

# EXUS ANALYZER

# User Guide

Rev 1.4

multiLane

Benefits and Applications:

- System and host port characterization: I2C and low-speed signals.
- 800G capable SI traces
- Ecosystem interoperability testing: I2C sniffer between host and module
- Validates CMIS implementation on module in seconds.
- Voltage noise measurements
- Platform for active modules with module state machine, data path state machine tests and MBM validation tools





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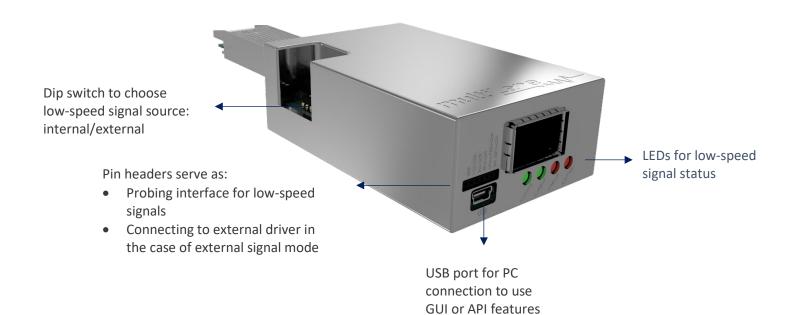
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## **Key Features**

The same key features below apply for every available form factor of Nexus.



## Adapter

800G Adapter Key Features:

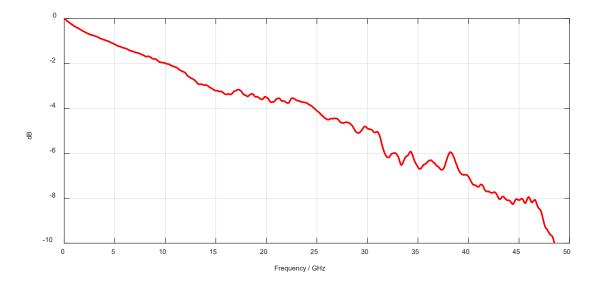
- SI traces and connector support 112G rates
- Support up to 30W modules
- Current and temperature sensor
- Module power ripples and inrush current measurement
- Detection of power spikes during module state transitions
- Probing interface for Vcc and GND pins
- External I2C
- Dip switch to choose low-speed signal source: internal/external
- Available in all SFF/CMIS form factors

Analyzer

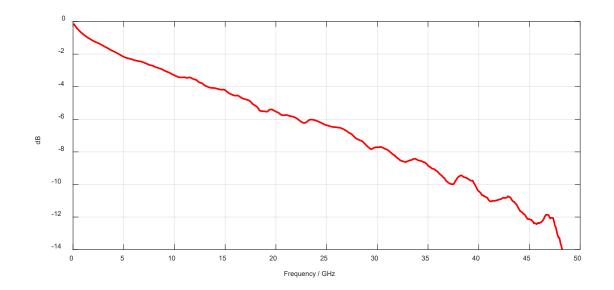
800G Analyzer Key Features:

- Voltage sensor
- ePPS signal validation
- 1 MHz I2C
- Probing interface for low-speed signals
- External control for any low-speed signal:
  - INT/RST
  - LPW/PRS
  - o SDA
  - o SCL
- LEDs for control/alarm signal status
- USB port for PC connection to use GUI or API features
- Available in all SFF/CMIS form factors

Measured Insertion Loss data of 800G **OSFP** Adapter:



Measured Insertion Loss data of 800G QSFP-DD Adapter:



# Nexus Hardware

Nexus includes an adapter with 800G traces, which supports 30W modules. Through a set of low-speed pin headers, the adapter mates with the analyzer which gives the user access to the Nexus Software.

The hardware also includes a dip switch, and a front probing interface for low-speed signals access and control:

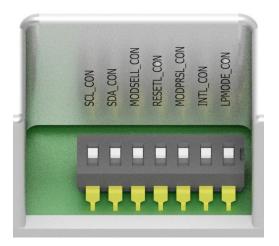


#### A: Signals from host side at plug

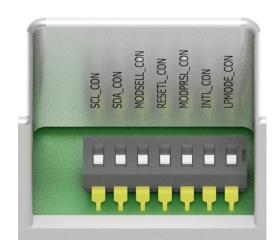
#### **B:** Signals to connector inside Nexus, going to module

Low-speed	Dip s	switch	Front Pir	n Headers	
signals	ON	OFF	DIP SWITCH ON	DIP SWITCH OFF	
SCL	Plug connected to connector	Front pin headers to connector, plug side disconnected	Probing interface	External driver	
SDA	Plug connected to connector	Front pin headers to connector, plug side disconnected	Probing interface	External driver	
INT/RSTn	Plug connected to connector	Front pin headers to connector, plug side disconnected	Probing interface	External driver	
LPWn/PRSn	Plug connected to connector	Front pin headers to connector, plug side disconnected	Probing interface	External driver	

## **DIPSWITCH ON**



# **DIPSWITCH OFF**



Each low-speed signal can be controlled independently from the next. To switch each of the low-speed signals sources, it suffices to slide its' switch to the top or bottom side.



# Nexus GUI Installation

**GUI installation is only accessible to users with ML4066-NX-Pro.** This does not apply and is inaccessible to users with ML4066-NX-HW.

The GUI installation license is available per each single ML4066-NX-Pro unit.

# Step 1: USB Driver

- Download USB Driver https://multilaneinc.com/wp-content/uploads/2023/06/ML4066\_ANA\_V2\_USB\_Driver\_Signed\_V0.1.zip
- Power up Nexus by plugging it into host
- Connect Nexus to the PC through USB cable
- Download the USB driver file
- Go to "Device Manager"
- Find the target device that need to install the driver
- Right-click on the device and select Update Driver Software
- Select Browse my computer for driver software
- Browse you PC and select the driver file
- Click Next and wait until the driver is installed

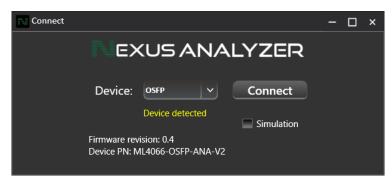
# Step 2: Download Software

The below link redirects you to the software download which supports every available form factor

https://www.multilaneinc.com/wp-content/uploads/2023/10/Setup\_Nexus-Analyzer\_v0.5.9.5\_2023-10-30.zip

#### Step 3: Connection & Initialization

Once the software was downloaded, you can access it and the below screen should appear:



Choose the device form factor accordingly and press "Connect".

Press "Simulation" for a GUI test run without hardware: Simulation mode is also accessed through a simulation license provided by MultiLane.

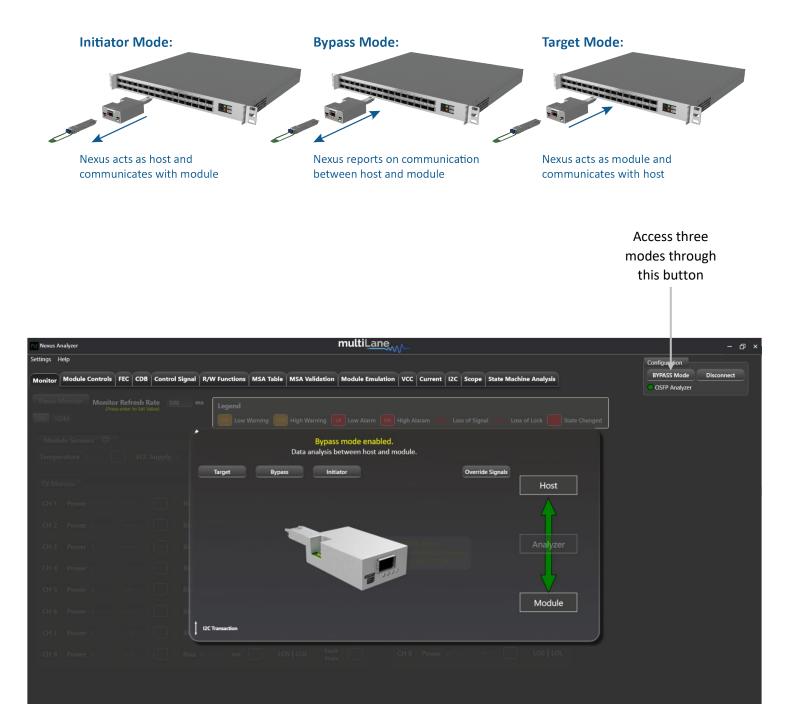


# Nexus GUI

Nexus GUI Features	Description				
Monitor	Diagnostic and Versatile Diagnostic Monitoring				
Module Controls	Access to TX and RX controls				
FEC	Monitor FEC status on their module.				
Common Data Block (CDB)	Update their module firmware.				
Control Signals	Access to low-speed signals in three different modes				
R/W Functions	I2C read/write operations				
MSA Table	Gives the user acccess to their module memory.				
MSA Validation	Full CMIS/SFF register sweep.				
Module Emulation	Emulation Module Memory to validate the host.				
VCC	Continuous VCC Supply measurements.				
Current	Continuous and in-rush current measurements.				
I2C	I2C packets capturing and packet details analysis.				
Scope Mode	SCL, SDA, VCC and Current measurements.				
State Machine Analysis Tab	State Machine, Data Path State Machine, and Module State				
State Machine Andrysis Idu	Behavior tests available.				

Nexus operates in three modes:

- Target mode: the analyzer acts as a module for a host DUT
- Initiator mode: the analyzer acts as a host for a module DUT
- Bypass mode: the analyzer monitors exchange between host and module



Connected successfully to OSFP.

7

Adapter Temperature: -30 °C Analyzer Temperature: 28 °C



xus Analyzer	multiLane	
	egend	Configuration INITIATOR Mode Disconnect Standard CCMIS  OSFP Analyze nanged
Module Sensors 📮 👘 👘 👘 👘 👘 👘 👘 👘	Initiator mode enabled. The Analyzer acts as a host and has control over the module.	altan <b>b</b>
K Monitor	get Bypas LPMode ResetL ModSelL Host Host	
H1 Power 6.5535 mW > Bi	High State     High State     High State     Release State     Release State     Release State	
H 3 Power 3.3022 mw ⊻ Bias 65.756	mit Int ModPrst.	TLOL
H 4 Power 3.3018 mw v Bi	mut LC Low State Low State mvv v LOS	, LOL
H5 Power 3.2868 mw ∽	Release State     Module	. LOL
H 7 Power 3.3008 mW V Bi	Inc. LOS LOL Ruth LOS LOL Ruth LOS	10
H 8 Power 3.2768 mW > Bias 65.996	mA LOS   LOL Fault CH 8 Power 65.285 mW v LOS	LOL
inalyzer mode changed to INITIATOR.	Data is purely simulated and may not be reflective of real-time performance.     Adapter	r Temperature: 0 °C Analyzer Temperature: 1 °C

#### Set Control Signals Defaults:

After choosing a mode to enable and work with, user can access low-speed signals on plug/host side to override them. These low-speed signals are accessible at any point in the GUI.

On the bottom left of the UI, there is a status bar for Nexus, and it will be updated throughout user application, effectively resetting when the user disconnects from the GUI, see example below:

Nexus Analyzer					multiLan	ew-				- ć
tings Help onitor Module Cor	ntrols FEC CDB	Control Signal R/W	/ Functions MSA Ta			tion VCC Current 120	C Scope Sta	te Machine Analysis		Configuration INITIATOR Mode Disconnect Standard C-CMIS V OSFP Analyze
TX Controls				RX Controls						Standard C-CMIS V OSFP Analyze
Output Disable	Polarity Flip	Squelch Disable	Force Squelch	Output Disable	Polarity Flip	Squelch Disable				
🔲 Tx 1	🗖 Tx 1	🔲 Tx 1	🗖 Tx 1	🗖 Rx 1	🗖 Rx 1	🔲 Rx 1				
🔤 Tx 2	🗖 Tx 2	Tx 2	Tx 2	🗖 Rx 2	🔲 Rx 2	🔲 Rx 2				
🗖 Tx 3	🗖 Tx 3	Tx 3	🔲 Tx 3	Rx 3	🔲 Rx 3	🔤 Rx 3				
🗖 Tx 4	🗖 Tx 4	🗖 Tx 4	🗖 Tx 4	🗖 Rx 4	🔲 Rx 4	🔤 Rx 4				
Tx 5	Tx 5	🗖 Tx 5	Tx 5	Rx 5	Rx 5	🗖 Rx 5				
Tx 6	Tx 6	Tx 6	Tx 6	Rx 6	Rx 6	🗖 Rx 6				
Tx 7	Tx 7	Tx 7	Tx 7	🗖 Rx 7	🗌 Rx 7	🗖 Rx 7				
Tx 8	Tx 8	Tx 8	Tx 8	🗖 Rx 8	🗖 Rx 8	🗖 Rx 8				
Input Equalization				Output Amplitud	le	Output Pre-Cursor		Output Post-Curs	or	
Тх 1 🦫	12 O dB	Tx 1 🌢		Rx 1	→ mV	Rx 1 🖕 1	<sup>2</sup> 0 dB	Rx 1 🖕	12 0 dB	
Tx 2 🧯	12 0 dB	Tx 2 🧯		Rx 2	→ mV	Rx 2 🖕 1	² <b>0</b> dB	Rx 2 🧯	12 0 dB	
Tx 3 🧯	12 0 dB	Tx 3 🧯		Rx 3	✓ mV	Rx 3 🕛 1	<sup>2</sup> 0 dB	Rx 3 🧯	12 0 dB	
Тх 4 🧯	12 0 dB	Tx 4 🧯		Rx 4	→ mV	Rx 4 🕛 1	<sup>2</sup> 0 dB	Rx 4 🖕	12 0 dB	
Тх 5 🦢	12 0 dB	Тх 5 🦫				Rx 5 🕒 1	<sup>2</sup> 0 dB	Rx 5 🖕	12 0 dB	
Tx 6	12 0 dB	Тх 6 🖢	12	Rx 5	→ mV	Rx 6 🕒 1	<sup>2</sup> 0 dB	Rx 6 🖕	12 0 dB	
[13:43:29.160] Analyzer				Rx 6	→ mV	Rx 7 🥚 1	² <b>0</b> dB	Rx 7 🧯	12 0 dB	
[13:43:32.606] VCC ena				Rx 7	→ mV	Rx 8 👲 1	<sup>2</sup> 0 dB	Rx 8 🧁	12 0 dB	
[13:43:35.041] Starting [13:43:35.645] Resolutio				Rx 8	→ mV					
[13:43:35.879] Speed se										
[13:43:36.291] Capturin	g data started.									
[13:43:37.344] Stopped										
Module asserted to	reset			🗘 🛕 Data is j	ourely simulated and	d may not be reflective of real-	time performance		Adapter Temperature: 35	°C Analyzer Temperature: 35 °C

#### Firmware Upgrade on Nexus:

The latest firmware revision on Nexus is v0.5.1.5.

It is possible to update the FW revision directly from user side, following the steps below:

- On the top right of the UI, press on Settings -> Device Info -> Update Firmware
- You will be redirected to FW packages already downloaded with the full Nexus UI setup:
  - OSFP/QDD FW packages will be available
  - Select the corresponding form factor, and select "QDD\_FirmwarePackage.hex" or "OSFP\_FirmwarePackage.hex"
- Update device
- Please reach out to dctssupport@multilaneinc.com for a FW upgrade guide.

The FW Upgrade procedure requires the disabling of anti-virus of the laptop in use. Please refer to your IT department.

Nexus Analyzer		
Settings Help		
Monitor Module Controls		nctions MSA Table MSA Valid
	EXUSANALYZE	R
Device PN	ML4066-OSFP-ANA-V2	Low Warning
Firmware Revision	0.5.1.5	Update Firmware
Device SN	v0:A90967:A84000001726OSNP00A3	
TX Monitor		

# Nexus GUI Features

# Monitor

Nexus Analyzer		multiL <u>ane</u>		- o
		dation Module Emulation VCC Current 12C Sco	pe State Machine Analysis	Configuration INITIATOR Mode Disconnect Standard CCMIS V OSEP Analyzer
Pause Monitor Monitor Refresh Rate 500 (Press enter to Set Value)	ms Legend	ning 🚺 Low Alarm 🔛 High Alaram 1.05 : Loss of S	ignal 101.; Loss of Lock <b>State Changed</b>	
Module Sensors				
Temperature 31 VCC Supply 2.1	AUX1 100 AUX2	2 100 AUX3 1.04 State Cha	· U	mary, Register 3, Bits: 1-3
TX Monitor		RX Monitor		
CH 1 Power 6.5535 mw -	Bias 130.562 mA LOS   LOL	Fault CH 1 Power	er 32.768 mw v LOS LOL	
CH 2 Power 3.3019 mW ~	Bias 65.836 mA LOS   LOL	Fault CH 2 Powe	97 32.818 mw v LOS LOL	
CH 3 Power 3.3022 mW v	Bias 65.796 mA LOS   LOL	Fault CH 3 Powe	er 32.878 mw ~ LOS   LOL	
CH 4 Power 3.3018 mW v	Bias 65.816 mA LOS   LOL	Fault CH 4 Powe	r 32.978 mw v LOS   LOL	
CH 5 Power 3.2868 mW v	Bias 65.556 mA LOS   LOL	Fault CH 5 Powe	er 65.41	
CH 6 Power 6.548 mW ~	Bias 130.6 mA LOS   LOL	Fault CH 6 Powe	r 32.928 mw v LOS LOL	
CH 7 Power 3.3008 mW v	Bias 65.696 mA LOS   LOL	Fault CH 7 Powe	r 32.948 mW v LOS LOL	
CH 8 Power 8.2768 mW V	Bias 65.996 mA LOS   LOL	Fault CH 8 Powe	er 65.285 mw v LOS   LOL	
C Module asserted to reset	^ A	Data is purely simulated and may not be reflective of real-time per	formunce. Adapter Temperature:	19 °C Analyzer Temperature: 15 *C

							_						
						ultiLang							
emperature	38 Analyzer Terr	iperature 49										Configuration OSFP Analyzer	Disconnect
C CDB Co	entrol Signals R/W	Functions MS/	Table MSA	Validation Mo	dule Emulatio	VCC Curren	nt I2C Scop	e State Machine	Analysis ePF	s			
	itor Refres 500 Press enter to Set Value)	ms	Legend	iming 🔤 High	Warning 🔼	Low Alarm HA	High Alaram	1011 Loss of Signal L	OL : Loss of Loc	k 🔽 State Ch	anged		
Group 2 Gr	oup 3 Group 4												
/Samples	Mask Flag And Thre	shold											
6425	Descriptor		Sample 17	13364	Descriptor		Sample 33	8224	Descriptor		Sample 49	Descriptor	
29298	Descriptor		Sample 18	8224	Descriptor		Sample 34	8224	Descriptor		Sample 50	Descriptor	
29555	Descriptor		Sample 19	13364	Descriptor		Sample 35	8224	Descriptor		Sample 51	Descriptor	
24929	Descriptor		Sample 20	22616	Descriptor		Sample 36	8224	Descriptor		Sample 52	Descriptor	
20046	Descriptor		Sample 21	21588	Descriptor		Sample 37	32896	Descriptor		Sample 53	Descriptor	
29812	Descriptor		Sample 22	12886	 Descriptor		Sample 38		Descriptor		Sample 54	Descriptor	
28527	Descriptor		Sample 23	12593	Descriptor		Sample 39	•	) Descriptor		Sample 55	Descriptor	
27499	Descriptor		Sample 24	12336	Descriptor		Sample 40		Descriptor		Sample 56	Descriptor	
8224	Descriptor		Sample 25	14185	Descriptor		Sample 41		] Descriptor		Sample 57	Descriptor	
7196	Descriptor		Sample 26	8224	Descriptor		Sample 42	61680	) Descriptor		Sample 58	Descriptor	
20303	Descriptor		Sample 27	8224	Descriptor		Sample 43	1542	Descriptor		Sample 59	Descriptor	
17990	Descriptor		Sample 28	12850	Descriptor		Sample 44		Descriptor		Sample 60	Descriptor	
11565	Descriptor		Sample 29	12336	 Descriptor		Sample 45	•	Descriptor		Sample 61	Descriptor	
12336	Descriptor		Sample 30	12593	Descriptor		Sample 46		) Descriptor		Sample 62	Descriptor	

#### **Digital Monitoring**

- Operates in initiator mode
- Module monitoring interface
- Color coded high alarms/ high warnings.
- Color coded low alarms/ low warnings.
- Module Sensors can be docked to the top of the GUI by pressing on the docking icon, right side of "Module Sensors"

#### Versatile Diagnostic Monitoring

- Operates in initiator mode
- Access to enabled/disabled groups in the module
- Indexing available for module interrupts

# **Module Controls**

Analyser Monitor FE Monitor FE Pause Mon DM VOM Group 1 G Descriptor, Sample 1 Sample 5 Sample 6 Sample 6 Sample 7 Sample 8 Sample 10 Sample 10

Nexus Analyzer					multiLan	em-				- 0
ttings Help Ionitor Module Cor	ntrols FEC CDB	Control Signal R/V	V Functions MSA Ta	able MSA Validation	Module Emula	tion VCC Current 12C	Scope State	e Machine Analysis		Disconnect
TX Controls				RX Controls					Standard CCMIS V	OSFP Analyzer
Output Disable	Polarity Flip	Squelch Disable	Force Squelch	Output Disable	Polarity Flip	Squelch Disable				
🔤 Tx 1	🚍 Tx 1	🚍 Tx 1	🚍 Tx 1	🔜 Rx 1	E Rx 1	🔤 Rx 1				
📰 Tx 2	🚍 Tx 2	🚍 Tx 2	🚍 Tx 2	🚍 Rx 2	🔳 Rx 2	🚍 Rx 2				
🚍 Tx 3	🗮 Tx 3	🚍 Tx 3	🚍 Tx 3	🔤 Rx 3	🚍 Rx 3	🔤 Rx 3				
🚍 Tx 4	🚍 Tx 4	≣ Tx 4	= Tx 4	🚍 Rx 4	🔙 Rx 4	🚍 Rx 4				
Tx 5	🚍 Tx 5	Tx 5	Tx 5	🚍 Rx 5	Rx 5	🔤 Rx 5				
🔤 Tx 6	🔤 Tx 6	🔤 Tx 6	🔤 Tx 6	🚍 Rx 6	Rx 6	🚍 Rx 6				
🔤 Tx 7	🔤 Tx 7	🔲 Tx 7	🗆 Tx 7	🔤 Rx 7	Rx 7	🔤 Rx 7				
🔤 Tx 8	📰 Tx 8	🔤 Tx 8	🗔 Tx 8	🔤 Rx 8	🔤 Rx 8	🔤 Rx 8				
Input Equalization				Output Amplitud		Output Pre-Cursor		Output Post-Cursor		
Тк 1 🧯	<sup>12</sup> 0 d8			Rx 1 100 - 400	✓ mV	Rx 1 0 12		Rx 1 🖁 12 🚺		
Tx 2 🖕	17 0 dB			Rx 2 400 - 800	w mV		4 de	Rx 2 6 12 0		
Тх 3 🦢	12 0 dB 12 0 dB			Rx 3 100 - 400	¥ mV		89 (C) 89 (C)	Rx 3 6 12 0		
Tx 4 💩	12 0 dB			Rx 4 100 - 400	mV			Rx 4 6 12 0 Rx 5 6 12 0		
Tx 6	12 0 d8	Tx 6		Rx 5 100 - 400	¥ mV		0 48	Rx 6 8 22 0		
Tx 7	12 0 dB	Tx 7		Rx 6 300 - 600	→ mV		0 m	Rx 7 12 0		
Тх 8 🦫	12 0 dR			Rx 7 300 - 600	⊻ mV			Rx 8 12 0		
				Rx 8 100 - 400	₩V					
C Module asserted to	reset				and a strength of the	d may not be reflective of real-tin			perature: 37 *C. Analyzer Temperature: 35 *C	

- Initiator Mode
- Gives user access to TX and RX controls
  - Output disable 0
  - Polarity flip 0
  - Squelch disable 0
  - Force squelch 0
- Control and monitoring over TX equalization techniques.

#### FEC

Nexus Analyzer		mul	tiLane		
tings Help					Configuration
	CDB Control Signal R/W Functions				INITIATOR Mode Disconnect
onitor Module Controls FEC	COB Control Signal R/W Functions	MSA lable MSA Validation Modu	le Emulation VCC Current 12C S	cope State Machine Analysis	O QDD Analyzer
EC Advertisment BER/FEC Mon	itor				
is supported.					
Media Side FEC		Host Side FEC			
PRBS Generator Pre FEC	Checker Data Invert	PRBS Generator Pre FEC	Checker Data Invert		
Supported	Supported	Not Supported	Not Supported		
PRBS Generator Post FEC	Checker Per Lane	PRBS Generator Post FEC	Checker Per Lane		
Supported	Supported	Not Supported	Not Supported		
PRBS Checker Pre FEC	Generator Data Invert	PRBS Checker Pre FEC	Generator Per Lane Enable		
Supported	Supported	Not Supported	Not Supported		
PRBS Checker Post FEC	Simultaneous Loopbacks	PRBS Checker Post FEC	Simultaneous Loopbacks		
Supported	Supported	Not Supported	Not Supported		
Generator Data Swap	Output Loopback	Generator Data Swap	output Loopback		
Supported	Supported	Not Supported	Not Supported		
Generator Data Invert	Per Lane Loopback	Generator Data Invert	Per Lane Loopbacks		
Supported	Supported	Not Supported	Not Supported		
Generator Data Invert	Input Loopback	Checker Data Swap	Input Loopback		
Supported	Supported	Not Supported	Not Supported		
Generator Per Lane Pattern	Checker Per Lane Pattern	Generator Per Lane Pattern	Checker Per Lane Pattern		
Lane 1 pattern is used for all lanes	Pattern selection per lane	Lane 1 pattern is used for all lanes	Lane 1 pattern is used for all lanes		
	Generator Supported Patterns				
Checker Supported Patterns	PRBS-31QPRBS-31PRBS-23QPR	Checker Supported Patterns	Generator Supported Patterns		
PRBS-31QPRBS-31PRBS-23QPR BS-23PRBS-15QPRBS-15PRBS-1	BS-23PRBS-15QPRBS-15PRBS-1 3QPRBS-13PRBS-9QPRBS-9PRB	PRBS-31QPRBS-31PRBS-23QPR BS-23PRBS-15QPRBS-15PRBS-1	PRBS-31QPRBS-31PRBS-23QPR BS-23PRBS-15QPRBS-15PRBS-1		
3QPRBS-13PRBS-9QPRBS-9PRB	S-7QPRBS-7SSPRQReservedCus	3QPRBS-13PRBS-9QPRBS-9PRB	3QPRBS-13PRBS-9QPRBS-9PRB		
S-7QPRBS-7SSPRQReservedCus	tom	S-7QPRBS-75SPRQReservedCus	S-7QPRBS-7SSPRQReservedCus		

#### FEC Advertisement

- Operates in initiator mode
- FEC advertisement for

tings He	dp.								Configuration	
onitor	Modula Controls	DB Control Signal P/	W Functions MSA Table	MSA Validation	Module Emulation	VCC Current 12C Scon	State Machine Analysis		INITIATOR Mode	Disconne
				max tunuition		ree current lize scop	State matinie sharyss		O QDD Analyzer	
	rtisment BER/FEC Mor	itor								
Media S	Side				Host S	iide				
	BER	Error Count	Total Bits Count	SNR		BER	Error Count	Total Bits Count	SNR	
ane 1	19956	7083	531250315264	531250315264	Lane 1	26153	764	531250315264	22.43359375	
	BER	Error Count	Total Bits Count	SNR		BER	Error Count	Total Bits Count	SNR	
ane 2	256	165370	531250315264	531250315264	Lane 2		1275	531250315264	22.24609375	
	BER	Error Count	Total Bits Count	SNR		BER	Error Count	Total Bits Count	SNR	
ane 3		2825	531250315264		Lane 3			531250315264	23	
	BER	Error Count	Total Bits Count	SNR		BER	Error Count	Total Bits Count	SNR	
ane 4		33681	531250315264	531250315264	Lane 4		869	531250315264	22.140625	
	BER	Error Count	Total Bits Count	SNR		BER	Error Count	Total Bits Count	SNR	
ane 5	128	7083	531250315264	531250315264	Lane 5	128	7083	531250315264	21.921875	
	BER	Error Count	Total Bits Count	SNR		BER	Error Count	Total Bits Count	SNR	
ane 6	64688	165370	531250315264	531250315264	Lane 6	64688	165370	531250315264	20.7265625	
	BER	Error Count	Total Bits Count	SNR		BER	Error Count	Total Bits Count	SNR	
ane 7	31488	2825	531250315264	531250315264	Lane 7	31611	2825	531250315264	22.03515625	
	BER	Error Count	Total Bits Count	SNR		BER	Error Count	Total Bits Count	SNR	
ane 8	0	33681	531250315264	531250315264	lane 8		33681	531250315264	21.25	

- transceiver characteristics
- Access to post FEC
- FEC Monitoring interface for BER, error count, and SNR
- Reads FEC diagnostics from module, implements MSA formatting and presents final BER data

## FEC Monitor

- Operates in initiator mode
- FEC Monitoring interface for BER, error count, and SNR
- Reads FEC diagnostics from module, implements MSA formatting and presents final BER data

# Common Data Management (CDB)

#### CDB operates in initiator mode

Analyzer		multiL <u>ane</u>				-	· Ø
		Module Emulation VCC Current I2C Scope State Get PM Media Side LPL/EPL	: Machine Analysis	Configuratio OSFP Analy INITIATOR Name CDB status	zer O Mode		
PM Controls         PM objects are       Link Mode         No Operation       Clear All         PM Feature Information       Read PM Additional Features         Data Monitoring and Recording Controls       Refresh         Clear       Clear         DM and Recording Advertisement       DM Advertisement         DM Advertisement       Temperature Histogram         ✓ Save Current histogram       Clear Temperature Histogram         Clear Temperature Histogram       Temperature Histogram	Get Module PM LPL/EPL 6 Bytes   Record Type Module Temperature VCC Aux1 AUx2 AUX3 Refresh and Read LPL Clear and Read LPL Clear and Read EPL Clear and Read EPL	Media Side Lane SNR       8 Bytes       Record T         Media Side PAM4 LTP       Tx Laser Bias       Tx         Tx Laser Bias       Tx       Tx         Tx Laser Bias       Tx       Tx         Tx Power       Tx       Tx         Rx Power       Tx       Tx         Per-Lane Laser Temperature       Tx       Tx         Get Data Path PM LPL/EPL       Frame Error Count       Data Path Lane 1-8         Media Side Pre-Side Ber       Data Path Lane 9-16       Data Path Lane 9-16         Tx       Data Path Lane 17-24       Data Path Lane 25-32         Clear and Read LPL       Clear and Read EPL       Clear and Read EPL	ype Lane 1-8 Refresh LPL Lane 9-16 Clear/Read LPL Lane 9-16 Clear/Read EPL Lane 25-3 Refresh EPL Get PM Host Side LPL/EPL V Host Side Lane SNR V Host Side PAM4 LTP Host Side PAM4 LTP Host Side PAM4 LTP Host Side PAM4 LTP Lane 17-24 Lane 17-24 Lane 17-24 Lane 17-24 Lane 17-24 Lane 25-32 Refresh and Read LPL Clear and Read EPL Clear and Read EPL	CDB complete flag Firmware download password Copy/Abort/Fall Image Readb Start command payload size Erased Byte bsize Write LPL / EPL Read LPL / EPL Run Image A or B hitless suppi CMD Start 0101h max time m €	CO 9F 9F 9F 9F 9F 9F 9F 9F 9F 9F 9F	Address         D           37         6           30         37           30         8           47         136           37         6           37         6           37         6           37         138           37         133           37         139           37         141           37         142           37         143           37         144	

#### Performance and Data Monitoring

- CMD 0200h PM Controls: Extract Performance Monitoring data records such as minimum/average/maximum
  values. "No Operation" reads the most recent values, while "Clear All" clears the extracted values for all lanes in
  the interconnect.
- CMD 0201h PM Feature Information: Reads the PM's additional features.
- CMD 0280h Data Monitoring and Recording Controls: "Refresh" loads the most recent attributes. "Clear All" clears all values for all parameters for all lanes at the same time.
- CMD 0281h Data monitoring and recording advertisement
- CMD 0290h Temperature Histogram: Displays the temperature intervals of the interconnect and how long it stayed at each temperature interval.
- CMD 0210h, 0211h Get Module PM LPL/EPL: Choose parameters of the module's performance monitoring records, and replace the current values of the minimum, average, and maximum values. "Refresh" replaces the old values, while "Clear and Read" reads and resets the old values.
- CMD 0212h, 0213h Get PM Host Side LPL/EPL: Choose parameters of the host's performance monitoring
  records, and replace the current values of the minimum, average, and maximum values. "Refresh" replaces the
  old values, while "Clear and Read" reads and resets the old values.
- CMD 0214h, 0214h Get PM Media Side LPL/EPL: Choose parameters the performance monitoring records of specific lanes, and replace the current values of the minimum, average, and maximum values. "Refresh" replaces the old values, while "Clear and Read" reads and resets the old values.
- CMD 0216h, 0217h Get Data Path PM LPL/EPL: Choose the data path for specific lanes and replace the current values of the minimum, average, and maximum values. "Refresh" replaces the old values, while "Clear and Read" reads and resets the old values.

N Analyzer	multiLane			-	- 0
Settings Help Monitoring Adapter Temperature 21 Analyzer Temperature 27 Monitor FEC CDB Control Signals R/W Functions MSA Table MSA Valia Features Performance/Data Monitoring Commands FW Download Com	idation Module Emulation VCC Current 12C Scope State Machine Analysis	Configuratie OSFP Analy INITIATOR	yzer 🗢	Disconnec	at discussion
CDB Performance/Data Monitoring Max Duration for completion (ms)	Get PM Media Side LPL/EPL				D
PM Controls Get Module PM LPL/EPL	Media Side Lane SNR 8 Bytes   Record Type	CDB status CDB complete flag	00	37 8	
PM objects are V Link Mode 6 Bytes V Record Type	✓ Media Side PAM4 LTP Lane 1-8 Refresh LPL	Firmware download password	9F	136	
No Operation Clear All V Module Temperature	Tx Laser Bias	Copy/Abort/Full Image Readb Start command payload size	9F 9F	137 138	
PM Feature Information	Tx Power  Tx Power  Clear/Read EPL	Eranad Buda	95	120	

PM Feature Information			Erased Byte	91	139	2
Read PM Additional Features	Rx Power	Lane 25-3 Refresh EPL	bsize	9F	140	2
AUX2	Per-Lane Laser Temperature		Write LPL / EPL	9F	141	
Data Monitoring and Recording Controls AUX3	Get Data Path PM LPL/EPL	Get PM Host Side LPL/EPL	Read LPL / EPL	9F	142	
Refresh Clear Refresh and Read Li			Run Image A or B hitless supp	9F	143	
DM and Recording Advertisement Clear and Read LP	Frame Error Count	✓ Host Side Lane SNR	CMD Start 0101h max time m	9F	144	
DM Advertisement Refresh and Read El	Media Side Pre-Side Ber	✓ Host Side PAM4 LTP				
	8 Bytes 🔍	Host Side Pre-Fec Ber		xport		
Temperature Histogram Clear and Read EP	Data Path Lane 1-8	Record Type		sport		
✓ Save Current histogram to NVR	Data Path Lane 9-16	6 Bytes 🗸 🚽 👘 Lane 1-8	Command Progress			
Return histogram	Data Path Lane 17-24	B Bytes		_	_	
Clear Temperature histogram	Data Path Lane 25-32	<b>√</b> Lane 17-24				- 11
	Clear and Read LPL Clear and Read EPL	Lane 25-32	Success			
Temperature Histogram		Refresh and Read LPL				
		Clear and Read LPL				
		Refresh and Read EPL				
		Clear and Read EPL				



#### **CDB** Commands

- CMD 0000h Query Status
- CMD 0001h Enter Password
- CMD 0002h Change Password
- CMD 0003h Enable/Disable Password Protection
- CMD 0004h General Abort
- CMD 0380h Loopbacks

Analyzer								multiLane					- ć
tings Help													figuration
Monitoring													
Adapter Temperature 21	Analyzer	Temperat	ture 27										iFP Analyzer
												I	IITIATOR Mode Disconnect
Annihon FEC CDP Cont	val Signala - F	0 AN E	tions M	CA Table	MEAN	idation	Medula F	ulation VCC Current I2C Scope State M	Machine Anabuic				
eatures Performance/D	and the second second						Module El	ulation vec current ize scope state i	Macrillic Analysis				
A. 1994.			innunus	111 201	Miloud Co	Tirriurica							
CDB Feature and capabil	1000							Firmware Update Features Implemented	CDB status	00	37	01	Command completed successfully
Module Features	Performan	ce Monit	toring	Bert A	nd Diagno	stic		Read FW Features	CDB complete flag	00	8	00	CDB complete flag assertion
Command Support 0		4						Read PW Peatures	Firmware download password		136		00h: Download unlocked by vendor pass
CMDs 0000h-000Fh 🔍	000	0 0	00		000		000		Copy/Abort/Full Image Readb	9F	137		Bit0: Abort Support, Bit1: Copy Support.
CMDs 0010h-001Fh O	000	0 0	00	0 0	000	o c	000		Start command payload size	9F	138	16	Start command payload size in bytes
CMDs 0020h-002Fh O	000	00	00	0 0	000	o c	> o o		Erased Byte bsize	9F 9F	139 140	255	The default erased byte value Block size = (bsize + 1) * 8, E.g.bsize= 0.1
	000	00	00		000				Write LPL / EPL	9F	140	3	Firmware upgrade supported mechanisi
	• • •		00		000				Read LPL / EPL	9F	142		Firmware read / readback support mech
	000		00		000				Run Image A or B hitless supp	9F	143	0	0 : CMD Run A or B causes a reset. Traffi
CMDs 0060h-006Fh O			00		000				CMD Start 0101h max time m:	9F	144		This is the maximum execution time for
CMDs 0070h-007Fh O			00		000								
CMDs 0080h-008Fh O			00								Ехр	ort	
CMDs 0090h-009Fh O			00							Comman	d Progress		
			00							_			
CMDs 00A0h-00AFh O											_	_	
CMDs 00B0h-00BFh O			00		000					Success			
CMDs 00C0h-00CFh O			00		000		00						
CMDs 00D0h-00DFh O					000		>						
CMDs 00E0h-00EFh O					000								
					000		000						

# CDB Features

- CMD 0040h Module Features: Identifies which commands are supported, from CMD 0 to CMD 00FF along with the maximum CDB command execution time.
- CMD 0042h Performance Monitoring: Identifies which commands are supported from 0200h to 02FFh.
- CMD 0043h Bert and diagnostics: Identifies CMD 0300h to 03FFh.
- CMD 0041h Read FW Features: Identifies many parameters supported the firmware features including firmware download transfer type, if copy/abort/full image readback commands are supported, start command payload size, erased byte, the firmware update features, if read/write firmware is supported, the firmware can be upgraded, etc. Use this feature to determine whether a device supports LPL or EPL firmware.
- The green buttons indicate which commands are supported.

Analyzer		multiL <u>ane</u> M_					- C ×
Settings Help Monitoring Adapter Temperature 21 Analyzer Temperature 27 Monitor FEC CDB Control Signals R/W Functions M Features Performance/Data Monitoring Commands	/ISA Table MSA Validation Module Emulat	ion VCC Current 12C	Scope Stat	e Machine An	nalysis		Configuration OSIP Analyzer INITIATOR Mode Disconnect
CDB Firmware Download Commands	Get Firmware Info						
Load Corresponding Binary file	Get FW Version	CDB status CDB complete flag	00	37	41 01	Command ID unknown CDB complete flag assertion	
C:\User\alphabin\Downloads \FW_3_8.bin Download new Firmware Image Program LPL Abort Firmware download	Current Firmware Image Version Firmware Version 02.03 Refresh						
Abort Firmware Run Downloaded Firmware Image Delay MSB (Hot) Delay MSB (Hot) Reset 0 Run Image Traffic affecting reset to ina Attempt hitess reset to ina Switch to the new firmware image Copy firmware image Copy Image A to B Copy Image B to A	ctive image nning image			•	mmand F	Export Progress	

# CDB FW Download Commands

- CMD 0101h, 0103h, 0107h Program LPL: Loads the firmware binary file for Local Payload (LPL). Allows for updating interconnect firmware.
- CMD 0101h, 0104h, 0107h Program EPL: Loads the firmware binary file for Extended Payload (EPL). EPL support varies depending on the interconnect. Allows for updating interconnect firmware.
- CMD 0101h, 0105h, 0107h Read Image LPL: Read the latest upgraded firmware image using LPL
- CMD 0101h, 0106h, 0107h Read Image EPL: Read the latest upgraded firmware image using EPL.
- Export Image: Exports an image of the firmware after the read is completed as a .bin file, which in turn can be loaded into and read by other interconnects.
- CMD 0102h Abort FW download: Stops the firmware from being installed onto the interconnect.
- CMD 0109h Run image: After the new LPL or EPL Firmware is loaded, this command switches to the latest firmware image. Does not replace the existing firmware image on the interconnect.
- CMD 010Ah Commit image: Replaces the firmware image on the interconnect with the new loaded firmware image. Prior to this command being executed, the old firmware will still be executed on startup. Always ensure the new image is running perfectly (by running it on the interconnect using the previous commands) before using this command.
- CMD 0108h Copy image A to B/B to A: In the event of two images being present on the same interconnect and both images are written to flash, this command makes ensures that both images are identical, with the copied image being specified in the commands as either image A to image B, or image B to image A.
- CMD 0100h Get FW Info: Loads the information about the latest firmware on the interconnect, for both image A and image B.



# Control Signals

- Output/Input Signals:
- Read/ drive control signals
- Analog sampling of signals in real time

- Graph features vertical and horizontal markers.
- Pull up resistors: display SDA and SCL resistors values, where I2C should be in idle state to detect accurate values.
- Ability to export/import data
- Ability to dock Output Signals to the top of the GUI and control them throughout the application

Access to **OSFP** low-speed signals in three modes:

Signals Modes	LWPn	RSTn	INTn	PRSn
Initiator	Output signal	Output signal	Input signal	Input signal
Bypass*	No control	No control	No control	No control
Target	Input signal	Input signal	Output signal	Output signal

#### Access to **QSFP-DD** low-speed signals in three modes:

Signals Modes	LPMode	ResetL	IntL	ModPrsL
Initiator	Output signal	Output signal	Input signal	Input signal
Bypass*	No control	No control	No control	No control
Target	Input signal	Input signal	Output signal	Output Signal

\*In bypass mode, Nexus only samples the signal between host and module.

# I2C Read/Write Operations

Analyzer	multi	iLane		- @ ×
	r Temperature 30 RAW Functions MSA Table MSA Validation VCC Current 12C Scc	ope State Machine Analysis		Configuration OSTP Analyzer INITIATOR Mode Disconnect
Read/Write Byte		Advanced Read/Write		
Page(hex)	Bank(hex)	Page(hex)	Bank(hex) Slave address(h	x) A0
Single	Multiple	Single	Multiple	
Address(dec) 0	Start Address(dec)	Address(dec)	Start Address(dec)	
Data(hex)	End Address(dec)	Data(hex)	End Address(dec)	
Data(Dec)	Read Save	Data(Dec)	Read Write	Save
Data(Ascii)		Data(Ascii)	Address Data (Hex) Data (Dec	Data (Ascii)
Read Write		Read Write		

Operates in initiator mode

- Single byte read/write operations
- Multiple byte read operations
- Advanced R/W used to read from or write to multiple registers simultaneously

# MSA Table

/zer					multiLane		
Help itoring pter Temperature or FEC CDB C		zer Temperatur R/W Functio		MSA Validation	Module Emulation VCC Current 12C Scope State Machine Analysis		Configuration OSFP Analyzer O INITIATOR Mode Disconnect
nory Map							
Pages ^ 🝸	T <sup>o</sup> Clear Filter			Data (Ascii)	Description	Read Only	
Pages : LowMe							Read Data
LowMem	Search		٩		Identifier	✓	
LowMem	🗹 🔳 (Selec	t Alb	-	(	Revision Compliance	~	Load Data from file
LowMem	▼ LowN				Characteristics	7	
LowMem					Module State	~	Save Data to file
LowMem	✓ Page				Bank 0 flag summary	~	
LowMem	Page	01			Bank 1 flag summary	v	Write Data to Hardware
LowMem	= Page	02			Bank 2 flag summary	7	
LowMem	= Page	03			Bank 3 flag summary	~	Revert Read Only
LowMem	= Page	04			Data Path/Module firmware fault and Module State changed flag	<b>v</b>	
LowMem	= Page	10		0	Latched VCC3.3/Temp Alarm and Warning	7	The affected pages are the ones selected in the tab To choose the desired page(s) use the filter button
LowMem	= Page				Latched AUX1/2 Alarm and Warning	7	
LowMem					Latched Vendor Defined/AUX3 Alarm and Warning		
LowMem	= Page				Reserved		
LowMem	Page	13			Custom		
LowMem	= Page	14			Internally measured Temperature 1 MSB	~	
LowMem		011			Internally measured Temperature 1 LSB	7	
LowMem		ОК	Cancel		Internally measured Supply 3.3v MSB	7	
LowMem	17	45	69	E	Internally measured Supply 3.3v LSB	~	
LowMem	18	00	0		Internally measured AUX1 MSB	7	
LowMem	19	00	0		Internally measured AUX1 LSB		
LowMem	20	00	0		Internally measured AUX2 MSB	7	
LowMem	21	00	0		Internally measured AUX2 LSB	7	

- Operates in initiator mode
- Select page(s) to read
- Read data from device for selected page(s)
- Save data to file
- Load data from file
- Write data to hardware to have the data required in respective addresses
- Read only column: checked boxes refer to read only registers, while unchecked boxes refer to read/write registers, as per MSA. Use these to make R/W registers RO, and RO registers R/W, affecting MSA compliance
- Revert read only: revert back to the original type access of all registers as per MSA

# MSA Validation

#### Module side

Nexus Analyzer	multiL <u>ane</u> M	×
Settings Help Monitor Module Controls FEC CDB Control Signal R/W Functions MSA Tab		Configuration INITIATOR Mode Disconnect Standard C-CMIS OSFP Analyzer
Module Host		
Select a standard: CMIS Y Read and Validate Data S	Save Data Generate PDF report	
Validation Table		
	Register Tent Validation Notes	
A Page : LowMem - 128 Items		
A Page : Page 00 - 128 Items		
A Page : Page 01 - 128 Items		
A Page : Page 02 - 128 Items		
▲ Page : Page 03 - 128 Items		
A Page : Page 04 - 128 Items		
Page : Page 10 - 128 Items		
▲ Page : Page 11 - 128 Items		
▲ Page : Page 12 - 128 Items		
A Page : Page 13 - 128 Items		
A Page : Page 14 - 128 Items		
A Page : Page 15 - 128 Items		
A Page : Page 16 - 128 Items		
A Page : Page 17 - 128 Items		
▲ Page : Page 20 - 128 Items		
▲ Page : Page 21 - 128 Items		
▲ Page : Page 22 - 128 Items		
▲ Page : Page 23 - 128 Items		
▲ Page : Page 24 - 128 Items		
A Page : Page 25 - 128 Items		
Dago : Dago 26 - 129 Home		
Module asserted to reset	🗇 🛕 Data is purely simulated and may not be reflective of real-time performance. 🛛 🗛	apter Temperature: 24 °C Analyzer Temperature: 11 °C

- Operates in initiator mode
- Select page(s) to read
- Read data from device for selected page(s)
- Select validation type: Register Access Type Validation or Register Content Validation, or both
- Validation on bit level available
- Validate data against selected standards:
  - CMIS: Nexus validates module memory map against CMIS specifications and standards. Bit level Validation available.
  - Custom: Nexus validates module memory map against user custom standards. Customization on bit level available.
- Save data to file
- Load data from file
- Generate PDF report for the selected page(s)

#### CMIS VALIDATION

After validating the chosen page(s), a set of pass/fail registers appear as shown with the respective description of success or failure.

Analyzer					multiLane	• (
ings Help Monitoring Adapter Temperature		lyzer Temperature			Configuration OSFP Analyzer INITIATOR Mode Disconnect	
lect a validation type:			Y Read Da		nulation VCC Current I2C Scope State Machine Analysis ata Save Data Load Data From File Generate PDF report	
/alidation Table			D	Register		
Page \land 🝸	Address	Data (Hex)	Register Access Type Validation	Content Validation	Notes	
▼ Page : Page 01 ·	128 Items					
Page 01	128	01			Address 128 of Page Page 01, Register Access type Passed. Register Content Passed.	
Page 01	129	00			Address 129 of Page Page 01, Register Access type Passed. Register Content Passed.	
Page 01	130	02			Address 130 of Page Page 01, Register Access type Passed. Register Content Passed.	
Page 01	131	01			Address 131 of Page Page 01, Register Access type Passed. Register Content Passed.	
Page 01	132	00			Address 132 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
Page 01	133	00			Address 133 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
Page 01	134	00			Address 134 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
Page 01	135	00			Address 135 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
Page 01	136	00			Address 136 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
Page 01	137	00			Address 137 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
Page 01	138	00			Address 138 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
Page 01	139	00			Address 139 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
Page 01	140	00			Address 140 of Page Page 01, Register Access type Passed. Register Content Passed.	
Page 01	141	00			Address 141 of Page Page 01, Register Access type Passed. Register Content Passed.	
Page 01	142	00			Address 142 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
Page 01	143	00			Address 143 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
Page 01	144	00			Address 144 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
Page 01	145	00			Address 145 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
Page 01	146	00			Address 146 of Page Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.	
	147	00			Address 147 of Page Page 01, Read Only Register, Access type Failed: Register is writable. Register Content Passed.	

One example reads:

Page 01, Address 136-

Register Access Type Validation: Failed

Register Content Validation: Passed

Notes: address 136 of Page 01, Read Only Register. Access type Failed: Register is writable. Register Content Passed.

According to the CMIS specifications, address 136 of page 01 should be Read Only in a compliant module. Nexus tries writing to the register and succeeds, resulting in a Fail on Register Access Type.



# **Bit Level Validation**

xus Analyzer						multiLane	- c
gs Help itor Module dule Host	Controls F	EC CDB	Control Sign	al R/W Functions M	5A Table MSA Validation	n Module Emulation VCC Current 12C Scope State Machine Analysis	Configuration INITIATOR Mode Disconnect Standard CCMIS V OSFP Analyze
ect a standard:	смія		- Read	and Validate Data	Save Data	enerate PDF report	
idation Table		dress D	-1- (11)	Register Access 🚽	Register		
Page		uress D	ata (Hex)	Type Validation	Content Validation	Notes	
Page : LowN							
LowMem		0	18			Access type failed. Content validation passed. Expand for more details.	
LowMem			50	Failed		Read Only register. Access type failed: register is writable. Register Content Passed.	
LowMem			00	Falled		Access type failed. Content validation passed. Expand for more details.	
			Undefin			ess type and content validation are undefined.	
	RO					lidation Failed :Writable, content validation passed.	
	RO	0 - 0		Undefined		only. Access type validation Failed : Writable. Content validation is undefined.	
6-7	RO	0 - 3			Access type va	lidation Failed :Writable, content validation passed.	
+ LowMem			02			Access type failed. Content validation passed. Expand for more details.	
+ LowMem		4	00			Access type failed. Content validation passed. Expand for more details.	
+ LowMem			00			Access type failed. Content validation passed. Expand for more details.	
- LowMem		6	00			Access type failed. Content validation passed. Expand for more details.	
LowMem			00			Access type failed. Content validation passed. Expand for more details.	
+ LowMem		8	00			Access type failed. Content validation passed. Expand for more details.	
+ LowMem			20			Read Only register.Register Access type Passed. Register Content Passed.	
+ LowMem		10	00			Read Only register.Register Access type Passed. Register Content Passed.	
LowMem		11	00			Read Only register.Register Access type Passed. Register Content Passed.	
LowMem		12	00	Undefined	Undefined	Reserved/Custom register. Access type undefined. Register Content undefined	
LowMem		13	00			Reserved/Custom register. Access type undefined. Register Content undefined	

One example reads:

LowMem, Address 2-

Register Access Type Validation: Failed

Register Content Validation: Passed

Expand for more details:

Bits	Туре	Range	Type Validation	Content Validation	Notes
0-1	RESERVED	0-0	Undefined	Undefined	Reserved, access type and content validation undefined
2-3	RO	0-1	Failed	Passed	Access type validation Failed: Writable, content validation passed.
4-5	RO	0-0	Failed	Undefined	Reserved read only. Access type validation Failed: Writable. Content validation is undefined.
6-7	RO	0-3	Failed	Passed	Access type validation Failed: Writable, content validation passed.

When a register or a bit within that register are undefined as per CMIS, Nexus validates them as such.

Otherwise, each bit or pair of bits are validated against their Type, and Content specifications as per CMIS.



#### **Custom Validation**

The CMIS memory map includes registers and bits that are open to customization. In addition, a user may want to customize a few registers to their liking, effectively not fully complying to the CMIS standards.

In this case, Nexus allows users to upload their own standards as .CSV files, or allows them to edit the CMIS memory map directly on the software, as shown in the example above and to follow.

Custom Validation is available on register and bit level, the below example follows the bit level custom validation of address 2, LowMem.

Nexus Analyzer		multiLane			- @ ×
Settings Help Monitor Module Controls FEC CDB	Control Signal R/W Functions MSA Table	MSA Validation Module Emulation VCC	Current I2C Scope State Mac	hine Analysis	Configuration INITIATOR Mode Disconnect Standard C-CMIS V OSFP Analyzer
Module Host					
Select a standard: Custom					
Validation Table	Set For Validation	mport from csv Export t	to csv Rest	ore checked Registers to CMIS default	×
Page ^ 🔻 Address	Reserved Table				
▲ Page : LowMem - 128 Items ▲ Page : Page 00 - 128 Items	Check All Page A Y Add				
Page : Page 00 - 126 items	Page : LowMem - 128 Items				
	Page : Page 00 - 128 Items				
	Page : Page 01 - 128 Items				
	Page : Page 02 - 128 Items				
	A Page : Page 03 - 128 Items				
	A Page : Page 04 - 128 Items				
	<ul> <li>Page : Page 10 - 128 Items</li> <li>Page : Page 11 - 128 Items</li> </ul>				
	<ul> <li>Page : Page 11 - 128 items</li> <li>Page : Page 12 - 128 items</li> </ul>				
	<ul> <li>Page : Page 12 - 128 Items</li> <li>Page : Page 13 - 128 Items</li> </ul>				
	A Page : Page 14 - 128 Items				
	A Page : Page 15 - 128 Items				
	<ul> <li>Page : Page 16 - 128 Items</li> </ul>				
	Page : Page 17 - 128 Items				
	A Page : Page 20 - 128 Items				
	A Page : Page 21 - 128 Items				*
🗘 Validation Done.		Data is purely simulated and may not be	reflective of real-time performance.	Adapter Temperature: 20 °C	C Analyzer Temperature: 30 °C

Follow the example below:

Select LowMem as shown below, to start with:

Nexus Analyzer		mult	Lane		- 6
tings Help onitor Module Controls FEC CDB	Control Signal R/W Functions MSA	Table MSA Validation Module	Emulation VCC Current 12C Scope State Machine Ana	lysis	nfiguration NITIATOR Mode Disconnect
Module Host				Sta	andard C-CMIS 🗸 🔵 OSFP Analyzer
Select a standard: Custom					
Validation Table	Set For Validation	Import from csv	Export to csv Restore checke	ed Registers to CMIS default	⊗
Page \land 🔻 Address	Reserved Table				
Page : LowMem - 128 Items	Check All Page 🔨 🍸			e A	
Page : Page 00 - 128 Items	Page : LowMem - 128 Items				
	LowMem	0 RO/ENUM	Identifier	Edit	
	0-7	RO 0-37			
		RO 128 - 25			
	LowMem	1 RO/VALUE	Revision Compliance	Edit	
	LowMem	2 RO/VALUE	Characteristics	Edit	
		RESERVED 0 - 0			
		RO 0-1			
		RO 0-0			
		RO 0-3			
	LowMem	3 RO/VALUE	Module State	Edit	
	LowMem	4 RO/VALUE 5 RO/VALUE	Bank 0 flag summary Bank 1 flag summary	Edit	
	Lowiviem	RO/VALUE	Bank i nag summary	- COIL T	

Selecting LowMem, address 2 to edit and customize as shown below:

								- L
								INITIATOR Mode Disconnect
Control Signal R/W Functions MSA	Table MSA Val	idation Module Em	ulation VC	C Current	I2C Sco	pe State Machine Analys	is	Standard c-cmis v OSFP Analyze
	0 1		it Selection	5	6	7 C Refresh Bits		
Set For Validation			- Cont				Registers to CMIS default	$\odot$
Reserved Table		Set Group						
Check All Page A				Min:	0	Add Range		Â
	[]							-
			170	255 Max:	255	Edit Range	Edit	
			<b>R</b> Type	Ranges				
LowMem				0.0	F# ¥	evistance	Edit	
				0-0			Edit	
		2,3		0-1	e ×			
0-1		Bits : 4,5 - 1 Iten						
		4,5	RO	0-0	C ×			
4-5								
		6,7	RO	0-3	Ľ ×			
LowMem						e State:	Edit	
LowMem	Set Register	Remove All				Cancel	Edit	
LowMem						Summury 2	Edit	
	Read and Validate Dat Set For Validation Reserved Table Page : LowMern - 128 Iten Date Date Date Date Date Date Date Date		Reard and Validation       0       1       2       3         Set For Validation       Set For Validation       Set Group       Value Rance         Check All       Page       Croup       Value Rance         Check All       Page       Croup       Value Rance         Corr       Context All       Bits       Set Group       Value Rance         Dor       Dor       Set Group       Value Rance       Set	Read and Validate Date       0       1       2       3       4         Set For Validation       0       1       2       3       4         Reserved Table       0       1       2       3       4         Page Torvalidation       0       1       2       3       4         Reserved Table       Group       Value Range	Reard and Walidate Do       0       1       2       3       4       5         Set For Validation       0       1       2       3       4       5         Reserved Table       Set Group       Value Range       Mirc       1<	Bits       Bits	Read and Wildate Date       0       1       2       3       4       5       6       7       refer to the transmitted of t	Set of could with data bits       0       1       2       3       4       5       6       7       Exterior bits         Set For Validation       Reserved Table       0       1       2       3       4       5       6       7       Exterior bits         Preserved Table       Croup       Value Range       Min:       0       Add Range       Edit         V       Page : LowMem       128 lten       0       0       255       Max:       255       Edit Range       Edit         0       0       0       10       255       Max:       255       Edit Range       Edit         0       0       0       10       255       Max:       255       Edit Range       Edit         0       0       0       10       255       Max:       255       Edit Range       Edit         0

multiLane

Upon selecting the register to customize, the window shown in the photo above will appear, showcasing the following:

- Accessible Bits 0-7: select which or all bits to customize
- Editable Value Range of register: customize value range of selected bits
- Editable Access type and ranges of each of the bits

Select bits to customize

Nexus Analyzer multiLane	
Settings Help	Configuration
Monitor Module Controls FEC CDB Control Signal R/W Functions MSA Table MSA Validation Module Emulation VCC Current 12C Scope State Machine Analysis	INITIATOR Mode Disconnect
Module Host	Standard C-CMIS V OSFP Analyzer
Select a standard: Custom 9.10 Pead and Validate Data Since Data Cenenter PDF report	
Validation Table Set For Validation Import from csv Export to csv Restore checked Registers to CMIS default	. ⊗
Page A T Address Reserved Table	
Page : LowMem - 128 Items     Page : Page 00 - 128 Items     Page : Page 00 - 128 Items	
Page : LowMem - 128 Iten Set Group	
Bits Group Value Range Mir: 0 Add Range	
0-7 [] 0-7 0.7 85 120 255	
LowMem E RD/Vetus Person Completions	
Bits A C Type Ranges	
4-5 Set Register Remove All Cancel	
6-7 RO 0-3	
LowMem 3 RO/VALUE Module State Edit	
conversion - coversion - coversio - coversion - coversion - coversion - coversion - covers	
🗘 Validation Done.	C Analyzer Temperature: 3 °C

Select range of values for selected bits

Nexus Analyzer	,	multiLane,,,	V		– @ ×
Settings Help					Configuration
Monitor Module Controls FEC CDB	Control Signal R/W Functions MSA	Table MSA Validation Module Emulation	VCC Current I2C Scope State Machine	Analysis	INITIATOR Mode Disconnect
Module Host					Standard C-CMIS V OSFP Analyzer
Select a standard: Custom					
Validation Table	Set For Validation	Import from cav Bit Selec	port to csv Restore ch	ecked Registers to CMIS default	
Page \land 🔻 Address	Reserved Table	0 $1$ $2$ $3$ $4$	5 6 7 C Refresh Bits		
<ul> <li>Page : LowMem - 128 Items</li> <li>Page : Page 00 - 128 Items</li> </ul>	Check All Page 🔨 🎙		Retresh Bits		
= rage.rage ou - 120 items	Page : LowMem - 128 Iten	Set Group			
	LowMem	Group 1 Value Rang 5	Min: 1 Add Range	Edit	
		[3-5] —			
		0 2 <sup>37</sup> 4	6 Max: 5 Edit Range		
	LowMem	Bits ^ ピ Ty	pe Ranges	Edit	
	LowMem		Changes Change Enstice	Edit	
		Bits : 3,4,5 - 1 Items			
		RESERVED 3,4,5 RW	1-5 🛛 🗙		
		Set Register Remove All	Cancel		
	LowMem	3 RO/VALUE	Module State	Edit	
	LowMem	4 RO/VALUE	Bank 0 flag summary	Edit	
	LowMem	5 RO/VALUE	Bank 1 flag summary	Edit	<b>v</b>
🗘 Validation Done.		🗢 🛕 Data is purely simulated and may	not be reflective of real-time performance.	Adapter Temperature: 25 °C	C Analyzer Temperature: 16 °C

Edit access type and range through the table



Validation Table	Set For Validation			tion Better he	cked Registers to CMIS default	3
Page \land <b>T</b> Address	Reserved Table	(0) $(1)$	) (2) 3 4	5 6 7 C Refresh Bits		
Page : LowMem - 128 Items	Check All Page \land 🎙				c i	
A Page : Page 00 - 128 Items	Page : LowMem - 128 Iten		Set Group			
	LowMem			Min: 1 Add Range	Edit	
	Bits 0-7	[3-5]	0 2 4	6 Max: 5 Edit Range		
	LowMem			Periodan Compliance	Edit	
	LowMem		Bits ^ ピ Typ	e Ranges	Edit	
			Bits : 3,4,5 - 1 Items 3,4,5 RW	▼ 1-5		
				▼ 1-3 <u></u>		
	2 - 3 4 - 5		RW			
	6-7	Set Register	Remove All RESERVE	Cancel		
	LowMem	3	RO/VALUE	Module State	Edit	
	LowMem		RO/VALUE	Bank 0 flag summary	Edit	
	LowMem		RO/VALUE	Bank 1 flag summary	Edit	
Analyzer mode changed to INITIATOR.				not be reflective of real-time performance.	Adapter Temperature: 25 °C Analyz	

In the photo shown above, user can change the access type of each standalone bit, or group of bits.

Nexus Analyzer		multiL	ane		- O >
Settings Help					Configuration
Monitor Module Controls FEC CDB Contro	I Signal R/W Functions MSA	Table MSA Validation Module Er	nulation   VCC   Current   I2C   Scope   State Machine Ana	alysis	INITIATOR Mode Disconnect
Module Host					OSFP Analyzer
Select a standard: Custom					
Validation Table	Set For Validation		Bit Selection	ed Registers to CMIS default	⊗
Page ∧ ▼ Address Rese	erved Table	0 $1$ $2$ $3$	4 5 6 7 C		
Page : LowMem - 128 Items Page : Page 00 - 128 Items	Check All Page A			e i	
Page : Page 00 - 128 items	Page : LowMem - 128 Iten	Set Group			
	LowMem		ange Min: 1 Add Range	Edit	
		[3-5] —			
	0-7		4 6 Max: 5 Edit Range		
	LowMem		🕑 Type Ranges	Edit	
		▼ Bits : 3,4,5 - 11		Edit	
	Bits 0-1	3,4,5	RW 1.5		
	2-3		Edit this range		
	4-5				
		Set Register Remove All	Cancel		
	LowMem	3 RO/VALUE	Module State	Edit	
	LowMem	4 RO/VALUE	Bank 0 flag summary	Edit	
	LowMem	5 RO/VALUE	Bank 1 flag summary	Edit	
C Analyzer mode changed to INITIATOR.		🗘 🛕 Data is purely simulate	d and may not be reflective of real-time performance.	Adapter Temperature: 46 °C Ana	lyzer Temperature: 50 °C

In the photo shown above, user can edit the range of values from the table

Upon reading and validating the data, user will get a set of pass/fail registers against their customized standards



# MSA Validation

lost Side	:				
sus Analyzer					
n Help					
or Module Cont	train FEC CDB	Control Signal   R	W Functions MS	A Table MSA Validation	Module Emu
		and all a second second		MSA validation	
tule Host					
Stop Analysis					
Jave Address	Pages	Address	Operation	MSA Access Type	Status
AO	Page 11h	140	Read	RO	
AO	Page 11h	141	Read	RO	
A0	Page 11h	142	Read	RO	
A0	Page 11h	143	Read	RO	
A0	Page 11h	144	Read	RO	
AO	Page 11h	145	Read	RO	
	Page 11h	146	Read	RO	
AO	Page 11h	147	Read	RO	
A0	Page 11h	148	Read	RO	
A0	Page 11h	149	Read	RO	
A0	Page 11h	150	Read	RO	
A0 A0	Page 11h	151	Read Read	RO	
A0 A0	Page 11h Page 11h	152	Read	RO	
A0	Page 11h Page 11h	153	Read	RO	
A0	Page 11h	155	Read	RO	
A0	Page 11h	156	Read	RO	
A0	Page 11h	157	Read	RO	
AO	Page 11h	158	Read	RO	
A0	Page 11h	159	Read	RO	
AO	Low Memory		Read	RO	
A0	Low Memory		Read	RO	
A0	Low Memory		Write	RO	
	Low Memory		Write	RO	
A0	Low Memory		Read	RO	
A0	Low Memory		Read	RO	
A0	Low Memory		Write	RO	
A0	Low Memory	10	Read	RO	
A0 A0	Low Memory	11	Read Write	RO	
AO	Low Memory	10	Write	RO	

On the host side, this tab operates in Target mode. From the host side, the user can send out R/W operations to the module, and Nexus will validate these operations and registers involved as shown above.

Press on "Start Analysis", go to host UI, and send out commands. Nexus will show you the page and register, the type of operation, and will show you as per CMIS standards the access type of each of those registers, with a pass/fail according to CMIS.

Press on "Stop Analysis" once testing is done.



# Module Emulation

Module emulation works in target mode, where Nexus emulates a module memory as per CMIS. It allows you to validate the host register access, by confirming that the host is adopting the proper access types (RO/RW) for CMIS specific addresses.

Module Emulation also allows user to emulate Module monitored parameters including temperature and signal loss, validating that your host is monitoring correctly.

Memory Map		
Nexus Analyzer	multiLane	- 0 ×
Settings Help		Configuration
Monitor Module Controls FEC CDB Control Signal R/W Functions MSA Table MSA	Validation Module Emulation VCC Current I2C Scope State Machine Analysis	TARGET Mode Disconnect Standard C-CMIS V OSFP Analyzer
Memory Map Monitor Control		Standard ccms OSFP Analyzer
Read Data Load Data from file Save Data to file	Write Data to Hardware Clock Stretching 0 (us) I2C Faults Disable clock stretching	Page Selection
Memory Map		Custom Map Custom Y Set
Pages ^ 🍸 Address Data (Hex) Data (Dec) Data (Ascii)	Description v2.8	Page 02
Pages : LowMem - 128 Items     A Pages : Page 00 - 128 Items		Page 03
Pages : Page 01 - 128 Items		Page 04
		Page 10
		Page 11
		Page 12
		Page 13
		Page 14
		Page 20
		Page 21
		Page 22
		Page 23
		Page 24
Done Reading.         0	▲ Data is purely simulated and may not be reflective of real-time performance. Adapter Temperatu	re: 11 °C Analyzer Temperature: 25 °C

**Emulate Module Memory:** 

- LowMem, Page00 and Page01 are emulated by default
- User can add a maximum of three extra pages to emulate by dragging and dropping, or simply clicking on the page.
  - Once user adds a page to the emulated module memory, the Nexus FW will continue emulating the pages added until or unless the page/pages are removed. If the pages are not removed, expect the same pages to reappear after Nexus GUI disconnection
- Write to memory directly on the table and commit by pressing "Write Data to Hardware"
- Option to emulate a MultiLane custom memory by choosing one of the following:
  - Active Electrical Cable (AEC)
  - Active Loopback (ALB)
  - Passive Electrical Loopback (ELB)

#### Validate Host:

- Access the host to validate it is reading/ writing correctly to emulated module memory
- Carry out R/W operations from the host side on the registers changed from Nexus side

#### Module Emulation tab also allows user to:

- Change Clock Stretching
- Choose and add an I2C Fault Trigger (Choose "Reset I2C" to remove fault):
  - Expect communication to be interrupted by I2C fault triggers from Host side, for example choosing a "Single Read" I2C Fault will interrupt the Host from reading a single register

Force I2C Faults	v
	Disable clock stretching
	Change slave address
	Single write
	Single read
	Sequential write
	Sequential read
	Force NACK
	None



#### **Monitor Control**

Emulate module parameters as below, and validate your host monitoring capabilities:

In addition to emulating output power, temperature and VCC supply, you can also trigger alarms and warnings.

Nexus Analyzer		multiLane		— 凸 >
Settings Help				Configuration
Monitor Module Controls FEC CDB Co	ontrol Signal R/W Functions MSA Table MSA	Validation Module Emulation VCC Current I2C Scope	State Machine Analysis	TARGET Mode Disconnect
Memory Map Monitor Control				OSFP Analyzer
TX Monitor		RX Monitor	Module Sensors	
CH 1 Power mw v	Bias mA LOS LOL State	CH 1 Power mw v LOS LOL	Temperature 67 VCC Supply 3.65	AUX1
HA LA HW LW	HA LA HW LW	HA LA HW LW		HA LA HW LW
CH 2 Power 12 mW V	Bias mA LOS LOL State	CH 2 Power mw v 1.05 LOL	AUX2 AUX3	State Changed
HA LA HW LW	HA LA HW LW	HA LA HW LW	HA LA HW LW HA LA HW LW	
CH 3 Power mw v	Bias mA LOS LOL Fault State	CH 3 Power www v LOS LOL	Legend	
HA LA HW LW	HA LA HW LW	HA LA HW LW		Alarm HA High Alaram
CH 4 Power mw ~	Bias mA LOS LOL State	CH 4 Power LOS LOL		te Changed
	(HA) LA) (HW) (LW)	WI WH AI AH	(Press enter to apply any value)	
CH 5 Power 9 mw v	Bias mA LOS LOL State	CH 5 Power LOS LOL	MSA Register Custom	
(HA) (LA) (HW) (LW)	HA LA HW LW		Refresh Page Content	
CH 6 Power	Bias mA LOS LOL State	CH 6 Power		
(HA) LA (HW) LW	(HA) (LA) (HW) (LW)			
CH 7 Power ww v	Bias mA LOS LOL State	CH 7 Power LOS LOL		
HA LA HW LW	HA LA HW LW	HA LA HW LW		
CH 8 Power	Bias mA LOS   LOL Fault State	CH 8 Power LOS LOL		
	HA LA HW LW	HA LA HW LW		
Loss of signal enabled on RX CH 7.			Adapter Temperature: -40 °C Anal	lvzer Temperature: 34 °C

Press "Refresh Page Content" to refresh the content of the page.

Enable "MSA Register Custom" to reset the alarms and warnings and making them abide by CMIS standards of warnings/alarms type. Some of these are standardized as "Clear On Read", so enabling MSA Register Custom will clear these warnings and alarms being monitored or read from your host. Disabling "MSA Register Custom" is customizing their type as "Read Only", giving user access to emulate alarms and warnings as desired. After disabling "MSA Register Custom", press "Refresh Page Content".

multiLane

#### Graphs and Measurements

Nexus allows for the measurement of real-time VCC supply, In-rush and continuous current, I2C communication, and real time probing of voltage, current, SDA and SCL signals. All graphs and measurements are configured in the same steps, listed below:

The below example was done on the VCC tab, and applies to the Current tab, I2C Tab, and Scope Mode tab.

#### Data Configuration

Set your required sampling speed

Monitor FEC CDB Control Signals R/W Fun	ctions MSA Table MSA Validation Module Emulation VCC Current I2C Scope State Machine Analysis
Continuous Sampling Speed	1 MSPS V 8 Bit V Channel Configuration AutoScale
	4.166 MSPS
4	3.125 MSPS
	2.5 MSPS
3.5	2 MSPS
	1.5625 MSPS
	1.25 MSPS
	1.111 MSPS
	1 MSPS

Set your required sampling resolution

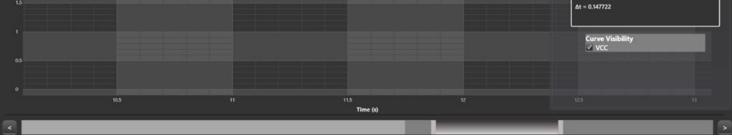
Monitor	FEC CDB Contro	ol Signals R/W Func	tions MSA	Table	MSA \	alidation Module Emulation	VCC Current	I2C Scope	State Machine Analysis
	Continuous -	Sampling Speed and Resolution	1 MSPS 🗸	8 Bit	•)	Channel Configuration	AutoScale		
4				6 Bit					
				8 Bit 10 Bit					
3.5				12 Bit					

Set your channel configuration

Monitor FEC CDB Contro	ol Signals R/W Functions MSA Table	e MSA Validation Module Emulation VCC	Current I2C Scope State Machine Analysis
► Continuous -	Sampling Speed and Resolution	t  Channel Configuration Aut	itoScale
4		Channel 1	Channel 2
35		vcc 💽 On	vcc 💿 off
3.5		vcc on	VCC • Off

Once the measurement is done, expand the Details window as below:

Analyzer	multiLane	- Ø ×
Settings Help Monitoring Adapter Temperature <b>32</b> Analyzer Temperature <b>41</b>		Configuration OSFP Analyzer O BYPASS Mode Disconnect
Monitor FEC CDB Control Signals R/W Functions MS	A Table MSA Validation Module Emulation VCC Current I2C Scope State Machine Analysis	
	8 Bit      Channel Configuration     AutoScale	
		Signature Add Marker Off
35 134		Clear Graph • Export Data •
		Import Markers Export
		time = 0.280673 and voltage ImportHistc
		time = 0.428395 and voltage = 3.3439154624939
٤.		
stage ()		Differences
5 15		Δν = 0



- Add Marker: go back to the graph and press on any point directly onto it to add your marker.
- "Markers" box indicates the time and voltage marker values
- "Differences" box indicates the difference by voltage and time between markers
- Clear graph:
  - o Data: clear all markers
  - o Graph: clear all captured data
- Export data:
  - o Import: import a single file to visualize data on graph
  - o Export: export data and save file
  - o Import History: import more than one file

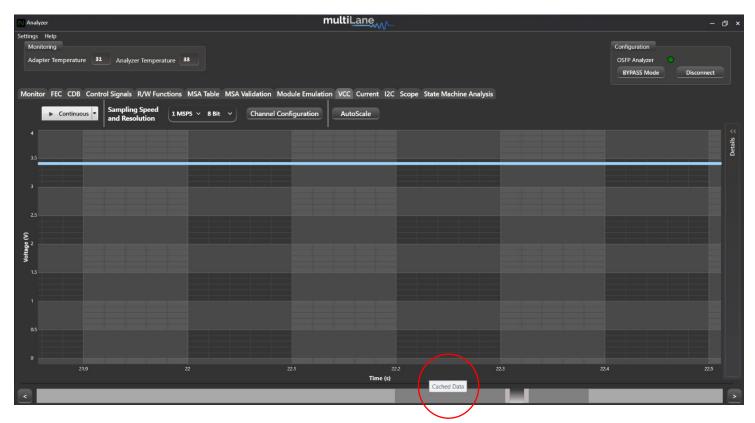
multiLane

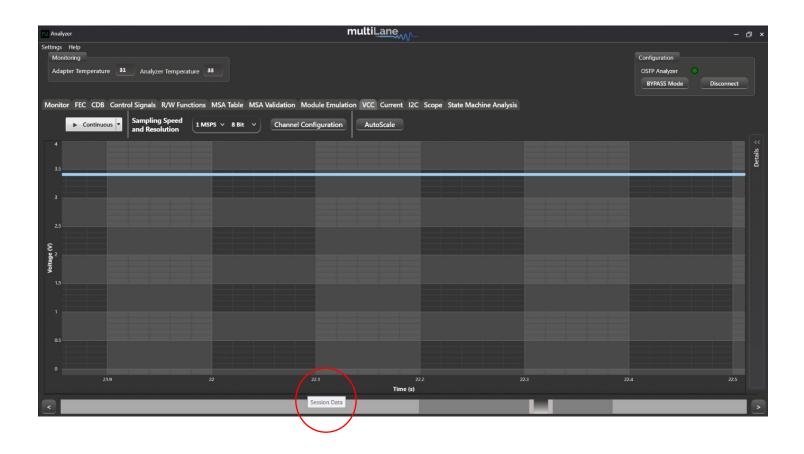
# Graph Timeline

After capturing data in continuous mode for a large interval of time, you can use the graph timeline as shown below, to focus the data on a specific interval of time.

Hovering over the timeline you will see the data is categorized into cached data, and session data.

Cached data offers real time reading of data, while session data is saved into files which we have to access to read.







# VCC Measurements

VCC Measurements can be done in initiator, bypass or target modes.

	, ,,			
Analyzer	multiLane			- @ ×
Settings Help Monitoring Adapter Temperature 27 Analyzer Temperature 28			Configuration OSFP Analyzer BYPASS Mode	Disconnect
Monitor FEC CDB Control Signals R/W Functions MSA Table MSA	/alidation Module Emulation VCC Current I	2C Scope State Machine Analysis		
Sampling Speed and Resolution	Channel Configuration AutoScale			
35				Details 📯
25				
()				
Voltas				
15				
as				
9 95	10	10.5	n	11.5
	Time (	s)		
				>

Measure VCC in continuous mode, or measure VCC spikes, by configuring the sampling speed and resolution, as well as the channels:

		Analyzer	multiLane
		Settings Help Monitoring	
		Adapter Temperature 32 Analyzer Temperature 41	
Monitor FEC CDB Control Signals R/W Fund	tions MSA Table MSA Validation Module Emulation VCC Current		
Continuous     Sampling Speed	1 MSPS V 8 Bit V Channel Configuration AutoScale		A Validation Module Emulation VCC Current I2C Scope State Machine Analysis
and Resolution	4.166 MSPS	Continuous     Sampling Speed     and Resolution     1 MSPS      8 Bit	Channel Configuration AutoScale
4	3.125 MSPS	4 6 Bit 8 Bit	
35	2.5 MSPS 2 MSPS	10 Bit	
	1.5625 MSPS Analyzer	multiLane	
3	1.25 MSPS Settings Help 1.111 MSPS Monitoring		
	Adapter Temperature 32 Analyzer Temperature	41	
	Monitor FEC CDB Control Signals R/W Functions	MSA Table MSA Validation Module Emulation VCC Current I2C	Scope State Machine Analysis
	Continuous Sampling Speed and Resolution	ISPS V 8 Bit V Channel Configuration AutoScale	
	4	Channel 1 Cha	innel 2
	33	Current O Off Current	<b>On</b>

Once your configuration is done, press "Continuous" to get the data.



#### Current Measurements

Current Measurements can be done in initiator, bypass or target modes.

Analyzer	multi	iLane		- @ ×
Settings Help Monitoring Adapter Temperature 32 Analyzer Temperature				Configuration OSFP Analyzer BYPASS Mode Disconnect
	MSA Table MSA Validation Module Emulation VCC	C Current I2C Scope State Machine Analysis	s	
and Resolution	ISPS V 8 Bit V Channel Configuration	utoScale		
4 Inrush				Details >>
3.5				
3				
Contrast (X)				
15				
as				
0				
0 0.2 0.4	0.6 0.8	1 1.2 Time (s)		
				>

Choose your required current measurement:

- Continuous current measurements
- In-rush current measurements

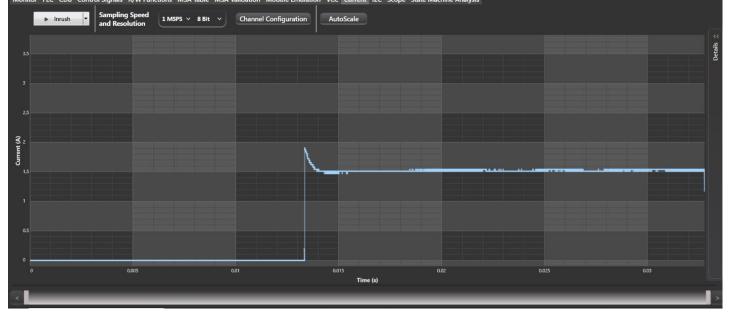
Set your sampling speed and resolution, and configure the channels:

				Analyzer		multiLane
				Settings Help Monitoring		
				Adapter Temperature 32 Analyzer Temp	perature 41	
Monitor FEC CDB Contro	ol Signals R/W Fund	tions MSA Table MSA	Validation Module Emulation VCC Current I2C Scop			
► Continuous -	Sampling Speed	1 MSPS V 8 Bit V	Channel Configuration AutoScale			ulation VCC Current I2C Scope State Machine Analysis
3.5	and Resolution	4.166 MSPS 3.125 MSPS 2.5 MSPS 2 MSPS 1.5625 MSPS		Continuous Sampling Spee and Resolution	6 Bit 10 Bit 12 Bit	on AutoScale
4		1.25 MSPS 1.111 MSPS	Analyzer		multiLane	
		1 MSPS	Settings Holp Monitoring Adapter Temperature <b>32</b> Analyzer Temperature			
			Monitor FEC CDB Control Signals R/W Functions	MSA Table MSA Validation Module Emul	ation VCC Current I2C Scope State Machine	Analysis
			Continuous     Sampling Speed     and Resolution	SPS × 8 Bit × Channel Config +	AutoScale	
			33	Curr	Channel 1 Channel 2 ent • Off Carrent • On	

In-rush current measurements

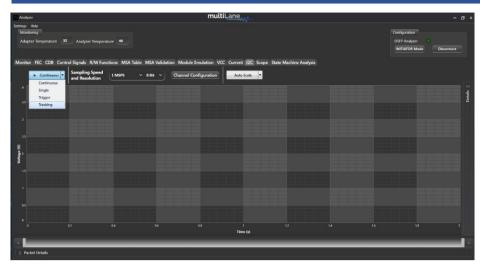
- Nexus should be in Initiator mode
- DUT should be unplugged from Nexus
- To capture in-rush current upon module power-up, start capturing while DUT is unplugged, and plug in DUT once you start capturing data. (shown below)

Analyzer multiLane – O x Settings Help Monitoring Adapter Temperature 32 Analyzer Temperature 40 Monitor FEC CDB Control Signals R/W Functions MSA Table MSA Validation Module Emulation VCC Current 12C Scope State Machine Analysis





# I2C Packet Analysis

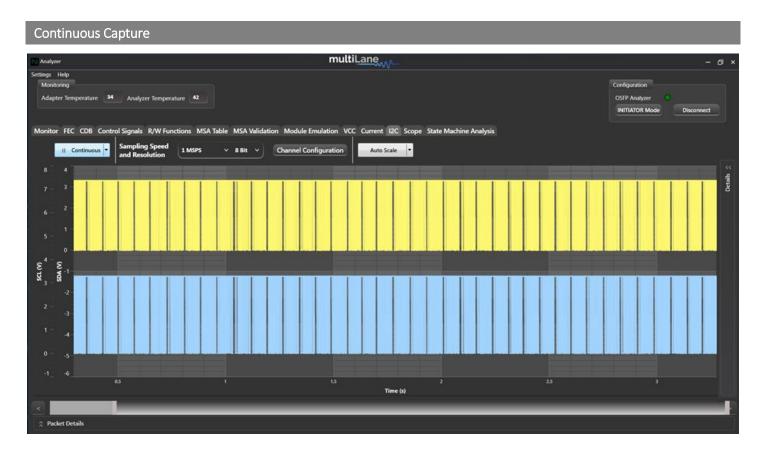


- I2C Captures can be done in initiator, bypass or target modes
- Single and continuous captures
- I2C trigger and tracking events
- Different sampling speeds available
- Represent SCL, SDA, ACK/NACK, and I2C edges graphically

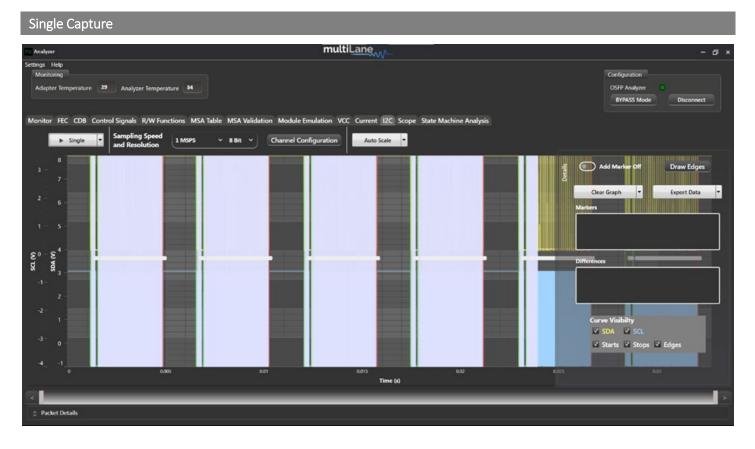
#### Configure the sampling speed, resolution and choose channels:

Analyzer	multiLane	- @ ×
Settings Help Monitoring Adapter Temperature 32 Analyzer Temperature 40 Monitor FEC CDB Control Signals R/W Functions MSA Table MSA Validation Modul		Configuration OSFP Analyzer INITIATOR Mode Disconnect
	Configuration	
	Channel 1 Channel 2 SDA On SDA Off	Details
8 8 - 8	SCL OIT SCL ON 12C Tringer Disabled 12C Tracker Disabled	
6 - 6 - S - S - S - S	I2C Trigger Delay: 0 ms	
g g g	(Value between 0 and 10 ms)	
3 3 2 2 - 2 -		
0 0.2 0.4 0.6	0.8 1 1.2 1.4 1.5 Time (s)	
		>
↑ Packet Details		

# multiLane



# I2C continuous capture shows SDA and SCL data.

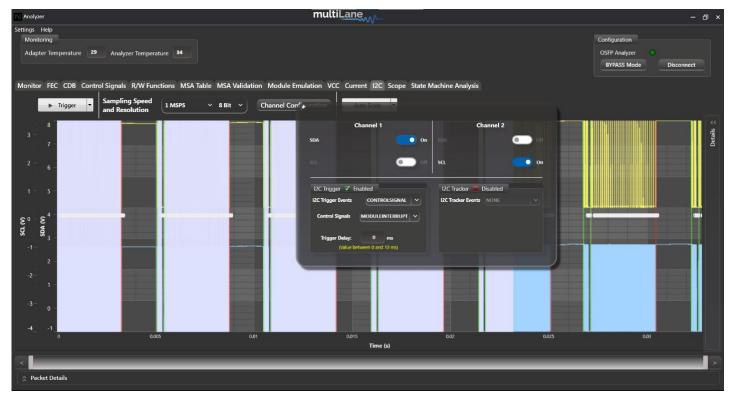


I2C Single, trigger and tracking captures show SDA, SCL, Start, Stop and Edges on the graphs.



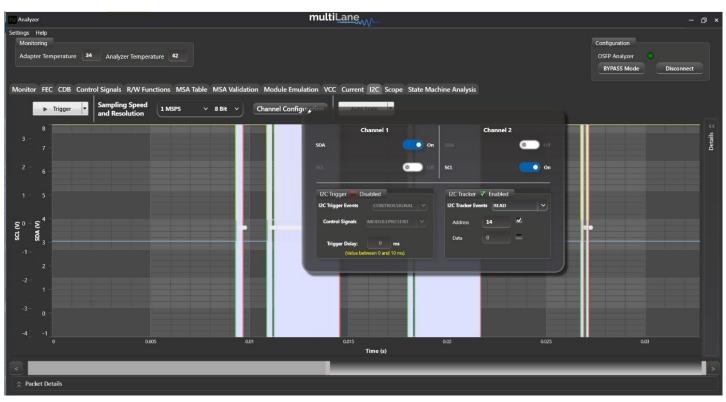
I2C Trigger Capture		
Clock Stretching (us)	Get Default 🔻	Trigger I2C with: Control Signals:
Channel 1	Channel 2	<ul> <li>Module Interrupt</li> </ul>
SDA On	SDA Off	<ul> <li>Module Present</li> <li>Reset</li> <li>Low Power</li> </ul>
SCL Off	SCL On	<ul><li>State Machine</li><li>I2C Signal:</li></ul>
I2C Trigger 🗸 Enabled	I2C Tracker 📕 Disabled	<ul><li>Start</li><li>Stop</li></ul>
I2C Trigger Events NONE Trigger Delay: (Value betw Value betw CONTROLSIGNAL STATEMACHINE I2CSIGNAL	I2C Tracker Events NONE	0 Stop

## Choose the trigger required and measure the data:



## I2C Tracking Capture

Indicate which address you want to capture, and if you'd like this data tracked.





#### 

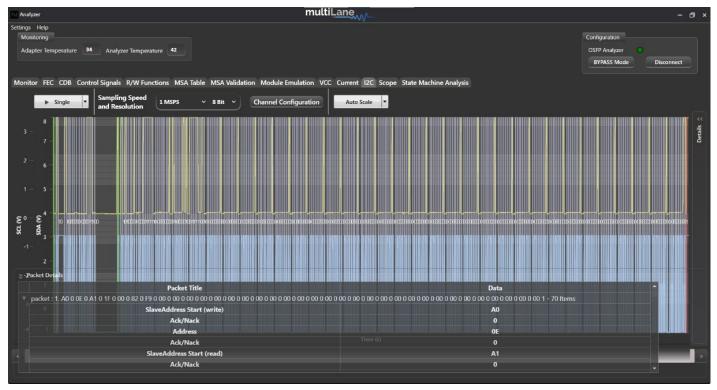
Packet Title Data ng : 15µ address 198 Ack/Nack C6 0 Address Ack/Nack ching : 14µ Clock St Dat ess 198 Ack/Nack 0 00 Data 00 read on address 199 Data Data 00 read on address 200

Single/Trigger/Tracker Capture: press on Packet Details to expand and look into the data captured.

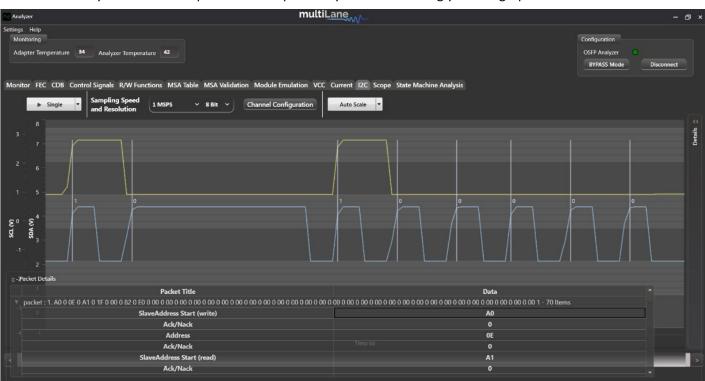
Continuous Capture: draw a precise portion of data on the graph, click Draw Edges, and expand Packet Details.

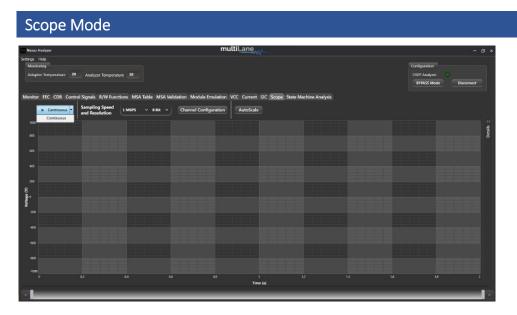
# Press on one packet for more details on the data. This will also position you to the chosen packet on the graph:

EnPASS Mode



# Press on one byte from chosen packet to also position yourself accordingly on the graph:





- Scope Mode data can be measured in initiator, bypass and target modes.
- Measure data in continuous mode.

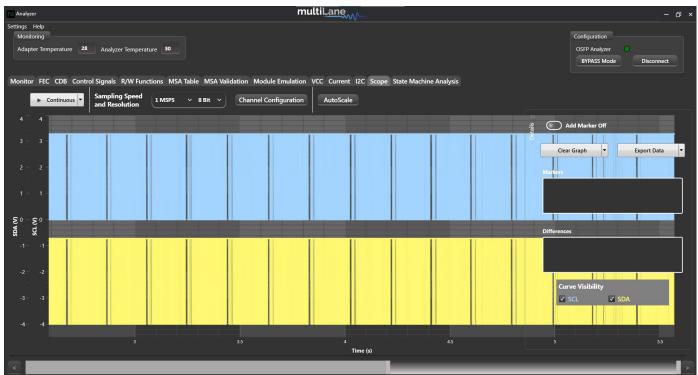
Configure your sampling speed and resolution, and move on to the channel configuration:

Monito	r FEC CDB Control Signals R/W Functions MSA Table MSA Validation Modu	ele Emulation VCC Current	I2C Scope State Machine Analysis
		Channel 1	Channel 2
		SDA 💿 On	SDA Off
		sal 💿 off	SCL On
		Current 💿 Off	Current Off
		vcc 💿 off	vcc off
SCL (V)	8		

Choose to measure two signals from two different channels at once, choosing between:

- SDA
- SCLCurre
  - Current
- VCC

# Measure the continuous data:





#### State Machine Test

All tests below are equipped with detailed logging on time and state transitions, which can be generated into a PDF report. All the tests and state transitions are manually driven: take the module from one state to another by manually pressing on the desired state transition (the below tests are not automatic)

For the below state machine tests, it is possible for the user to override state transitions CMIS time limitations. Press "Set Duration", and check "Override CMIS limits". Control the slider to the time range required.

Module Host	
Module State Machine Data Path State Machine	🔗 Module Behavioral Model 🛛 🔍 Network Path State Machine
Stop Test Generate PDF report Save Log	MgmtInit (ms) 0 2000 Override CMIS limits
Applied Durations : Set Duration	ModulePwrUp (ms) 0 20000 20000 Voerride CMIS limits
	ModulePwrDown (ms) 100 500 Override CMIS limits
LowPwrS ResetS	Resetting (ms) 0 20000 20000 V Override CMIS limits
Steady State Transient State	Apply Revert CMIS Values
-	MaduteLowPwr

#### Module Side

The below tests are all automatically done in initiator mode

Interactive tests to drive module state transitions, using MSM and DPSM to debug and validate module implementation, and confirm compliance between host and module.

Module state machine test	
Analyzer multiLane	- 0 ×
Settings Help Monitoring Adapter Temperature 34 Analyzer Temperature 39	Configuration OSFP Analyzer BYPASS Mode Disconnect
Monitor FEC CDB Control Signals R/W Functions MSA Table MSA Validation Module Emulation VCC Current I2C Scope State Machine Analysis	
💿 Module State Machine 🌑 Data Path State Machine 💿 Module Behavioral Model 🛛	
Stop Test Generate PDF report Save Log	
[2023-05-24T11:12:46]: Module was successfully set in Reset mode.	Fault
Elapsed time: 101ms	
[2023-05-24T11:12:50]: ResetL HW pin is set to high. ResetS state: False Resetting	l t
[2023-05-24T11:12:50]: Initializing Module	Max Transition Time: (ms)
(2023-05-24T11:12:50): Module was successfully set in Low Power mode.	sooc Set
Elapsed time: 8ms	LowPwrS
[2023-05-24T11:12:53]: LPMode HW pin is set to low. LowPwrS ModulePwrDn  ModulePwrDn	
state: False	Legend:
[2023-05-24T11:12:53]: Powering up Module	Steady State
[2023-05-24T11:12:53]: Module was successfully set in High Power ModuleReady	
mode.	Transient State
Elapsed time: 132ms	

#### Data path state machine test

Analyzer	multiLane	- CJ ×	
Settings Help Monitoring Adapter Temperature 34 Analyzer Temperature 39		Configuration OSFP Analyzer BYPASS Mode Disconnect	



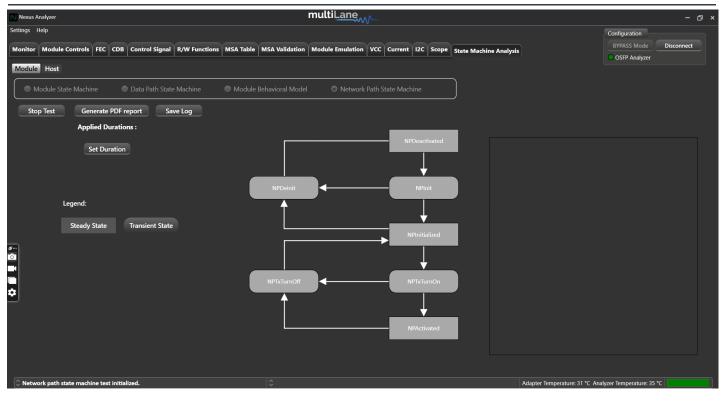
#### Module Behavioral Model

Access the Appsel codes supported on your DUT through the Module behavioral model.

N Analyzer	multiLane	- 0 ×
Settings Help Monitoring Adapter Temperature 34 Analyzer Temperature 39 Monitor FEC CDB Control Signals R/W Functions MSA Table MSA Validation Module Emul	lation VCC Current 12C Scope State Machine Analysis	Configuration OSFP Analyzer BYPASS Mode Disconnect
Module State Machine     Data Path State Machine     Module Behavioral Model       Stop Test     Generate PDF report     Save Log		
	Application 1 : 400GAUI-8 C2M	
		AppSelCode: 0001
		Ļ
	Application 5	
	Application 6	ApplyImmidate ApplyDPInit
	Application 7	
		ConfigStatus

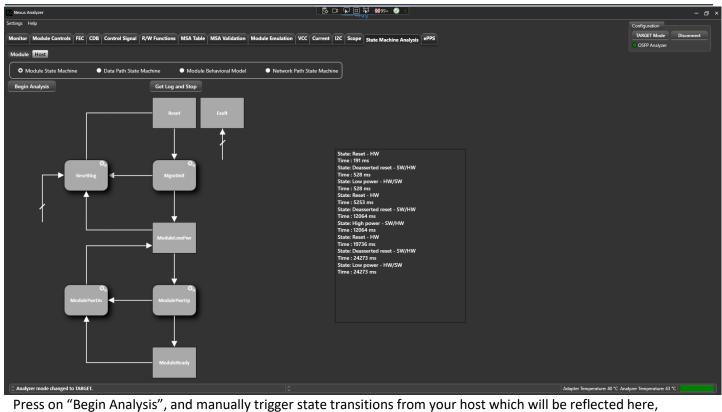


#### Network Path State Machine Test



#### Host Side

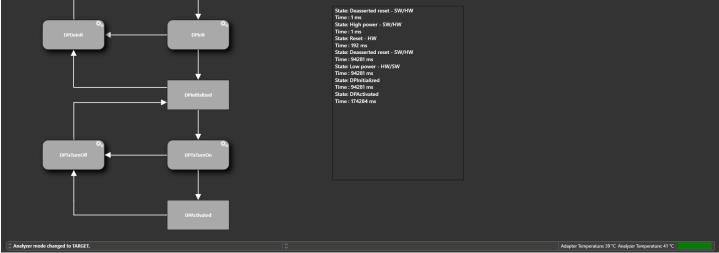
#### **Module State Machine**



validating host to module communication.

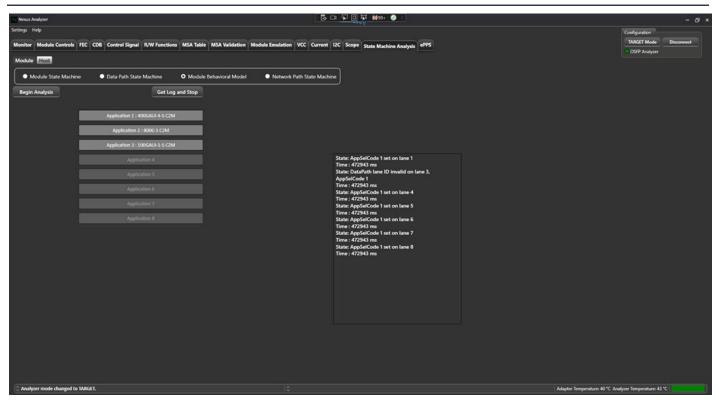
## Data Path State Machine

Nexus Analyzer	◎ E - □ - ↓ □ ↓ □ ↓ ● <	- @ ×
Settings Help	MSA Validation Module Emulation VCC Current 12C Scope State Machine Analysis ePPS	Configuration TARGET Mode Disconnect
Monitor Module Controls PEC CDB Control signal K/W Punctions MSA table 1 Module Host		OSFP Analyzer
Module State Machine     O Data Path State Machine     Module Be	havioral Model 🔹 🔍 Network Path State Machine	
Begin Analysis Get Log and Stop		
DPDeactivat	ied	



For DPSM host side testing, press on "Begin Analysis", and then please refer to CMIS 5.2 specifications, section 6.3.3, for more information on how to trigger state transitions from the host side, and check which registers are involved.

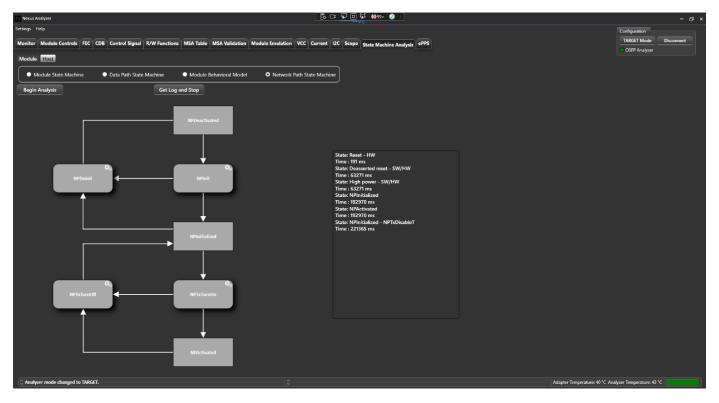
## Module Behavioral Model



Press on "Begin Analysis", and change/implement specific apsel codes by writing to the correct registers from the host side. Validate with Nexus.



#### **Network Path State Machine**



Press on "Begin Analysis", and then please refer to CMIS 5.2 specifications, section 7.6.7, for more information on how to trigger state transitions from the host side, and check which registers are involved.



# Revision History

Revision Number	Date	Description
1.0	6/12/2023	Preliminary
1.1	8/2/2023	Added Module Emulation
1.2	11/1/2023	Added QSFP-DD Support in control signals
1.3	4/9/2024	Instructions for Update 2, v0.7 changes and features: nexus gui monitor tab (pending undocking feature) module controls Module Emulation updates MSA validation (pending host side) I2C packets (photos) state machine tests (pending host side) Control signals( pending docking/undocking)
1.4		Formatting and Styling



# Software and Firmware Revision History

SW Revision Number	Date	Description	Compatible FW Revision
V0.5.8	26/05/23	<ul> <li>Management Interface</li> <li>FEC</li> <li>CDB</li> <li>Control Signals</li> <li>R/W</li> <li>MSA Table</li> <li>MSA Validation</li> <li>VCC</li> <li>Current</li> <li>I2C</li> <li>Scope Mode</li> <li>State Machine Test</li> </ul>	V0.3.9 OSFP
V0.5.9.3	18/09/23	Added Module Emulation	V0.3.9 OSFP V0.4.3 QDD
V0.6	14/11/23	<ul> <li>Network Path State Machine</li> <li>Detection of power spikes</li> <li>Management interface host side</li> <li>State machine tests host side</li> <li>MSA Validation host side</li> </ul>	
V0.7		<ul> <li>Module Behavioral Model host side</li> <li>Updated Module Emulation</li> <li>Updated State Machine Tests</li> <li>Changes in UI</li> </ul>	V1.6.1 OSFP 1.7.1 QDD



# Appendix

Accuracy of signals for ML4066-NX-Pro-OSFP REV1.0:

Signal	Notes
VCC	+/- 5 mv accuracy (12 bit sampling resolution)
Current	+/-40 mA accuracy (12 bit sampling resolution)
Operating Temperature	Max 85C
Sampling Resolution	6 bit, 8 bit, 10 bit, 12 bit
Sampling Speed	Min 1 MSPS
	Max 4.1666 MSPS



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