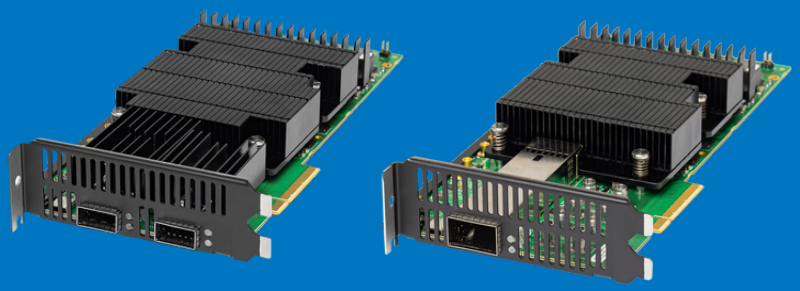
TELEDYNE LECROY
Everywhereyoulook™

Z800 Freya

Test 8 speeds up to 800Gbps via QSFP-DD or OSFP



Key Features

- Dual media: QSFP-DD800 + QSFP112 or OSFP
- Supports 800GE, 400GE, 200GE & 100GE speeds @112G PAM4
- Supports, 400GE, 200GE, 100GE & 50GE speeds @56G PAM4
- Supports 100GE, 50GE, 40GE, 25GE & 10GE speeds @NRZ
- Traffic Generation and Analysis
- Test with optics, LPOs, AECs, ACCs and DAC's
- Advanced Physical Layer testing with Xena PHY providing valuable Layer 1 insights
- Advanced Auto-Negotiation & Link Training (AN/LT) analysis on NRZ & PAM4 signals
- Extensive Software package with systems including test suites for RFC2544, RFC2889 and RFC3918
- Python based open-source automation framework
- Ease of use

Find out more here:

Z800 Freya traffic generators can test eight Ethernet speeds - 800GE, 400GE, 200GE, 100GE, 50GE, 40GE, 25GE and 10GE using 10G/25G/56G/112G SerDes via QSFP and OSFP interfaces.

Z800 Freya is a versatile solution for testing the performance and functionality of Ethernet network infrastructure and equipment including switches, routers and NICs.

Z800 Freya can test up to 800GE using 112G PAM4 SerDes, helping developers optimize signal integrity and Bit Error Rate (BER) performance.

Z800 Freya supports extensive L1 test features, with the integrated Xena PHY providing valuable insights into advanced PCS and PMA layer testing including dynamic transceiver clock sweep, lane skewing and PRBS modes. Signals can be analyzed in advanced Signal Integrity View (SIV), to provide visual information on signal quality.

Both versions can be installed in Xena B2400 chassis where they each require 2 of the 12 slots, or they can be delivered in our Compact chassis, making it the smallest and lightest 800G Ethernet test solution in the market.

Z800 Freya comes complete with XenaManager, the intuitive multi-user management software for generating and analyzing traffic. Also included is Xena OpenAutomation (XOA), an open-source scripting and automation framework designed to help test engineers make the most of Xena testers with tailored tests and standardized test methodologies.

Ethernet Auto-Negotiation & Link Training Test Tools

Z800 Freya traffic generators support Auto-Negotiation and Link Training (AN/LT) on 112G SerDes and 56G SerDes (PAM4).

Z800qx Freya also provides a AN/LT Utility making additional AN/LT tools available for thorough testing of the endpoint behavior during AN and LT process.

The AN/LT Utility adds insight, visibility, and configuration possibilities to the AN and LT process making it easy to analyze DUT behavior during AN/LT, configure and optimize the relevant AN parameters and LT coefficients, on PAM4 signals.

INTERFACES AND STANDARDS

Number of module cages/connectors	Z800q Freya: • 1 x QSFP-DD800 • 1 x QSFP112 Z800o Freya: • 1 x OSFP800
Interface options in each cage	**QSFP-DD800/QSFP112 & OSFP cage** **112G SerDes** **Line Code** **IEEE/ETC*** 1 x 800GE PAM4 IEEE 802.3df or ETC* 800G R1.1 2** x 400GE PAM4 802.3ck 4** x 200GE PAM4 802.3ck 8** x 100GE PAM4 802.3ck **56G Serdes** **Line Code** **IEEE/ETC*** 1 x 400GE PAM4 IEEE 802.3bs or ETC* 400G 2** x 200GE PAM4 802.3cd 4** x 100GE PAM4 802.3cd 8** x 50GE PAM4 802.3cd **25G/10G Serdes** **Line Code** **IEEE/ETC*** 2** x 100GE NRZ 802.3bj 4** x 50GE NRZ ETC* 25G/50G R2.0 2** x 40GE NRZ 802.3ba 8** x 25GE NRZ IEEE 802.3by or ETC* 25G/50G R2.0 8** x 10GE NRZ 802.3ae Power capacity using single cage: OSFP or QSFP-DD800: 25W or QSFP112: 15W Power capacity using both cages: QSFP-DD800: 15W + QSFP112: 15W * ETC = Ethernet Technology Consortium ** QSFP-DD module offers the option to provide connectivity in both 2 cages. If any of those modes is selected, the same interface configuration will be on all ports,- furthermore the ports will be shared across the 2 cages. For instance if the QSFP112 mode with 8 x 100G is chosen, 4 ports will be available in QSFP-DD cage and 4 ports will be available in the QSFP112 cage.

LAYER 1 FEATURES	
Pattern Generation	• PRBS-13, PRBS-31, PRBS-13Q, PRBS-31Q • SSPRQ test pattern (IEEE 802.3 Clause 120.5.11.2.3) • Square Wave (IEEE 802.3 Clause 120.5.11.2.4) • Statistics: Lock status, PRBS errors, PRBS error rate
Physical Coding Sublayer	• PCS virtual lane-to-SerDes mapping configuration
Forward error Correction	• BASE-R FEC (Firecode) (2112,2080), IEEE 802.3 Clause 74 (25GE, 10GE) • RS-FEC KR (528, 514, t=7), IEEE 802.3 Clause 91 (100GE) • RS-FEC KR (528, 514, t=7), IEEE 802.3 Clause 108 (25GE) • RS-FEC KR (528, 514, t=7), 25/50G Ethernet Consortium (25/50GE) • RS-FEC KP (544,514,t=15), IEEE802.3 Clause 119 • RS-FEC KP (544,514,t=15), IEEE802.3 Clause 134 • RS-FEC Int KP (544,514,t=15), IEEE802.3 Clause 161 (100G)
FEC Error Injection	• RS-FEC KP (544, 514, T=15) (excluding RS-FEC Int KP) • RS-FEC KR (528, 514, T=7) • Configuration: Consecutive, Errored Codewords, Total Codewords Per Cycle, Errored Symbols Per Codeword • Bit error mask modes: Static, Rotate, Increment • Pre-defined profiles: Max. Consecutive Uncorrectable w/o Link Loss, Min. Consecutive Uncorrectable with Link Loss • Loop modes: Single, Continuous, Repeat • Injection statistics: Injected FEC Errors; Total Codewords, Total Uncorrectable Codewords, Total Correctable Codewords, Total Error-Free Codewords, Codeword Error Ratio, and Total Symbol Errors
Reconciliation Sublayer (Local/Remote Fault feature)	• Normal: Acts according to 802.3 standard • Force Local: Port will continuously transmit “Local Fault indication”. • Force Remote: Port will continuously transmit “Remote Fault indication” . • Disabled: Port does not respond to Local/Remote Fault from DUT
PMA Error Injection	• Repeatable error injection periods at PMA layer with millisecond precision.
Link Flap	• Single shot or repeatable link-down with millisecond precision.
Equalization Controls	• Tx Equalization Control • Rx Equalization Control: CTLE, AGC Adapt, OC Adapt, DFE Tap, CDR, Pre FFEs, and Post FFEs • Support value freezing and auto on Rx equalizations
Signal Integrity Analysis	• Advanced Signal Integrity View for modulated signal quality analysis
PPM Sweep	• Configurable • linear or step sweep +/- 400 ppm in steps of 1ppm (shared across all ports on module)
Auto Negotiation and Link Training	• Auto-negotiation: IEEE 802.3 Clause 73, ETC 400G/800G & ETC 25G/50G • Link training: IEEE 802.3 Clause 72, 136 and 161
Advanced Auto Negotiation and Link Training analysis	Capture, Decode and analysis of Auto Negotiation and Link Training protocol

TRANSMIT ENGINES	
Traffic Generation	• Wire-speed multi-stream traffic generation • Up to 256 hardware streams per port • Each stream can generate millions of traffic flows using field modifier
Transmit line clock adjustment	• From -400 to 400 ppm in steps of 1 ppm (shared across all ports on module)
Oscillator Characteristics	• Initial Accuracy is +/- 1,5 ppm including temperature Stability. • Frequency drift over 1st year: +/- 2.5 ppm including temperature Stability. • Frequency drift over over 20 years: +/- 3.5 ppm including temperature Stability. • Temperature Stability mentioned above is +/- 0.5 ppm
Transmit Control	• Support adjustment of the effective line rate by forcing idle gaps equivalent to -1000 ppm (increments of 10 ppm) • Configurable Inter-Frame Gap (IFG) from 16 to 63 bytes, default is 20B (12B IFG + 8B preamble) • Support optical laser or copper link enable/disable
Loopback Modes	• L1 RX-to-TX: Any received packet is bounced back through TX • TX(on)-to-RX: Packet goes out of TX but also internally direct to RX • TX(off)-to-RX: Packet goes directly to RX (No link sync needed) • Port-to-Port: Any received packet goes out through the neighbor port
Port Transmit Scheduling Modes	• Normal (stream interleaved mode): Default scheduling mode, precise rates, minor variation in packet inter-frame gap. • Uniform: With 100% uniform packet inter-frame gap, minor deviation from configured rates is available. • Sequential: Streams are scheduled continuously in sequential order, with configurable number of packets per stream. • Burst: Packets in a stream are organized in bursts. Bursts from active streams form a burst group is available. The user specifies time from start of one burst group till start of next burst group.
Stream Profile	• Packet Length: Fixed; Incrementing, Random, Butterfly. Minumum 56 bytes, maximum 16K bytes. • Packet Payload: Incrementing 8-bit, custom pattern (up to 18B repeated) • Burst Traffic with configurable Burst Size, and Burst Density • Flow Control: PFC support for both VLAN tagged and untagged traffic
Stream Header Types	Ethernet, VLAN, ARP, IPv4, IPv6, UDP, TCP, LLC, SNAP, GTP, ICMP, RTP, RTCP, STP, SCTP, MacCtrl, MPLS, PBB, FCoE, FC, IGMPv2, GRE, GTP, VxLAN, NVGRE, DHCPv4, Geneve, eCPRI, RoE, PWE, PFC, Custom.
Stream Modifiers	• Maximum 8 x 24-bit modifiers per stream • 24-bit header field modifiers with incremental, decremental, or random mode. • Each modifier has configurable bit-mask, repetition, min, max, and step parameters.

TRANSMIT ENGINES, CONT.	
Layer 2 Error Injection	• Undersize (56 bytes min), and oversize (12288 bytes max.) packet lengths • FCS Error, Sequence Error, Misordering Error, Payload Integrity Error, Test Payload Error
Multicast	• Support for IPv4 • Up to 8 multicast group addresses • IGMPv2: Join (with configurable repeat interval), Leave All-Devices, Leave, General Query, Group Query • IGMPv3: Exclude (with configurable repeat interval), Include, Change-to-Exclude, Change-to-Include, Multi-group record support
ARP/NDP/Ping	• Auto address resolution • Auto reply to request per port and per stream
LLDP	• Configurable LLDP operation mode, timers, and TLVs • Support mandatory and optional TLV types • Display received LLDP information
Transmit Statistics	• Per-stream: bits/s, bytes/s, packets/s, packets, bytes • Per-port: ARP, NDP, Ping, requests and replies • Per-port injected errors: FCS Error, Sequence Error, Misordering Error, Payload Integrity Error, Test Payload Error • Two real-time histograms per port: TX Packet Length, IFG, or latency distribution for all traffic, a specific stream, or a filter
Packet scheduling modes	• Normal (stream interleaved mode) – standard scheduling mode, precise rates, minor variation in packet inter-frame gap. • Strict Uniform – with 100% uniform packet inter-frame gap, minor deviation from configured rates is available. • Sequential packet scheduling (sequential stream scheduling) is available. Streams are scheduled continuously in sequential order, with configurable number of packets per stream. • Burst. Packets in a stream are organized in bursts. Bursts from active streams form a burst group is available. The user specifies time from start of one burst group till start of next burst group.

RECEIVE ENGINE	
Traffic Receive Capability	Number of Traceable Rx Streams Per Port : 2016 (wire-speed)
Receive Statistics	• Per-stream: bits/s, bytes/s, packets/s, packets, bytes • Per-stream: Packet Loss, Misordered, Payload Errors • Per-stream: Latency and jitter with minimum, maximum and average • Per-port: ARP, NDP, Ping, with requests and replies • Per-port injected errors: FCS Error, Sequence Error, Misordering Error, Payload Integrity Error, Test Payload Error • Two real-time histograms per port: RX Packet Length, IFG, or latency distribution for all traffic, a specific stream, or a filter • Filter statistics: bits/s, bytes/s, packets/s, packets, bytes
Latency Measurement	• Latency can be measured on up to 256 streams • Accuracy: ±16 ns • Resolution: 1 ns (Latency measurements can be calibrated to remove latency from transceiver modules) • Measurement modes: Last-to-last, last-to-first, first-to-last, first-to-first
Jitter Measurement	• Jitter can be measured on up to 256 streams • Jitter (Packet Delay Variation) measurements compliant to MEF10 standard with 1ns accuracy.
Traffic Filter	• 6 x 64-bit configurable match-term patterns with mask, and offset • 6 x frame length comparator terms (longer, shorter) • 6 x configurable filters expressed in logical expressions of the match and length terms
Filter statistics (Counter size: 64 bits)	Per filter: • RX Mbit/s • packets/s • packets • bytes
Capture	• Start Trigger Criteria: FCS errors, filter match, payload error, manual • Stop Trigger Criteria: FCS errors, filter match, payload error, manual, buffer full • Capture Limit Per Packet: 16 – 16383 bytes • Wire-Speed Capture Buffer Per Port: 64 kB • Low Speed Capture Buffer Per Port (10 Mbits/s): 4096 packets (any size) • Packet header auto decode

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SPECIFICATION	
Max. Power	100 W Power value for module only. and not including transceivers/mediums inserted into the module
Weight	2.32 lbs (1.05 kg)
Environmental	• Operating Temperature: 10 to 30º C • Storage Temperature: -40 to 70º C • Humidity: 8% to 90% non-condensing
Regulatory	• FCC (US) • CE (Europe)
Connector insertions	Xena uses high-quality 112Gbps-capable electrical connectors on Z800 Freya modules for optimal signal integrity and performance. However, all connectors experience wear when inserted, resulting in decreased signal integrity over time. The specification below is the minimum number of insertions where optimal signal integrity is guaranteed: • Connectors, minimum number of guaranteed insertions: 1000 cycles
Notes	• The Z800q and Z8000 Freya occupies 2 slot in a B2400 chassis. Please refer to module install guide for additional info and instruction if air guides are required. (Air guides are provided with module) • The Z800q and Z800o Freya modules are also available in the standalone Compact chassis (P/N Z800qc Freya or Z800oc Freya)

Ordering Information

Product Description	Product Code
Z800qc Freya QSFP in 1U Compact Chassis 8-speed 800Gbps (112/56 PAM4 + 25/10G NRZ) test module	C-Freya-800G-4S-1P
Z800q Freya QSFP 800GE 8-speed 800Gbps (112/56 PAM4 + 25/10G NRZ) test module	Freya-800G-4S-1P
Z800oc Freya OSFP in 1U Compact Chassis 8-speed 800Gbps (112/56 PAM4 + 25/10G NRZ) test module	C-Freya-800G-4S-1P-OSFP
Z800o Freya OSFP 800GE 8-speed 800Gbps (112/56 PAM4 + 25/10G NRZ) test module	Freya-800G-4S-1P-OSFP