VIAVI Solutions

**VIAVI**

**VST**

6 GHz RF Vector Signal Transceiver (VST)

The Vector Signal Transceiver (VST) is an essential building block in RF communications test solutions supplied by VIAVI Solutions.

**Overview**

Comprised of a vector signal generator and vector signal analyzer the vector signal transceiver combines multiple instruments into a single PXI Express module with the performance, flexibility and speed at low cost, and small form factor required of a manufacturing test system.

**Benefits**

- Vector signal analyzer and generator in a single 3U x 3 slot wide PXIe module
- 65 MHz to 6 GHz frequency range
- 80 MHz or 200 MHz instantaneous bandwidth
- Optional baseband I/Q inputs and outputs
- Optional communications standards analysis software and waveform generation tools

**Software Analysis/Generation (optional)**

The VST is a software-designed instrument with software analysis and generation packages for the latest cellular, connectivity and IoT standards.

**Expanded Bandwidth (option 02)**

The VST module provides an industry leading 200 MHz of RF bandwidth leveraging the speed and flexibility of the user programmable FPGA. The added bandwidth enables the user to test the latest options added to the leading wireless and cellular standards including 802.11ac 160 MHz and LTE-A carrier aggregation while also leveraging the latest performance enhancing processing techniques such as digital pre-distortion.

**Baseband I/Q Interface (option 03)**

The VST can be configured with high-performance, differential or single-ended baseband I/Q interface with 16-bit data sampled at 120 MS/s, for a total of 80 MHz of complex equalized I/Q bandwidth. This baseband I/Q interface allows the VST to address many additional applications, such as testing both the up-converted RF and downconverted baseband signals of a device with a single instrument.
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VIAVI Solutions use the VST integrated with other modular instruments and software to produce custom solutions for manufacturing test.

The VST features a zero-IF receiver enabling higher bandwidth, lower cost, less power consumption, and a smaller footprint when compared to heterodyne receivers. Other advantages include simpler designs with single LOs, and high selectivity, which allows separation of adjacent channels whose signals overlap.

<table>
<thead>
<tr>
<th>Specification Highlights</th>
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<tr>
<td><strong>Parameter</strong></td>
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<tr>
<td>Frequency range</td>
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<tr>
<td>Bandwidth</td>
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<tr>
<td>Phase Noise (1 GHz)</td>
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<tr>
<td>Level Accuracy</td>
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<tr>
<td>Level Range</td>
</tr>
<tr>
<td>Tuning Time</td>
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<tr>
<td>Level Settling Time</td>
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</table>
The VST offers industry-leading performance and measurement speed. Using IEEE 802.11ac as an example, the VST achieves an error vector magnitude (EVM) measurement floor of better than -45 dB (0.5 %) at 5.8 GHz for an 80 MHz MCS9 signal.

**Software Analysis and Generation (optional)**

Options for various radio communications standards are supported, ideal for measuring transmitters, receivers and RF component performance in accordance with methods defined in 3GPP / 3GPP2 and ETSI standards.

Waveform generation is supported using IQCreator™. IQCreator supports all cellular and wireless connectivity standards and can be downloaded from the VIAVI website. A runtime license is all that is required to load and play IQCreator waveforms using the VST.

**Communication Standards**

- LTE uplink and downlink
- UMTS uplink and downlink
- TD-SCDMA
- c2K/EV-DO reverse link
- GSM/EDGE
- WLAN 802.11a,b,g,n,p,ac
- Bluetooth BR/EDR/LE
- WiMAX OFDMA
- DECT
- Zigbee®
- Z-Wave®¹
- APCO-25¹
- TETRA¹
- VDL¹

**Cellular Measurements**

**GSM / EDGE Tx & Rx Measurements Per 3GPP TS51-101-1 section 13**

- Frequency error and modulation accuracy
- Transmit output power and burst timing
- Spectrum due to Modulation & Switching transients
- Receiver sensitivity, BER/BLER

**WCDMA Uplink Tx & Rx Measurements Per 3GPP TS34.121-1 V8.10.0 (2010-03)**

- 5.2 Maximum Output Power
- 5.3 Frequency Error
- 5.8 Occupied Bandwidth (OBW)
- 5.9 Spectral Emission Mask (SEM)
- 5.10 Adjacent Channel Leakage Ratio (ACLR)
- 5.13 Modulation Accuracy, EVM, phase discontinuity, PCDE
- 6.2 Reference sensitivity, test loop mode 1 & 2 3 GPP TS34.109 V7.3.0

**WCDMA Downlink Tx & Rx Measurements Per 3GPP TS25.141 release 10 section 6² & 7¹**

- 6.2.1 Base Station Power
- 6.2.2 P-CPICH Power
- 6.3 Frequency Error
- 6.5.1 Occupied Bandwidth (OBW)
- 6.5.2.1 Spectral Emission Mask (SEM)
- 6.5.2.2 Adjacent Channel leakage Ratio (ACLR)
- 6.7.1 Error Vector Magnitude (EVM)
- 6.7.2 Peak Code Domain Error (PCDE)
- 6.7.4 RCDE
- 7.2 Reference Sensitivity

**cdma2k / EV-DO Reverse link Tx Measurements (RC1-RC4) per 3GPP2 C.S0033-B rev1 and C.S0024-B rev 0, A & B**

- Channel Power, Total Power
- Adjacent Channel Power Ratio (ACPR)
• Spectral Emission Mask (SEM)
• Modulation accuracy (Rho) per 3GPP2 C.S0011-A or 3GPP2 C.S0033-A
• Frequency Error

**TD-SCDMA Tx Measurements Per 3GPP TS34.12**

• Total Average Power, mid-amble power, data power
• Tx on/off mask
• Occupied band width (OBW)
• Spectral Emission Mask (SEM)

**LTE FDD Uplink Tx & Rx Measurements Per 3GPP 36.521-1 V9.6.0 (2011-09)**

• 6.2 Transmit Power
• 6.3 Output Power Dynamics
• 6.5 Transmit Signal Quality

**LTE TDD Uplink Tx & Rx Measurements Per 3GPP 36.521-1 V9.6.0 (2011-09)**

• 6.2 Transmit Power
• 6.3 Output Power Dynamics
• 6.5 Transmit Signal Quality

**LTE Downlink TDD & FDD Tx & Rx Measurements Per 3GPP TS136.141 release 10 section 6 & 7**

• 6.2 Base Station Output Power
• 6.5.1 Frequency Error
• 6.5.2 Error Vector Magnitude (EVM)
• 6.6.1 Occupied Bandwidth (OBW)
• 6.6.2 Adjacent Channel Leakage Power (ACLP)
• 6.6.3 Operating band unwanted emissions
• 7.2 Reference Sensitivity
Connectivity Measurements

WLAN Tx & Rx Measurements Per IEEE 802.11 (2012) for a,b,g,n,p IEEE 802.11 (D4.0) for ac

- Power
- Frequency and Clock/Chip rate
- Modulation Accuracy
- Spectral Mask and Flatness
- Receiver Sensitivity (Option 500 required)

Bluetooth Tx & Rx Measurements Per version 2.1+EDR, LE 4.0

- Output Power TRM/CA/01/C
- Power Density TRM/CA/02/C
- Tx Output Spectrum 20dB BW TRM/CA/05/C
- Tx Output Spectrum Adjacent Channel TRM/CA/06/C
- Modulation Characteristics TRM/CA/07/C
- Initial Carrier Frequency Tolerance TRM/CA/08/C
- Carrier Frequency Drift TRM/CA/09/C
- BR Reference Sensitivity RCV/CA/01/C, RCV/CA/02/C
- EDR Relative Tx power TRM/CA/10/C
- EDR Carrier Frequency Stability and Mod Accuracy
- EDR Differential Phase Encoding TRM/CA/11/C
- EDR In-band Spurious Emissions TRM/CA/12/C
- EDR Reference Sensitivity RCV/CA/07/C
- Output Power at NOC TRM-LE/CA/01/C
- In band emissions at NOC TRM-LE/CA/03/C
- Modulation Characteristics TRM-LE/CA/05/C
- Carrier Frequency Offset and Drift at NOC TRM-LE/CA/06/C
- LE Receiver Sensitivity (single ended) RCV-LE/CA/01C, RCV-LE/CA/02/C

DECT Tx Measurements Per EN176-1

- 7.4 Accuracy and stability of RF carriers RFP
- 7.5 Accuracy and stability of RF carriers PP
- 8.3 Packet timing jitter
- 8.4 Reference timing accuracy (RFP)
- 8.5 Packet transmission accuracy (PP)
- 9.1.3 Normal Transmit Power (NTP)
- 11.4–7 RF Carrier Modulation Part 1 to 4

Generic Signal Analysis

Bit/Symbol demodulation power and mod analysis for:
- BPSK, DBPSK, /2 DBPSK, QPSK, OQPSK, DQPSK, /4 DQPSK, 8-PSK, D8PSK, /8 D8PSK, 8-PSK EDGE
- FM/FM stereo demodulation power and mod analysis
- SNR, SINAD, THD, THD+N
- Spectrum Analysis
- OBW, ACLR, SEM

Example use cases:

Support for ITU-T G.9959 Z-Wave® 71.2.2
Symbol Clock Error
- 7.1.2.5.1 Transmit Frequency Error
- 7.1.2.5.2 Transmit Power Adjustments
- Frequency Deviations
- Power Spectral Density

Support for IEEE 802.15.4 ZigBee® 10.3.2 Transmit Power Spectral Density (PSD) Mask
- 10.3.3 Symbol Rate
- 10.3.8 Error Vector Magnitude
- 10.3.9 Transmit Centre Frequency Tolerance
- 10.3.10 Transmit Power
## Ordering Information

<table>
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<tr>
<th>Order as</th>
<th>Vector Signal Transceiver</th>
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### Options

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<tr>
<th></th>
<th>Description</th>
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<tbody>
<tr>
<td>01</td>
<td>80 MHz bandwidth</td>
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<tr>
<td>02</td>
<td>160 MHz bandwidth</td>
</tr>
<tr>
<td>03</td>
<td>80 MHz bandwidth + baseband I&amp;Q inputs / outputs</td>
</tr>
<tr>
<td>100</td>
<td>GSM/EDGE analysis / generation</td>
</tr>
<tr>
<td>101</td>
<td>UMTS-Uplink analysis / generation</td>
</tr>
<tr>
<td>102</td>
<td>cdma2k®/Ev-Do analysis</td>
</tr>
<tr>
<td>103</td>
<td>WLAN a/b/g/n/p analysis</td>
</tr>
<tr>
<td>104</td>
<td>WiMAX OFDMA analysis</td>
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<td>105</td>
<td>DECT analysis</td>
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<tr>
<td>106</td>
<td>Bluetooth® BR/EDR/LE analysis / generation</td>
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<tr>
<td>107</td>
<td>LTE-FDD uplink analysis / generation</td>
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<td>108</td>
<td>LTE-TDD uplink analysis / generation</td>
</tr>
<tr>
<td>109</td>
<td>TD-SCDMA uplink analysis</td>
</tr>
<tr>
<td>110</td>
<td>UMTS downlink analysis / generation</td>
</tr>
<tr>
<td>111</td>
<td>Generic PSK, FSK, QAM, FM analysis</td>
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<tr>
<td>113</td>
<td>WLAN ac analysis</td>
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<tr>
<td>115</td>
<td>BRCM MC10/11 1024QAM analysis</td>
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<tr>
<td>117</td>
<td>LTE FDD &amp; TDD Downlink analysis / generation</td>
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<tr>
<td>500</td>
<td>iQCreator Runtime license</td>
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### Test Sequencing Options

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<thead>
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<th></th>
<th>Description</th>
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<tbody>
<tr>
<td>203</td>
<td>WLAN Test Sequencer</td>
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<tr>
<td>210</td>
<td>UMTS Downlink Test Sequencer</td>
</tr>
<tr>
<td>217</td>
<td>LTE Downlink Test Sequencer</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>43139/973</td>
<td>Multiway Synch Cable Assembly</td>
</tr>
</tbody>
</table>

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1 Available as pre-sets in the Generic Analysis Library for FM, FSK, PSK, QAM 2 UMTS bands 1-14
2 Requires option 113
3 UMTS bands 1-14
4 Requires option 110
5 For use with option 217 for multi-up device Rx testing
6 Requires option 117
7 Requires option 114
8 Select from options 01, 02, 03
9 Requires options 02 and 103
10 Requires option 113
11 Requires option 103
12 Requires option 104
13 Requires option 110
14 Requires option 117
15 For use with option 217 for multi-up device Rx testing