MPM-400G[™] 400G Multi-Protocol Module





MPA Multi-Protocol Analzyer

Modular Test Platform

Specifically designed to meet the test and measurement challenges of developers and early adopters of 400G ASICs, CFP8 optics, transport/switching modules, and service delivery.

Module Highlights

- 400G test module with native support for 400G CFP8 pluggable optics
- 400G Ethernet testing per IEEE 802.3bs draft specification (16 x 26.5625G/425G) with RS (544, 514) KP4 Forward Error Correction (FEC)
- Provides all the necessary features to test CFP8 modules and the 400GE data pipe
- Advanced and flexible FPGA based test module provides future proof hardware support for emerging standards
- The advanced pluggable hardware module supports easy field installation in deployed MPA chassis with existing 10G and 100G test modules

Applications

- Comprehensive 400GE test applications for layers 1-3
- Full rate 400GE BERT, throughput and frame loss measurements
- PCS & RS-FEC layer testing with skew generation and analysis
- Service disruption time measurement
- CDAUI-16 16x25G signal integrity testing with multi-lane unframed BERT
- CFP8 & MDIO verification including CFP8 Module Health check feature
- High speed lane clock stressing/analysis and optical power level verification

CFP8 Interface

- Native support for 1st generation 400G CFP8 modules
- Supports any MSA and IEEE 802.3bs compliant CFP8 module

MPM - 400G

• Supports CDAUI-16 (16x25G) electrical interface to CFP8

Supported CFP8 Modules

Interface	Distance	Media	Optical Modulation
400GBASE-SR-16	100M	Parallel MMF MPO connector	16x25G NRZ
400GBASE-FR8	2 km	Duplex SMF LC Connector	8x50G PAM4 LAN-WDM
400GBASE-LR8	10 km	Duplex SMF LC connector	8x50G PAM4 LAN-WDM
16x25G electrical breakout		Electrical	

400G Ethernet/IP

CFP8 MDIO Testing

- Complete CFP8 MDIO access
- Raw read/write capability for all MDIO registers
- Formal display of commonly used fields
- Module hardware control pin read/write access



Advanced PHY Features

- Per lane user controllable swing, pre & post emphasis signal conditioning settings to stress transceiver interfaces
- Receiver auto-tune mode for best optimization of receive SerDes

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Optical Testing

- Global and per optical lane power output enable/disable
- Received per lane and broadband optical power level monitoring
- User-defined alarm threshold for received optical power level



Transmit Clock Sources

- Chassis: Internal stratum 3
- Chassis: 1.544 MHz, 2.048 MHz, BITS/1.544 Mbps, SETS/2.048 Mbps, 100/120 Ohm RJ-48
- Recovered: from the incoming signal
- External: 8 kHz, 1.544 MHz, 2.048 MHz, 10 MHz, TTL level via 50 Ohm MMCX connector (connector shared with trigger input)

Line frequency Offset Generation

• Line frequency offset generation +/-120 ppm in steps of 0.1 ppm

Line Frequency Measurement Capability

- Displays measured transmit line frequency offset in Hz
- Displays measured transmit line frequency offset from external reference clock in both Hz and ppm
- User defined alarm threshold for external transmit reference clock offset measurements
- Provides line frequency measurements in Hz with offset in Hz and ppm. Measures all lanes for Unframed BERT, single lane for 400GE
- User defined alarm threshold for received line frequency measurements

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Module Health Check

Simple one button pass/fail test for verifying all transceiver properties

- Advanced user defined thresholds
- Simple test report includes settings, results and CFP8 Module MDIO information

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400G Ethernet/IP cont'd

Acceptance Tests

- Module optical power threshold high/low
- Module line frequency generation and tolerance
- Module skew generation and tolerance
- Module BERT performance with PRBS Test pattern selection

Reference Clock Outputs

- Eye Clock out: 1/170th line rate, 50 Ohm MMCX connector (connector shared with trigger output)
- CFP8 module monitor clock output: 50 Ohm MMCX connector

Advanced Triggering

- Trigger in: TTL level via 50 Ohm MMCX connector (connector shared with external clock input)
- Trigger out: TTL level via 50 Ohm MMCX connector (connector shared with eye clock out)

Multi-lane Unframed BERT Testing

Per lane BERT testing for transceiver and equipment characterization and acceptance testing

Test Patterns

- Modes: 16 x 26.5625G
- PRBS 2³¹-1, 2²³-1, 2²⁰-1, 2¹⁵-1, 2¹¹-1, 2⁹-1 normal or inverted
- Per lane test pattern selection

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Error Generation

- Bit error per lane and global
- Insertion: single, rates from 1E-3 to 1E-10 user defined rates

Error Measurement

- Per lane loss of pattern sync
- Per lane bit error count, average and current bit error rates

PCS/RS-FEC layer Generation

Skew Generation

• Per lane static skew generation

FEC Lane

• FEC lane marker swapping and rotation

Error Generation

- FEC Correctable Codeword, single and rates
- FEC Uncorrectable, single and rates

Alarm Generation

- Per lane FEC alignment marker loss
- FEC LOA
- High SER

PCS/RS-FEC Layer Analysis

FEC Lane

• FEC lane identification

Skew Analysis

- Per lane skew analysis in bit time and picoseconds
- User defined alarm threshold for received skew measurement

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Error Measurement

Supports counts, current and average error rates

- FEC Correctable Codeword
- FEC Correctable Symbol
- FEC Uncorrectable
- 64B/66B code

Alarm Measurement

- Per lane FEC alignment marker loss
- FEC LOA
- High SER

Ethernet/IP

Traffic Generation/Test Stream Flow

Test flow is generated with a signature field in the beginning of the UDP payload area for traceability and measurement purposes

- MAC/IP/UDP formatted traffic generation
- IP Version: IPv4 or IPv6
- MAC/IP/UDP source and destination addressing
- User defined Ethernet Type, Traffic Class, Hop Limit, Flow label fields
- Frame sizes: 64 to 16,000 bytes
- Test Pattern: Variable
- VLAN tags up to 4 levels with user defined TPID, PCP/ QOS, DEI, VID
- MPLS tags up to 4 levels with user defined label, TC, S(bottom), TTL

Traffic Rate Generation

- Full rate generation¹ and analysis
- Constant rate by % BW and Mbps
- Ramp by % BW or Mbps
- Burst

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Service Disruption Time (SDT) Measurement

- Event Triggers: Ethernet frame disruption, FCS error
- Event threshold: consecutive SD time required, measurement clearing time
- Single or continuous measurements
- Reports SDT min, max, and average values in milliseconds
- Displays the last measurement plus 10 historical events, last 250 events saved in test report



RFC 2544 Testing

Supports standardized and user-defined thresholds/values including graphical results¹

- Throughput/Latency
- Frame Loss
- Back to Back Burst tests

Error Generation

Supports single and rate generation¹

- Test pattern bit and sequence errors
- IP Checksum

Alarm Generation

- Remote and local fault alarms
- Auto reply to local fault

Results

Result Filtering

• Results can be filtered by VLAN tag TPID

Transmit and Receive Port Counts

- Packets, packets/second, bytes, Mbps, % BW
- VLAN packets, MPLS packets
- IPv4 & IPv6 packets

Receive Port Counts

- TCP, UDP, IGMP, ICMP packets
- Broadcast, multicast, unicast
- Jumbo, super jumbo packets (greater than 9000 bytes)

Distribution Results

- VLAN distribution by tag level and quality of service level
- MPLS distribution by tag level and traffic class
- Packet size distribution for 64, 65-127, 128-255, 256-511, 512-1023, 1024-1518, 1519–max byte ranges with support for counts, percentage and graphing



Utilization Counts

- Total, IPv4, IPv6, VLAN, MPLS binning
- Current, min, max, and average % BW, Mbps, and packets per second statistics for generated and received traffic

Errors

Displays counts, errored seconds, current and average error rates

Code, undersized, invalid FCS, invalid IP

Alarms

• Loss of link, local fault, remote fault

Test Stream Results

- Transmitted and received packet counts, byte counts and rate in %BW
- Test stream sequence errors, bit errors and lost frame counts in errored seconds, current and average rates
- User-defined pass/fail threshold alarm from sequence errors, bit errors and lost frames
- Latency min, max, and average measurements in microseconds
- Packet jitter min, max, and average measurements in microseconds



Results

- LEDs and detailed statistical counters
- Graphs and Histograms
- Event log history showing event, count, day/time, and duration for last 1,000 events
- Flexible test reporting options including PDF





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Test Profiles

Supports save and restore of test profiles



Notes:

1. 100% full rate generation on selected packet sizes.

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