

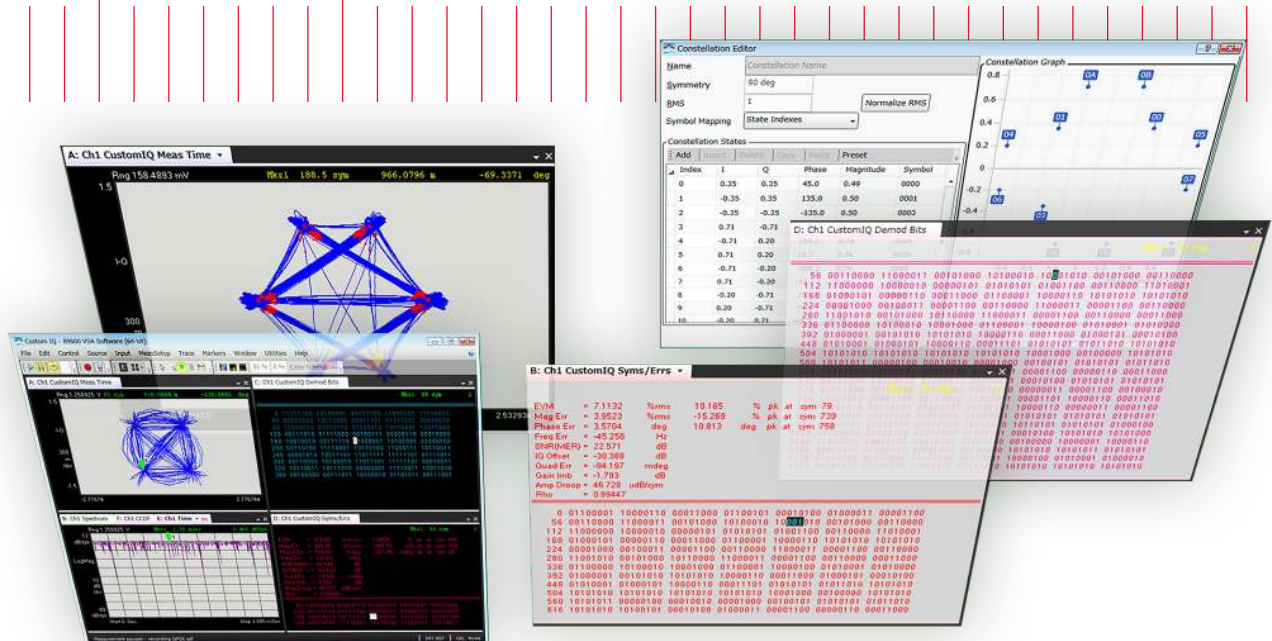
Keysight Technologies

89601B/BN-BHK

Custom IQ Modulation Analysis

89600 VSA Software

Technical Overview





Introduction

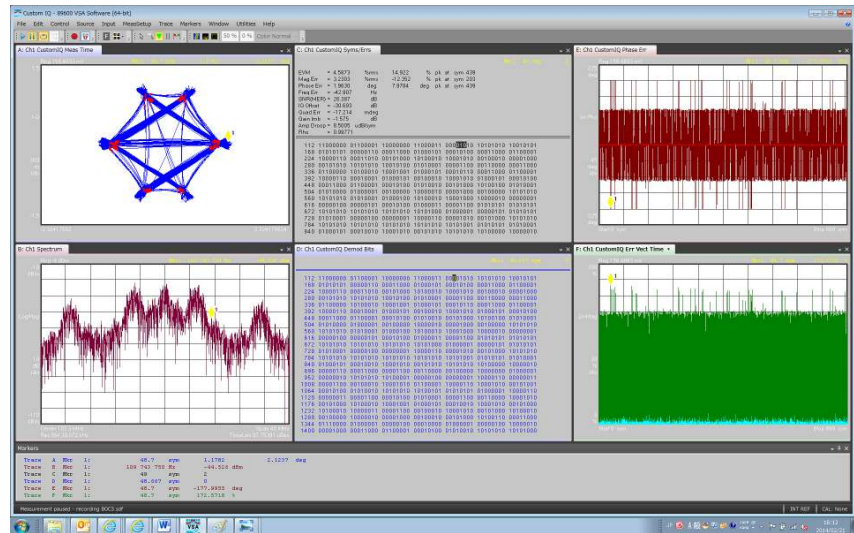
Key Features

- Utilize comprehensive design tools for proprietary or non-standard unique signals in aerospace, defense, and satellite
- Easily map custom IQ constellations in the editor for demodulation
- Verify transmitters and use as a reference receiver for proprietary signals with EVM, frequency error, and more
- Track down demodulated bits by coupled markers in IQ domain, time, and symbol data

Custom IQ Modulation Analysis

Custom IQ modulation analysis (Option BHK) streamlines signal quality measurements on unique and non-standard signals in industries such as satellite and military communications where proprietary signals are commonly used for security concerns. Add this option to test proprietary signals quickly and easily with familiar 89600 VSA result metrics on the top of vector modulation analysis (Option AYA).

Option BHK extends the signal analysis capabilities of the 89600 VSA software, adding non-standard signals to its more than 75 signal standards and modulation types. The Keysight Technologies, Inc. 89600 VSA software is a comprehensive set of tools for signal demodulation and vector signal analysis that provide simultaneous views of virtually every facet of complex signals. This critical information enables engineers to achieve the clarity needed to find the root cause of transmitter signal problems. The software runs on a PC or inside PC-based instruments. It works with spectrum analyzers, signal analyzers, oscilloscopes, logic analyzers and modular instrument systems, as well as simulation software.



Easily track down the symbols and demodulated bits with higher error rates in EVM and phase error by using coupled marker

Why use custom IQ?

Vector modulation, also referred to as digital or complex modulation, occurs when both amplitude and phase are used simultaneously to carry information on a signal. Common examples are BPSK, QPSK, QAM, and their many derivative forms.

Increased demand to design new transmitters and receivers with new and proprietary modulation formats

has resulted in many complex IQ constellation signals, even in unique geometric or asymmetric forms. Testing these signals can be very time-consuming, requiring engineers to develop their own algorithms and modify them for each domain and hardware platform. Option BHK leverages the proven 89600 VSA software for accurately designing and verifying proprietary signals by adding a new constellation editor function.

Try before you buy!

Download the 89600 VSA software and use it free for 30 days to make measurements with your analysis hardware, or use our recorded demo signals by selecting File > Recall > Recall Demo > CustomIQ.

www.keysight.com/find/VSA_trial

Analysis and Troubleshooting

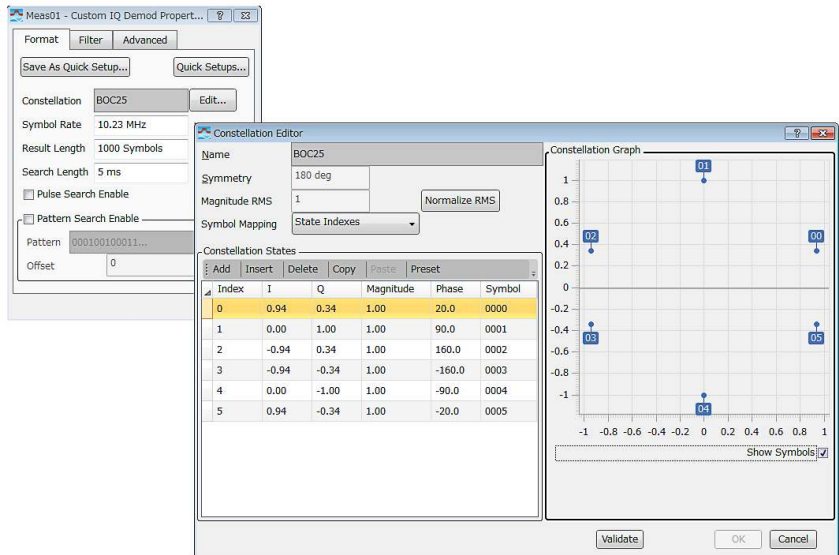
For most general modulation formats and standard-based signals, you can use 89600 VSA software with Option AYA vector modulation analysis to provide >40 modulation formats with various traces and metrics in time, frequency, and modulation domain. However, for customization of these formats or completely unique geometry constellations, Option BHK supplements the modulation analysis with the IQ constellation editor to make accurate signal measurements.

Easy-to-use IQ constellation editor

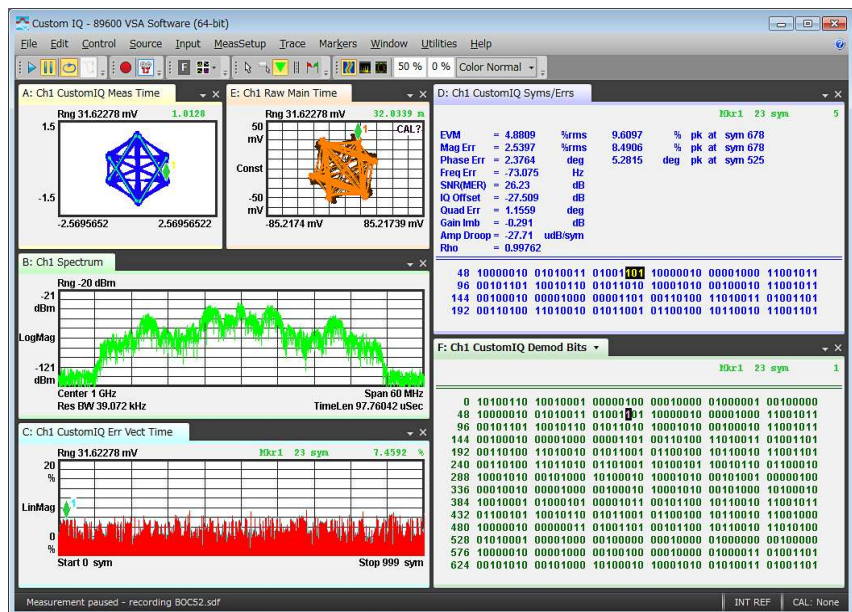
Create your own IQ map in the constellation editor, which allows you make modifications in the state index table or user-definable symbols. If you already have the constellation mapping with parameters I, Q, phase, and magnitude, just copy and paste them from your editor. Once copied into the state table, you can save them as "Quick Setup" for future reuse.

Track down symbols and demodulated bits

You may sometimes discover your demodulated signal does not meet your design goals. For example, EVM results may be worse than simulation results or baseband fails the synchronization at times. 89600 VSA software provides various traces and metrics to help with troubleshooting.



Make your IQ constellation in the states table with the visual constellation graph



Use coupled markers in IQ measurement time, demod bits, and symbols in error metric to troubleshoot signals

Software Features

Custom IQ modulation analysis (Option BHK)

Note: The following features are independent of hardware platform used, unless otherwise noted.

| Signal setup | |
|---------------------------------------|---|
| Maximum symbol rate | Frequency span/(1+ α) Symbol rate is limited only by the measurement span—the entire signal must fit within the analyzer’s currently selected frequency span |
| Result length | 10 to 100,000 symbols, user-definable, depends on hardware or recorded signal length |
| Search parameters | |
| Pulse search | Defined search length in msec |
| Pattern search | User-selected synchronization with pattern editor |
| Pattern search offset | Determine the location of result length within search length |
| Quick setup | |
| Save IQ constellation to recall later | You can decide to use the save IQ map exclusively or share with all users using the same VSA software |
| Constellation editor | Set name, symmetry, RMS, and symbol mapping parameters along with state table and graph views |
| Symbol mapping | State indexes or user-defined symbols |
| Constellation states | Index, I, Q, magnitude, phase, symbol |
| Preset | PSK or square QAM with number of state selection |
| Normalize RMS | Normalize RMS with configured IQ constellations |
| Validate | Check the constellation setting validity |
| Filtering | |
| Measurement filter | None, rectangular, root raised cosine, Gaussian, low pass |
| Reference filter | Rectangular, raised cosine, root raised cosine, Gaussian, half sine |
| User-selectable alpha/BT | Continuously adjustable from 0.05 to 100 |
| Adaptive equalization | Removes linear errors from modulated signals by dynamically creating and applying a FIR (feed-forward) compensating filter |
| Type | Decision directed, LMS, feed forward, equalization with adjustable convergence rate |
| Filter length | Sets the length of the analyzer’s equalization filter; 3-99 symbols, odd values only |
| Convergence | Determines the rate at which the equalization filter converges |
| Adaptive operations | “Run” reshapes the equalization filter after each subsequent measurement “Hold” keeps the filter at the current value “Reset” resets the equalization filter to a unit impulse response |

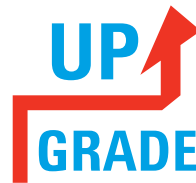
| Advanced | |
|---|---|
| Points per symbol | 1, 2, 4, 5, 10, 20 |
| Clock adjust | Determines when the analyzer's signal demodulator samples the IQ trajectory (-0.5 symbol to 0.5 symbol) |
| Coarse frequency estimation enable | Allows synchronization to signals with large center frequency offset, performance is modulation dependent |
| IQ normalization enable | Turn normalization on to let the analyzer normalize or scale the demodulated trace data results to nominal values as provided by the constellation definition |
| EVM normalization reference | Allows EVM normalization from constellation maximum or reference RMS |
| Synch persistence target | Optimize synchronization persistence either for wider frequency lock range or for higher synchronization stability |
| Measurement results | |
| Pre-demodulation (vector) trace results | Refer to 89601B/BN-AYA Technical Overview (5990-6387EN) |
| Demod trace results | Refer to 89601B/BN-AYA Technical Overview (5990-6387EN) |
| Demod bits | Table containing demodulated bits |

Keep your 89600 VSA software up-to-date

With rapidly evolving standards and continuous advancements in signal analysis, the 89601BU/BNU software update and subscription service offers you the advantage of immediate access to the latest features and enhancements available for the 89600 VSA software.

<http://www.keysight.com/find/89601BU>

You can upgrade!



All 89600 VSA Software options can be added after your initial purchase and are license-key enabled. For more information please refer to

www.keysight.com/find/89600vsa_upgrades

Additional Resources

Literature

89600B Vector Signal Analysis Software, Brochure, 5990-6553EN

89600B Vector Signal Analysis Software, Configuration Guide, 5990-6386EN

89601B/BN-200 Basic VSA and -300 Hardware Connectivity, Technical Overview 5990-6405EN

89601B/BN-AYA Vector Modulation Analysis, Technical Overview, 5990-6387EN

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