**TELEDYNE LECROY**
Everywhere**you**look™

VectorLinQ Vector Signal Analysis

Key Features

- Comprehensive signal demodulation and vector signal analysis

- Supports RF modulated or direct I-Q inputs

- PSK, QAM, Circular QAM, ASK, FSK and Custom input signal types

- Up to 8 data streams

- I-Q constellation plots with trajectory, symbol, and reference symbol views

- I, Q EVM, Phase, Magnitude, and Power Eye Diagrams

- Spectral views of I, Q, and Total Spectrum

- A comprehensive set of measurement parameters enables characterization of modulation quality

- Built-in signal processing blocks including filters, mixers, phase estimator, and equalizers

- Insert custom MATLAB processing blocks anywhere in the signal chain

- Flexible user interface to provide maximum insight and visualization
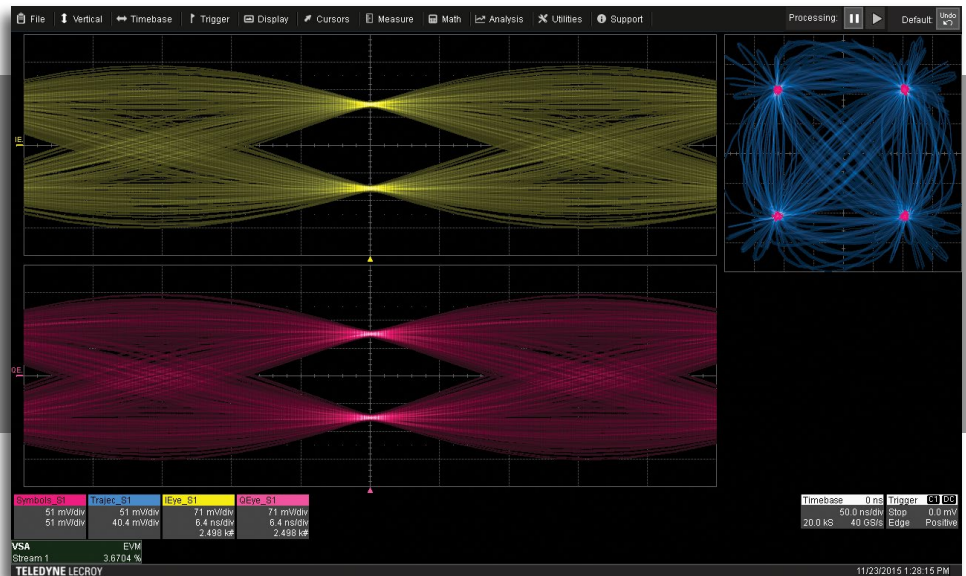
The VectorLinQ Vector Signal Analysis (VSA) option provides an extensive toolset for demodulation and analysis of RF and IQ modulated signals. These tools provide deep insight into advanced signal types with maximum measurement flexibility and sophisticated signal visualization. The intuitive user interface is easy to set up and allows for user customization to meet the needs of even the most complex signals.

Ultimate Flexibility

VectorLinQ transforms your Teledyne LeCroy oscilloscope into the most flexible vector signal analysis platform available. Acquire up to eight inputs through the oscilloscope channels - PSK, QAM, Circular QAM, ASK, and FSK signal types are all supported, as well as user-defined symbol configurations. VectorLinQ operates through a unique, intuitive model, passing the signal through a chain of user-defined processing blocks, simplifying the most sophisticated analysis. Standard processing blocks include mixers, filters, phase estimators, and equalizers. Users may also insert custom MATLAB processing blocks at any point in the processing chain.

Advanced Visualization and Measurement

VectorLinQ VSA offers various ways to analyze and view demodulated waveforms. The I-Q constellation diagram helps identify signal quality issues such as amplitude imbalances, quadrature error, and phase noise. I and Q components, Amplitude, Power, Phase, and EVM can be viewed as "traces" in the time domain, fully correlated with other waveforms in the oscilloscope. Any trace can also be viewed as an eye diagram, providing deeper insight into the signal quality of the demodulated waveforms. Spectral views of the total signal, as well as the individual I and Q components, are also available as standard.

VectorLinQ VSA offers a unique user interface and feature set, with the ability to analyze up to eight signal streams simultaneously. Each stream can analyze a separate input signal, or the same signal can be distributed to multiple streams to compare different processing chains. The example above shows how to easily assess the performance of an equalizer on a 28 Gbaud 16QAM signal, by comparing the raw input signal on Stream 1 with the equalized version on Stream 2.

1. Constellation Diagrams

Each stream contains its own constellation diagram view. Visualize symbol locations, trajectories, and reference symbol positions for QAM, PSK, circular QAM, and user-defined modulation formats.

2. Eye Diagrams and Traces

Achieve deeper insight with time-domain views of I and Q waveforms, total power, EVM% and more. New waveform grids appear automatically to support selected views.

3. Measurement Parameters

EVM, IQ skew, Q factor (in % or dB), and many other common measurements are available. Measurements are made on a "per-stream" basis, enabling easy comparisons.

4. Signal Setup

Select modulation format, symbol rate, and bits per symbol (supporting up to 1024-symbol modulation formats).

5. Signal Processing Chain

The signal processing chain is the core of VectorLinQ's unique architecture. Connect up to 8 standard and custom processing nodes together to build the most comprehensive visualization and analysis for your signal under test.

6. Node Configuration

Each processing node has its own independent configuration - adjust filter bandwidths, equalizer taps, and other parameters - and watch the visualizations and measurements react.

7. Up to 8 Streams at Once

The multi-stream layout delivers the ultimate in flexibility. View one stream at a time in a tabbed layout, two streams side-by-side, or all streams simultaneously.

Complete Processing Flexibility With Custom DSP Blocks

Custom MATLAB blocks can be inserted at any point in the processing chain. The I and Q signals are passed to MATLAB, the custom code is applied to them, and the results are returned directly to VectorLinQ to be passed on to the next processing block, visualized, and measured. To get you started, example MATLAB code is included directly inside the VectorLinQ application.
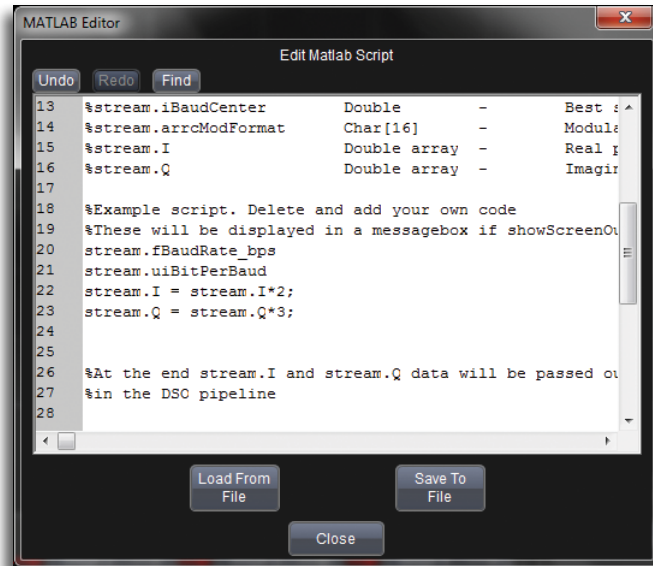
Complete Format Flexibility With Custom Symbol Positions

Leading-edge communications research creates demands that can be difficult to predict. Rather than restrict you to "standard" modulation formats, VectorLinQ allows analysis of completely custom modulation types through a set of user-defined symbol positions. A Custom Symbol Editor tool is integrated directly into the software, with example symbol positions included, making it quick and easy to analyze virtually any signal type.
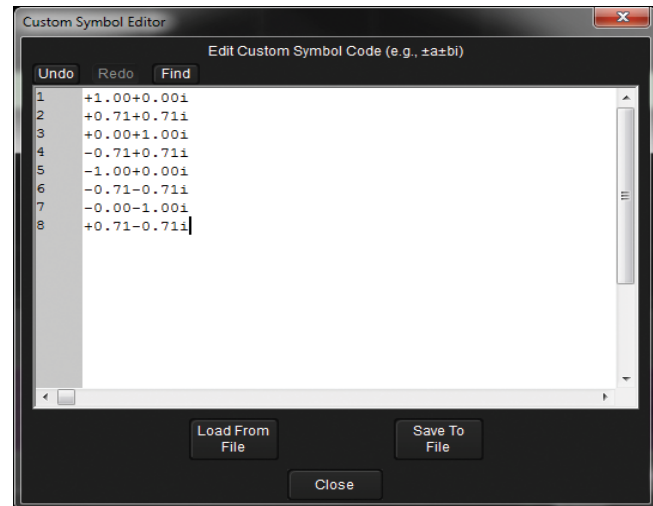
Seamless Integration

VectorLinQ VSA is not a standalone application that "takes control" of the oscilloscope. Rather, it integrates seamlessly with Teledyne LeCroy's MAUI - the most advanced oscilloscope user interface available. Signals and parameters from VectorLinQ are available to be used elsewhere in MAUI, for simple and complete control and analysis.
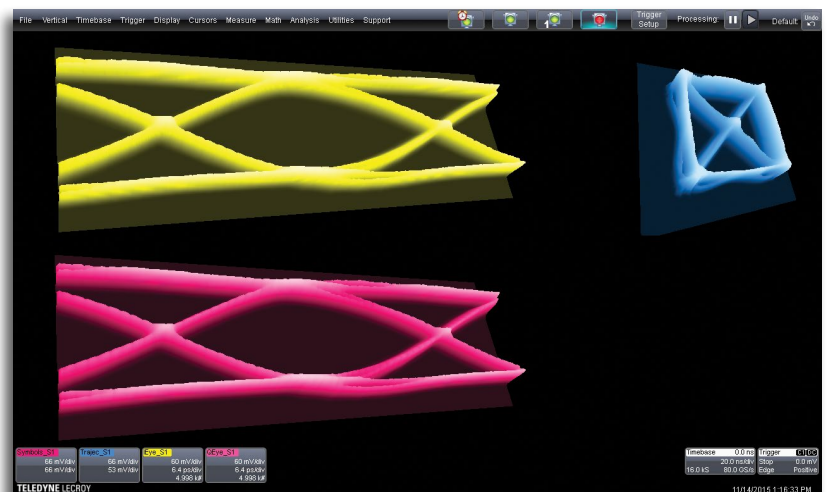
VSA Features

Input types
Modulated RF or direct I-Q inputs

Signal Types
• PSK
  – BPSK, QPSK, 8-PSK, up to 1024-PSK
• QAM
  – 16-QAM, 256-QAM, up to 1024-QAM
• Circular QAM
• ASK
• FSK
• Custom
  – User-defined custom symbol positions

Visualizations
• IQ Plots
  – Constellation
  – Vector
  – Reference Symbols
• Eye Diagrams
  – I Eye Diagram
  – Q Eye Diagram
  – EVM Eye (EVM% vs. Time)
  – Phase Eye
  – Magnitude Eye
  – Power Eye
• Tracks (signals versus Time)
  – Recovered Data I
  – Recovered Data Q
  – Magnitude
  – Power
  – Phase
  – EVM % vs. Time
  – Phase Error vs. Time
• Spectral Plots
  – BaseBand Spectrums
  – Complex Spectrums

Parameters
• EVM (% RMS)
• BER Estimate
• Q-Factor (dB)
• Q-Factor
• SNR (dB)
• SNR
• IQ RF (Gain) Imbalance (dB)
• IQ RF (Gain) Imbalance (%)
• IQ Skew UI
• IQ Skew (secs)
• I-Q Offset (dB)
• I-Q Offset (%)
• I-Q Offset phase
• I Offset (%)
• Q Offset (%)
• EVM Phase Error @ Symbol

Signal Processing
• Digital Local Oscillator Downconverter
• Carrier Recovery
• DC block
• Baud Rate Detection
• Matlab-Defined Algorithm Support
• Filters
  – Raised Cosine
  – Root Raised Cosine
  – Gaussian
  – Bessel
  – Butterworth
  – Brickwall
• Phase Estimation
• Adaptive Equalization
• Packet Detection

Ordering Information

Product Description	Product Code
VectorLinQ VSA for WavePro 7 Zi Oscilloscopes	WPZi-VECTORLINQ
VectorLinQ VSA for WaveMaster 8 Zi Oscilloscopes	WM8Zi-VECTORLINQ
VectorLinQ VSA for LabMaster 9 Zi Oscilloscopes	LM9ZI-VECTORLINQ
VectorLinQ VSA for LabMaster 10 Zi Oscilloscopes	LM10ZI-VECTORLINQ

Customer Service

Teledyne LeCroy oscilloscopes and probes are designed, built, and tested to ensure high reliability. In the unlikely event you experience difficulties, our digital oscilloscopes are fully warranted for three years and our probes are warranted for one year. This warranty includes:
• No charge for return shipping
• Long-term 7-year support
• Upgrade to latest software at no charge