Keysight 89600 VSA Software Revision History

VSA2024 Update 2.0 (Build 28.60; Release Date April 2024)

License Version 2024.0401 required

89601200C: 89600 VSA Basic Software and Hardware Connectivity

- Common Feature
  - Recording overload status available per channel (in Recording Info dialog or Playback API)
  - Added several Preset, Recall and Save toolbar controls for user convenience
  - .NET 6.0+ client support
  - Support for instrument address management within the VSA application without needing to use Keysight Connection Expert or the VSA IO Connections utility for LAN based instruments.
  - Instrument management enhancements
    - View the Instrument Discovery Log
    - Associate a name with an instrument
    - Edit an instrument
    - Ignore an instrument
    - Indicator when list is out of sync with discovered instruments
    - Support for IPv6
- Power Spectrum Analysis
  - Support for gating when using time domain inputs for Power Spectrum based measurements
- Hardware Connectivity (analyzer)
  - Support for 'a' receiver channels with M983xA Series VNAs.
- Hardware Connectivity (source)
  - SCPI support for controlling the Source functionality
  - Added Waveform Adjustment mode (Zero Extend or Ensure Periodicity) to select how to adjust user waveform when it doesn't meet source min length and quantum requirements
  - Support for Source Control of S9110A 5G Multi-Band Vector Transceiver
  - Support for multiple channels on M9484C VXG-C and N5186A MXG sources
    - Frequency, Amplitude, RF On, and Modulation On properties are channelized
    - Source channels can be individually enabled/disabled
    - Ability to trigger downloaded arb waveforms using a software trigger
- Channel Quality Measurement
  - Added ability to track frequency/phase/gain when in Compute Unbalanced Response mode
  - Enabled freq error/phase drift/gain drift compensation for Unbalanced mode
  - Removed need for trigger when computing unbalanced response (IQ impairments)

89601101C: Direct Data Connectivity

- Support VITA-49 streaming

89601CSDC: Channel Sounding

- For loopback calibration, added new Eq Ch Frequency Response trace for use with User Correction > Fixed Equalization

89601BHNC: 5G NR/5G-Advanced Modulation Analysis

- 5G-Advanced (Rel-18) MIMO Enhancements
  - Up to 8 Layers/8x8 MIMO in the UL (was limited to 4 Layers/4x4 in 5G NR)
  - Enhanced DMRS with maximum number of DMRS ports for PDSCH/PUSCH to 16 for DMRS Type 1 and 24 for DMRS Type 2 (was limited to 8 and 12 in 5G NR)
- Uplink and Downlink
  - Updated to 3GPP v18.1.0 (2023-12) specification
  - Allow CRC Pass with All 0 Payload
  - Added Configuration3 and Custom RA Configuration settings for PDSCH/PUSCH RAType = Type0 resource allocations
  - Speed improvements for concurrent 5GNR measurements
- Uplink
  - SRS MIMO Info table is added, which can show the TAE/Power/Phase per SRS port per Channel
  - SRS MIMO per port EVM in Frame Summary table
  - (Rel-18) Up to 8 PUSCH DMRS ports for up to 8x8 SU-MIMO measurement
  - (Rel-18) FR1 3 MHz PUSCH measurement
- Downlink
  - (Rel-18) Up to 24 PDSCH DMRS ports for MU-MIMO measurement
  - (Rel-18) FR1 3MHz SSB, CORESET0 and PDSCH measurement
  - Support for PDCCH MIMO Info table, which can show the TAE/Power/Phase per PDCCH DMRS port per Channel (BETA)

89601BHFC: Custom OFDM Modulation Analysis

- Support ccEvm optimized auto-range when making Custom OFDM measurement
- Support for Symbol Clock Estimation/Compensation when data and pilot are in time domain (BETA)
- Added a parameter to control whether the Error Vector vs. Carrier is calculated before or after IDFT Despreading
- Added Error Vector vs. Sample (Sym overlay) and Error Vector vs. Sym (Sample overlay) traces
- Improved existing Error Vector traces

89601BVXC: High Throughput WLAN Measurement (NEW)

- 89601BVXC has all the same features as 89601BHXC which removes the WLAN 4096QAM modulation support and work with VSA2024 U2 or above release
- Work together with new license 89601QAMC for higher-order 4096QAM modulation support for 802.11ax/be (89601BVXC or 89601BHXC stand-alone can't enable WLAN 4096QAM with VSA2024 or above release)

Issues Resolved:

- [Hardware Connectivity][Channel Quality] Waveforms truncated when downloaded to source, causing periodic waveforms to no longer be periodic. Now zero padded instead of truncated by default. Additional mode to support periodic waveform playback.
- [5G NR] FR2, 240 kHz numerology does not remain selected on the resource grid
- [5G NR] PRACH - high EVM on DC subcarriers caused by parallel processing of multiple PRACH occasions

VSA2024 Update 1.1 (Build 28.41; Release Date Mar 2024)

License Version 2023.1201 required

89601200C: 89600 VSA Basic Software and Hardware Connectivity

- Support the new 30-day trial license 89601TRVC which enables all 89600 VSA applications and features except the export control protected features like 4096QAM support in WLAN 802.11ax and 802.11be

89601BHXC: High Throughput WLAN Modulation Analysis

- Remove the feature of 4096QAM support in 802.11ax and 802.11be
- 4096QAM support will be protected by a new export-controlled license released in VSA2024 Update 2.0 – 89601QAMC

VSA2024 Update 1.0 (Build 28.40; Release Date Dec 2023)

License Version 2023.1201 required

89601200C: 89600 VSA Basic Software and Hardware Connectivity

- Common Feature
  - Windows 11 support
  - Allow users to make an X-Y plot of trend lines
  - Support for selecting samples as the X-Axis unit for trend-lines
  - Support for hardware-provided or user-provided timestamps for data captures
  - Support for timestamp formatting in the marker readout (time-domain traces)
  - Added number buttons to the Edit Value popup window (better touchscreen support)

- Channel Quality Measurement
  - Enhancements for homodyne modulator/demodulator testing (separate measurement of I/Q impairment portion of channel response)
  - Support for separate channel responses for In phase (I) and Quadrature phase (Q) components
  - Support for inverse channel responses
- Hardware Connectivity (analyzer)
  - Support for S9115A Wideband Transceiver Test Solution, with one or two transceivers
  - Support for S9110A Multi-Band Vector Transceiver, with one or two transceivers
  - Support for N9048B PXE EMI Test Receive. RF Input 1, up to 40 MHz BW. (requires firmware A.37.01 or greater)
  - Support for EXR-Series Oscilloscope models EXR404A/408A/604A/608A
  - Support for MXR B-Series Oscilloscopes
  - Support for InfiniiVision 4000G X-Series
  - Support for FieldFox C models N9912C, N9913C, N9914C, N9915C, N9933C, N9934C, N9935C (was BETA in previous version)
  - M9410E (M9410A + M9471A), M9411E (M9411A + M9471A), M9415E (M9415A + M9471A), M9416E (M9416A + M9471A) VXT PXI Vector Transceiver (single channel) (requires firmware M.37.50 or greater)
  - N9042B enhancements
    - Support frequency mask trigger (FMT)
    - Increased maximum recording length from 2 GSa to 4 GSa
    - Cable correction with V3050A Signal Analyzer Frequency Extender
    - EVM auto ranging with V3050A Signal Analyzer Frequency Extender
    - Support for N9042B Alternate 1 GHz IF Path (R10)
  - PXI VXT Transceiver enhancements
    - ADC Magnitude Trigger. Requires VXT firmware M.37.50 or greater.
    - Faster remote data transfers. Requires VXT firmware M.37.50 or greater.
- Hardware Connectivity (source)
  - N5186A MXG Vector Signal Generator (Channel 1)
  - M9410A/M9411A/M9415A/M9416A VXT PXI Vector Transceiver (single channel)
  - M9410E (M9410A + M9471A), M9411E (M9411A + M9471A), M9415E (M9415A + M9471A), M9416E (M9416A + M9471A) VXT PXI Vector Transceiver (single channel) (requires VXT firmware M.37.50 or greater)

89601101C: Direct Data Connectivity

- SCPI support for UserInput Direct Data Connectivity
- VITA-49 enhancements (BETA)
  - Fixed length segmented capture
  - 6-bit and 8-bit depths in payload format

89601CSDC: Channel Sounding

- Entire Impulse Response trace width is now valid (2x valid length compared to previous releases) → can reduce sequence length in half to measure same delay spread → faster measurements, less data

89601DVBC: DVB-S2/S2X Satellite Modulation Analysis

- Support measuring low SNR accurately with known payload bits and Payload Header set to None

89601BHNC: 5G NR Modulation Analysis

- Uplink and Downlink
    - Updated to 3GPP v.17.6 (2023-09) specification
    - Display Number of Corrected Bits in Decoded Info table for PDSCH/PUSCH
    - Symbol table showing demodulated symbols with marker coupling with other traces such as the constellation diagram
    - Allow user to adjust Trigger Margin when using Frame Trigger or Slot Trigger
    - Support demodulation with phase discontinuity between slots
    - Improved performance when analyzing uplink and downlink simultaneously (mixed mode)
    - Improved MIMO and Massive MIMO demod speed
    - Opacity for 3DBeamforming Plot
- Downlink
    - Test Models updated to 3GPP v17.11 (2023-09) standard
    - Periodic CSI-RS with periodicity configuration per 3GPP specification
    - CSI-RS antenna port detection threshold parameter for MIMO analysis
    - Support measurement of multiple non-overlapped CSI-RS ports on the same physical channel
- Uplink
    - PRACH Timing Advance (TA) measurement relative to External Trigger
    - SRS Start RB Hopping, Frequency Scaling Factor and Start RB Index for SRS partial frequency sounding in 3GPP Rel.17
    - Different Sequence Cyclic Shift (mcs) per Slot

89601BHFC: Custom OFDM Modulation Analysis

- Symbol phase compensation similar to 5G NR
- 3D Power trace
- For MIMO measurement, data allocations can be mapped to a single layer or multiple layers
- Multiple pilot allocations each with different IQ sequence, symbol allocations and subcarrier allocations mapped to the same user specified antenna port.
- Pilot in time domain (DFT-Spread pilot)

89601BHGC and 89601BHHC: LTE/LTE-Advanced FDD and TDD

- Auto detection of PRACH Preamble ID (PID) for each active PRACH resource

- Measurement results, per PRACH resource, and Preamble ID (PID) added to Frame Summary table
- Support for Direct Data Calculation with Time and Frequency (OFDM) domain input data modes (equivalent to 5GNR support)

89601BHTC: IoT Modulation Analysis
- IEEE802.15.4ab UWB for UWB-Only MMS (BETA)

89601BHXC: High Throughput WLAN Modulation Analysis
- Report detected puncturing pattern
- Improve IQ estimation and compensation for punctured signals

89601OR1C: Direct Calculation of EVM for 5G NR
- Support phase compensation for Direct Calculation when the input data is in frequency domain

VSA2024 Update 0.1 (Build 28.01; Release Date Aug 2023)

License Version 2023.0601 required

89601200C: 89600 VSA Basic Software and Hardware Connectivity
- Common Feature
  - Support for Vita49 (Vita49A) file format preview and recall
  - Support for Vita49 (Vita49A, Vita49.2, and ODI) streaming (BETA)
  - Export selected trace feature via SCPI (via .NET API already support)
  - Recall multiple single channel recording files into a multichannel measurement using one file per channel
  - [Event Based Actions] support for trend line: trend a summary table, trace marker, or data header value over multiple measurements (BETA)
- Hardware Connectivity
  - Support for VDI Mixer with UXA N9042B-EXW
  - Support for M5200A PXIe Digitizer: 4 Channels, 2 GHz, 12-bit
  - Enhancement for M9393A to enable power spectrum full span measurement
  - Support for new Fieldfox C models (BETA)
  - Support for Dual N9032B Hardware Configuration
  - Support for B models of Infiniium UXR-Series Oscilloscopes
  - Support for DSOx2k and MSOx2k scopes Hardware Configuration
  - Support for S9110A Multi-Band Vector Transceiver (BETA)
  - Support RF system calibration up to 110 GHz using U9361x RCal Receiver Calibrator

89601BHNC: 5G NR Modulation Analysis
- Uplink and Downlink
  - Comply with 3GPP TS38 Series 17.4.0 (2023-01) specification

- Improve the measurement speed of FR2-2 800 MHz, 1600 MHz and 2 GHz bandwidth signal measurement
- Test Models for FR2-2 480 kHz and 960 kHz SCS supported per 3GPP TS 38.141-2 V17.9.0 (2023-03)
- The number of BWPs is increased to 5 (was 4 previously)
- Multi-GSCN SSBs is now supported
- Normalized beam pattern results with each channel's total power
- Enhancement on the Beam Weights and Beam Pattern display
- MU-MIMO with DC Puncture in the transmitted signal is now supported
- Uplink
  - CSI2 for PUCCH Format 2
  - 3GPP Rel-17 PUCCH enhancements
  - Add Sequence Cyclic Shift (mcs) manual mode for PUCCH Format 0
  - PRACH 480 kHz and 960 kHz SCS
- Downlink
  - Use CSI-RS as a sync source

89601BHFC: Custom OFDM Modulation Analysis

- Graphical display for resource allocation added to Demod Property Dialog.

89601BHGC: LTE/LTE-Advanced FDD Modulation Analysis

- Low load ETSI test is now supported

89601BHQC: Advanced Radar and Pulse

- Advanced Radar
  - FM Sync Domain: add segmented capture and playback for Burst Analysis
  - PM Sync Domain: add segmented capture and playback for Burst Analysis

89601BHXC: High Throughput WLAN Modulation Analysis

- 802.11ac/ax/be
  - Support 802.11be D3.0 specification
  - Support HE masked HE-LTF sequence mode for Trigger-based PPDU
  - Support TB PPDU non-OFDMA 996+484+242 case
  - Support more than 9 MPDUs
  - Support Non-HT punctured mode
  - Update unused tone mask
  - Show Midamble Periodicity in SIG info

89601EVMC: Cross-correlated EVM

- MIMO 2x2 and 4x4 signals are now supported in the 802.11n/ac/ax/be, Custom OFDM, and 5G NR measurements
- Cross-correlated EVM based auto ranging is now supported for 5G NR and Flex Frame measurements

89601DVBC: DVB-S2/S2X Satellite Modulation Analysis (NEW)

- Support DVB-S2 and DVB-S2X standard based modulation analysis (Pi/2-BPSK, QPSK, 8PSK, 16/32/64/128/256APSK)
- Support BER metrics with full channel decoding
- Support multi-carrier configuration
- Support ccEVM with multiple channels

Issues Resolved:

- [Basic Core] Fix defect in EVM optimized auto-range on N9042B when triggering is enabled
- [Basic Core] Error when using EVM - Meas Based Iteration auto range with M9703B and BBIQ
- [Basic Core] Frequency limits incorrect with N9042B + EDC + M8131 + VDI
- [Basic Core] Frequency Mask Trigger does not trigger with span above 235M with 510M DIF
- [Basic Core] Installation error on S9110A system
- [Basic Core] MXR unexpected display blanking
- [Basic Core] No signal when using MSOS804A+M1971E
- [Basic Core] Not able to delete a folder that contains a .setx that is being used
- [Basic Core] Player scroll bar inactive after recall recording
- [Basic Core] SCPI PULSe:REFerence:COPY 1,2 throws errors
- [Basic Core] Unable to connect to UXR0051AP
- [Basic Core] Unexpected frequency band blanking with MXR
- [5G NR] IQ Offset compensation doesn't work well when there is IQ imbalance
- [5G NR] PUCCH Format 4 decoding error
- [5G NR] High EVM with inter-slot frequency hopping
- [5G NR] SRS demod fails when exporting certain .setx files
- [5G NR] PUCCH Decoding Error
- [5G NR] PUCCH Format 4 CSI-2 decode fails
- [5G NR] Frame Trigger On causes worse EVM
- [5G NR] PUCCH Format 0/1 wrong decoded bits in some cases
- [5G NR] Crash when deleting a component carrier
- [5G NR] PUCCH Sync Not Found issue
- [5G NR] some results don't show CSI-RS
- [5G NR] PDCCH - wrong aggregation level and candidate Index values in decoded info table
- [5G NR] PUCCH Format 0 wrong decoded bits
- [5G NR] crashes when recalling the setx file generated by PWSG or recalling the recordings that are captured by MTRX in an offline mode
- [5G NR] signal with 63 users: VSA stops decoding after user #47.

- [5G NR] CSI-RS not recognized by the VSA
- [5G NR] PUCCH Demodulation Issue - The EVM of PUCCH2 and PUCCH3 are very high
- [5G NR] SRS with Frequency Hopping not working
- [5G NR] Distorted PRACH EVM when transmitted along Downlink and Uplink carriers
- [5G NR] High peak EVM on selected symbols
- [5G NR] Mixed DL and UL configuration resulting wrong decoding info
- [5G NR] CSI-RS MIMO and the EVM numbers in Frame Summary and MIMO Info Table don't align
- [5G NR] PUCCH Format 1 wrong decoded bit
- [5G NR] PDSCH demod issue when Scrambling is OFF in Signal Studio
- [5G NR] Decoded bits incorrect when CSI2 included
- [5G NR] Direct Calculation - BLER result is not correct
- [Advanced Radar] COM error about SelectedInstFMerror
- [Custom IQ] Pattern search finds the wrong pattern
- [Custom OFDM] Pilot values are not aligned with Power Boost setting
- [Custom OFDM] Overall EVM is not correct
- [Flex Frame] unstable sync when data mod is QPSK
- [Flex Frame] Cross Correlated EVM (ccEVM) for DVB-S2X shows high EVM on one of the CCs
- [Flex Frame] IQ Poor EVM compared to Custom IQ
- [LTE/LTE-A] Sync not found when the signal power is increased 3dB
- [WLAN] 802.11be 160M Demodulation Issue when Symbol Time Adjustment was set to AUTO
- [WLAN] 802.11ax 80M/160M TB PPDU for Center RU 26 MIMO setting issue
- [Cross-Correlated EVM] Cross Correlated EVM - Incorrect results with Fast Average enabled
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VSA2023 Update 2.2 (Build 27.42; Release Date December 2022)

License Version 2022.1201 required

Issues Resolved:

- Fix the issue for CVE-2023-1967 Product Security Vulnerability

   Note: we recommend that customers install the updated versions VSA2023 Update 2.2 or later as soon as possible. Older versions of impacted software may have this vulnerability; we recommend that customers discontinue the use of these older versions and uninstall them.

VSA2023 Update 2.0 (Build 27.40; Release Date December 2022)

License Version 2022.1201 required

89601200C: 89600 VSA Basic Software and Hardware Connectivity

- Common Feature
  - [Event Based Actions] Event log that contains information about an event (rule name, value that exceeded threshold, time of event, etc.) (BETA)
  - [Event Based Actions] Return to event by double-clicking the entry in the event log (when playing back a recording)
  - [Recording] Support BINF (Little Endian Real32Binary) (.binf) file format
  - [Recording] Support VITA-49 file format
  - [Power Reference Plane] Reference plane for power metrics may now be chosen as RF or Baseband when using I + jQ channel configurations, previously only RF input was assumed. This is only applicable for Vector mode and WLAN so far.
- Hardware Connectivity
  - [M9415A] Multi-channel Support (was BETA in previous versions)
  - Support for InfiniVision 3000G series scopes
  - Support for [M9484C] the VXG Vector Signal Generator capable of generating signals up to 54 GHz with 2.5 GHz of modulation bandwidth per channel.
  - Support for M9416A VXT PXI Transceiver (BETA)
  - Support for M9834A VNA
  - Support for M9837A VNA
  - SCPI support for controlling RF Switch (L8990A-01A and L8990A-01H) (BETA)

89601AYAC: Digital Demodulation Analysis

- Custom IQ
  - Auto range for optimal EVM now supports Custom IQ measurement.
- Digital Demod
  - Auto range for optimal EVM now supports Digital Demod measurement.
  - PDF/CDF/CCDF traces and CCDF summary table are now supported.
- Flex Frame
  - Auto range for optimal EVM now supports Flex Frame measurement.
  - Support preset to IEEE 802.15.3d standard
  - Support auto range for optimal EVM
  - Support for cross-correlated EVM measurements (requires 89601EVMC license)

89601BHFC: Custom OFDM Modulation Analysis

- Support 8x8 MIMO with overlapped and non-overlapped pilots
- Added Frame Definition GUI and API to enable pre-6G OFDM signal demodulation
- Support for cross-correlated EVM measurements (requires 89601EVMC license)

89601BHNC: 5G NR Modulation Analysis

- Uplink and Downlink

- o Demodulation and decoding speed improvement
- o 3GPP Rel-17 FR1: New 35 MHz and 45 MHz BW
- o 3GPP Rel-17 FR2: New 480 kHz and 960 kHz numerology
- o 3GPP Rel-17 FR2: New 800 MHz, 1.6 GHz, and 2 GHz BW
- o Multi-User MIMO (MU-MIMO) support using single carrier
- o User selectable PDSCH/PUSCH decoding algorithm to improve receiver sensitivity performance
- o SINR for each channel (under Frame Summary and Slot Summary tables)
- o Burst CCDF measurement - measure CCDF for active slots/symbols (important for TDD)
- o Demodulate one time slot data repeated across a full frame (different from 3GPPs definition of repetition pattern)
- o Display the Decoded Info Trace per-component carrier (CC)
- o Cell ID column added to Context Window
- o Support for low SNR signal demodulation
- Uplink
  - o PUCCH Inter-Slot frequency hopping for Formats 1, 3 and 4
  - o Couple payload size with modulation format for PUCCH Format 1
  - o For MIMO, Rank Number value now matches the number of used DMRS ports when Used Antenna Port Index is unchecked
  - o PUCCH Format 0 - Cyclic Shift value added to Decoded Info Trace
  - o PUCCH Format 1 and 4 - OCC Index value added to Decoded Info Trace
  - o PUCCH Format 3 and 4 - CSI2 Decoding and large code block size (where previously was limited to 153 bits)
- Downlink
  - o 3GPP Rel-17: New 35 and 45 MHz BW for all FR1 Test Models
  - o PDSCH BER when the PDSCH IQ Reference data is NR-TM PN23 or All-0s
  - o Support RIM-RS per 3GPP Rel-16
  - o Use of PN23 All Symbols (PN sequence for all DL & UL) for PDSCH IQ Reference
  - o RSRP/RSRQ/RSSI/SINR metrics for SSB and CSI-RS (under UE Reported Metrics Summary table)

89601BHQC: Advanced Radar and Pulse
- Advanced Radar
  - o Support for Amplitude, FM, Phase, and Chirp measured, reference and error traces.
  - o Amplitude synchronization domain
    - o Pulse detection includes intra-pulse modulation analysis.
    - o Statistic features: cumulative pulse table, trend lines, histogram lines, etc.
  - o Linear Chirp Region Detection
    - o Support Chirp Meas Time, Ref Time and Error Time traces for linear chirp sync domain
    - o Pulses may now be identified as regions of constant chirp rate for bursts of chirps or constant envelope signal

- o The combination of Linear Chirp Region Detection and Segmented Capture is in BETA status

89601BHXC: High Throughput WLAN Modulation Analysis

- 802.11ac/ax/be
  - o Non-HT Duplicated support for 40/80/160/320 MHz bandwidth
  - o 802.11be: show EHT-SIG content in UL MU PPDU

89601EVMC: Cross-correlated EVM

- Cross-correlated EVM is now supported for the Custom OFDM and Flex Frame measurements, in addition to the WLAN and 5G NR measurements.
- Ability to reduce the variance of the ccEVM value by averaging the results from multiple measurements.
- Per-symbol and per-subcarrier Cross-Correlated Error Vector Spectrum/Time trace results, similar to the RMS Err Vect Spectrum/Time traces.

89601PSMC: PowerSuite Measurement Application

- Preset is now supported for SEM measurement with Pass/Fail results for all WLAN formats
- 5G NR 3GPP Rel-17 FR1: New 35 and 45 MHz bandwidth support under Contexts extension

Issues Resolved:

- [Basic Core] Frequency Counter function is broken
  - o Reported against VSA 2023 Update 1.0. The marker window displays "Freq 0: Not valid for this trace data"
- [Basic Core] Ext Mixer Dual conversion mode does not work with M1971V
  - o Reported against VSA 2023. Using M1971V with PXA - no signal is seen when Dual Conversion mode is selected.
- [Basic Core] Wrong channels using pre-Keysight M3102A modules
  - o Reported against VSA 2023 Update 2.0 BETA4.
- [5G NR] SRS EVM shows 0 % even when changing the below parameters - Sequence ID, Transmission Comb, and Comb Offset
  - o Reported against VSA 2022 Update 1.0
- [5G NR] Decoded Info table only returns two of the four generated slots for PUCCH
  - o Reported against VSA 2023. the Decoded Info table only returns Slots 8 and 9, not Slots 18 and 19
- [5G NR] When CRC fails, "Failed Code Blocks" result in Decoded Info table is not correct
  - o Reported against VSA 2023. Failed Code Blocks shows: None at CC0's Slot = 3 & 5, but the actual failed code block is 10.
- [5G NR] Wrong Resource Grid for 240kHz numerology

- o Reported against VSA 2023. Grid size of 34 for 240 kHz numerology. This should be 32.
- [5G NR] MIMO signal, Layer1 constellation is distorted
- Reported against VSA 2022 Update 1.0. The constellation diagram for Layer 1 is much worse than Layer 0.
- [5G NR] Slot Summary table doesn't return the correct SF and Slot numbers
- Reported against VSA 2023
- [5G NR] SSB Decoding fails with high LO Feedthrough
  - o Reported against VSA 2023. SSB performance is impacted by very high LO feedthrough and the decoding fails in most of the SSBlocks.
- [5G NR] PUCCH Format 3 CSI-2 decode fail
  - o Reported against VSA 2023 Update 2.0 BETA2. PUCCH Format 3 CRC fails when CSI-2 is transmitted.
- [Digital Demod] Memory leak causing crashes
  - o Reported against VSA 2023. Running tests with DigDemod continuously and sees the system crash every two weeks after the VSA consumes 30GB of memory.
- [WLAN] PSDU CRC status only checks first user
  - o Reported against VSA 2023. A math error causes only the first user to be checked in when reporting the PSDU CRC status in the burst info trace.

VSA2023 Update 1.0 (Build 27.20; Release Date September 2022)

License Version 2022.0901 required

89601OR1C: Direct Calculation of EVM (Error Vector Magnitude) for 5G NR
- Uplink
  - o 5G NR EVM with OFDM (frequency) domain or time domain input data
- Downlink
  - o 5G NR EVM with time domain input data
- This model has no dependency with 89601BHNC. But this feature can also be enabled with 89601BHNC

89601OR2C: Direct Calculation of BLER (Block Error Rate) for 5G NR
- Uplink
  - o 5G NR BLER with OFDM (frequency) domain or time domain input data
- Downlink
  - o 5G NR BLER with time domain input data
- This model has no dependency with 89601BHNC. But this feature can also be enabled with 89601BHNC

VSA2023 (Build 27.00; Release Date June 2022)

License Version 2022.0601 required

89601200C: 89600 VSA Basic Software and Hardware Connectivity

- Common Feature
  - Floating license manager migrated from Keysight License Manager (KLM6) to PathWave License Manager
  - Support for fault tolerant licensing
  - Support for custom toolbar
  - Allow users to define VSA actions based on events
- Power Spectrum
  - Multiple-band spectrum feature is officially supported (previously BETA support)
  - Added noise correction with X-Series analyzers and PXI VXT Transceivers
- Hardware Connectivity
  - Control of RF Switch (L8990A-01A and L8990A-01H) when using sequential input channel configurations (BETA)
  - Support for daisy-chained switch, L8990A-01H with L8990A-016 or L8990A-01A, for 64 port configuration (BETA)
  - Support for N9021B new models (8.4GHz, 13.6GHz, and 26.5GHz) with up to 510MHz analysis bandwidth
  - Support for N9032B new models (44GHz, 50GHz, and 55GHz) with up to 2GHz analysis bandwidth (BETA)
  - Support for differential channels with Infiniium UXR-Series and MXR-Series real-time oscilloscopes, and M3102A
  - Support for channelized IF magnitude trigger level with Infiniium UXR-Series real-time oscilloscopes
  - Support for baseband DDC with Infiniium MXR-Series real-time oscilloscopes
  - Support for channelized trigger delay with the X-series analyzer multiple-instrument configuration
  - Support for low noise amplifier (LNA) M9415A VXT PXI Transceiver
  - Support for automatic spur dodging when used in power spectrum based measurements with M9415A VXT PXI Transceiver
  - Auto range for optimal EVM now supports the Custom OFDM measurement in addition to the WLAN and 5G NR measurements
  - Support for multiple-instrument configuration is now expanded to N9042B signal analyzer
  - Support for E6680E Wireless Test Set
  - Support for SCPI command to control attenuation V3050A Signal Analyzer Frequency Extender
  - Speed improvement for data transfers when using VSA from a remote machine and connected to X-Series analyzers with A.33 firmware or newer

89601AYAC: Digital Demodulation Analysis

- Added adaptive equalization
- Speed improvement to LMS equalization

- Support 16APSK and 32 APSK modulation formats for DVB-S2
- Increase the number of component carriers from 16 to 32

89601BHNC: 5G NR Modulation Analysis
- Uplink and Downlink
  - 3GPP Rel-17 two new test models - TM2b and TM3.1b (both using 1024QAM)
  - Cross-correlated EVM measurement to reduce the EVM contribution by the instruments
  - PUSCH/PDSCH supports user-defined constellation
  - Per-CC Symbol Phase Compensation and Per-CC traces
  - Manual configuration of synchronization channel
  - Three sector antenna pattern defined in 3GPP and ITU
  - User defined antenna layout
  - Sub antenna rectangular panel configuration
  - Import antenna pattern defined in Keysight Propsim via a file
  - Extended frequency lock range up to 1 MHz to support initial NTN measurements. NTN will introduce up to 700 kHz of Doppler shift
  - Increase the number of component carriers from 16 to 32
- Uplink
  - UCI + PUSCH multiplexing without PUSCH data
  - Two overlapped PUCCHs of Format0
  - Precoding matrix for PUSCH
- Downlink
  - PDSCH reference bits of Test Model PN23, and All zeros

89601BHXC: High Throughput WLAN Modulation Analysis
802.11n/ac/ax/be Modulation Analysis
- PSDU CRC result is added to Burst Info trace
- Reference symbols can now be specified manually

89601BHTC: IoT Modulation Analysis
IEEE 802.15.4/4z High Rate Pulse Repetition Frequency Ultra-Wide Band (HRP UWB) Modulation Analysis
- Frame Info results added
  - Frame check results (pass/fail) indicating whether pulse polarity/position is correct
  - MAC FCS check
  - PHR Info
- Baseband Pulse Mask trace
  - Pulse shape computed according to Fira specifications
  - Limit lines with IEEE mask
- Synchronization improvement when multiple frames in acquisition
- Support for pulse amplitude average

89601PSMC: PowerSuite Measurement

- ACP measurement is officially supported (previously BETA support)
- Spectrum Emission Mask (SEM) and Adjacent Channel Power Measurement (ACP)
  o Multiple-band spectrum feature is officially supported (previously BETA support)
  o Added noise correction with X-Series analyzers and PXI VXT Transceivers
  o Added SCPI API support
  o Added 5G NR standard-specific presets (requires option 89601BHNC)
  o Added measurement averaging

89601CSDC: Channel Sounding Analysis

- Replaced Option 89600CSP-H51, which was introduced in **VSA2020 Update 1.0 (Build 25.20; Release Date August 2020)**.

Issues Resolved:

- [5G NR] PRACH demodulation for Retricted Set A and Set B is broken
  o Reported against VSA 2022. Set A and Set B setting does not affect the EVM results
- [5G NR] PDSCH CRC fails when CSI-RS is enabled
  o Reported against VSA 2022 Update 1.0. Disabling CSI-RS1 or CSI-RS2 leads to PDSCH1 CRC failure
- [5G NR[Symbol clock error compensation setting doesn't get saved in .setx file
  o Reported against VSA 2022 Update 1.0. The setting information of symbol clock error compensation is missed when saving VSA setup
- [5G NR] Uplink PTRS power ratio is not automatically configured properly
  o Reported against VSA 2022 Update 1.0. UL PTRS power is not scaled based on TS38.214
- [5G NR] First timeslot DMRS EVM is higher than the rest
  o Reported against VSA 2022 Update 1.0
- [5G NR] Crash when PUCCH format 3 payload size is greater than 153bits
  o Reported against VSA 2022 Update 1.0. Increased the internal hard limit for payload size
- [WLAN] (802.11ax) Demouldation fails when Guard Interval is set from Sig Decode
  o Reported against VSA 2022 Update 1.0. For SU PPDU, VSA parses the CP mode incorrectly based on the SIG information
- [Digital Demod] DVB-S2 missing supported modulation formats
  o Reported against VSA 2022 Update 1.0. Added 16APSK and 32APSK modulation formats to DVB-S2

VSA2022 Update 1.0 (Build 26.20; Release Date December 2021)

License Version 2021.1101 required

89601200C: 89600 VSA Basic Software and Hardware Connectivity

- Common Feature
  - Direct Data Connectivity examples
- Power Spectrum
  - Official support for time domain input data capture (BETA in VSA2022)
    - All existing hardware connectivity can now be used with Power Spectrum measurement
    - This also includes support for recording file playback and SystemVue integration
  - Added multi-band spectrum support (BETA)
- Hardware Connectivity
  - Control of RF Switch (L8990A and U1816C) when using sequential input channel configurations (BETA)
  - Support for IF magnitude trigger with Keysight MXR oscilloscopes
  - Auto-range criteria enhancement
    - EVM optimization now supported with all hardware that support the Range parameter
    - Allow specifying Measurement based vs Algorithm/Table based EVM optimization for X-Series analyzers
  - Official support for N9042 UXA with up to 4 GHz analysis bandwidth (BETA in VSA2022)
  - M3102A digitizer support
  - M9415A multi-channel support (BETA)
  - Internal Source trigger type supported for use with VXT Vector Transceiver instruments
  - Network Analyzers
    - Support for PNA series
    - Support for period trigger
    - Support for "a" receivers when using benchtop network analyzers

89601AYAC: Digital Demodulation Analysis

- Support for bit-to-symbol mapping important for standard nPSK and nQAM modulation types
- Enhancements to measurement configuration UI
- Support for constellation scrambling for DVB-S2X

89601BHNC: 5G NR Modulation Analysis

- Uplink and Downlink
  - PUSCH/PDSCH code-block decoding
  - Optimize EVM auto range for instruments other than X-series signal analyzers
  - Slot trigger and single slot measurement
- Downlink
  - Synchronization to PDCCH-DMRS
  - Multiple frame with different configurations per frame
  - 8x8 MIMO channel decoding

- o 3GPP Rel-17 1024QAM decoding (CRC pass/fail)

89601BHXC: High Throughput WLAN Modulation Analysis

- IEEE WLAN 802.11be
  - o Support for 802.11be TB (Trigger-Based) PPDU, including allocation auto-detection (single RU), or manual allocations
  - o Gamma Phase Rotation parameter for 320MHz bandwidth PPDU
  - o Support for different contents per 80 MHz for U-SIG and EHT-SIG info
  - o Cross-Correlated EVM support (reduce analyzer imperfection contribution to EVM measurement; require the 89601EVMC license)

89601BHTC: IoT Modulation Analysis

- Demodulation results added
  - o NRMSE (Normalized Root Mean Square Error) for each part of the frame
  - o IQ Meas and IQ Ref traces
  - o Error Vector Time trace
- Parameter to exclude transmitter settling time from analysis

89601PSMC: PowerSuite Measurement

- Spectrum Emission Mask (SEM)
  - o Official support for Spectral Emission Mask (.NET API has changed, BETA in VSA2022)
  - o Support for complex SEM measurement definitions including multiple offsets, multiple carriers (with sub-blocks), cumulating masks, and interfering signals
  - o Extends existing Power Spectrum measurement capability to support standard-specific spectral emissions mask testing
  - o QuickSetups are provided for IEEE 802.11be 160 MHz and 320 MHz
  - o QuickSetup feature enables capturing a complex SEM definition for sharing and subsequent single button setup function
  - o Supports extensive tabular results (including summary pass/fail information) and a composite SEM Spectrum trace showing limit lines
- Adjacent Channel Power Measurement (ACP) (BETA)
  - o Support for complex ACP measurement definitions including multiple offsets, multiple carriers (with subblocks), cumulating limits, and interfering signals
  - o Examples for 5G NR single component carrier (CC) and carrier aggregation (CA) scenarios.
  - o QuickSetup feature enables capturing a complex ACP definition for sharing and subsequent single button setup function
  - o Extensive tabular results (including summary pass/fail information) and a composite ACP Spectrum trace

89601101C: Direct Data Connectivity (NEW)

- Programmatically push IQ data directly from your own software or hardware platform

89601EVMC: Cross-correlated EVM (NEW)

- Cross-correlated EVM for WLAN measurements

89601CC1C: Phase Coherent Channel Count Expander Up to 8-Port with Sequential Acquisition (NEW)

- Leverage 2-channel phase coherent receiver with 8-port switch to create a phase coherent 8-port measurement system

89601CC2C: Phase Coherent Channel Count Expander Up to 64-Port with Sequential Acquisition (NEW)

- Leverage 2-channel phase coherent receiver with 64-port switch to create a phase coherent 64-port measurement system

VSA2022 Update 0.2 (Build 26.00; Release Date August 2021)

License Version 2021.0601 required

89601200C: 89600 VSA Basic Software and Hardware Connectivity

- Common Feature
  - Support for playback user correction when playing back recording files
  - Allow SCPI to be used by a VSA instance launched by X-Apps
- Power Spectrum
  - All existing hardware connectivity can now be used with Power Spectrum measurement
  - This also includes support for recording file playback and SystemVue integration
- Hardware Connectivity
  - UXA N9042B with up to 4 GHz analysis bandwidth and V3050A with extended frequency range to 110GHz (BETA)
  - PXA N9032B with up to 2 GHz analysis bandwidth (BETA)
  - E6680A Wireless Test Set with up to 800 MHz analysis bandwidth and 4 simultaneous input channels (4 ports selectable for each input channel) (BETA)
  - Improvement to table-based EVM auto-range for 5G NR and WLAN for N9030A B1X DIF path
  - Improvement to UXR and MXR phase coherence across variable length segmented capture (VLSC)
  - Improvement to sequential input to allow more parameters to be independent between acquisitions
  - Fine range step for MXR and S-Series oscilliscopes

89601AYAC: Digital Demodulation Analysis

- FlexFrame Modulation Analysis (NEW)
  - Multiple component carrier and multiple channel support
  - Improvement to measurement configuration UI
  - Support for DVB-S2X and DVB-RCS2 measurement configurations with quick setup

- o Support constellation scrambling
- o Support transmitter BER

89601BHNC: 5G NR Modulation Analysis
- Uplink and Downlink
  - o PUSCH/PDSCH Rate Match Pattern support
  - o MIMO Eq Ch Freq Resp Trace
- Uplink
  - o PRACH auto detection official support
  - o PRACH auto detection of Preamble ID (PID) and Time Advanced (TA)
  - o UCI decoding on PUSCH
  - o PUCCH decoded bits for Format 0
  - o Multiple PUCCH demod (up to 100 PUCCHs)
- Downlink
  - o PDSCH Interleaved VRB-to-PRB Mapping
  - o Support for CSI-RS MIMO and Beamforming
  - o SRS multiple slots definition and SRS for positioning compliant to Rel-16

89601BHXC: High Throughput WLAN Modulation Analysis
- IEEE WLAN 802.11be
  - o Compliant to IEEE 802.11be D0.4 specification
  - o Support for MU OFDMA (SIG Decoding or manually configured allocations) (BETA)
  - o Support for Compression Mode MU-MIMO (SIG Decoding)

89601BHQC: Pulse Analysis
- Support multi-channel pulse table

89601PSMC: PowerSuite Measurement (NEW)
- Spectrum Emission Mask (BETA)
  - o Support for complex spectral emissions mask (SEM) measurement definitions including multiple offsets, multiple carriers (with subblocks), cumulating masks, and interfering signals
  - o Extends existing Power Spectrum measurement capability to support standard-specific spectral emissions mask testing
  - o Quick Setups are provided for IEEE 802.11be 160 MHz and 320 MHz
  - o Quick Setup feature enables capturing a complex SEM definition for sharing and subsequential single button setup function
  - o Supports extensive tabular results (including summary pass/fail information) and a composite SEM Spectrum trace showing limit lines

VSA2021 Update 1 (Build 25.60; Release Date March 2021)

License Version 2021.0201 required

89601200C: 89600 VSA Basic Software

- Hardware Connectivity
  - Support for the latest UXA N9042B signal analyzer models with various offerings for analysis bandwidth and performance improvement
  - Support for N9950B/N9951B/N9952B/N9960B/N9961B/N9962B Fieldfox handheld RF and Microwave Analyzers

89601BHXC: High Throughput WLAN Modulation Analysis

- IEEE 802.11be
  - Support single user compressed-mode 20 MHz/40 MHz/80 MHz/160 MHz/320 MHz EHT MU PPDU
  - Support preamble puncture for 80 MHz/160 MHz/320 MHz EHT MU PPDU
  - Auto-detection of preamble puncture pattern

VSA2021 (Build 25.40; Release Date December 2020)

License Version 2020.1101 required

89601200C: 89600 VSA Basic Software

- Common Feature
  - Time vs. Time heatmap
  - Time vs. Frequency heatmap
  - Cross trace delta markers
- Hardware Connectivity
  - Infiniium MXR and EXR Series real-time oscilloscopes connectivity up to 8 channels
  - Variable length segment capture with X-series signal analyzers and Infiniium UXR-Series real-time oscilloscopes
  - IF Mag trigger with Infiniium UXR-Series real-time oscilloscopes
  - Single-channel support for M9415A PXI VXT transceiver
  - Periodic trigger supporting X-Series signal analyzers (except for UXA-H1G DIF path) and PXI VXT transceiver
  - Power spectrum measurement with M9808A VNA

89601AYAC: Digital Demodulation Analysis

- Add new Flex Frame measurement which provides the ability to flexibly define and measure single-carrier signals (Beta)
  - Support for frame definition with multiple segments with different modulation types
  - Support for synchronization and channel estimation based on selected signal segments
  - Support for Least-Mean-Squares and Zero-Forcing channel equalization modes

89601BHNC: 5G NR Modulation Analysis

- Uplink and Downlink
  - Support to 3GPP TS 38 series v.16.2.0 (2020-06) specification
  - Enhancement to 5G NR EVM auto ranging using X-Series signal analyzers

- o Multiple PTRS antenna port support
- o Channel power (Active) result in summary table to measure RMS power of the ON part of the signal
- o Effective code rate value in decoded info table
- Uplink
  - o Frequency error per subframe result table for uplink RF conformance test
  - o PRACH multiple time occasions support
  - o PRACH auto detection (beta)
  - o PTRS support with transform precoding (DFT-S-OFDM)
- Downlink
  - o Test Models updated based on TS38.141 v.16.4.0 (2020-06) standard
  - o User defined PRB bundle size for PDSCH
  - o RB Offset to CORESET per 3GPP Rel-16

89601BHXC: High Throughput WLAN Modulation Analysis

- IEEE 802.11be (beta)
  - o Support 320 MHz, 160+160 MHz, and 160+80 MHz signals composed of 802.11be single user (SU) PPDUs
  - o Up to 4096QAM modulation format
- IEEE 802.11ax
  - o Support 4096QAM modulation format
- IEEE 802.11n/ac/ax/be
  - o Support Wiener interpolation filter for channel estimation

89601BHQC: Pulse Analysis

- Support for Non-linear FM analysis

89601BHTC: IoT Modulation Analysis

- IEEE 802.15.4/4z HRP UWB
  - o Support demodulated bits (before convolutional decoding)
  - o Show PHR + PSDU decoding bits with FEC containing the bits after convolutional encoding is removed
  - o Show PSDU decoding bits after Reed-Solomon decoding (if applicable)

VSA2020 Update 1.0 (Build 25.20; Release Date August 2020)
License Version 2020.0701 required

89601200C: 89600 VSA Basic Software

- CCDF summary table is added to most of the measurements

89601BHNC: 5G NR Modulation Analysis

- Uplink and downlink modulation quality measurements comply with 3GPP TS 38 series v.16.1.0 (2020-03) specification
- 3GPP Release-16 specification feature support

- - - NR unlicensed (NR-U)
    - PDSCH Type B symbol extension
    - Uplink Intra-Cell Guard-Band
  - Enhanced MIMO (eMIMO)
    - Low PAPR DMRS for PDSCH
    - Low PAPR DMRS for PUSCH CP-OFDM
    - Low PAPR DMRS for PUSCH DFT-s-OFDM & PUCCH Formats 3 & 4
  - Enhanced Dynamic Spectrum Sharing (eDSS)
    - PDSCH Type-B symbol extension
    - Multiple LTE-CRS rate matching
  - UL-SCH parameter n_RAPID for scrambling msgA PUSCH
- Speed improvement to modulation quality measurements
- Result Trace
  - Per-slot summary
  - New implementation of RMS Error Vector Spectrum and RMS Error Vector Time
- Miscellaneous updates
  - 1024QAM and 8-PSK modulation analysis. Not part of 3GPP's NR definition

89601BHQC: Pulse Analysis

- Angle of Arrival Measurement
  - Support up to 4 receiver antennas and provide simultaneous measurement of azimuth and elevation angles of the emitter relative to the receiver antenna orientation

89600CSP-H51: Channel Sounding Analysis

- Work with provided demo signal or Keysight N7608C Signal Studio Pro for Custom Modulation
- Support latest Keysight signal sources and analyzer platforms up to mmWave frequency, including M9384B VXG, N9040B/N9041B UXA, Infiniium UXR-Series real-time oscilloscopes
  - Support complex channel impulse response, frequency response, and sound metrics such as frequency error, symbol clock error, and RMS delay spread
  - Analyze up to 64 channels of data

VSA2020 Update 0.1 (Build 25.01; Release Date April 2020)
License Version 2020.0301 required

89601200C: 89600 VSA Basic Software

- Fix the installer not installing the Visual Studio 2015-2019 redistributable
- Fix the VXT2 model name typo from N9410A/N9411A to M9410A/M9411A

- Resampler behavior change: data from hardware is now resampled only when needed to improve speed

89601BHNC: 5G NR Modulation Analysis

- Constrain 5G NR 8x8 MIMO to DL only

VSA2020 (Build 25.00; Release Date April 2020)

License Version 2020.0301 required

89601200C: 89600 VSA Basic Software

- Recall recording supports larger than 2GB file size for both N5106A and N5110A formats
- Sequential data capture within a measurement
- Support for N9021B with 510MHz analysis bandwidth
- N9040B/N9041B with U9361F/G calibration usability improvement
- M9410A/M9411A VXT PXI Transceiver additional functionality
  - Multiple-channel support (up to 4 channels)
  - Support for selecting PXI trigger lines as an input trigger
- Support for InfiniiVision DSOX1202A/DSOX1202G/DSOX1204A/DSOX1204G
- Support for Infiniium UXR0051AP Single Channel UXR-Series Oscilloscope with DDC (Digital Down Converter)
- Support for M9383B/M9384B: Single channel VXG mmWave Vector Signal Generator: 1 MHz to 44 GHz
- Use on virtual machines no longer restricted

89601AYAC: Digital Demodulation Analysis

- Custom IQ Modulation Analysis
  - New Adaptive Equalizer mode that allows minimization of the entire error vector, not just at the decision points

89601BHNC: 5G NR Modulation Analysis

- Demodulation speed improvement
- GUI responsiveness improvement
- Uplink and downlink modulation quality measurements comply with 3GPP TS 38 series v.15.8.0 (2019-12) specification
- Dynamic spectrum sharing
- Support per subcarrier IQ imbalance estimation and compensation
- Support IQ Offset compensation
- Carrier Aggregation
  - Support sequential data capture
  - Support auto configuration for data capture based on Carrier Center location

- o Support per carrier input channel mapping
- o Improved GUI usability
- o Improved Test Model usability
- UL Spectrum Flatness Measurement
- Add peakEVM, magError, phaseError results
- Test Models updated based on TS38.141 v.15.8.0 (2019-12) standard
- Time Scale Factor
- DL MIMO up to 8x8
- PUCCH Format 3 and Format 4
- UL SRS
- 3D EVM Trace

89601BHQC: Pulse Analysis

- Frequency Hopping Analysis
  - o Allow specifying dwell time and settling tolerance for hop state calculation
  - o Allow specifying start, stop and step frequency for hopping states analysis
- Pulse Scoring
  - o Support pulse pattern (train) search and scoring of the patterns
  - o Train Search Table
- Allows specifying phase shift angle for BPSK modulation
- Cumulative pulse table

89601BHTC: IoT Analysis

IEEE 802.15.4/4z High Rate Pulse Repetition Frequency Ultra-Wide Band (HRP UWB) Analysis

- Three PHY modes: Non-ERDEV, ERDEV-BPRF and ERDEV-HPRF
- Channels 0-15 with corresponding pulse bandwidths
- Standard combinations of SHR, STS and PHR/PSDU parameters
- Traces and Metrics
  - o RRC Correlated trace and Main Lobe/Side Lobe metrics (including pass/fail indication)
  - o RMARKER location relative to beginning of recording (for calculating Time of Flight)
  - o Channel Impulse Response/Frequency Response
  - o Transmit Mask (including pass/fail indication)
  - o Frequency Error/Chip Clock Error
  - o Peak/Average Power for SHR, STS, and Data (PHR/PSDU)

VSA2019 Update 1.3 (Build 24.23; Release Date December 2019)

License Version 2019.0901 required

89601200C: 89600 VSA Basic Software

- Support for UXR DDC

VSA2019 Update 1.2 (Build 24.22; Release Date November 2019)

License Version 2019.0901 required

- Issues Resolved:
  - Can't connect with .NET API after upgrading VSA 2019 U1 to U1.1
  - 5G NR SCPI command not available for PdschCollection.DmrsNidSource

VSA2019 Update 1.1 (Build 24.21; Release Date October 2019)

License Version 2019.0901 required

- Issues Resolved:
  - Abnormal memory usage

VSA2019 Update 1.0 (Build 24.20; Release Date September 2019)

License Version 2019.0901 required

- Issues Resolved:
  - [5G NR] SyncNotFound status bit not set
  - [5G NR] Unable to reliably demod UL when DL is present
  - [802.11ax] Poor EVM on segment 2 when analyzing 80 + 80
  - [FMCW] reported phase noise too high

89601200C: 89600 VSA Basic Software

- Support for "C" licenses
- Default auto-range speed-up for X-Series signal analyzers with wideband digitizer option with firmware revision A.25.00 or later
- Improve speed and better filter flatness for fractional delay corrections when not doing sample rate resampling during data acquisition or playback
- Infiniium UXR-Series Oscilloscope Frequency Extension
- Supports M9381A PXIe Vector Signal Generator: 1 MHz to 3 GHz or 6 GHz
- N9040/N9041/M9410/M9411 Spur Avoidance
- M9410/M9411 Single channel

89601AYAC: Digital Demodulation Analysis

- Custom IQ Modulation Analysis
  - Faster loading time for very high order modulation QAM signals with large constellation definitions (> 1024 states)
  - Recall constellation definitions from files exported by Keysight Signal Studio for Custom Modulation (N7608B)

89601BHNC: 5G NR Modulation Analysis

- Demodulation speed improvement
- Uplink and downlink modulation quality measurements comply with 3GPP TS 38 series v.15.6.0 (2019-06) specification
- Supports SSB and PxSCH beamforming measurement. Provide 3D beam pattern trace, beam peak summary table and beamforming weight table.
- Supports four BWPs
- "Results & Filters" panel to change colors of channels, filter channels from measurement traces and/or EVM computation
- PDCCH and PDSCH measurement related to CORESET0
- Condition Number measurement for MIMO
- Test Models updated based on TS38.141 v.15.2.0 (2019-06) standard

89601BHQC: Pulse Analysis

- Pulse de-interleaving works with up to 30 emitters with different PRI, pulse width, modulation, etc
- Pulse Scoring
  - Pulse scoring is the quality index of how pulse parameters/metrics (Top Level, Width, PRI, Freq Mean and FM Slope) are consistent with reference pulse(s).
  - Scoring results are displayed in the Pulse Table and are scored as a 0 (worst) to 1 (best) range value.

89601BHTC: IoT Analysis

- IEEE 802.15.4 High-rate PHY Ultra Wide Band (HRP UWB) Measurement
  - Standard combinations of Code Index, Delta Length, SYNC Length, and SFD Length
  - Channels 0-15
  - Traces and Metrics
    - RRC Correlated trace and Main Lobe/Side Lobe metrics (including pass/fail indication)
    - Channel Impulse Response/Frequency Response
    - Transmit Mask (including pass/fail indication)
    - Frequency Error
    - Chip Clock Error
    - Time Offset from trigger

VSA2019 (Build 24.00; Release Date March 2019)

License Version 2019.0301 required

- Issues Resolved:
  - [5G NR] MIB decoded info is not accurate
  - [5G NR] Decoded PBCH bits do not change with decoding type selected

- o [5G NR] PUSCH RB Number restricted per TS38.211 6.3.1.4
- o [802.11ax] Memory Leak
- o [802.11ax] SIG-B modulation format is wrong
- o [Custom IQ] Pattern Search no longer works
- o Long startup time when obtaining licenses from Agileesofd server

Option 200: Basic VSA

- Vector mode FFT and Main Time length increased 32x to maximum of 16 MPts

- Measurement block diagram for configuration navigation and overview

- Data file recall allows users to enter sampling rate and center frequency for binary file format

- Wideband IF trigger output from X-series signal analyzer

- Ranging enhancements for X-series signal analyzer

- Up to 8x8 MIMO for M9420A/M9421A

- Updates to N9041 EDC (external digitizer control) with up to 5GHz bandwidth as Beta

- Infiniium UXR-Series Oscilloscope frequency extension as Beta

- E7515A UXM multi-channel as Beta

- M1740 + M9410A/M9411A as Beta

Option BHN: 5G NR/Pre-5G Modulation Analysis

- 5G NR Modulation Analysis
  - o New modulation quality measurements comply with 3GPP TS 38 series v.15.3.0 and v.15.4.0
  - o Carrier aggregation up to 16 component carriers
  - o UL code-book based MIMO up to 4x4
  - o DL MIMO up to 4x4
  - o DL Test Model
  - o Conformance Test
  - o Auto detection
  - o PUCCH (format 3,4) EVM
  - o Multiple PUSCH channels
  - o DCI decoding
  - o PRACH

Option BHQ: Pulse Analysis

- Pulse descriptor word export for Keysight UXG

- Up to 1024 chips BPSK/QPSK demodulation

Option BHT: NB-IoT Modulation Analysis

- Uplink support
  - o NPUSCH Format 1 and 2

- o 15 kHz or 3.75 kHz subcarrier spacing
- o 1, 3, 6, or 12 tones
- o Autodetection of many parameters including number of subcarriers, spacing, and offset
- o Decoding support
- NPRACH formats 0 and 1
- Downlink
  - o NPRS analysis
  - o NPDSCH decoding

VSA2018 Update 1.0 (Build 23.20; Release Date September 2018)
License Version 2018.0901 required

Option 200: Basic VSA
- User Correction - Support cascaded S parameter files
- Updated Display Themes
- Fixed length segmented capture for X-series signal analyzer
- Support for Infiniium UXR-Series Oscilloscope
- Input extension usability enhancement
- Support for N9041B EDC (external digitizer control) with up to 5GHz bandwidth [Beta]
- Support for M9410A/M9411A [Beta]

Option BHN: 5G NR/Pre-5G Modulation Analysis
- 5G NR Modulation Analysis
  - o New modulation quality measurements comply with 3GPP TS 38 series v.15.1.0 and v.15.2.0
  - o UL MIMO (non-codebook based) up to 4x4
  - o Multiple PDSCH, PDCCH and CSI-RS channels
  - o Mixed numerology SSB/PDSCH
  - o PDCCH EVM and decoding
  - o PUSCH transform precoding (DFT-s-OFDM)
  - o PUCCH (format 0,1) EVM and decoding
  - o Cell ID auto-detection
  - o PBCH decoding with SFN info, SSB index and MIB
  - o CSI-RS (single antenna port)
  - o In-band emissions

Option BHQ: Pulse Analysis
- Sidelobe level measurement

Option BHT: NB-IoT Modulation Analysis
- New option - Only Downlink support in this release.
  - o Operation modes: In-band (same or different PCI), Standalone, Guard-band

- o Physical channels: NPBCH, NPDCCH, NPDSCH
- o Physical signals: NRS, NPSS, NSSS

VSA2018 Update 0.1 (Build 23.01; Release Date April 2018)

License Version 2018.0301 required

- Issues Resolved:
  - o Crash during startup
  - o Floating licenses not accessed properly
  - o 5G NR – IQ Offset reading reports 999
  - o 5G NR - SSB L64 measurement fails when active index goes beyond 31
  - o 5G NR - No error message when there is no channel active
  - o 5G NR - Channel frequency response not continuous in the SSB frequency range

VSA2018 (Build 23.00; Release Date March 2018)

License Version 2018.0301 required

- Issues Resolved:
  - o Ignore environment variable LM_LICENSE_FILE to avoid slow startup
  - o Custom IQ channel frequency response inverted
  - o SCPI with multiple commands in one line does not work
  - o Docsis 3.1 upstream SCPI command for Normalize IQ setting added
  - o Docsis 3.1 Phy38 burst flatness failures
  - o 802.11ax removed non-standard usage of legacy preamble L-LTF to improve accuracy of channel estimation

Option 200: Basic VSA

- Save and recall recordings in sdf and hdf5 format supports 64 bit addressing
- Padding or repetition of recording files during the recall process
- Support HiSlip connections with Infiniium scopes
- Support for Infiniium scopes with software version 6.20 installed
- Support for wideband M9393A
- Support for E7515A/E7515B UXM
- Support for M8920A

Option AYA: Digital Modulation Analysis

- SOQPSK type A and B filter types
- Longer result length for OQPSK measurements

Option BHM: DOCSIS 3.1 Modulation Analysis

- DOCSIS3.1 US support for multi-group mini-slot configuration in manual mode

Option BHN: 5G NR/Pre-5G Modulation Analysis

- EVM based auto range
- New measurement 3GPP Compliant 5G NR analysis

- o New modulation quality measurements comply to latest version of 3GPP specifications (February, 2018)
  - o DL (SS, PBCH, PDSCH) or UL(PUSCH, PUCCH) CP-OFDM analysis
  - o All numerologies (15, 30, 60, 120, 240 KHz subcarrier spacing)
  - o Modulation up to 256QAM
  - o PDSCH, PUCCH and PUSCH decoding
- Pre-5G
  - o BRS symbol power trace for beam sweeping test
  - o Symbol vs. Power trace
  - o PCI detection using Keysight FieldFox with 10 MHz BW

Option BHQ: Pulse Analysis
- Multi emitter pulse analysis
- Colorization of scatter plot for pulse deinterleaving

Option BHX: 802.11ax Modulation Analysis
- EVM based auto range
- RU Info Trace with streams and users
- Channel matrix by RU
- Enhanced autodetection for trigger based PPDU format

Version 22.21 (Release Date August, 2017)

License Version 2017.0401 required

- Issues Resolved:
  - o Option 301 functionality enabled by Trial and Distributor licenses

Version 22.20 (Release Date July, 2017)

License Version 2017.0401 required

Option 200: Basic VSA
- Support for M9393A VSA with M9203A digitizer
- Support for Input 2 of Keysight N9041B UXA with extended frequency range to 110GHz
  - o manual ranging control only
- Power Spectrum measurement now included with option 200
- Support for additional Math Function features
  - o Cross correlation
  - o Differentiate
  - o Smoothing
  - o Sine
  - o Cosine
  - o Tangent
  - o Power operator
  - o Constants

Options BHD: LTE FDD Modulation Analysis

- 3D beamforming

Options BHE: LTE TDD Modulation Analysis

- 3D beamforming

Options BHG: LTE-Advanced FDD Modulation Analysis

- 3D beamforming

Options BHH: LTE-Advanced TDD Modulation Analysis

- 3D beamforming

Option BHF: Custom OFDM Modulation Analysis

- Half subcarrier shift
- DFT-S-OFDM modulation

Option BHM: DOCSIS 3.1 Modulation Analysis

- DOCSIS3.1 US Normalize IQ setting added

Option BHN: Pre-5G Modulation Analysis

- New option
- Provides OFDM measurement trace data results for subframe analysis of signals described by the 5GTF V5G.211 standard
- Setup file compatibility with Keysight N7630C Signal Studio software

Option BHQ: Pulse Analysis

- Additional modulation types supported
  - BPSK
  - QPSK
  - Frank Code
  - P1 – P4 Code
- Graph trace for analysis

Option BHX: 802.11ax Modulation Analysis

- MU auto detection
- Symbol clock error compensation
- Inband emission measurement

Version 22.01 (Release Date April, 2017)

License Version 2017.0401 required

- Issues Resolved:
  - Crash during startup

Version 22.00 (Release Date April, 2017)

License Version 2017.0401 required

- Issues Resolved:
  - LTE E-TM setup files corrupt
  - Custom IQ Sync Not Found does not set a bit in the status register
  - Docsis 3.1 Upstream Marker coupling does not work as expected
  - Infiniium V,Z scopes front panel locked after disconnect or exit
  - Digital Demod Custom APSK SNR cannot be read via API
  - Custom OFDM Average symbol clock error is always positive
  - Full bandwidth not available with DSA/DSO Z634A

Option 200: Basic VSA

- Support for 32 bit application removed. Only 64 bit application provided starting with this release.
- Support for floating and USB licenses using Agileesofd daemon
- Keysight E7760 Wideband Transceiver support
- Input 1 of Keysight N9041B UXA support
- Keysight InfiniiVision 1000 X-series support
- Keysight M9242A PXIe Modular Oscilloscope support
- Keysight M9710A AXIe 10-bit High-Speed Digitizer support
- 2x2/3x3/4x4 MIMO support for VXT M9421A
- The maximum VSA recording length can go up to 800M samples with Keysight S-series Oscilloscopes
- Removed support for InfiniiVision 6000 series
- Removed support for InfiniiVision 7000 series
- Removed support for Infiniium 80000A/B series
- Removed support for N7109A
- Removed support for N4010A

Option BHF: Custom OFDM Modulation Analysis

- New tracking selection to include the Data Subcarriers to improve phase and timing performance

Options BHG: LTE-Advanced FDD Modulation Analysis

- Up to 64 channel measurement.

Options BHH: LTE-Advanced TDD Modulation Analysis

- Up to 64 channel measurement.

Option BHJ: 802.11 n/ac Modulation Analysis

- 802.11n analysis now included with option BHJ

Option BHM: Docsis 3.1 Modulation Analysis

- DOCSIS3.1 US measurement enhancements
  - New optional multi-carrier filter for optimal EVM results
  - New trace for IQ Meas Full-Band and RMS IQ Meas Full-Band
  - Color annotation to data segment in the IQ Meas trace
  - Synchronized ACP display of null subcarriers in the trace result
- DOCSIS3.1 DS measurement enhancements
  - New measurement results for channel power
  - New optional notch filter to reject the adjacent interference for optimal EVM results
  - New trace for IQ Meas Full-Band and RMS IQ Meas Full-Band
  - Color annotation to data segment in the IQ Meas trace

Option BHX: 802.11ax Modulation Analysis

- New option
- OFDMA and MU-MIMO for both uplink and downlink
- All PPDU formats and up to 8 users and 8x8 MIMO
- LDPC decoding

Version 21.20 (Release Date August, 2016)

License Version 2016.0401 required

- Issues Resolved:
  - Docsis 3.1 downstream PLC raw data bits inverted

Option 200: Basic VSA

- Windows 10 support
- Manual control of X Series analyzer attenuator and gain settings
- UXA as a tuner for Z9070B
- UXA option H1G support
- N9030B option B5X support
- New API command to set range in units of dBm

Option BHD/BHE: LTE FDD/TDD Modulation Analysis

- Support for RB power auto detection threshold

Options BHG/BHH: LTE-Advanced FDD/TDD Modulation Analysis

- Support for RB power auto detection threshold

Option BHJ: 802.11 ac Modulation Analysis

- Limited support for 802.11ax as beta
  - Single user only

Option BHM: Docsis 3.1 Modulation Analysis

- DOCSIS3.1 US measurement enhancements
  - o BER measurement
  - o Add Copy to Manual
- DOCSIS3.1 DS measurement enhancements
  - o Multi-carrier filter
  - o Allow defining of exclude subcarriers for MER calculation

Version 21.00 (Release Date April, 2016)

License Version 2016.0401 required

- Issues Resolved:
  - o Custom IQ Equalizer behavior changes after pressing Reset
  - o Aborting measurement or recording causes error message "error locking deep capture resource"
  - o DSP error when configuring triggering with UXA

Option 200: Basic VSA

- Support for S-Series scopes with E band mixers
- Support for "B" models of CXA, EXA, MXA and PXA
- Support for Infiniium DSAZ592A, DSOZ592A, DSAZ632A, DSOZ632A
- Support for Z9070B RF Tuner as a standard hardware configuration
- 16-channel support with dual M9703A or M9703B Digitizers

Option B7U: Modulation Analysis for W-CDMA (3GPP) and HSPA+

- DTCH based BER/BLER (RMC 12.2K)

Option BHF: Custom OFDM Analysis

- Variable CP and time gaps
- Multi carrier filtering

Option BHD: LTE FDD Modulation Analysis

- Time scale factor extended to 1000

Option BHE: LTE TDD Modulation Analysis

- Time scale factor extended to 1000

Options BHG: LTE-Advanced FDD Modulation Analysis

- LTE-A CSI-RS 8x8 MIMO Info Table
- PSDCH (physical sidelink dedicated channel) support
- Time scale factor extended to 1000

Options BHH: LTE-Advanced TDD Modulation Analysis

- LTE-A CSI-RS 8x8 MIMO Info Table

- PSDCH (physical sidelink dedicated channel) support
- Time scale factor extended to 1000

Option BHL: Channel Quality Measurement
- Significant speed improvement for the case of large tone count
- Stimulus bandwidth can now extend to full measurement span (previously limited to span x 5/6)
- Sample utility supports N8241A AWG and M8190A + PSG

Option BHM: Docsis 3.1 Modulation Analysis
- Upstream measurement (New)
- DOCSIS3.1 Downstream measurement enhancements
  - Embedded profile editor for Profile A-P and support for mixed modulation
  - Allow removal up to 5 sub-carriers for MER calculation

Option BHP: FMCW Radar Analysis
- Copy Auto to Manual function for auto detected reference regions
- Support for customizable decimation for FM traces

Option BHQ: Pulse Analysis
- Ability to export the entire recording at once for Pulse Descriptor Word (PDW)
- Support for 2-channel measurements

Version 20.20 (Release Date October, 2015)

License Version 2015.0601 required

- Issues Resolved:
  - Crash occurs when sending SCPI commands while connected to PXI hardware

Option 200: Basic VSA
- Support for M9420A VXT PXIe Transceiver Modules
- Support for InfiniiVision 3000T Series
- Support for Infiniium DSAZ594A, DSOZ594A
- E-Band Mixer Utility

Option BHF: Custom OFDM Analysis
- IEEE 802.11ah presets added

Option BHJ: 802.11 ac Modulation Analysis
- 1024QAM support

Option BHM: Docsis 3.1 Downstream Modulation Analysis
- BER testing for variable-bit-loading profiles

Option BHP: FMCW Radar Analysis

- New measurement pause test conditions ("between" and "not between")

Option BHQ: Pulse Analysis

- New measurement pause test conditions ("between" and "not between")

Version 20.00 (Release Date July, 2015)

License Version 2015.0601 required

Option 200: Basic VSA

- Increase maximum input sample points from 82 MSa to 134 MSa for the 64-bit version
- Support for M9290A CXA-m PXIe Signal Analyzer
- Support for M1971E smart mixer
- Support for Infinivision 6000X Series
- Support for Infiniium V Series
- 5 MSa limit removed from X- Series analyzers

Options BHG: LTE-Advanced FDD Modulation Analysis

- DL PDSCH 256QAM (E-TM3.1a) support in 3GPP Rel-12
- UL virtual cell ID support in 3GPP Rel-11

Options BHH: LTE-Advanced TDD Modulation Analysis

- DL PDSCH 256QAM (E-TM3.1a) support in 3GPP Rel-12
- UL virtual cell ID support in 3GPP Rel-11

Option BHJ: 802.11 ac Modulation Analysis

- Frequency estimation mode selection
- Automatic symbol timing adjustment
- Frequency dependent IQ impairment estimation and compensation

Option BHK: Custom IQ Modulation Analysis

- Add disabling frequency estimation option
- Improved constellation preset UI (including new DVB-APSK presets)
- Improved synchronization pattern search

Option BHM: Docsis 3.1 Downstream Modulation Analysis

- New demodulation result summary for raw bit stream and information through demodulation and decoding process
- User profiler editor for profile configuration even with mixed modulation formats
- MER for ZBL
- Average power over measurement interval in dBm

Option BHP: FMCW Radar Analysis

- New FMCW phase noise spectrum trace

Option BHQ: Pulse Analysis

- Add triangular FM chirp, Barker code detection and analysis
- Automatic detection of modulation per pulse (CW, LFM, Triangular FM, and Barker)
- Save PDW into .csv file for use by Keysight UXG

Version 19.50 (Release Date April, 2015)

License Version 2014.1101 required

Option AYA: Digital Modulation Analysis

- Added 4RC reference filter for HCPM modulation used by APCO25

Option BHJ: 802.11 ac Modulation Analysis

- Added two frequency estimation modes, preamble & pilots, preamble & pilots & data

Option BHM: Docsis 3.1 Downstream Modulation Analysis

- New Option

Version 19.02 (Release Date March, 2015)

License Version 2014.1101 required

- Issues Resolved:
  - UXA external/IFMag/FMT triggers produce DSP errors for higher spans (>230MHz).
  - UXA Time Qualified Trigger minimum step size increased for higher spans (>230MHz).
  - Startup error when Keysight IO Libraries is not installed.
  - Crash when CSI-RS is enabled in LTE Advanced measurement.
  - Degraded CSI-RS EVM when measurement interval is <= 1 slot.
  - Power Spectrum measurement not enabled with trial license.
  - Symbol clock error reported is not accurate with Upstream Docsis signals

Version 19.00 (Release Date December, 2014)

License Version 2014.1101 required

- Issues Resolved:
  - Crash occurs after presetting a multi-measurement configuration that includes one or more digital demod measurements.
  - Sync search fails in Custom IQ.

Option 200: Basic VSA

- Option 300: Hardware Connectivity is now included with option 200
- Support for N9040B, UXA.
- Support for segmented capture.

- Time qualified triggering.
- VXI hardware support discontinued.

Option BHD/BHE: LTE FDD/TDD Modulation Analysis
- Support for Version 13.1.1 Signal Studio Setup files

Options BHG/BHH: LTE-Advanced FDD/TDD Modulation Analysis
- Cross-carrier in-band emission measurement
- Cross-carrier scheduling
- DCI decoding for Rel-10
- Transmission Mode 9 (up to 8x8 MIMO) auto-detection

Option BHK: Custom IQ Modulation Analysis
- Support for analysis on two channels

Option SSA: Spectrum Analysis
- Support for zero span measurement
- Equivalent sweep time
- Sweep trigger
- SCPI for gate trigger
- Additional X-series SA compatible SCPI commands

Option BHL: Channel Quality Measurement
- New Option
- Multi-tone stimulus based channel response measurement

Option BHP: FMCW Radar Analysis
- New Option
- Modulation quality measurements on multi-chirp linear FM modulated signals

Option BHQ: Pulse Analysis
- New Option
- Support for various Keysight hardware platforms with wide dynamic range and analysis bandwidth required by narrow pulse analysis

Version 18.70 (Release Date August, 2014)

License Version 2014.0501 required

Option 200: Basic VSA
- Cosmetic rebranding to Keysight Technologies

Version 18.50 (Release Date August, 2014)

License Version 2014.0501 required

Option 200: Basic VSA

- Sequencing measurements
- Trace Averaging
- In process SCPI Server including support for HiSLIP connections
- Support for running 89600 in process

Option 300: Hardware Connectivity

- Support for Infiniium Z-Series scopes.
- Support for M9393A.
- Resource sharing of M9393 and M9391 Vector Signal Analyzers using M9000 Resource Manager.

Options BHG/BHH: LTE-Advanced FDD/TDD Modulation Analysis

- • SCPI Support

Option BHF: Custom OFDM Analysis

- Support for 8192-QAM and 16384-QAM

Option SSA: Spectrum Analysis

- New Option
- Supports M9391A and M9393A
- Limited X-Series SA Mode Compatible SCPI

Version 18.02 (Release Date September, 2014)

License Version N/A required

This version was never officially released but was mistakenly included on the factory disk image of X Series analyzers that shipped with A.14.54 software. This version will not run with an error message:

>> Startup Failed

>> Unable to load one or more of the requested types. Retrieve the LoaderExceptions property for more information.

>> Agilent 89600 VSA software failed to start - exit code -1.

If you have this version installed on your analyzer please upgrade to a released version.

Version 18.00 (Release Date May, 2014)

License Version 2014.0501 required

Option 200: Basic VSA

- Support for Windows 8 (WinXP no longer supported)
- Increase maximum input sample points by 10-fold for the 64-bit version.
- Increase the maximum decimation factor to allow narrower RBW for wide-band analysis for the 64-bit version.
- Graph traces can use stimulus/response data at different center frequencies.

- Support of Matlab Simulink discontinued.

Option 300: Hardware Connectivity
- Support for Infiniium S-Series scopes.
- Support logic analyzers with the 64 bit application.

Options BHG/BHH: LTE-Advanced FDD/TDD Modulation Analysis
- Support for UL-MIMO single channel analysis.
- Support measuring LTE release-11 defined sub-frame type.
- Add Time Alignment Error results between component carriers to the error summary table.

Option BHK: Custom IQ Modulation Analysis
- New option.

Model 89620B/BN: 89600 WLA software
- Support for Release 10 RRC message decoding.

Version 17.22 (Release Date April, 2014)

License Version 2013.0601 required

- Issues Resolved:
  - Measurements can be slowed on some processors due to blocking threads in the Intel DSP libraries.
  - Legacy floating licenses (agilevsa2) not working, introduced in 17.21.

Version 17.21 (Release Date February, 2014)

License Version 2013.0601 required

- Issues Resolved:
  - Errors when running on Intel Haswell processors.

Version 17.20 (Release Date October, 2013)

License Version 2013.0601 required

Option 300: Hardware Connectivity
- Added user preference to automatically restore measurement after hardware configuration change.

Option AYA: Digital Modulation Analysis
- Added presets and new metrics to support Wi-SUN 2-FSK modulation quality measurements.
- Enhanced custom APSK measurement to handle non-uniform phase shift definitions for the case of 4 or 6 constellation states.
- Added MER metrics to the Syms/Errs summary table for 8PSK.
- Extended QAM modulation quality analysis to include QAM2048 and QAM4096.

Version 17.00 (Release Date June, 2013)

<div align="center">License Version 2013.0601 required</div>

- Issues Resolved:
  - Errors when attempting to upload large files to a signal generator

Option 200: Basic VSA

- Complex Stimulus / Response: new Graph traces for computing and plotting AM/AM, AM/PM, Gain Compression, Differential EVM and other key metrics for power amplifiers and other two port devices.
- Added support for Blackman-Harris, Kaiser-Bessel, and Gaussian window types.

Option 300: Hardware Connectivity

- Support for frequency-mask triggering (FMT) using Agilent X-Series Analyzers Option RT1/RT2.
- Support for Agilent Infiniium MSOX90000 Series oscilloscopes.

Option BHD/BHE: LTE FDD/TDD Modulation Analysis

- Improved power level auto-detection for downlink control channels (P-SS, S-SS, PBCH, PCFICH).
- Uplink auto-detection of frame boundary (for automatic exclusion of EVM transient time).

Options BHG/BHH: LTE-Advanced FDD/TDD Modulation Analysis

- Updates to decoding for UL PUCCH UCI.

Model 89620B/BN: 89600 WLA software

- Support for simultaneous Uplink and Downlink measurements and protocol analysis has been added.
- Charting capabilities have been improved.
- Examples have been added to demonstrate protocol analysis verification tasks such as: UL/DL throughput, UL power control, and connection setup.

Version 16.20 (Release Date March, 2013)

<div align="center">License Version 2012.1201 required</div>

- Issues Resolved:
  - Host ID changes after a reboot

Option 200: Basic VSA

- Additional SCPI commands and queries for all Input Correction and Correction APIs

Option 300: Hardware Connectivity

- Support for Agilent Infiniium 9000 H-Series oscilloscopes.
- Support for 13 GHz models of Agilent Infiniium 90000 X-Series oscilloscopes.

Option AYA: Digital Modulation Analysis

- New measurement parameter to specify EVM Normalization Reference as either Constellation Maximum (default) or Reference RMS.
- Improved filter response when filter alpha <0.4, for the following formats:

BPSK	Custom APSK
QPSK	16-APSK
DQPSK	16-APSK w/DVB
8-PSK	32-APSK
D8PSK	32-APSK w/DVB

Option BHF: Custom OFDM Analysis

- Support for 2048-QAM and 4096-QAM.

Version 16.01 (Release Date January, 2013)

License Version 2012.1201 required

- Issues Resolved:
  - Startup Error on Win XP with no network connectivity and no Windows Updates

Version 16.00 (Release Date December, 2012)

License Version 2012.1201 required

- Issues Resolved:
  - Translator Framework failures related to Null Reference Exception

Option 200: Basic VSA

- Improved synchronization within Multi-Measurements Analysis using multiple hardware configurations.
- Support for customized routing of physical input channels onto measurement channels.
- Additional SCPI commands and queries for improved coverage of the .NET API
- Simplified download of current recording for arbitrary waveform playback through Source control.
- Option 105: Dynamic link to ADS/SystemVue is now included with option 200.
- Option 106: Link to MathWorks Simulink is now included with option 200.

Option 300: Hardware Connectivity

- Support for Agilent InfiniiVision 4000 X-Series Oscilloscopes

Option BHD/BHE: LTE FDD/TDD Modulation Analysis

- Support for FDD Beamforming has been added.
- Support for analysis of MBSFN with mixed-mode CP's has been added.
- Summary metrics have been added for in-band emissions and spectral flatness measurement results.

Options BHG/BHH: LTE-Advanced FDD/TDD Modulation Analysis

- Support for PUCCH Format 3 has been added.
- Support for TM9 (Downlink 8x8 MIMO) has been added.
- Support for CSI-RS analysis has been added.

Option BHJ: 802.11 ac Modulation Analysis

- Support for 8x8 MIMO analysis.
- Support for Multi-User analysis.
- Support for Dynamic Phase Noise measurement.
- Channel equalization has been improved, including an optional frequency-domain smoothing algorithm.

Option BHA: TETRA (TEDS) Modulation Analysis

- New option
- Measurement analysis matching 89600 VSA 12.02 capabilities.

Version 15.01 (Release Date August, 2012)

License Version 2012.0401 required

- Issues Resolved:
  - Unsigned assembly error
  - Connection to Logic Analyzers fails
  - Translator Framework interferes with non-English keyboards

Option 300: Hardware Connectivity

- Support for Agilent Infiniium 90000 Q-Series Oscilloscopes.
- Support for Agilent InfiniiVision 3000 X-Series 1 GHz Bandwidth Oscilloscopes
- Support for source control using N5172B EXG, N5182B MXG

Option BHF: Custom OFDM Analysis

- Support for non-power-of-two FFT sizes

Version 15.00 (Release Date April, 2012)

License Version 2012.0401 required

Option 200: Basic VSA

- Native 64-bit 89600 VSA application (32-bit 89600 VSA application still supported).
- Multi-Measurements Analysis. Note: because this can potentially use a large amount of memory, we recommend using the 64-bit 89600 VSA application when doing Multi-Measurements analysis.
- Multiple Trace Windows.
- Support for channel configurations using 8 input channels.
- Cross-channel measurements (cross-correlation, coherence, etc.) now support arbitrary pairs of channels.

- Improvements to SCPI API help documentation, and some additional commands and queries.
- Source control and arbitrary waveform playback using signal recording files.

Option 300: Hardware Connectivity
- Support for Agilent InfiniiVision 3000 X-Series oscilloscopes.
- Support for source control using Agilent ESG/MXG/PSG-series signal generators.
- Support for external mixing using Agilent X-series signal analyzers.
- Support for the Agilent N6841A RF Sensor.
- Support for 8-channel configuration of Agilent N7109A Multi-Channel Signal Analyzer.

Option 105: Link to EEsof ADS/SystemVue
- Support for ADS connectivity is now available with ADS 2011.10.

Option 106: Link to the MathWorks Simulink Model-Based Design (New)
- Agilent 89600 VSA Blockset now supports side-by-side installations of 89600 VSA version 14.23 and newer.
- Supports MATLAB versions 2010a and newer.
- 89600 VSA Blockset installation available from the More Installation Choices section of the 89600 Software Installation Manager.

Option AYA: Digital Modulation Analysis
- Support for Shaped Offset QPSK modulation format, including filter and preset for SOQPSK-TG (IRIG 106).

Option BHD/BHE: LTE FDD/TDD Modulation Analysis
- Support for Positioning-RS analysis
- Support for analysis of MBSFN-RS/PMCH
- Support for 8-antenna beamforming analysis (TDD only)

Options BHG/BHH: LTE-Advanced FDD/TDD Modulation Analysis
- Support for Inter-band Carrier Aggregation

Version 14.23 (Release Date February, 2012)

License Version 2011.0701 required

Option 300: Hardware Connectivity
- Support for 160 MHz analysis bandwidth when using N9030A-B1X with PXA Signal Analyzers (requires firmware version A.10.00 or later)

Option 244: 89600 VSA software for Simulation Environments
- Available for 89601BE and 89601BNE products. Enables simulation environment use of the 89600 VSA software without hardware connectivity.

Version 14.20 (Release Date October, 2011)

<div align="center">License Version 2011.0701 required</div>

Option 200: Basic VSA

* C++ redistributables not re-installed during each installation

New Application: 89600 WLA

* The 89600 WLA software lets you perform detailed analysis of your downlink LTE signal by correlating 89600 VSA measurements with protocol events across multiple frames and multiple protocol layers (MAC, RLC, PDCP, and RRC). Demodulation of the LTE signal is performed by the VSA and the results are further decoded by WLA.

Version 14.00 (Release Date July, 2011)

<div align="center">License Version 2011.0701 required</div>

* Issues Resolved:
  o Option 200: Basic VSA
    - Windows firewall exception installed for floating licenses
    - Unable to install Agilent Application Services
  o Option 300: Hardware Connectivity
    - Errors in AliasChecker macro
  o Option BHE: LTE TDD Modulation Analysis
    - Crash when both UL and DL present in the waveform

Option 300: Hardware Connectivity

* Support for N9030A-BBA
* Support for N9030A-550, -544, -543
* Support for N9038A
* Support for M9392

Option AYA: Digital Modulation Analysis

* Custom APSK modulation analysis
* Low SNR mode for OQPSK and DQPSK

Option B7Y: Mobile and Fixed WiMAX modulation analysis

* This license enables both 802.16 OFDM and 802.16 OFDMA

Option BHJ: 802.11 ac Modulation Analysis

* New option

Option BHG: LTE-Advanced FDD Modulation Analysis

* New option

Option BHH: LTE-Advanced TDD Modulation Analysis

* New option

<div align="center">45</div>

Version 13.01 (Release Date March, 2011)

<div align="center">License Version 2010.1201 required</div>

- o New Application: 89600 WLAOption 200: Basic VSA
    - SystemVue will not connect when using a trial license
    - Double characters entered in dialog boxes with Japanese language setting
    - Input User Corrections only applied to "I" part of I+jQ signal
- o Option 300: Hardware Connectivity
    - Installation on X-Series signal analyzers
    - Connection issues for external PC to X-Series signal analyzers
    - ESA models E4402B, E4404B, and E4405B are not recognized
- o Option AYA: Digital Modulation Analysis
    - Sync search without Pulse search disables Search Length

Version 13.00 (Release Date February, 2011)

<div align="center">License Version 2010.1201 required
Initial release, below are the changes relative to 89601A version 12.xx</div>

- Issues Resolved:
  - o Option 300: Hardware Connectivity
      - PSA returns invalid data with long time measurements after changing span.
      - No measurement updates occur when using PSA via GPIB
      - VISA timeout error while using 90000 series scopes
  - o Option B7U: Modulation Analysis for W-CDMA (3GPP) and HSPA+
      - Improved HSPA synchronization algorithm
      - Inconsistent results when switching Pilot Aided Timing Estimation on and off
  - o Option B7Z: 802.11n Modulation Analysis
      - Software crash when using PXA hardware
  - o Option BHC: RFID Modulation Analysis
      - Various measurement setups could cause the software to crash

Option 200: Basic VSA

- Many more traces (up to 20 traces supported)
- Many more markers (up to 20 markers supported)
- Flexible trace layout. Traces can be docked, floated, and overlaid.
- New Digital Persistence and Cumulative History trace display modes
- Print preview & save screen or selected traces to file
- Macros support Visual Basic .NET and C# languages
- New Output window with Show Code feature
- New SCPI based remote control
- New .NET API based remote control
- COM API Backwards Compatibility (see online help topic "89600B VSA COM API (Backwards Compatibility)")

- Side-by-Side installation of multiple versions
- Dynamic Context Sensitive Help
- New licensing redemption and software subscription update via Agilent Software Licensing and Agilent Software Manager

Option 300: Hardware Connectivity
- Built-in Auto Range function
- Easier to use Hardware Configuration, dynamic HW rediscover
- Custom channel configuration for Infiniium Oscilloscopes
- Input coupling/Impedance and Probe support for Infiniium Oscilloscopes
- Support for Infiniium 90000 X-Series High-performance Oscilloscopes
- Support for N7100 Series SIGINT System

Option BHD: LTE FDD Modulation Analysis
- Uplink decoding
- Auto-detection of PUCCH parameters
- Auto-detection of UL power levels
- Demodulation of DL in the presence of UL for TDD and vice-versa

Option BHE: LTE TDD Modulation Analysis
- Uplink decoding
- Auto-detection of PUCCH parameters
- Auto-detection of UL power levels
- Demodulation of DL in the presence of UL for TDD and vice-versa
- UE-specific RS Analysis with auto-detection
- One layer and dual layer Beamforming analysis with new Antenna Beam Pattern trace

Option BHF: Custom OFDM Analysis
- New flexible demodulator supports
  - TDD or FDD
  - FFT size up to 65536 points
  - Subcarrier modulation to 1024 QAM
  - MIMO (max 4 streams)
  - Multi-users (max 8)
  - Choice of sync techniques – pilot, preamble, cyclic prefix, etc.
  - Choice of EQ training – preamble, pilots, data.

89600A Features not available 89600B:

- TETRA/TEDS (option BHA)
- Source Control
- Acqiris ADC Support

- Simulink support
- ADS link (SystemVue link is supported)
- 89607A WLAN Test Suite
- 89604A Distortion Suite
- ESA as a down converter
- PSA as a down converter
- Agilent SI Spectrum Analyzer
- Existing VBScript macros need to ported to Visual Basic.NET or C#