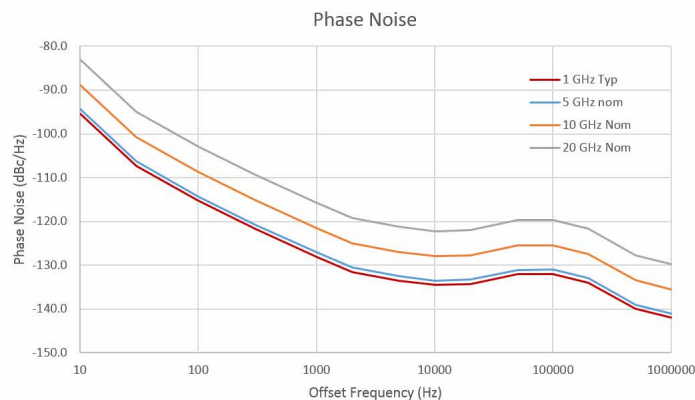
Shown below, the phase noise of a 1 GHz carrier is measured at -133 dBc/Hz at 10 kHz offset. Single-sideband phase noise is displayed in dBc/Hz versus offset frequencies from carrier, shown in trace or tabular form: one  $\pm$ Peak trace (in blue) and one average trace (in yellow). Trace smoothing and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



The RSA7100B'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 RSA7100B together with this measurement application allows for high-performance phase noise measurements at frequencies up to 26.5 GHz.



The previous figure shows the RSA7100B typical and nominal phase noise performance.

### Education license

Qualified educational facilities can cost-effectively use SignalVu-PC in teaching environments. The specially priced education version includes all available applications except the 5GNR analysis option and provides results watermarked 'Education Version'.

### Measurement functions

Spectrum analyzer measurements (base software)	Channel power, Adjacent channel power, Multicarrier adjacent channel Power/Leakage ratio, Occupied bandwidth, xdB down, Marker measurements of power, delta power, integrated power, power density, dBm/Hz, and dBc/Hz, Signal strength with audible feedback.
Time domain and statistical measurements (base software)	RF IQ vs time, Amplitude vs time, Power vs time, Frequency vs time, Phase vs time, CCDF, Peak-to-Average ratio, Amplitude, Frequency, and Phase modulation analysis.
Automated phase noise / jitter measurements (PHAS) (RSA7100 only)	Carrier power, Frequency error, RMS phase noise, Jitter, Residual FM.
WLAN 802.11a/b/g/j/p measurement application (SV23)	All of the RF transmitter measurements as defined in the IEEE standard, and a wide range of additional scalar measurements such as Carrier Frequency error, Symbol Timing error, Average/peak burst power, IQ Origin Offset, RMS/Peak EVM, and analysis displays, such as EVM and Phase/Magnitude Error vs time/frequency or vs symbols/ subcarriers, as well as packet header decoded information and symbol table. SV24 requires SV23. SV25 requires SV24.
WLAN 802.11n measurement application (SV24)	
WLAN 802.11ac measurement application (SV25)	
APCO P25 compliance testing and analysis application (SV26)	Complete set of push-button TIA-102 standard-based transmitter measurements with pass/fail results including ACPR, transmitter power and encoder attack times, transmitter throughput delay, frequency deviation, modulation fidelity, symbol rate accuracy, and transient frequency behavior, as well as HCPM transmitter logical channel peak ACPR, off slot power, power envelope, and time alignment.

Table continued...

Bluetooth Basic LE TX SIG measurements (SV27)	Presets for transmitter measurements defined by Bluetooth SIG for Basic Rate and Bluetooth Low Energy. Results also include Pass/Fail information. Application also provides Packet Header Field Decoding and can automatically detect the standard including Enhanced Data Rate.
Bluetooth 5 measurements (SV31)	Bluetooth SIG measurements for Bluetooth Low Energy version 5. Results also include Pass/Fail information. Application also provides Packet Header Field Decoding of LE Data Packets. SV31 requires SV27.
AM/FM/PM modulation and audio measurements (SVA)	Carrier power, frequency error, modulation frequency, modulation parameters ( $\pm$ peak, peak-peak/2, RMS), SINAD, modulation distortion, S/N, THD, TNHD, hum and noise.
Settling time (frequency and phase) (SVT)	Measured frequency, Settling time from last settled frequency, Settling time from last settled phase, Settling time from trigger. Automatic or manual reference frequency selection. User-adjustable measurement bandwidth, averaging, and smoothing. Pass/Fail mask testing with 3 user-settable zones.
Advanced Pulse analysis (SVP)	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.
Flexible OFDM analysis (SVO)	OFDM analysis with support for WLAN 802.11a/g/j and WiMAX 802.16-2004. Constellation, Scalar measurement summary, EVM or power vs carrier, Symbol table (Binary or Hexadecimal).
General purpose digital modulation analysis	Error vector magnitude (EVM) (RMS, Peak, EVM vs Time), Modulation error ratio (MER), Magnitude Error (RMS, peak, mag error)

Table continued...

(SVM)	vs time), Phase error (RMS, Peak, Phase error vs time), Origin offset, Frequency error, Gain imbalance, Quadrature error, Rho, Constellation, Symbol table.  FSK only: Frequency deviation, Symbol timing error.
Playback of recorded files (SV56)	Playback of files recorded with one of the USB spectrum analyzers (RSA306, RSA500, or RSA600). Controls for file selection, begin/end points. Rate controls for gap-free or live-rate playback.
LTE Downlink RF measurements (SV28)	Presets for Cell ID, ACLR, SEM, Channel Power and TDD Toff Power. Supports TDD and FDD frame format and all base stations defined by 3GPP TS version 12.5. Results include Pass/Fail information. Real-Time settings make the ACLR and the SEM measurements fast, if the connected instrument has required bandwidth.
5G NR Measurements (5GNRNL-SVPC)	Presets for Channel Power (CHP), Adjacent Channel Power (ACP), Power Vs Time (PVT) <sup>2</sup> , Modulation Accuracy (including Error Vector Magnitude (EVM), Frequency Error, IQ Error), EVM vs. Symbol, Occupied Bandwidth (OBW), Spectral Emission Mask (SEM), Constellation Diagram, and summary table with scalar results.
WiGig IEEE 802.11ad/ay (SV30)  (For offline analysis only. Real-time 60 GHz measurements can be made with Opt. SV30 on DPO70000SX Series oscilloscopes.)	Presets for Control PHY (802.11ad) and Single Carrier PHY (802.11ad and 802.11ay). The 802.11ay analysis results are shown for the EDMG, PreEDMG1, and PreEDMG2 regions. The 802.11ad preset measures EVM in each of the packet fields per the standard, and decodes the header packet information. RF power, Received Channel Power Indicator, Frequency error, IQ DC origin offset, IQ Gain and Phase imbalance are reported in the Summary display. Pass/Fail results are reported using customizable limits.
CISPR Detectors (Quasi Peak and Average) (SVQP)	This option enables CISPR Quasi Peak and Average detectors (defined per CISPR16) in Spectrum and Spurious displays.

Table continued...

EMC/EMI pre-compliance and troubleshooting (EMCVU)	This option supports many predefined limit lines. It also adds a wizard for easy setup of recommended antennas, LISN, and other EMC accessories with a one-button push. When using the new EMC-EMI display, you can accelerate the test by applying the
--	---

time consuming quasi peak only on failures. This display also provides a push-button ambient measurement. The Inspect tool lets you measure frequencies of interest locally, removing the need for scanning.
--

## Specifications

### Performance (typical)

The following is typical performance of SignalVu-PC analyzing acquisitions from any DPO70000SX or DPO/DSA/MSO70000 Series oscilloscopes. Vector modulation analysis is provided for the MDO4000B/C spectrum analyzer acquisitions. All other MDO spectrum analysis specifications are available in the MDO4000 Series datasheet. Performance for SignalVu-PC when used with the RSA7100 real-time spectrum analyzer and the RSA306, RSA500, RSA600 USB real time spectrum analyzers are shown respectively in the RSA7100, RSA306, RSA500, and RSA600 datasheets.

#### Frequency-related

<b>Frequency range</b>	See appropriate instrument data sheet
<b>Initial center frequency setting accuracy</b>	Equal to time-base accuracy of instrument
<b>Center frequency setting resolution</b>	0.1 Hz
<b>Frequency offset range</b>	0 Hz to the maximum bandwidth of the oscilloscope
<b>Frequency marker readout accuracy</b>	$\pm(\text{Reference Frequency Error} \times \text{Marker Frequency} + 0.001 \times \text{Span} + 2)$ Hz
<b>Span accuracy</b>	$\pm 0.3\%$
<b>Reference frequency error</b>	Equal to oscilloscope reference frequency accuracy, aging, and drift. Refer to appropriate DPO/DSA/MSO data sheet.
<b>Tuning Tables</b>	Tables that present frequency selection in the form of standards-based channels are available for the following. Cellular standards families: AMPS, NADC, NMT-450, PDC, GSM, CDMA, CDMA-2000, 1xEV-DO WCDMA, TD-SCDMA, LTE, 5G NR, WiMax Unlicensed short range: 802.11a/b/j/g/p/n/ac, Bluetooth Cordless phone: DECT, PHS Broadcast: AM, FM, ATSC, DVBT/H, NTSC Mobile radio, pagers, other: GMRS/FRS, iDEN, FLEX, P25, PWT, SMR, WiMax

#### Analysis-related

<b>Frequency (base software)</b>	Spectrum (amplitude vs linear or log frequency) Spectrogram (amplitude vs frequency over time)
<b>Time and statistics (base software)</b>	Amplitude vs time Frequency vs time Phase vs time Amplitude modulation vs time Frequency modulation vs time Phase modulation vs time RF IQ vs time

	Time overview
	CCDF
	Peak-to-Average ratio
<b>Settling time, frequency, and phase (SVT)</b>	Frequency settling vs time
	Phase settling vs time
<b>Advanced Pulse measurements suite (SVP)</b>	Pulse results table
	Pulse trace (selectable by pulse number)
	Pulse statistics (trend of pulse results, FFT of time trend, and histogram)
	Cumulative statistics
	Cumulative histogram
	Pulse-Ogram
<b>Digital demod (SVM)</b>	Constellation diagram
	EVM vs Time
	Symbol table (binary or hexadecimal)
	Magnitude and phase error vs time, and signal quality
	Demodulated IQ vs time
	Eye diagram
	Trellis diagram
	Frequency deviation vs time
<b>Flexible OFDM (SVO)</b>	EVM vs Symbol, vs Subcarrier
	Subcarrier power vs symbol, vs subcarrier
	Subcarrier constellation
	Symbol data table
	Mag error vs Symbol, vs Subcarrier
	Phase error vs Symbol, vs Subcarrier
	Channel frequency response
<b>Automated phase noise and jitter measurements (PHAS)</b>	Carrier power
	Frequency error
	RMS phase noise
	Jitter
	Residual FM
<b>WLAN measurements (SV23, SV24, SV25 or SV2C)</b>	Burst index
	Burst power
	Peak to average burst power
	IQ origin offset
	Frequency error
	Common pilot error
	Symbol clock error
	RMS and Peak EVM for Pilots/Data
	Peak EVM located per symbol and subcarrier
	Packet header format information
	Average power and RMS EVM per section of the header
	WLAN power vs Time or vs Symbol
	Burst Width
	WLAN symbol table
	WLAN Constellation
	Spectrum emission mask
	Spurious

	EVM vs symbol (or time), vs subcarrier (or frequency)
	Mag error vs symbol (or time), vs subcarrier (or frequency)
	Phase error vs symbol (or time), vs subcarrier (or frequency)
	WLAN channel frequency response vs symbol (or time), vs subcarrier (or frequency)
	WLAN spectral flatness vs symbol (or time), vs subcarrier (or frequency)
<b>APCO P25 measurement application (SV26)</b>	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
<b>Bluetooth Basic LE Tx (SV27) and Bluetooth 5 (SV31) Measurements</b>	Peak Power, Average Power, Adjacent Channel Power or InBand Emission mask, -20dB Bandwidth, Frequency Error, Modulation Characteristics including $\Delta F1_{avg}$ (11110000), $\Delta F2_{avg}$ (10101010), $\Delta F2 > 115$ kHz, $\Delta F2/\Delta F1$ ratio, frequency deviation vs. time with packet and octet level measurement information, Carrier Frequency $f_0$ , 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, editable limits
<b>LTE Downlink RF measurements (SV28)</b>	Adjacent Channel Leakage Ratio (ACLR), Spectrum Emission Mask (SEM), Channel Power, Occupied Bandwidth, Power vs. Time displaying Transmitter OFF power for TDD signals and LTE constellation diagram for PSS, SSS with Cell ID, Group ID, Sector ID, Reference Signal (RS) Power, and Frequency Error.
<b>5G NR Uplink/Downlink measurements (5GNRNL-SVPC)</b>	Channel Power (CHP), Adjacent Channel Power (ACP), Power Vs Time (PVT) <sup>2</sup> , Modulation Accuracy (including Error Vector Magnitude (EVM), Frequency Error, IQ Error), EVM vs. Symbol, Occupied Bandwidth (OBW), Spectral Emission Mask (SEM), Constellation Diagram, and summary table with scalar results.
<b>WiGig 802.11ad/ay Measurements (SV30) (Offline analysis)</b>	RF output power, Received Channel Power Indicator (RCPI), Estimated SNR, Frequency Error, Symbol Rate Error, IQ Origin Offset, IQ Gain Imbalance, IQ Phase Imbalance, IQ Quadrature Error, EVM results for each packet region: Packet information, 802.11ad (STF, CEF, Header, Guard, and Data), 802.11ay (LSTF, LCEF, L Header, EDMG Header-A, EDMG STF, EDMG CEF Guard and Data) including the Packet type, Preamble, Synchronization Word or Access Code, Packet Header, Payload length, and CRC details.

## Signal strength

### Signal Strength display

<b>Signal strength indicator</b>	Located at right side of display
<b>Measurement bandwidth</b>	Up to 40 MHz, dependent on span and RBW setting
<b>Tone type</b>	Variable frequency based on received signal strength

## AM/FM/PM modulation and audio measurements (SVA)

All published performance based on conditions of Input Signal: 0 dBm, Input Frequency: 100 MHz, RBW: Auto, Averaging: Off, Filters: Off. Sampling and input parameters optimized for best results.

<b>Carrier frequency range<sup>3</sup></b>	1 kHz or (1/2 × audio analysis bandwidth) to maximum input frequency
<b>Maximum audio frequency span</b>	10 MHz

### Audio filters

<b>Low pass (kHz)</b>	0.3, 3, 15, 30, 80, 300, and user-entered up to $0.9 \times$ audio bandwidth
-----------------------	--

<sup>3</sup> Sampling rates of the oscilloscope are recommended to be adjusted to no more than 10X the audio carrier frequency for modulated signals, and 10X the audio analysis bandwidth for direct input audio. This reduces the length of acquisition required for narrow-band audio analysis.

<b>High pass (Hz)</b>	20, 50, 300, 400, and user-entered up to $0.9 \times$ audio bandwidth
<b>Standard</b>	CCITT, C-Message
<b>De-emphasis (<math>\mu</math>s)</b>	25, 50, 75, 750, and user-entered
<b>File</b>	User-supplied .TXT or .CSV file of amplitude/frequency pairs. Maximum 1000 pairs.

---

**FM modulation analysis**

<b>FM measurements,</b>	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
<b>FM deviation accuracy</b>	$\pm 1.5\%$ of deviation
<b>FM rate accuracy</b>	$\pm 1.0$ Hz
<b>Carrier frequency accuracy</b>	$\pm 1$ Hz + (transmitter frequency $\times$ reference frequency error)

---

**Residuals (FM) (rate: 1 kHz to 10 kHz, deviation: 5 kHz)**

<b>THD</b>	0.2% (MSO/DPO70000) 1.0% (MDO4000B Series)
<b>SINAD</b>	44 dB (MSO/DPO70000) 38 dB (MDO4000B Series)

---

**AM modulation analysis**

<b>AM measurements</b>	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
<b>AM depth accuracy (rate: 1 kHz, depth: 50%)</b>	$\pm 1\% + 0.01 \times$ measured value
<b>AM rate accuracy (rate: 1 kHz, depth: 50%)</b>	$\pm 1.0$ Hz

---

**Residuals (AM)**

<b>THD</b>	0.3% (MSO/DPO70000) 1.0% (MDO4000B Series)
<b>SINAD</b>	48 dB (MSO/DPO70000) 43 dB (MDO4000B Series)

---

**PM modulation analysis**

<b>PM measurement</b>	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
<b>PM deviation accuracy (rate: 1 kHz, deviation: 0.628 rad)</b>	$\pm 100\% \times (0.01 + (\text{rate} / 1 \text{ MHz}))$



PM rate accuracy  $\pm 1$  Hz  
(rate: 1 kHz,  
deviation: 0.628 rad)

---

**Residuals (PM)**

THD 0.1% (MSO/DPO70000)  
0.5% (MDO4000B Series)

SINAD 48 dB (MSO/DPO70000)  
43 dB (MDO4000B Series)

---

**Direct audio input**

**Audio measurements** Signal power, audio frequency (+peak, -peak, peak-peak/2, RMS), SINAD, modulation distortion, S/N, total harmonic distortion, total non-harmonic distortion, hum and noise

**Direct input frequency range (for audio measurements only)** 1 Hz to 10 MHz

**Maximum audio frequency span** 10 MHz

**Audio frequency accuracy**  $\pm 1$  Hz

---

**Residuals (PM)**

THD 1.5%

SINAD 38 dB

---

**Minimum audio analysis bandwidth and RBW vs. oscilloscope memory and sample rate (SVA)**

Model	Sample rate: 1 GS/s				Sample rate: maximum			
	Standard memory		Maximum memory		Standard memory		Maximum memory	
	Min. Aud. BW	RBW (Auto)	Min. Aud. BW	RBW (Auto)	Min. Aud. BW	RBW (Auto)	Min. Aud. BW	RBW (Auto)
DPO/DSA/ MSO 70000 $\geq 12.5$ GHz BW	200 kHz	400 Hz	10 kHz	20 Hz	Not recommended	>4 kHz	1 MHz	2 kHz
DPO/DSA/ MSO 70000 <12.5 GHz BW	200 kHz	400 Hz	20 kHz	40 Hz	Not recommended	>4 kHz	500 kHz	1 kHz

---

**Minimum audio analysis bandwidth for MDO4000B RF input** 7.8 kHz

**Minimum audio analysis RBW for MDO4000B RF input**  $\geq 15$  Hz (Span set to minimum 1 kHz)

---

## Settling time, frequency, and phase (SVT)

### Settled frequency uncertainty<sup>4</sup>

Measurement  
frequency: 1 GHz

Averages	Frequency uncertainty at stated measurement bandwidth			
	1 GHz	100 MHz	10 MHz	1 MHz
Single measurement	20 kHz	2 kHz	500 Hz	100 Hz
100 averages	10 kHz	500 Hz	200 Hz	50 Hz
1000 averages	2 kHz	200 Hz	50 Hz	10 Hz

Measurement  
frequency: 9 GHz

Averages	Frequency uncertainty at stated measurement bandwidth			
	1 GHz	100 MHz	10 MHz	1 MHz
Single Measurement	20 kHz	5 kHz	2 kHz	200 Hz
100 Averages	10 kHz	2 kHz	500 Hz	50 Hz
1000 Averages	2 kHz	500 Hz	200 Hz	20 Hz

### Settled phase uncertainty<sup>4</sup>

Measurement  
frequency: 1 GHz

Averages	Phase uncertainty at stated measurement bandwidth			
	1 GHz	100 MHz	10 MHz	1 MHz
Single measurement	2°	2°	2°	2°
100 averages	0.5°	0.5°	0.5°	0.5°
1000 averages	0.2°	0.2°	0.2°	0.2°

Measurement  
frequency: 9 GHz

Averages	Phase uncertainty at stated measurement bandwidth			
	1 GHz	100 MHz	10 MHz	1 MHz
Single measurement	5°	5°	5°	5°
100 averages	2°	2°	2°	2°
1000 averages	0.5°	0.5°	0.5°	0.5°

## Advanced Pulse measurement suite (SVP)

### General characteristics

#### Measurements

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.

#### System rise time (typical)

Equal to oscilloscope rise time

<sup>4</sup> Settled Frequency or Phase at the measurement frequency. Measured signal level > -20 dBm, Attenuator: Auto.

**Minimum pulse width for detection**<sup>5</sup>

Model	Minimum PW
MDO4000B	≥5 ns
MSO54	300 ps
MSO56	300 ps
MSO58	300 ps
MSO64B	300 ps
MSO66B	300 ps
MSO68B	300 ps

**Pulse measurement accuracy (typical)**<sup>6</sup>

<b>Average on power</b>	±0.3 dB + Absolute Amplitude Accuracy of instrument
<b>Average transmitted power</b>	±0.4 dB + Absolute Amplitude Accuracy of instrument
<b>Peak power</b>	±0.4 dB + Absolute Amplitude Accuracy of instrument
<b>Pulse width</b>	±(3% of reading + 0.5 × sample period)
<b>Pulse repetition rate</b>	±(3% of reading + 0.5 × sample period)

**Digital modulation analysis (SVM)**

**Modulation formats**  $\pi/2$ DQPSK, BPSK, SBPSK, QPSK, DQPSK,  $\pi/4$ DQPSK, 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

**Analysis period** Up to 80,000 samples

**Measurement filters** Square-root raised cosine, raised cosine, Gaussian, rectangular, IS-95, IS-95 EQ, C4FM-P25, half-sine, None, User Defined

**Reference filters** Raised cosine, Gaussian, rectangular, IS-95, SBPSK-MIL, SOQPSK-MIL, SOQPSK-ARTM, None, User Defined

**Alpha/B x T range** 0.001 to 1, 0.001 step

**Measurements** Constellation, Error Vector Magnitude (EVM) vs time, Modulation error ratio (MER), Magnitude error vs time, Phase error vs time, Signal quality, Symbol table  
rhoFSK only: Frequency deviation, Symbol timing error

**Symbol rate range** 1 kS/s to (0.4 \* Sample Rate) GS/s (modulated signal must be contained entirely within the acquisition bandwidth)

**Adaptive equalizer**

<sup>5</sup> Conditions: Approximately equal to 10/(IQ sampling rate). IQ sampling rate is the final sample rate after frequency domain processing from the oscilloscope. Pulse measurement filter set to max bandwidth.

<sup>6</sup> Conditions: Pulse Width > 450 ns, S/N Ratio ≥30 dB, Duty Cycle 0.5 to 0.001, Temperature 18 °C to 28 °C.

<b>Type</b>	Linear, decision-directed, feed-forward (FIR) equalizer with coefficient adaptation and adjustable convergence rate
<b>Modulation types supported</b>	$\pi/2$ DBPSK, BPSK, SBPSK, QPSK, DQPSK, $\pi/4$ DQPSK, D8PSK, 8PSK, D16PSK, OQPSK, SOQPSK, CPM, 16/32/64/128/256QAM, MSK, 2-FSK, 4-FSK, 8-FSK, 16-FSK, C4FM
<b>Reference filters for all modulation types except OQPSK</b>	Raised Cosine, Rectangular, None
<b>Reference filters for OQPSK</b>	Raised Cosine, Half Sine
<b>Filter length</b>	1-128 taps
<b>Taps/symbol: raised cosine, half sine, no filter</b>	1, 2, 4, 8
<b>Taps/symbol: rectangular filter</b>	1
<b>Equalizer controls</b>	Off, Train, Hold, Reset

**16QAM Residual EVM (typical) for DPO/DSA/MSO70000 series <sup>7</sup>**

Symbol Rate	RF	IQ
100 MS/s	<2.0%	<2.0%
312.5 MS/s	<3.0%	<3.0%

**OFDM residual EVM, 802.11g Signal at 2.4 GHz, input level optimized for best performance**

DPO/DSA/MSO70000 Series -38 dB

**QPSK Residual EVM (typical) for MDO4000B RF Input <sup>8</sup>**

Single Carrier, measured at 1 GHz

<b>0.1 MSymbols/sec rate</b>	0.26%
<b>10 MSymbols/sec rate</b>	0.28 %
<b>100 MSymbols/sec rate</b>	1.0 %
<b>312.5 MSymbols/sec rate</b>	3.0 %

**WLAN IEEE802.11a/b/g/j/p (SV23)**
**General characteristics**

<b>Modulation formats</b>	DBPSK (DSSS1M), DQPSK (DSSS2M), CCK5.5M, CCK11M , OFDM (BPSK, QPSK, 16 or 64QAM)
<b>Measurements and displays</b>	Burst Index, Burst Power, Peak to Average Burst Power, IQ Origin Offset, Frequency Error, Common Pilot Error, Symbol Clock Error RMS and Peak EVM for Pilots/Data, Peak EVM located per Symbol and Subcarrier Packet Header Format Information Average Power and RMS EVM per section of the header

<sup>7</sup> CF = 1 GHz, Measurement Filter = root raised cosine, Reference Filter = raised cosine, Analysis Length = 200 symbols.

WLAN Power vs Time, WLAN Symbol Table, WLAN Constellation  
 Spectrum Emission Mask<sup>9</sup>, Spurious  
 Error Vector Magnitude (EVM) vs Symbol (or Time), vs Subcarrier (or Frequency)  
 Mag Error vs Symbol (or Time), vs Subcarrier (or Frequency)  
 Phase Error vs Symbol (or Time), vs Subcarrier (or Frequency)  
 WLAN Channel Frequency Response vs Symbol (or Time), vs Subcarrier (or Frequency)  
 WLAN Spectral Flatness vs Symbol (or Time), vs Subcarrier (or Frequency)

**Typical residual EVM - 802.11b (CCK-11Mbps) with MDO4000B<sup>10</sup>** RMS-EVM over 1000 chips, EQ On  
 1.04% (2.4 GHz)

**Typical residual EVM - 802.11a/g/j (OFDM, 20 MHz, 64-QAM), with MDO4000B<sup>10</sup>** -44 dB (2.4 GHz)  
 -43 dB (5.8 GHz)  
 (RMS-EVM averaged over 20 bursts, 16 symbols each)

---

## WLAN IEEE802.11n (SV24)

### General characteristics

**Modulation formats** SISO, OFDM (BPSK, QPSK, 16 or 64QAM)

**Measurements and displays** Burst Index, Burst Power, Peak to Average Burst Power, IQ Origin Offset, Frequency Error, Common Pilot Error, Symbol Clock Error  
 RMS and Peak EVM for Pilots/Data, Peak EVM located per Symbol and Subcarrier  
 Packet Header Format Information  
 Average Power and RMS EVM per section of the header  
 WLAN Power vs Time, WLAN Symbol Table, WLAN Constellation  
 Spectrum Emission Mask<sup>9</sup>, Spurious  
 Error Vector Magnitude (EVM) vs Symbol (or Time), vs Subcarrier (or Frequency)  
 Mag Error vs Symbol (or Time), vs Subcarrier (or Frequency)  
 Phase Error vs Symbol (or Time), vs Subcarrier (or Frequency)  
 WLAN Channel Frequency Response vs Symbol (or Time), vs Subcarrier (or Frequency)  
 WLAN Spectral Flatness vs Symbol (or Time), vs Subcarrier (or Frequency)

**Typical residual EVM - 802.11n (40 MHz QAM) with MDO4000B<sup>10</sup>** -41 dB typical (5.8 GHz)  
 -42 dB (2.4 GHz)  
 (RMS-EVM averaged over 20 bursts, 16 symbols each)

---

## WLAN IEEE802.11ac (SV25)

### General characteristics

**Modulation formats** SISO, OFDM (BPSK, QPSK, 16/64/256/1024QAM)

**Measurements and displays** Burst Index, Burst Power, Peak to Average Burst Power, IQ Origin Offset, Frequency Error, Common Pilot Error, Symbol Clock Error,  
 RMS and Peak EVM for Pilots/Data, Peak EVM located per Symbol and Subcarrier  
 Packet Header Format Information

<sup>8</sup> Measurement filter = root raised cosine, reference filter = raised cosine, analysis Length = 400 symbols, 20 averages

<sup>9</sup> SEM is specified with noise reduction and at least 30 averages for 802.11a/n/ac signals in 5 GHz band. Residual noise performance of the instrument may exceed SEM mask at frequency above 5.85 GHz

Average Power and RMS EVM per section of the header  
 WLAN Power vs Time, WLAN Symbol Table, WLAN Constellation  
 Spectrum Emission Mask<sup>9</sup>, Spurious  
 Error Vector Magnitude (EVM) vs Symbol (or Time), vs Subcarrier (or Frequency)  
 Mag Error vs Symbol (or Time), vs Subcarrier (or Frequency)  
 Phase Error vs Symbol (or Time), vs Subcarrier (or Frequency)  
 WLAN Channel Frequency Response vs Symbol (or Time), vs Subcarrier (or Frequency)  
 WLAN Spectral Flatness vs Symbol (or Time), vs Subcarrier (or Frequency)

**Typical residual EVM - 802.11ac (160 MHz 256-QAM) with MDO4000B<sup>10</sup>** -37.3 dB (5.8 GHz), RMS-EVM averaged over 20 bursts, 16 symbols each

---

## APCO P25 (SV26)

**Modulation formats** Phase 1 (C4FM), Phase 2 (HCPM, HDQPSK)

**Measurements and displays** 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

---

### Residual modulation fidelity (with MDO4000B, 5/6 Series MSO, USB RF, RSA7100)

<b>Phase 1 (C4FM)</b>	≤1.0% typical
<b>Phase 2 (HCPM)</b>	≤0.5% typical
<b>Phase 2 (HDQPSK)</b>	≤0.5% typical

---

### Adjacent channel power ratio

<b>25 kHz offset from the center and bandwidth of 6 kHz<sup>11</sup></b>	Phase 1 (C4FM): -76 dBc typical
	Phase 2 (HCPM): -74 dBc typical
	Phase 2 (HDQPSK): -74 dBc typical

<sup>10</sup> Signal input power optimized for best EVM

<sup>11</sup> Measured with test signal amplitude adjusted for optimum performance if necessary. Measured with Averaging, 10 waveforms.

62.5 kHz offset from the center and bandwidth of 6 kHz	Phase 1 (C4FM): -77 dBc typical
	Phase 2 (HCPM): -78 dBc typical
	Phase 2 (HDQPSK): -76 dBc typical

## LTE Downlink RF measurements (SV28)

**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 PSS, SSS with Cell ID, Group ID, Sector ID, Frequency Error, and Reference Signal (RS) Power.

### ACLR with E-UTRA bands (Typical Mean, with Noise Correction)

<b>1st Adjacent Channel</b>	60 dB (MDO4000B); 61 dB (RSA600/RSA500); 65 dB (RSA306/B)
<b>2nd Adjacent Channel</b>	65 dB (MDO4000B); 63 dB (RSA600/RSA500); 66 dB (RSA306/B)

## 5G NR Uplink/Downlink measurements (5GNRNL-SVPC)

**Standard supported** TS 38.141-1 for BS and 38.521-1 for UE

**Modulation accuracy** Sec 6.5.2 for BS and Sec 6.4.2 for UE.

**ACP** Sec 6.6.3 for BS and Sec 6.5.2.4 for UE

**Frame format supported** Uplink (FDD and TDD)  
Downlink (FDD and TDD)

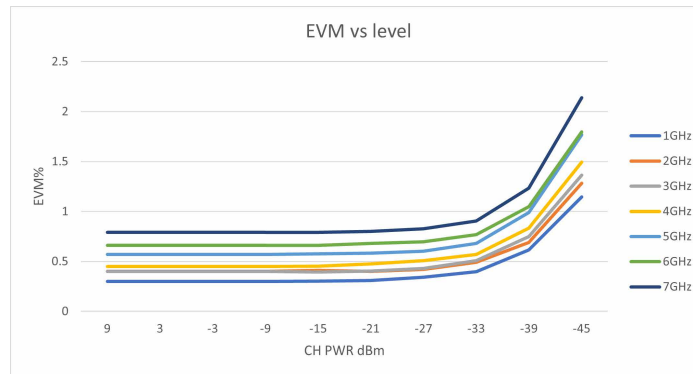
**Measurements and displays supported** Channel Power (CHP), Adjacent Channel Power (ACP), Power Vs Time (PVT)<sup>2</sup>, Modulation Accuracy (including Error Vector Magnitude (EVM), Frequency Error, IQ Error), EVM vs. Symbol, Occupied Bandwidth (OBW), Spectral Emission Mask (SEM), Constellation Diagram, and summary table with scalar results.

Measurements	Frequency (GHz)	MSO68B	DPO77002SX	RSA5126B	RSA518A
		100 MHz Bandwidth 1CC 256QAM UL 30 kHz			20 MHz Bandwidth 1CC 256QAM UL 30 kHz
<b>ACLR</b>	<7 GHz	-48 dBc	-48 dBc	≤48 dBc	≤48 dBc

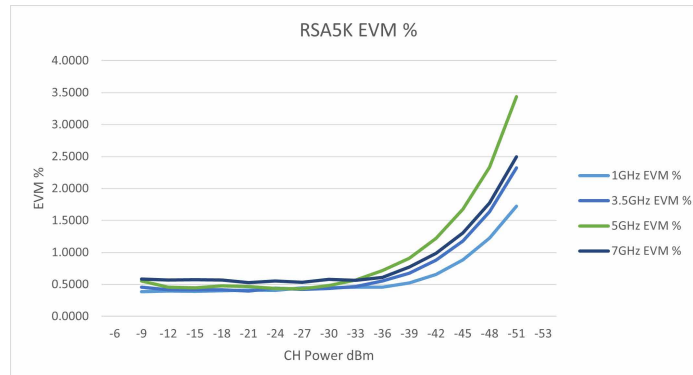
Table continued...

Measurements	Frequency (GHz)	MSO68B	DPO77002SX	RSA5126B	RSA518A
EVM (typical)	1 GHz	0.31%	0.50%	0.40%	0.78%
	2 GHz	0.40%	0.50%	-	0.93%
	3 GHz	0.40%	0.70%	-	-
	3.5 GHz	-	0.70%	0.41%	1.04%
	4 GHz	0.48%	0.70%	-	-
	5 GHz	0.59%	0.70%	0.46%	0.87%
	6 GHz	0.68%	0.90%	-	1.01%
	7 GHz	0.80%	0.90%	0.53%	1.05%

For 6 Series B MSO

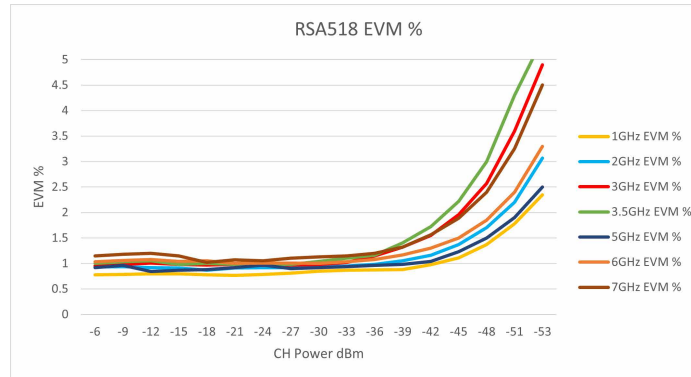


For RSA5100B Series Spectrum Analyzers:  $\leq 44.4$  dBc rms EVM from 1 GHz to 7 GHz



For RSA518 Series Spectrum Analyzers:  $\leq 39.2$  dBc rms EVM from 1 GHz to 7 GHz





**Channel power accuracy**  $\pm 1$  dB,  $\pm 0.4$  dB typical

## Bluetooth (SV27 and SV31)

**Modulation formats** Bluetooth® 4.2 Basic Rate, Bluetooth® 4.2 Low Energy, Bluetooth® 4.2 Enhanced Data Rate. Bluetooth® 5 when SV31 is enabled.

**Measurements and displays** Peak Power, Average Power, Adjacent Channel Power or InBand Emission mask, -20 dB Bandwidth, Frequency Error, Modulation Characteristics including  $\Delta F_{1avg}$  (11110000),  $\Delta F_{2avg}$  (10101010),  $\Delta F_2 > 115$  kHz,  $\Delta F_2/\Delta F_1$  ratio, frequency deviation vs. time with packet and octet level measurement information, Carrier Frequency  $f_0$ , 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.

## Output power (Average and Peak Power)

**Level uncertainty** Refer to instrument amplitude and flatness specification  
**Measurement range** Signal level  $> -70$  dBm (for USB Spectrum Analyzers) and  $-60$  dBm (for MDO4000B)

## Modulation Characteristics ( $\Delta F_{1avg}$ , $\Delta F_{2avg}$ , $\Delta F_{2avg}/\Delta F_{1avg}$ , $\Delta F_{2max} \geq 115$ kHz)

**Deviation range**  $\pm 280$  kHz  
**Deviation uncertainty**  $< 2$  kHz + instrument frequency uncertainty (Basic Rate)  
**(at 0 dBm)**  $< 3$  kHz + instrument frequency uncertainty (for USB spectrum analyzers and Low Energy)  
 $< 4$  kHz + MDO4000B frequency uncertainty (for MDO4000B and Low Energy)  
**Measurement resolution** 10 Hz  
**Measurement range** Nominal channel frequency  $\pm 100$  kHz

## Initial Carrier Frequency Tolerance (ICFT)

**Measurement uncertainty (at 0 dBm)**  $< 1$  kHz + instrument frequency uncertainty (for USB Spectrum Analyzers)  
 $< 1.5$  kHz + MDO4000B frequency uncertainty (for MDO4000B)  
**Measurement resolution** 10 Hz

**Measurement range** Nominal channel frequency  $\pm 100$  kHz

---

**Carrier Frequency Drift (Max freq. offset, drift  $f_1 - f_0$ , max drift  $f_n - f_0$ , max drift  $f_n - f_{n-5}$  (50  $\mu$ s))**

**Measurement uncertainty** < 2 kHz + instrument frequency uncertainty (for RSA306 and MDO4000B)

< 1 kHz + instrument frequency uncertainty (for RSA600 and RSA500)

**Measurement resolution** 10 Hz

**Measurement range** Nominal channel frequency  $\pm 100$  kHz

---

**In-band Emissions and ACP**

**Level uncertainty** Refer to instrument amplitude and flatness specification

---

**Phase noise and jitter measurements (PHAS)**

**Carrier frequency range** 1 MHz to maximum instrument frequency

**Measurements** Carrier power, Frequency error, RMS phase noise, Jitter (time interval error), Residual FM

**Residual Phase Noise** See instrument phase noise specifications.

**Phase noise and jitter integration bandwidth range** Minimum offset from carrier: 10 Hz

Maximum offset from carrier: 1 GHz

**Number of traces** 2

**Trace and measurement functions** Detection: average or  $\pm$ Peak

Smoothing Averaging Optimization: speed or dynamic range

---

**Mapping (MAP)**

**Map types directly supported** 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

---

**WiGig 802.11ad/ay (SV30) measurements (Offline analysis only)**

<b>WiGig 802.11ad/ay (SV30)</b>	(For offline analysis only. For online analysis, 60 GHz measurements can be made with Opt. SV30 on DPO70000SX Series oscilloscopes.)
<b>Measurements</b>	RF output power, Received Channel Power Indicator (RCPI), Estimated SNR, Frequency Error, Symbol Rate Error, IQ Origin Offset, IQ Gain Imbalance, IQ Phase Imbalance, IQ Quadrature Error, EVM results for each packet region: Packet information, 802.11ad (STF, CEF, Header, Guard, and Data), 802.11ay (LSTF, LCEF, L Header, EDMG Header-A, EDMG STF, EDMG CEF Guard and Data include the Packet type, Preamble, Synchronization Word or Access Code, Packet Header, Payload length, and CRC details.

---

## Playback of recorded signals (SV56)

<b>Playback file type</b>	R3F recorded by RSA306, RSA500, or RSA600
<b>Recorded file bandwidth</b>	40 MHz
<b>File playback controls</b>	General: Play, stop, exit playback Location: Begin/end points of playback settable from 0-100% Skip: Defined skip size from 73 $\mu$ s up to 99% of file size Live rate: Plays back at 1:1 rate to recording time Loop control: Play once, or loop continuously
<b>Memory requirement</b>	Recording of signals requires storage with write rates of 300 MB/sec. Playback of recorded files at live rates requires storage with read rates of 300 MB/sec.

---

## EMC pre-compliance and troubleshooting (EMCVU)

<b>Standards</b>	EN55011, EN55012, EN55013, EN55014, EN55015, EN55025, EN55032, EN60601, DEF STAN, FCC Part 15, FCC Part18, MIL-STD 461G
<b>Features</b>	EMC-EMI display, Wizard to setup accessories and limit lines, Inspect, Harmonic Markers, Level Target, Compare Traces, Measure Ambient, Report generation, Re-measure Spot
<b>Detectors</b>	+Peak, Avg, Avg (of logs), Avg (VRMS), CISPR QuasiPeak, CISPR Peak, CISPR Average, CISPR Average of Logs, MIL +Peak, DEF STAN Avg, DEF STAN Peak
<b>Limit lines</b>	Up to 3 Limit Lines with corresponding margins
<b>Resolution BW</b>	Set per standard or user definable
<b>Dwell time</b>	Set per standard or user definable
<b>Report format</b>	PDF, HTML, MHT,RTF, XLSX, Image File format
<b>Accessory type</b>	Antenna, Near Field Probe, Cable, Amplifier, Limiter, Attenuator, Filter, Other
<b>Correction format</b>	Gain/Loss Constant, Gain/loss table, Antenna Factor
<b>Traces</b>	Save/recall up to 5 traces, Math trace (trace1 minus trace2), Ambient trace

---

## General characteristics

### CON

Provides connection to Connect with 5 Series/ 6 Series/6 Series B MSO or 6 Series LPD or MDO4000 Series Oscilloscopes (some features such as CISPR detectors are disabled)

<b>Update rate</b>	< 0.2 /sec (802.11ac EVM, acq BW: 200 MHz, record length: 400 $\mu$ s)
--------------------	--

**Programmatic interface** SCPI-compliant command set. Requires installation of Tektronix Virtual Instrument Software Architecture (VISA) drivers

## System requirements

### Requirements

<b>Operating systems</b>	Windows 10 x64 Windows 8 x64
<b>Disk space</b>	20 GB free on C: drive
<b>RAM</b>	1 GB (4 GB recommended) Operation with one of the USB real-time spectrum analyzers has additional requirements. See the related instrument data sheet for details.  The 5G NR analysis is supported on Windows 10 (SignalVu-PC), 5 Series/6 Series/6 Series B MSO, and 6 Series LPD oscilloscope models.

## Instruments and file types supported

### Instrument family

#### Oscilloscopes

	File type				
	.WFM	.ISF	.TIQ	.IQT	.MAT
Performance: DPO70000SX	X		X <sup>12</sup>		
Mixed-domain: MDO4000 & MDO4000B/C		X	X <sup>13</sup>		
Touchscreen Mixed-Domain: 5 Series/6 Series/6 Series B MSO	X		X <sup>14</sup>		

#### Real-time signal analyzers

	File type							
	.WFM	.ISF	.TIQ	.IQT	.CSV	.R3F	.CDIF	.MAT
RSA5000			X		X			X
RSA306B			X	X	X	X	X	X
RSA500/ 600			X	X	X	X	X	X
RSA7100			X	X	X		X	X

<sup>12</sup> .TIQ files can be created on performance oscilloscopes with SignalVu installed. SignalVu is a separate product from SignalVu-PC.

<sup>13</sup> The MDO RF channel saves waveforms in the .TIQ format. MDO oscilloscope waveforms are stored in .ISF format.

<sup>14</sup> .TIQ file saved from the SignalVu-PC application.

## Other

	File type				
	.WFM	.ISF	.TIQ	.IQT	.MAT
3rd party waveforms in MATLAB Level 5 and Level 7.3 formats					X

**SignalVu-PC vs. SignalVu**

SignalVu for oscilloscopes is a separate product made to run directly on Tektronix performance oscilloscopes. SignalVu directly controls the acquisition settings of the oscilloscopes and automatically transfers data from the oscilloscope acquisition channel to the SignalVu software. SignalVu-PC is designed to run on a separate Windows 10 PC (64 bit). With 5 Series/6 Series/6 Series B MSO or 6 Series LPD you may choose to install SignalVu-PC directly on the Windows 10 SSD of the oscilloscope (opt. 5/6-WIN required). Files from oscilloscopes and spectrum analyzers can be recalled and analyzed. SignalVu-PC's base version is free to download and use for analyzing signals offline or for communicating and controlling the Tektronix RSA306, RSA500, RSA600, and RSA7100 Series Real-Time Spectrum (signal) Analyzers. With SignalVu-PC Connect (CON-SVPC), you can connect and analyze signals online (live) with SignalVu-PC using the 5 Series/6 Series/6 Series B MSO or 6 Series LPD or MDO4000 Series Oscilloscopes (with option SV-RFVT). To support acquisition length of more than 10 ms for a span of 2 GHz, RL-1 (125 Mpoints record length) or more license needs to be installed on 6 Series/6 Series B MSO or 6 Series LPD oscilloscope.

## Ordering information

### Purchasing, licensing, and activation

SignalVu-PC and its applications are available for download at [www.tektronix.com/downloads](http://www.tektronix.com/downloads). EDUFL-SVPC is a bundle version of SignalVu-PC that includes all analysis applications except the 5GNR analysis option for educational institutions.

A variety of optional, licensed applications are available for purchase for SignalVu-PC. These licenses can be associated with and stored on either your PC or any RSA300 series, RSA500 series, RSA600 series, and RSA7100A spectrum analyzers. Licenses can be purchased as an option to your hardware or separately as a Node-locked or a Floating license.

Contact your local Tektronix Account Manager to purchase a license. If your purchased license is not ordered as an option to your instrument, you will receive an email with a list of the applications purchased and the URL to the Tektronix Product License Web page, where you will create an account and can then manage your licenses using the Tektronix Asset Management System (AMS): [www.tek.com/products/product-license](http://www.tek.com/products/product-license).

AMS provides an inventory of the license(s) in your account. It enables you to check out or check in a license and view the history of licenses.

Optional applications are enabled by one of the following license types.

License type	Description
Node locked license (NL) purchased as an option to your instrument	When associated with an instrument, this license is factory-installed on that instrument at the time of manufacture. It will be recognized by any PC operating with SignalVu-PC when the instrument is connected. However, the licensed application is deactivated from the PC if the licensed instrument is disconnected.  This is the most common form of licensing, as it simplifies management of your applications.
Node locked license (NL) purchased separately	This license is initially assigned to a specific host id, which can be either a PC or an instrument. It can be reassociated to either a PC or instrument two times using Tek AMS.  This license is delivered via email and is associated with either your PC or with an instrument when you install the license.  This license should be purchased when you want your license to stay on your PC, or if you have an existing USB instrument on which you would like to install a license.
Floating license(FL) purchased separately	This license can be moved between different host ids, which can be either PCs or instruments. It can be reassociated to different PCs or instruments an unlimited number of times using Tek AMS.  This license is delivered via email and is associated with either your PC or with an instrument when you install the license.  This is the most flexible license and is recommended in applications where the license needs to be moved frequently.

In December 2015, the license policy and nomenclature was changed for SignalVu-PC and its options.

The legacy system is no longer supported and all customers are asked to transition to the new Tektronix license management system (TekAMS) going forward. Contact Tektronix sales or technical support for transferring previously purchased legacy license(s) to the new license file system.

The new license structure and the old options are shown below.

Legacy SignalVu-PC option	New application license	License type	Description
SVA	SVANL-SVPC	NL	AM/FM/PM/Direct Audio analysis
	SVAFL-SVPC	FL	
SVT	SVTNL-SVPC	NL	Settling Time (frequency and phase) measurements
	SVTFL-SVPC	FL	

Table continued...

Legacy SignalVu-PC option	New application license	License type	Description
SVM	SVMNL-SVPC	NL	General Purpose Modulation analysis to work with analyzer of acquisition bandwidth $\leq 40$ MHz, 5/6 Series MSO, or MDO4000B/C
	SVMFL-SVPC	FL	
SVP	SVPNL-SVPC	NL	Pulse Analysis to work with analyzer of acquisition bandwidth $\leq 40$ MHz, 5/6 Series MSO, or MDO4000B/C
	SVPFL-SVPC	FL	
Not available in legacy license	SVPHNL-SVPC	NL	Pulse Analysis to work with analyzer of any acquisition bandwidth
	SVPHFL-SVPC	FL	
SVO	SVONL-SVPC	NL	Flexible OFDM analysis
	SVOFL-SVPC	FL	
Not available in legacy license	PHASNL-SVPC	NL	Automated phase noise / jitter measurements (RSA7100A only)
	PHASFL-SVPC	FL	
SV23	SV23NL-SVPC	NL	WLAN 802.11a/b/g/j/p measurements
	SV23FL-SVPC	FL	
SV24	SV24NL-SVPC	NL	WLAN 802.11n measurements (requires SV23)
	SV24FL-SVPC	FL	
SV25	SV25NL-SVPC	NL	WLAN 802.11ac measurements (requires SV23 and SV24)
	SV25FL-SVPC	FL	
SV26	SV26NL-SVPC	NL	APCO P25 measurements
	SV26FL-SVPC	FL	
SV27	SV27NL-SVPC	NL	Bluetooth 4.2 measurements per Bluetooth SIG
	SV27FL-SVPC	FL	
Not available in legacy license	SV31NL-SVPC	NL	Bluetooth 5 measurements per Bluetooth SIG (requires SV27)
	SV31FL-SVPC	FL	
MAP	MAPNL-SVPC	NL	Mapping
	MAPFL-SVPC	FL	
SV56	SV56NL-SVPC	NL	Playback of recorded files
	SV56FL-SVPC	FL	
SV60	SV60NL-SVPC	NL	Return loss, VSWR, cable loss, and distance to fault (requires option 04 on RSA500A/600A)
	SV60FL-SVPC	FL	
CON	CONNL-SVPC	NL	SignalVu-PC Connect (with hardware Opt. SV-RFVT and a minimum of RL-1 (125 Mpoints record length)) 5 Series/6 Series/6 Series B MSO or 6 Series LPD or MDO4000 Series Oscilloscopes
	CONFL-SVPC	FL	
SV2C	SV2CNL-SVPC	NL	WLAN 802.11a/b/g/j/p/n/ac and Connect to 5/6 Series MSO (with opt. SV-RFVT) or MDO4000B/C to work with MDO4000B/C or analyzer of acquisition bandwidth $\leq 40$ MHz
	SV2CFL-SVPC	FL	
SV28	SV28NL-SVPC	NL	LTE Downlink RF measurements
	SV28FL-SVPC	FL	

Table continued...

Legacy SignalVu-PC option	New application license	License type	Description
Not available in legacy license	5GNRNL-SVPC	NL <sup>15</sup>	5G NR Uplink/Downlink RF Power, Bandwidth, Demodulation, and Error Vector Magnitude Measurements <sup>16</sup>
PHAS	PHASNL-SVPC	NL	Automated phase / jitter measurements (Available on the RSA7100 only)
	PHASFL-SVPC	FL	
Not available in legacy license	SV54NL-SVPC	NL	Signal survey and classification
	SV54FL-SVPC	FL	
Not available in legacy license	SVQPNL-SVPC	NL	EMI CISPR detectors
	SVQPFL-SVPC	FL	
Not available in legacy license	EMCVUNL-SVPC	NL	EMC pre-compliance and troubleshooting (includes EMI CISPR detectors)
	EMCVUFL-SVPC	FL	
SignalVu-PCEDU	EDUFL-SVPC	FL	Education-only version with all SignalVu-PC modules except 5GNR
Not available in legacy license	SV30NL-SVPC	NL	WiGig 802.11ad/ay measurements (only for offline analysis) <sup>17</sup>
	SV30FL-SVPC	FL	
Not available in legacy license	TRIGHNL-SVPC	NL	Advanced triggers (Frequency Mask, Density, Time Qualified) (RSA7100A only)
	TRIGHNL-SVPC	FL	
Not available in legacy license	STREAMNL-SVPC	NL	Streaming IQ data to RAID and 40 GbE (RSA7100A only)
	STREAMNL-SVPC	FL	

## SignalVu-PC application upgrades

Owners of SignalVu-PC applications can download any bug fixes or enhancements to existing products free of charge. New applications with new measurements may become available and upgrades can be purchased to add the new functionality using the ordering information described above.

**Bluetooth®**

Bluetooth is a registered trademark of Bluetooth SIG, Inc.



LTE is a trademark of ETSI.

<sup>15</sup> The 5GNR license supports node-locked license type only at this time.

<sup>16</sup> The 5GNR license is available as a standalone item, not as an option to your hardware, therefore it is considered a post-purchase upgrade and not installed at the time of purchase of the instrument.

<sup>17</sup> Refer to hardware opt. SV30 on DPO70000SX/DX oscilloscopes for full 60 GHz online analysis



**ASEAN / Australasia** (65) 6356 3900  
**Belgium** 00800 2255 4835\*  
**Central East Europe and the Baltics** +41 52 675 3777  
**Finland** +41 52 675 3777  
**Hong Kong** 400 820 5835  
**Japan** 81 (120) 441 046  
**Middle East, Asia, and North Africa** +41 52 675 3777  
**People's Republic of China** 400 820 5835  
**Republic of Korea** +822 6917 5084, 822 6917 5080  
**Spain** 00800 2255 4835\*  
**Taiwan** 886 (2) 2656 6688

**Austria** 00800 2255 4835\*  
**Brazil** +55 (11) 3759 7627  
**Central Europe & Greece** +41 52 675 3777  
**France** 00800 2255 4835\*  
**India** 000 800 650 1835  
**Luxembourg** +41 52 675 3777  
**The Netherlands** 00800 2255 4835\*  
**Poland** +41 52 675 3777  
**Russia & CIS** +7 (495) 6647564  
**Sweden** 00800 2255 4835\*  
**United Kingdom & Ireland** 00800 2255 4835\*

**Balkans, Israel, South Africa and other ISE Countries** +41 52 675 3777  
**Canada** 1 800 833 9200  
**Denmark** +45 80 88 1401  
**Germany** 00800 2255 4835\*  
**Italy** 00800 2255 4835\*  
**Mexico, Central/South America & Caribbean** 52 (55) 56 04 50 90  
**Norway** 800 16098  
**Portugal** 80 08 12370  
**South Africa** +41 52 675 3777  
**Switzerland** 00800 2255 4835\*  
**USA** 1 800 833 9200

\* European toll-free number. If not accessible, call: +41 52 675 3777

**For Further Information.** Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit [www.tek.com](http://www.tek.com).

Copyright © Tektronix, Inc. All rights reserved. Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specification and price change privileges reserved. TEKTRONIX and TEK are registered trademarks of Tektronix, Inc. All other trade names referenced are the service marks, trademarks, or registered trademarks of their respective companies.

11 Feb 2022 37W-27973-19  
[www.tek.com](http://www.tek.com)

**Tektronix**<sup>®</sup>