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 or MDO4000B/C Series Oscilloscopes into wide-band vector signal analyzers (VSAs) with up to 2 GHz analysis bandwidth using Connect (CON-SVPC).
  - The 5GNR analysis plug-in is supported on Windows 10 (SignalVu-PC), 5 Series/6 Series/6 Series B MSO models.

- 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

  - Windows 7 (64 bit), Windows 8 (64 bit), and Windows 10 compatible
- Node Locked and Floating License available for each SignalVu-PC optional application
- Analyze

  - Accurate measurements of 5GNR Uplink and Downlink frame structures in accordance to 3GPP Release 16 standards, including Modulation Accuracy, Channel Power, Adjacent Channel Power, and Spectrum Emission Mask
  - 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
- 5GNR 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/DPO70000/SX/DX 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.
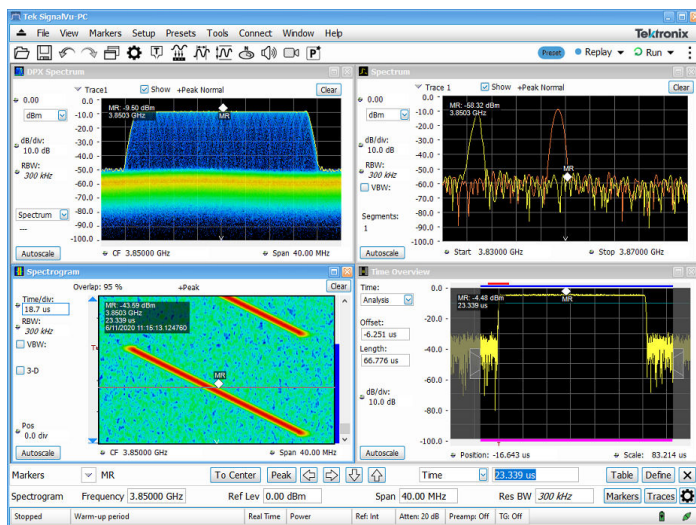
Once captured into memory, SignalVu-PC provides detailed analysis in multiple domains. The spectrogram display (bottom left panel) shows the frequency of an LFM pulse changing over time. By selecting the point in time in the spectrogram during the On time of the pulse, the

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 MDO4000 Series oscilloscopes

When the Connect (CON-SVPC) option is installed, SignalVu-PC extends the functionality of either the MO4000B/C or 5 Series/6 Series/6 Series B MSO (with hardware option SV-RFVT). The combination of hardware and software transforms the 6 Series MSO 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.

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 RSA5000 and 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.
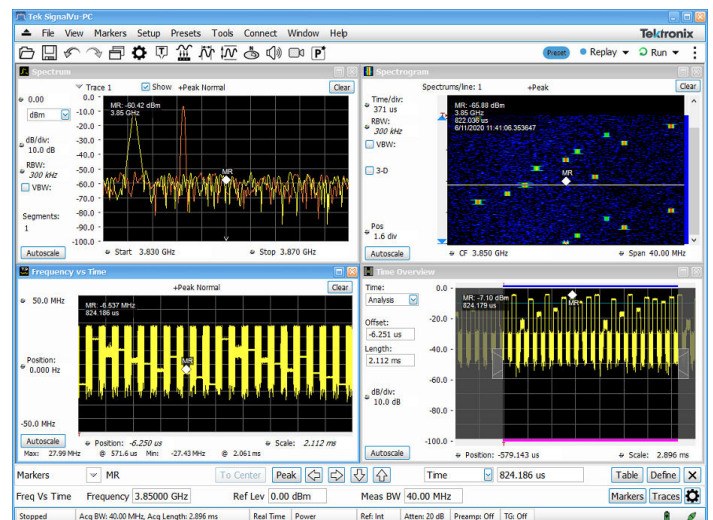
Time-correlated, multi-domain view provides a new level of insight into design or operational problems not possible with conventional analysis solutions. Here, the hop patterns of a narrowband signal can be observed using Spectrogram (upper right) and its hop characteristics can be precisely measured 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, 5GNR), playback of recorded files, and more.
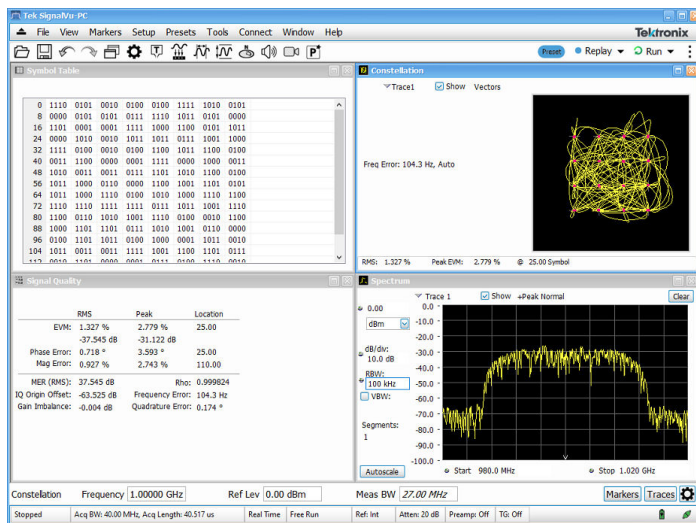

Wideband satellite and point-to-point microwave links can be directly observed with SignalVu-PC analysis software. Here, general purpose Digital Modulation Analysis (SVM) is demodulating a 16QAM backhaul link running at 312.5 MS/s.
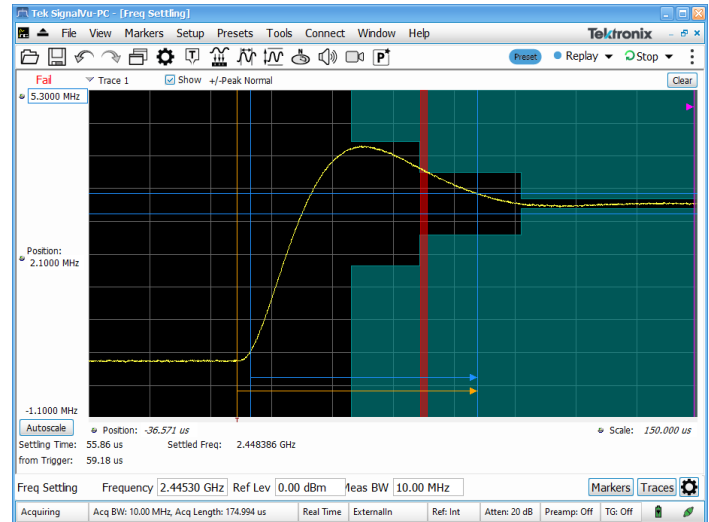
Settling time measurements (SVT) are easy and automated. The user can select measurement bandwidth, tolerance bands, reference frequency (auto or manual), and establish up to 3 tolerance bands vs. time for Pass/Fail testing. Settling time may be referenced to external or internal trigger, and from the 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	Band-width (max)	802.11-2012 section
802.11b	DSSS HR/ DSSS	2.4 GHz	DSSS/CCK 1 - 11 Mbps	DBSK, DQPSK CCK5.5 M, CCK11 M	20 MHz	16 & 17
Table continued…						

Standard	Std PHY	Freq band(s)	Signal	Modulation formats	Bandwidth (max)	802.11-2012 section
802.11g	ERP	2.4 GHz	DSSS/CCK/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.
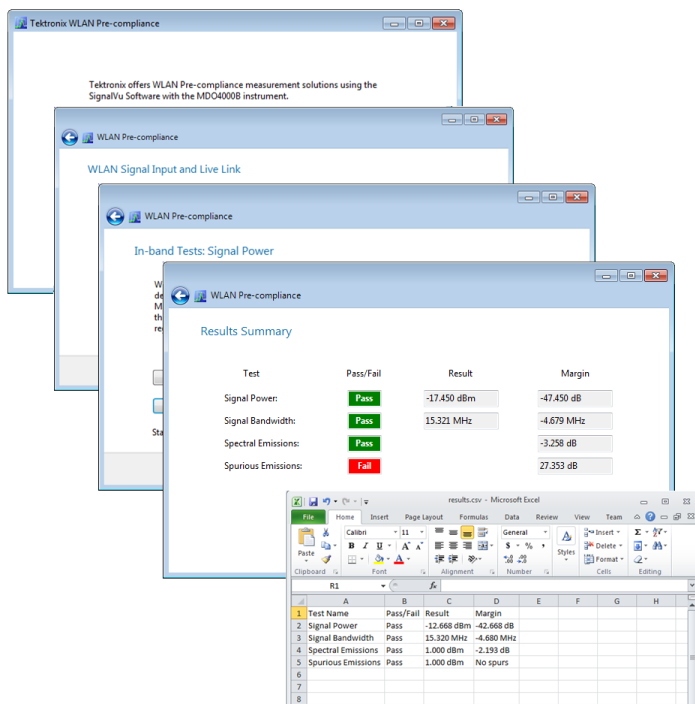
IEEE 802.11 RF layer test	IEEE reference 802.11-2012	Limit tested
Transmit power	16.4.7.2 (DSSS)	country dependent
	17.4.7.2 ("b")	country dependent
	18.3.9.2("a")	country dependent
	19.4.8.2 ("g")	country dependent
	20.3.20.3 ("n")	country dependent
Transmit Power On/Off Ramp	16.4.7.8 (DSSS)	(10%-90%) 2 usec
	17.4.7.7 ("b")	(10%-90%) 2 usec
Transmit Spectrum mask	16.4.7.5 (DSSS)	Std 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
RF Carrier suppression	16.4.7.9 ("DSSS")	-15dB
	17.4.7.8 ("b")	-15dB
Center frequency leakage	18.3.9.7.2 ("a")	-15 dBc or +2 dB w.r.t. average subcarrier power
	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
Transmit Spectral flatness	18.3.9.7.3 ("a")	+/- 4 dB (SC = -16...16), +4/-6 dB (other)
	20.3.20.2 ("n")	+/- 4 dB, +4/-6 dB
	22.3.18.2 ("ac")	+/- 4 dB, +4/-6 dB (various BWs, 20-160 MHz)
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		
		Modulation	Coding rate (R	Relative constellation error (dB)
Transmitter Constellation Error	18.3.9.7.4 ("a")	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
		256-QAM	3/4	-30
		256-QAM	5/6	-32
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		
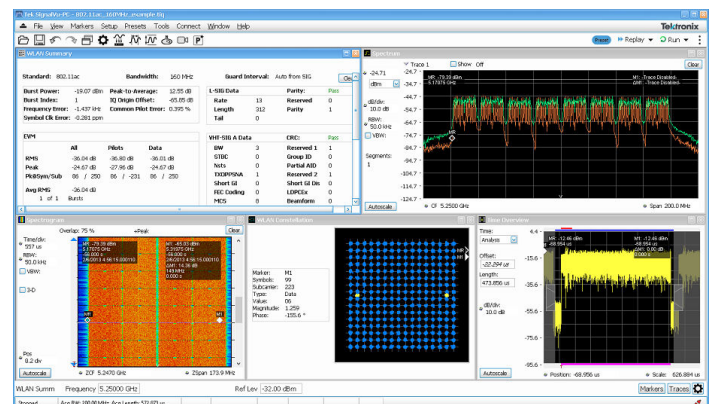
Easy analysis of WLAN 802.11ac transmitter with a WLAN preset that provides spectral emission mask, constellation diagram, and decoded burst information.

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.
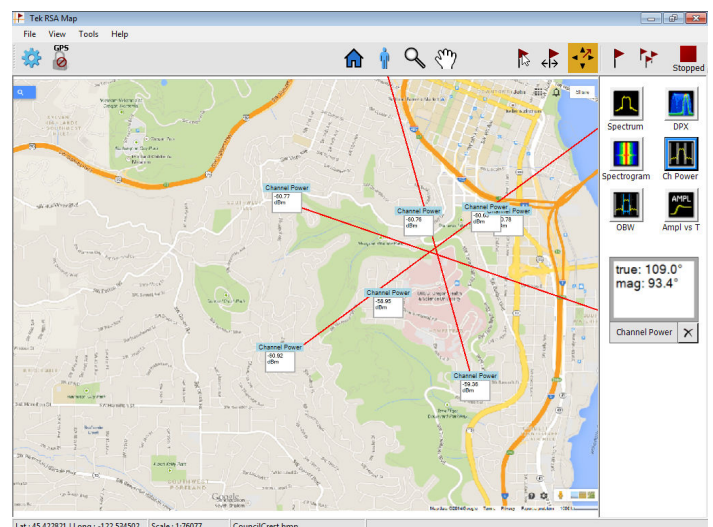
Mapped channel power readings using the azimuth function.

LTE FDD and TDD base station transmitter RF testing

Option SV28 enables the following LTE measurements:

- Cell ID
- Channel Power
- Occupied Bandwidth
- 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.
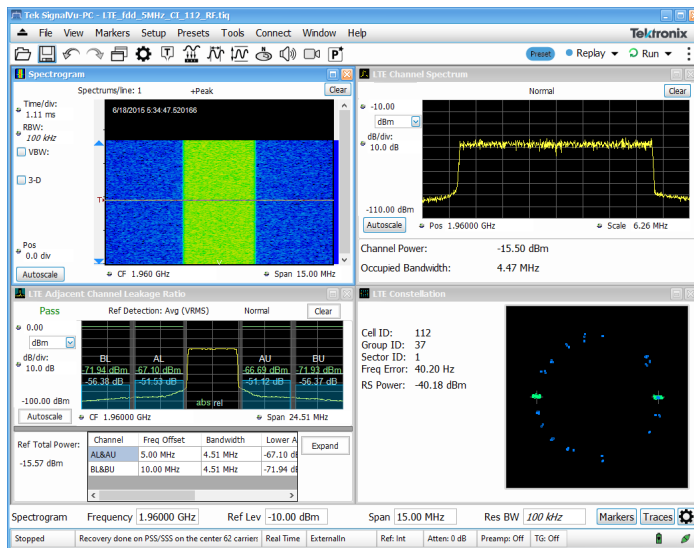

Fast validation of LTE base station transmitter with push button preset, and pass/fail information

5GNR modulation analysis and measurements option

The 5GNR 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 5GNR analysis option provides comprehensive analysis capabilities in the frequency, time, and modulation domains for signals based on the 3GPP's 5GNR 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.

For automated testing, SCPI remote interfaces are available to accelerate design, which enables the quick transition to the design verification and manufacturing phases.
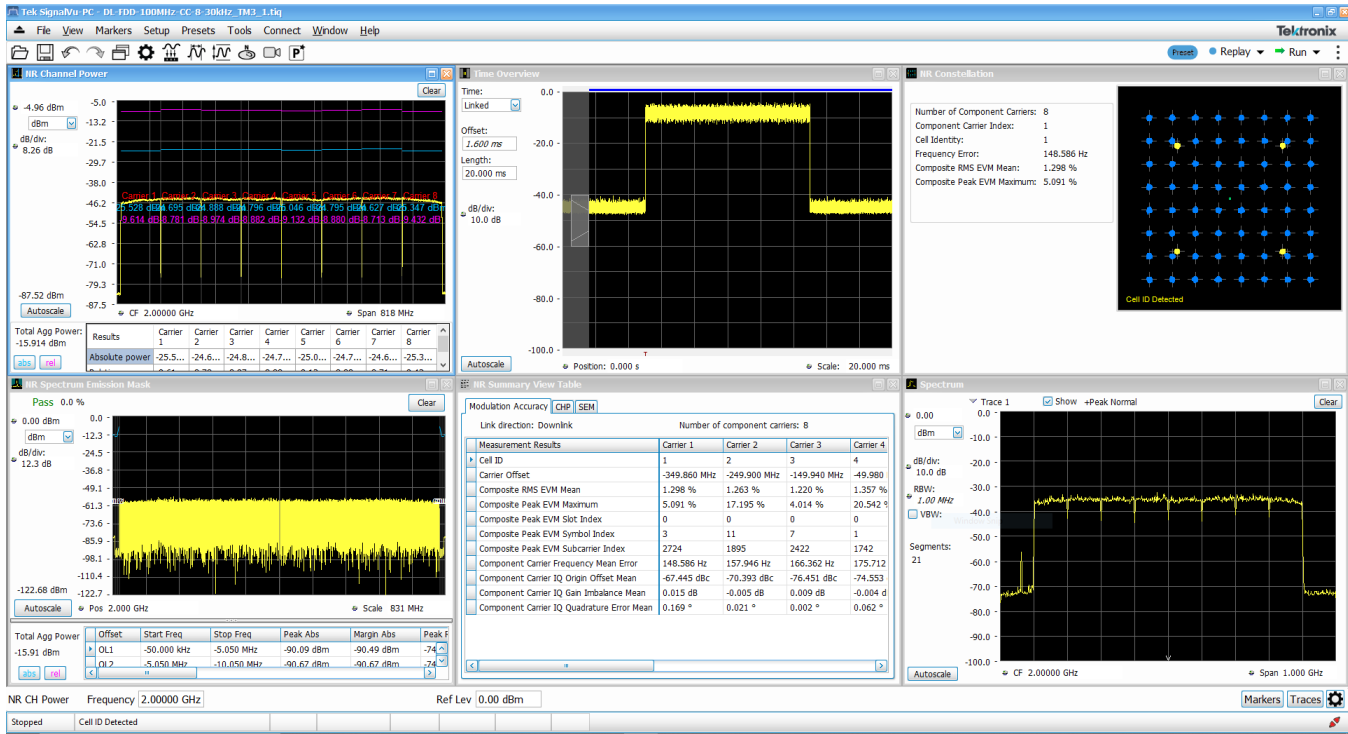
Constellation, Summary View, CHP and SEM displays supported in option 5GNR

5GNR transmitter measurements core supported features

The 5GNR option (5GNRNL-SVPC) supports 5GNR modulation analysis measurements according to Release 15 and Release 16 of 3GPP's TS38 specification, including:

- Analysis of uplink and downlink frame structures
- 5GNR measurements and displays including

  - Modulation Accuracy (ModAcc)
  - Channel Power (CHP)
  - Adjacent Channel Power (ACP)
  - Spectrum Emission Mask (SEM)
  - Summary table with all scalar results for ModAcc, SEM, CHP, ACP 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 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)

Modulation formats	**802.11ad**: MCS0-12.6
	802.11ay: MCS1-21
	802.11ad/ay Single carrier: π/2 BPSK, π/2 QPSK, π/2 16QAM, π/2 64QAM
	802.11ad Control PHY: π/2 DBPSK
Measurements	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.
Displays	Constellation, EVM vs Time, Symbol Table, Summary

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.
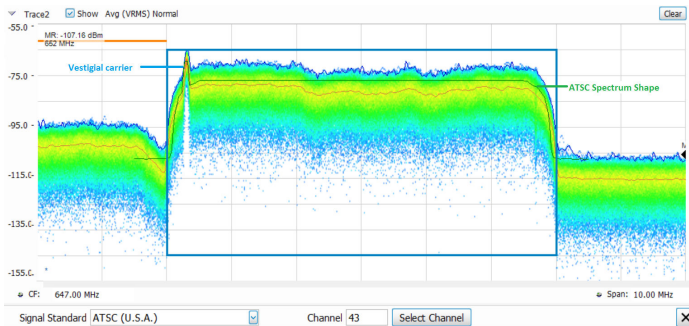

In this illustration, a single region has been selected. Since we have declared this to be an ATSC video signal, the spectrum mask for the ATSC signal is shown overlaid in the region. The signal is a close match to the spectrum mask, including the vestigial carrier at the lower side of the signal, characteristic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

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.
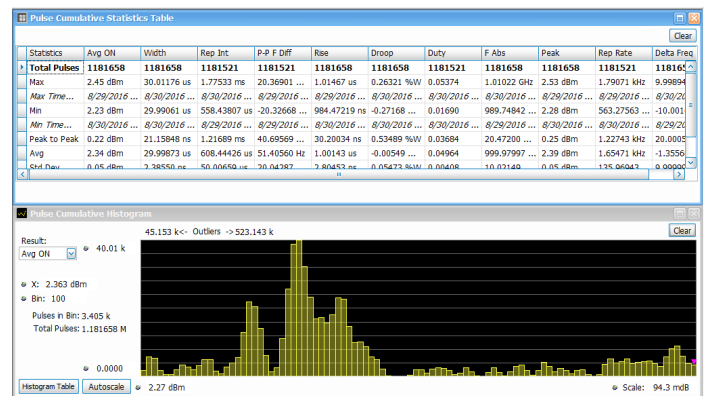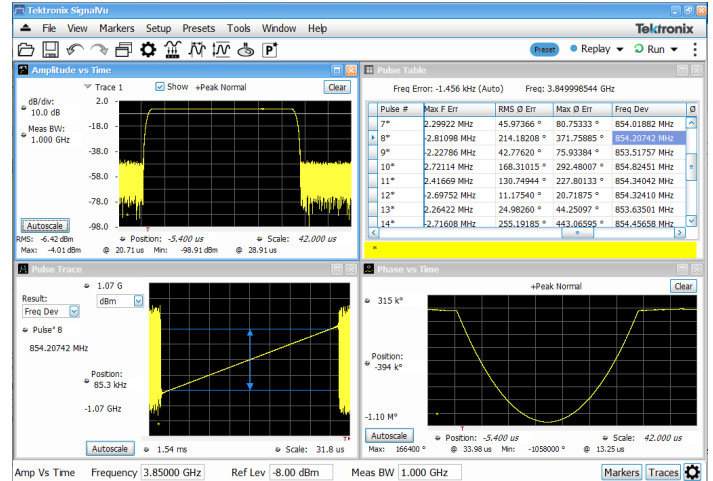
Cumulative statistics provides timestamps for Min, Max values as well as Peak to Peak, Average and Standard deviation over multiple acquisitions, further extending the analysis. Histogram shows you outliers on the right and left.
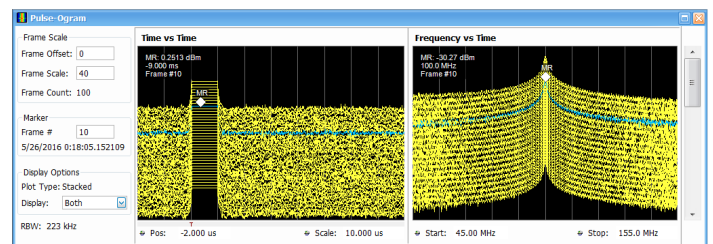
Pulse-Ogram displays a waterfall of multiple segmented captures, with correlated amplitude vs time and spectrum of each pulse. Can be used with an external trigger to show target range and speed.

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 ±Peak trace (in blue) and one average trace (in yellow). Trace smoothing and averaging is supported.
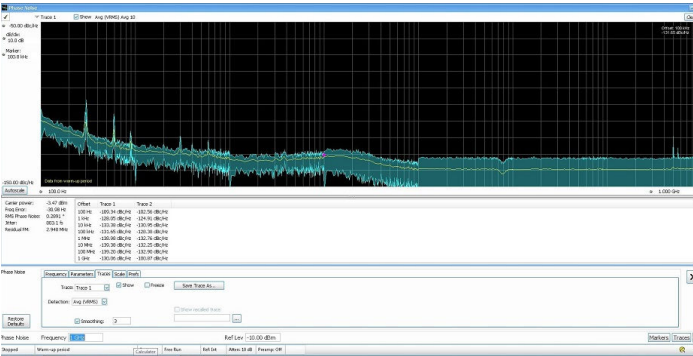
The RSA7100B's intrinsic phase noise of -134 dBc/Hz, at this frequency and across its operating range, provides ample measurement margin for a vast majority of applications.

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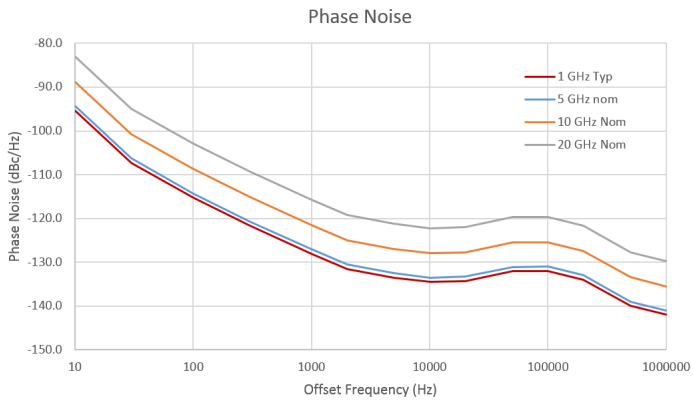
The previous figure shows the RSA7100B typical and nominal phase noise performance.

Education license

Qualified educational facilities can cost-effectively use SignalVu-PC in teaching environments. The specially priced education version includes all available analysis standard 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.
WLAN 802.11n measurement application (SV24)	
WLAN 802.11ac measurement application (SV25)	SV24 requires SV23. SV25 requires SV24.
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.	General purpose digital modulation analysis (SVM)	Error vector magnitude (EVM) (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, Constellation, Symbol table.	
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.		FSK only: Frequency deviation, Symbol timing error.	
AM/FM/PM modulation and audio measurements (SVA)	Carrier power, frequency error, modulation frequency, modulation parameters (±peak, peak-peak/2, RMS), SINAD, modulation distortion, S/N, THD, TNHD, hum and noise.	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.	
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.	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.	
		5GNR Measurements (5GNRNL-SVPC)	Presets for 5GNR Modulation Accuracy (EVM), ACP, CHP, and SEM measurements, supports both Uplink and Downlink (FDD and TDD) directions, single and multicomponent-carrier analysis with (Node-Locked).	
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.	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.	
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).			

Table continued…

Table continued…

EMC/EMI pre-compliance and	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	troubleshooting (EMCVU)	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 MSO/DPO5000, DPO7000, 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. No published performance is available for 5 Series/6 Series/6 Series B MSO, MSO/DPO2000, MDO/MSO/DPO3000, and MDO4000 Series oscilloscope acquisitions. 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

Frequency range	See appropriate oscilloscope data sheet
Initial center frequency setting accuracy	Equal to time-base accuracy of oscilloscope
Center frequency setting resolution	0.1 Hz
Frequency offset range	0 Hz to the maximum bandwidth of the oscilloscope
Frequency marker readout accuracy	±(Reference Frequency Error × Marker Frequency + 0.001 × Span + 2) Hz
Span accuracy	±0.3%
Reference frequency error	Equal to oscilloscope reference frequency accuracy, aging, and drift. Refer to appropriate DPO/DSA/MSO data sheet.
Tuning Tables	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, 5GNR, 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

Frequency (base software)	Spectrum (amplitude vs linear or log frequency)
	Spectrogram (amplitude vs frequency over time)
Time and statistics (base software)	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

Settling time, frequency, and phase (SVT)

Frequency settling vs time

Phase settling vs time

Advanced Pulse measurements suite (SVP)

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

Digital demod (SVM)

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

Flexible OFDM (SVO)

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

Automated phase noise and jitter measurements (PHAS)

Carrier power

Frequency error

RMS phase noise

Jitter

Residual FM

WLAN measurements (SV23, SV24, SV25 or SV2C)	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)
APCO P25 measurement application (SV26)	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
Bluetooth Basic LE Tx (SV27) and Bluetooth 5 (SV31) Measurements	Peak Power, Average Power, Adjacent Channel Power or InBand Emission mask, -20dB 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, editable limits
LTE Downlink RF measurements (SV28)	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.

5GNR Uplink/Downlink measurements (5GNRNL-SVPC)	Adjacent Channel Power (ACP), Modulation Accuracy (ModAcc for EVM) , Channel Power (CHP), and Spectrum Emission Mask (SEM) measurements supporting both Uplink and Downlink frame structures.
WiGig 802.11ad/ay Measurements (SV30) (Offline analysis)	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

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

AM/FM/PM modulation and audio measurements (SVA)[3]

[4]

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

Audio filters

Low pass (kHz)	0.3, 3, 15, 30, 80, 300, and user-entered up to 0.9 × audio bandwidth
High pass (Hz)	20, 50, 300, 400, and user-entered up to 0.9 × audio bandwidth
Standard	CCITT, C-Message
De-emphasis (µs)	25, 50, 75, 750, and user-entered
File	User-supplied .TXT or .CSV file of amplitude/frequency pairs. Maximum 1000 pairs.

FM modulation analysis

FM 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
FM deviation accuracy	±1.5% of deviation
FM rate accuracy	±1.0 Hz
Carrier frequency accuracy	±1 Hz + (transmitter frequency × reference frequency error)

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

THD	0.2% (MSO/DPO70000, DPO7000 Series)
	1.0% (MSO/DPO5000 Series)

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[3] 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.

	1.0% (MDO4000B Series)
SINAD	44 dB (MSO/DPO70000, DPO7000 Series)
	38 dB (MSO/DPO5000 Series)
	38 dB (MDO4000B Series)

AM modulation analysis

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
AM depth accuracy (rate: 1 kHz, depth: 50%)	±1% + 0.01 × measured value
AM rate accuracy (rate: 1 kHz, depth: 50%)	±1.0 Hz

Residuals (AM)

THD	0.3% (MSO/DPO70000, MDO7000 Series)
	1.0% (MSO/DPO5000 Series)
	1.0% (MDO4000B Series)
SINAD	48 dB (MSO/DPO70000, MDO7000 Series)
	43 dB (MSO/DPO5000 Series)
	43 dB (MDO4000B Series)

PM modulation analysis

PM measurement	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
PM deviation accuracy (rate: 1 kHz, deviation: 0.628 rad)	±100% × (0.01 + (rate / 1 MHz))
PM rate accuracy (rate: 1 kHz, deviation: 0.628 rad)	±1 Hz

Residuals (PM)

THD	0.1% (MSO/DPO70000, MDO7000 Series)
	0.5% (MSO/DPO5000 Series)
	0.5% (MDO4000B Series)
SINAD	48 dB (MSO/DPO70000, MDO7000 Series)
	43 dB (MSO/DPO5000 Series)
	43 dB (MDO4000B Series)

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[4] 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.

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	±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)
MSO/ DPO 5034 MSO/DPO 5054	200 kHz	400 Hz	20 kHz	40 Hz	1 MHz	2 kHz	100 kHz	200 hz
MSO/DPO 5104 MSO/DPO 5204	100 kHz	200 Hz	10 kHz	20 hz	1 MHz	2 kHz	100 kHz	200 Hz
DPO 7000	50 kHz	100 Hz	50 kHz	100 Hz	2 MHz	4 kHz	2 MHz	4 kHz
DPO/DSA/ MSO 70000 ≥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 ≥ 15 Hz (Span set to minimum 1 kHz)

Settling time, frequency, and phase (SVT) [5]

Settled frequency uncertainty,

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,

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

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[5] Settled Frequency or Phase at the measurement frequency. Measured signal level > -20 dBm, Attenuator: Auto.

Minimum pulse width for detection [6]

Model	Minimum PW
DPO/DSA72004B MSO72004	400 ps
DPO/DSA71604B MSO71604	500 ps
DPO/DSA71254B MSO71254	640 ps
DPO/DSA70804B MSO70804	1 ns
DPO/DSA70604B MSO70604	1.3 ns
DPO/DSA70404B MSO70404	2 ns
DPO7354	2.25 ns
DPO7254	3 ns
DPO7104	8 ns
DPO7054	16 ns
MSO/DPO5204	4 ns
MSO/DPO5104	8 ns
MSO/DPO5054	16 ns
MSO/DPO5034	25 ns
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) [7]

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

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[6] 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.

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

Digital modulation analysis (SVM)

Modulation formats	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
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

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

16QAM Residual EVM (typical) for DPO7000 and DPO/DSA/MSO70000 series [8]

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

16QAM Residual EVM (typical) for MSO/DPO5000 series [9]

Symbol Rate	RF	IQ
10 MS/s	1.5%	1.0%
100 MS/s	4.0%	2.0%

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

DPO7000 Series	−33 dB

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[8] CF = 1 GHz, Measurement Filter = root raised cosine, Reference Filter = raised cosine, Analysis Length = 200 symbols.
[9] Carrier frequency 700 MHz. MSO/DPO5054 and MSO/DPO5034 performance not listed. Use of external reference will degrade EVM performance.

DPO/DSA/MSO70000 Series	–38 dB

QPSK Residual EVM (typical) for MDO4000B RF Input [10]

Single Carrier, measured at 1 GHz

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

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

General characteristics

Modulation formats	DBPSK (DSSS1M), DQPSK (DSSS2M), CCK5.5M, CCK11M , 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 [11], 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 [12]	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[12]	-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,

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[10] Measurement filter = root raised cosine, reference filter = raised cosine, analysis Length = 400 symbols, 20 averages

[11] 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 MDO4000B may exceed SEM mask at frequency above 5.85 GHz

[12] Signal input power optimized for best EVM

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 [13], 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 [14]	–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

Average Power and RMS EVM per section of the header

WLAN Power vs Time, WLAN Symbol Table, WLAN Constellation

Spectrum Emission Mask [15], 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 [16]	–37.3 dB (5.8 GHz), RMS-EVM averaged over 20 bursts, 16 symbols each

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[13] 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

[14] Signal input power optimized for best EVM

[15] 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

[16] Signal input power optimized for best EVM

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)

Phase 1 (C4FM)	≤1.0% typical
Phase 2 (HCPM)	≤0.5% typical
Phase 2 (HDQPSK)	≤0.5% typical

Adjacent channel power ratio

25 kHz offset from the center and bandwidth of 6 kHz [17]	Phase 1 (C4FM): -76 dBc typical
	Phase 2 (HCPM): -74 dBc typical
	Phase 2 (HDQPSK): -74 dBc typical
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)

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

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[17] Measured with test signal amplitude adjusted for optimum performance if necessary. Measured with Averaging, 10 waveforms.

5GNR 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
	Downlink (FDD and TDD)
Measurements and displays supported	Adjacent Channel Power (ACP), Modulation Accuracy (ModAcc for EVM) , Channel Power (CHP), and Spectral Emission Mask (SEM) measurements supporting both Uplink and Downlink frame structures.

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 $\Delta F1avg$ (11110000), $\Delta F2avg$ (10101010), $\Delta F2 > 115$ kHz, $\Delta F2/\Delta F1$ 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.

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 (ΔF_1avg, ΔF_2avg, $\Delta F_2avg/\Delta F_1avg$, $\Delta F_2max \geq 115$ kHz)

Deviation range	± 280 kHz
Deviation uncertainty (at 0 dBm)	< 2 kHz + instrument frequency uncertainty (Basic Rate)
	< 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 ±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 ±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 µs))

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 ±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 ±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)

WiGig 802.11ad/ay (SV30) Measurements	(For offline analysis only. Real-time 60 GHz measurements can be made with Opt. SV30 on DPO70000SX Series oscilloscopes.)
	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)

Playback file type	R3F recorded by RSA306, RSA500, or RSA600
Recorded file bandwidth	40 MHz
File playback controls	General: Play, stop, exit playback Location: Begin/end points of playback settable from 0-100%
	Skip: Defined skip size from 73 µs up to 99% of file size
	Live rate: Plays back at 1:1 rate to recording time
	Loop control: Play once, or loop continuously
Memory requirement	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)

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

General characteristics

CON

Provides connection to the MDO4000B/C (some features such as CISPR detectors are disabled)

Update rate	< 0.2 /sec (802.11ac EVM, acq BW: 200 MHz, record length: 400 µs)

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

System requirements

Requirements

Operating systems	Windows 10 x64
	Windows 8 x64
	Windows 7 Service Pack 1 x64
Disk space	20 GB free on C: drive
RAM	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 5GNR analysis plug-in is supported on Windows 10 (SignalVu-PC), 5 Series/6 Series/6 Series B MSO oscilloscope models.

Instruments and file types supported

Instrument family

Oscilloscopes

	File type				
	.WFM	**.ISF**	**.TIQ**	**.IQT**	**.MAT**
Performance: MSO/DPO5000 DPO7000C DPO/DSA/ MSO70000 DPO70000SX	X		X [18]		
Mixed-domain: MDO4000 & MDO4000B/C		X	X [19]		
Bench: MSO/DPO2000 MDO/MSO/ DPO4000		X			
Touchscreen Mixed-Domain: 5 Series/6 Series/6 Series B MSO	X		X [20]		

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

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[18]   .TIQ files can be created on performance oscilloscopes with SignalVu installed. SignalVu is a separate product from SignalVu-PC.

[19]   The MDO RF channel saves waveforms in the .TIQ format. MDO oscilloscope waveforms are stored in .ISF format.

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 7, 8, or 10 PC. With the 5 Series/6 Series/6 Series B MSO, 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 (with option SV-RFVT), or MDO4000 Oscilloscope.

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[20] .TIQ file saved from the SignalVu-PC application.

Ordering information

Purchasing, licensing, and activation

SignalVu-PC and its applications are available for download atEDUFL-SVPC is a bundle version of SignalVu-PC that includes all analysis applications 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)

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	
SVM	SVMNL-SVPC	NL	General Purpose Modulation analysis to work with analyzer of acquisition bandwidth ≤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 ≤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 to the 5 or 6 series MSO (requires opt. SV-RFVT) or MDO4000B/C oscilloscopes
	CONFL-SVPC	FL	

Table continued…

Legacy SignalVu-PC option	New application license	License type	Description
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 ≤40 MHz
	SV2CFL-SVPC	FL	
SV28	SV28NL-SVPC	NL	LTE Downlink RF measurements
	SV28FL-SVPC	FL	
Not available in legacy license	5GNRNL-SVPC	NL[21]	5GNR Uplink/Downlink measurements with Modulation Accuracy (EVM), ACP, CHP, and SEM measurements[22]
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 of all modules for SignalVu-PC
Not available in legacy license	SV30NL-SVPC	NL	WiGig 802.11ad/ay measurements (only for offline analysis) [23]
	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.

Архангельск (8182)63-90-72
Астана (7172)727-132
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06

Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Липецк (4742)52-20-81

Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16

Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13

Сургут (3462)77-98-35
Тверь (4822)63-31-35
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Ярославль (4852)69-52-93

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