



NEXUS ANALYZER

User Guide

Rev 1.4

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

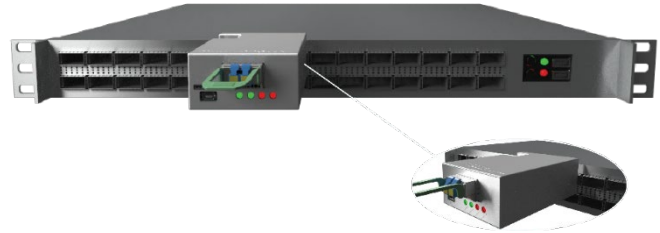
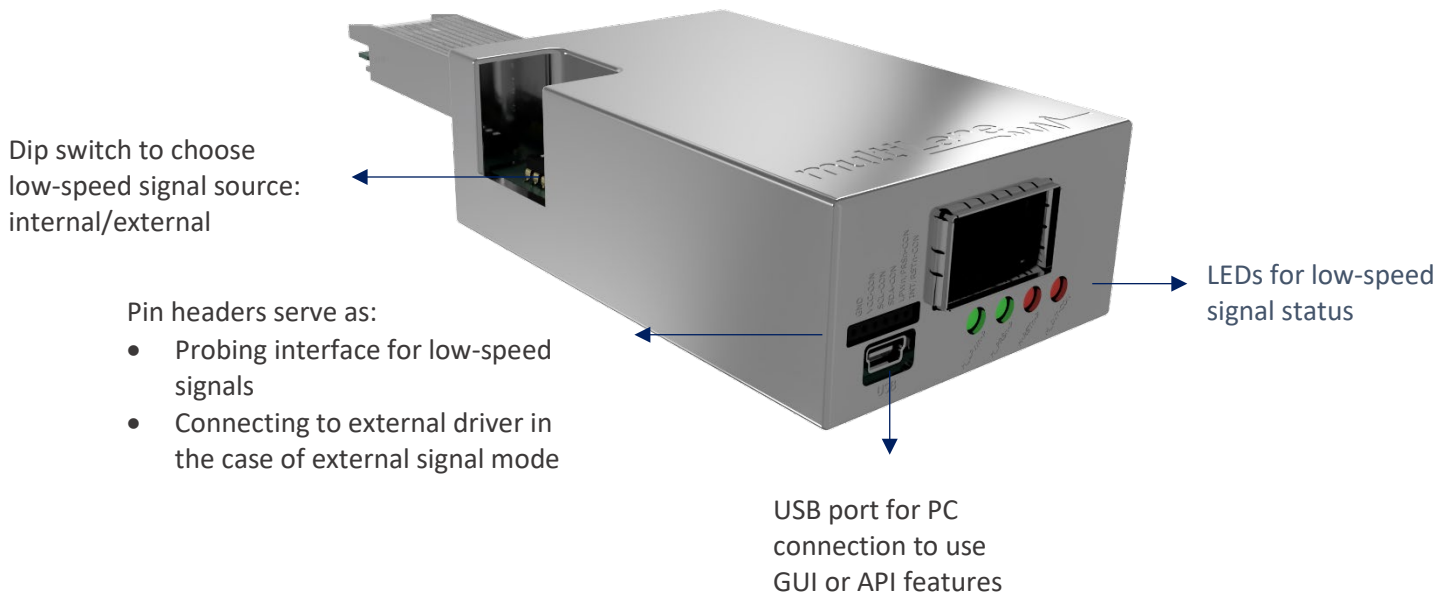


Table of Contents

I.	KEY FEATURES	4	VI.	REVISION HISTORY	32
II.	NEXUS HARDWARE	5	VII.	SOFTWARE AND FIRMWARE REVISION HISTORY	33
III.	NEXUS GUI INSTALLATION	6	VIII.	APPENDIX	34
IV.	NEXUS GUI	7			
V.	NEXUS GUI FEATURES	9			
	Monitor	9			
	Module Controls	9			
	FEC	9			
	Common Data Management (CDB)	10			
	Control Signals	12			
	I2C Read/Write Operations	12			
	MSA Table	12			
	MSA Validation	13			
	Module side	13			
	Host Side	17			
	Module Emulation	18			
	Graphs and Measurements	20			
	VCC Measurements	22			
	Current Measurements	23			
	In-rush current measurements	23			
	I2C Packet Analysis	24			
	Continuous Capture	25			
	Single Capture	25			
	I2C Trigger Capture	26			
	I2C Tracking Capture	26			
	Packet details expansion	27			
	Scope Mode	28			
	State Machine Test	29			
	Module Side	29			
	Host Side	30			

Key Features

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



Adapter

800G Adapter Key Features:

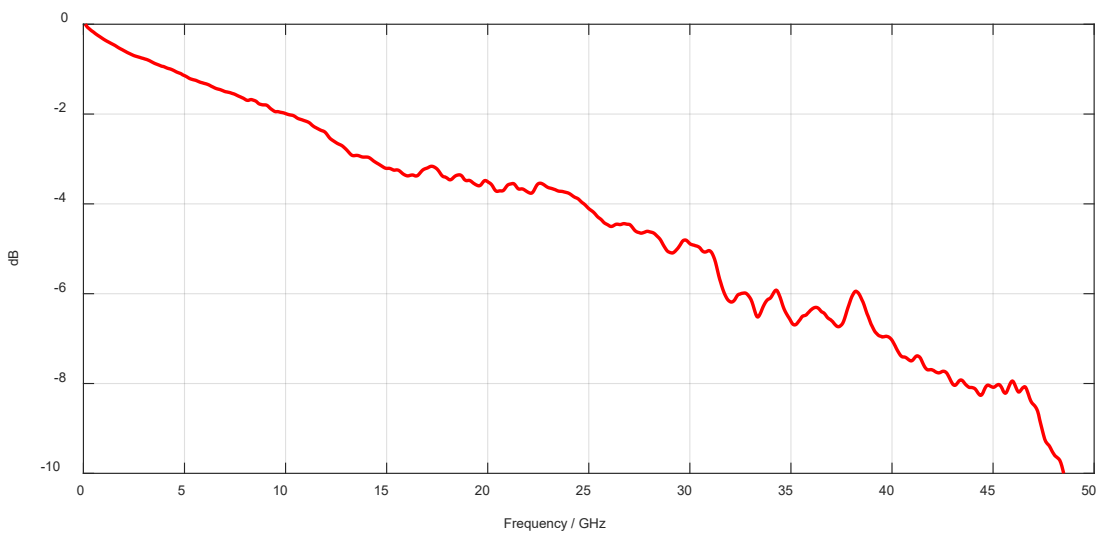
- SI traces and connector support 112G rates
- Support up to 30W modules
- Current and temperature sensor
- Module power ripples and inrush current measurement
- Detection of power spikes during module state transitions
- Probing interface for Vcc and GND pins
- External I2C
- Dip switch to choose low-speed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

Analyzer

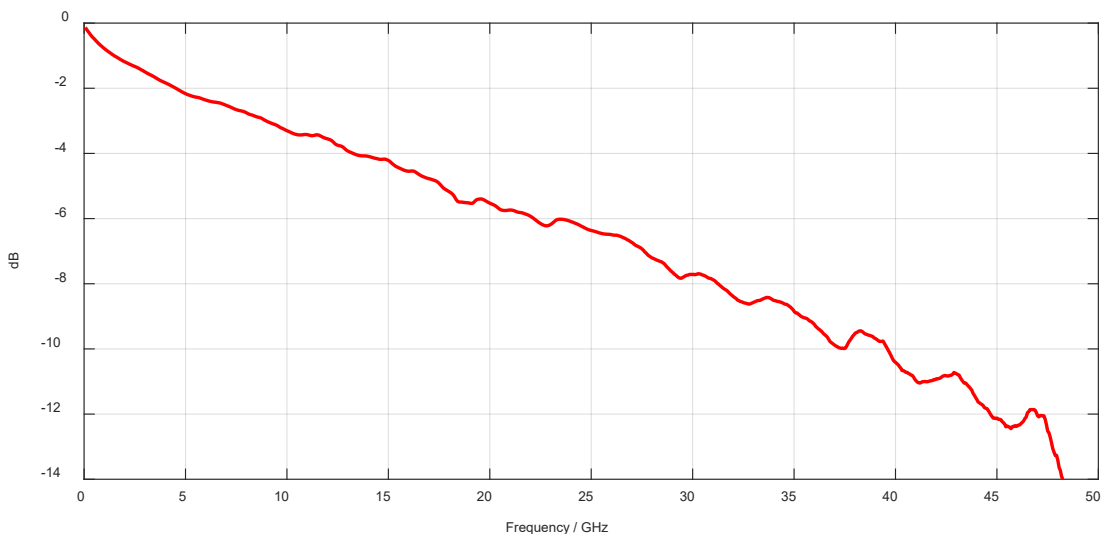
800G Analyzer Key Features:

- 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
 - SDA
 - 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:



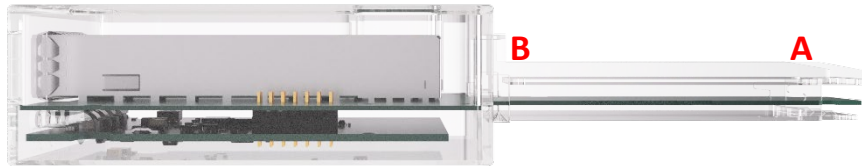
Measured Insertion Loss data of 800G QSFP-DD Adapter:



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:

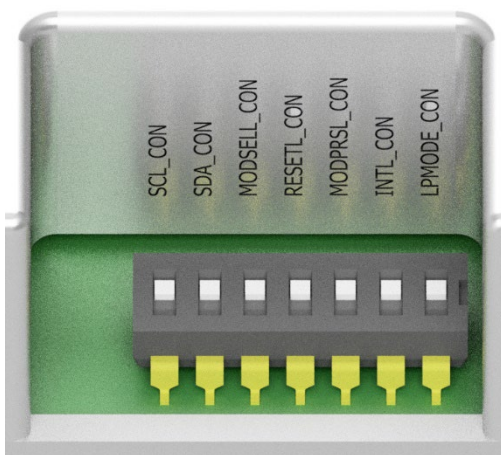


A: Signals from host side at plug

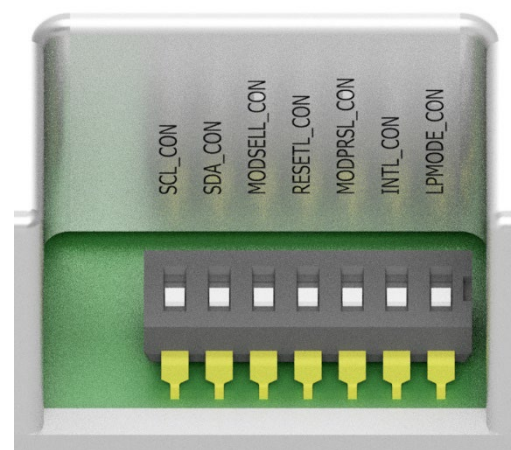
B: Signals to connector inside Nexus, going to module

Low-speed signals	Dip switch		Front Pin Headers	
	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

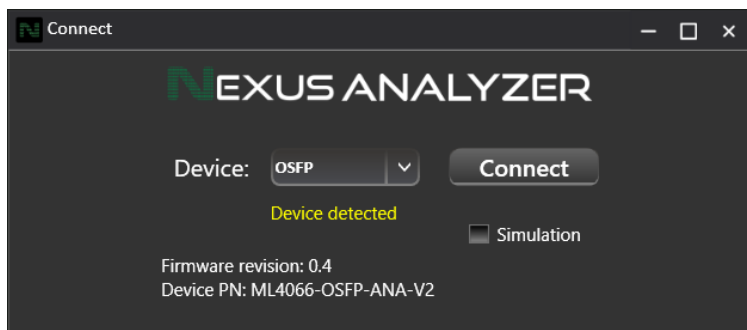
Step 2: Download Software

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".

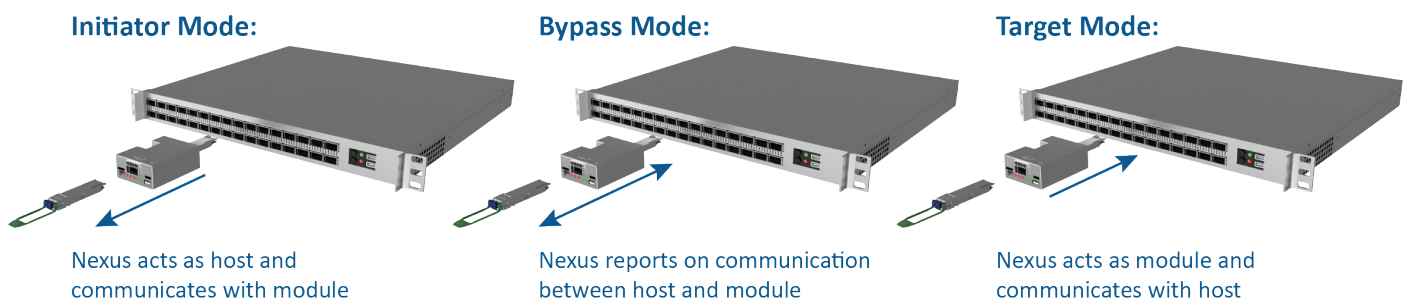
Press "Simulation" for a GUI test run without hardware: Simulation mode is also accessed through a simulation license provided by MultiLane.

Nexus GUI

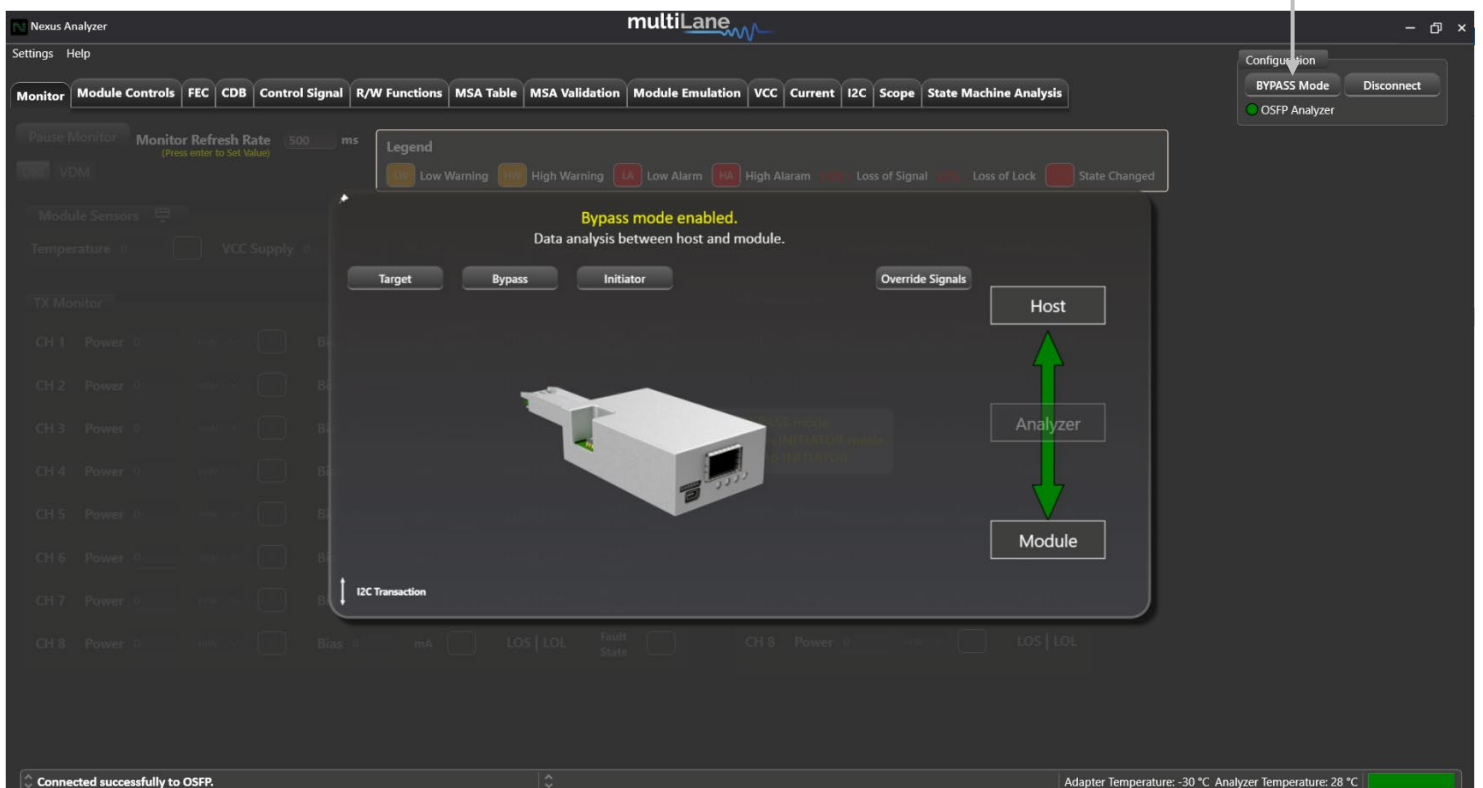
Nexus GUI Features	Description
Monitor	Diagnostic and Versatile Diagnostic Monitoring
Module Controls	Access to TX and RX controls
FEC	Monitor FEC status on their module.
Common Data Block (CDB)	Update their module firmware.
Control Signals	Access to low-speed signals in three different modes
R/W Functions	I2C read/write operations
MSA Table	Gives the user access 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 Behavior tests available.

Nexus operates in three modes:

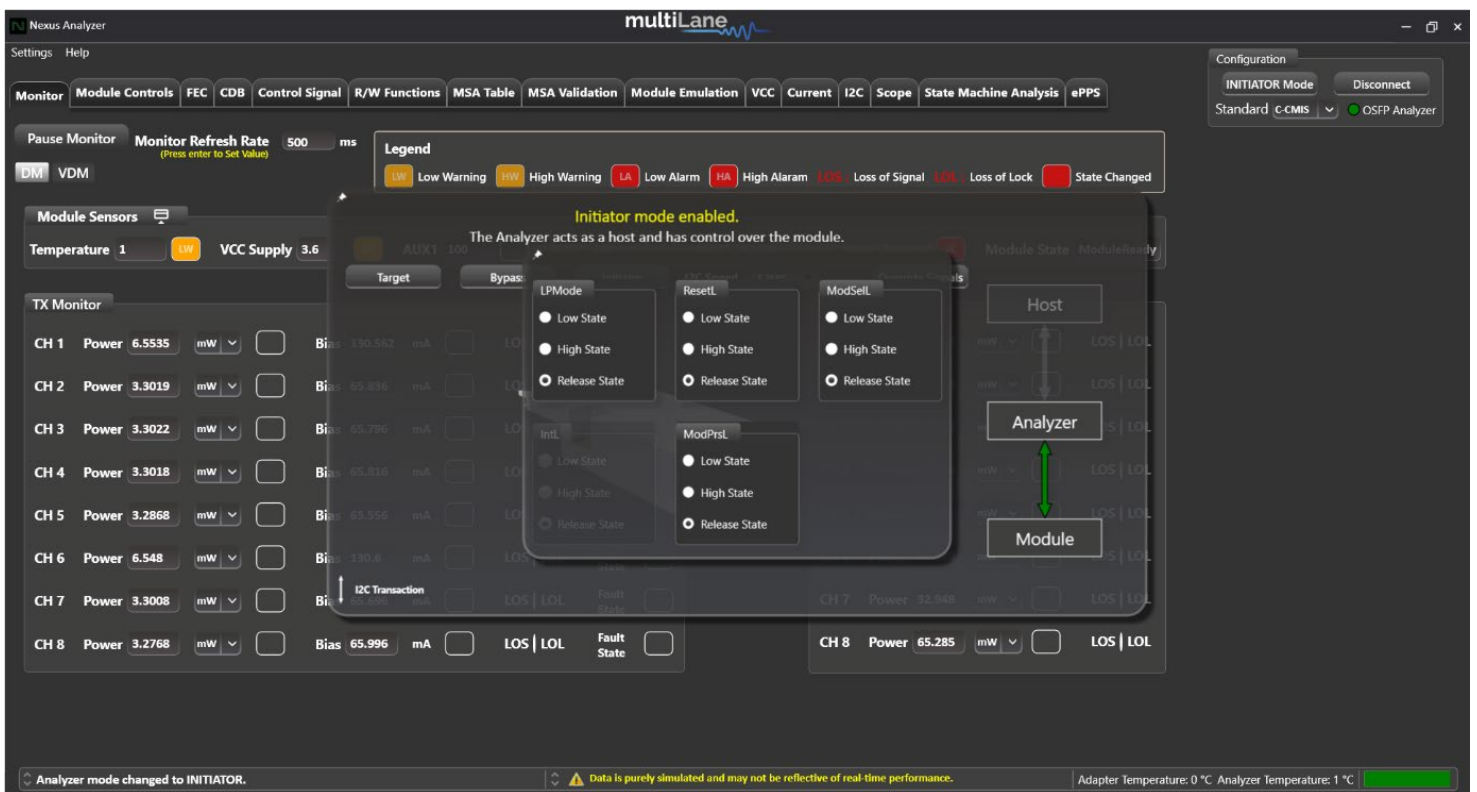
- Target mode: the analyzer acts as a module for a host DUT
- Initiator mode: the analyzer acts as a host for a module DUT
- Bypass mode: the analyzer monitors exchange between host and module



Access three modes through this button

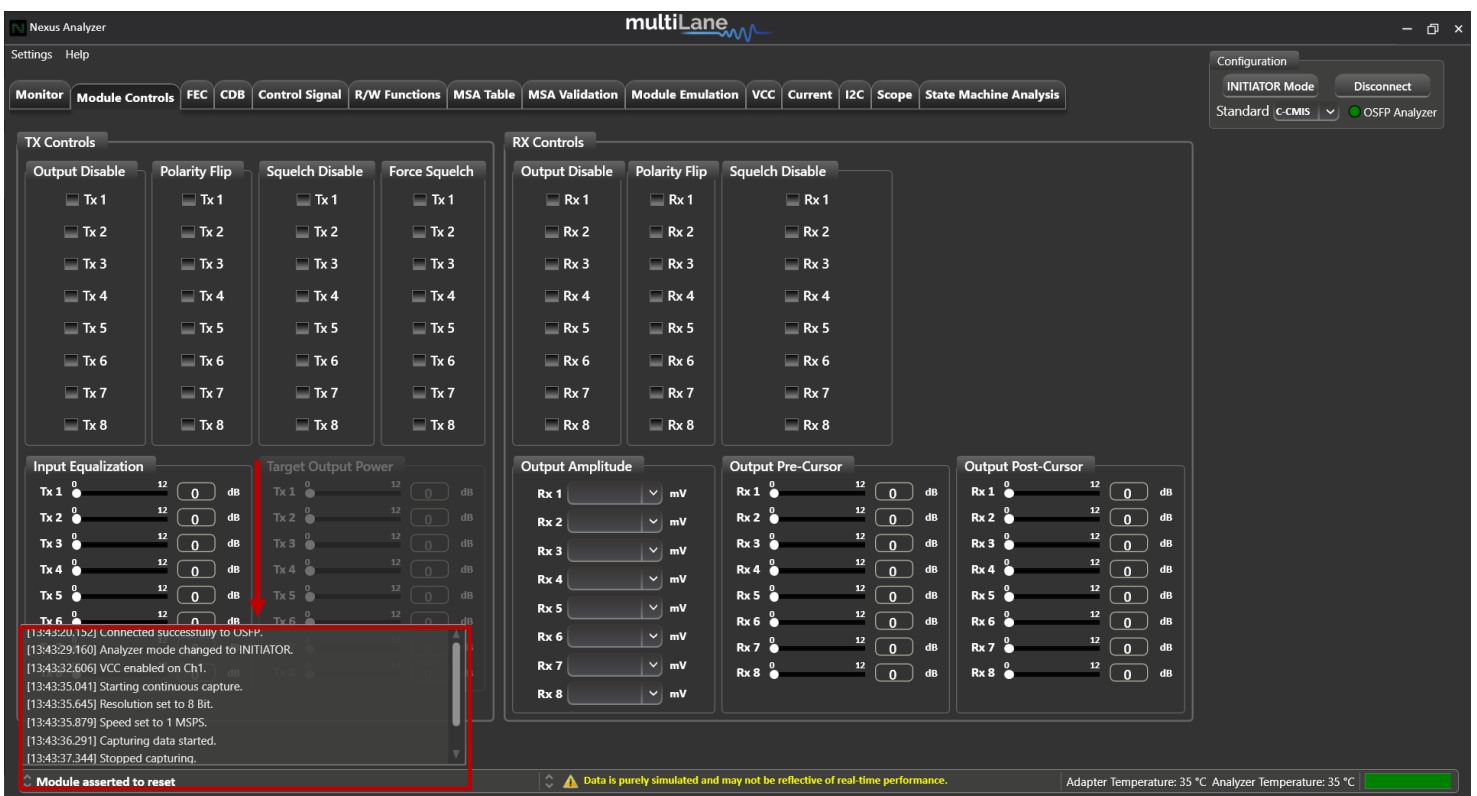


Set Control Signals Defaults:



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:



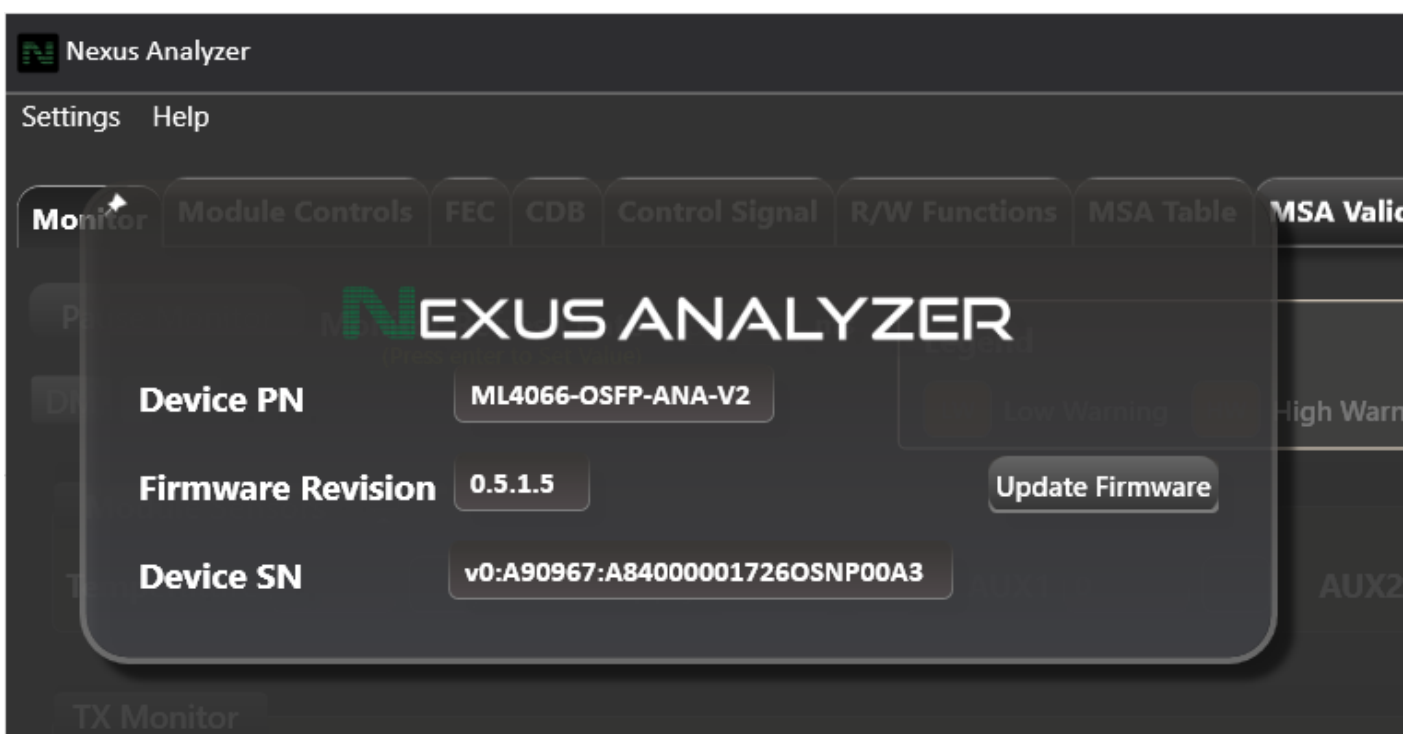
Firmware Upgrade on Nexus:

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:

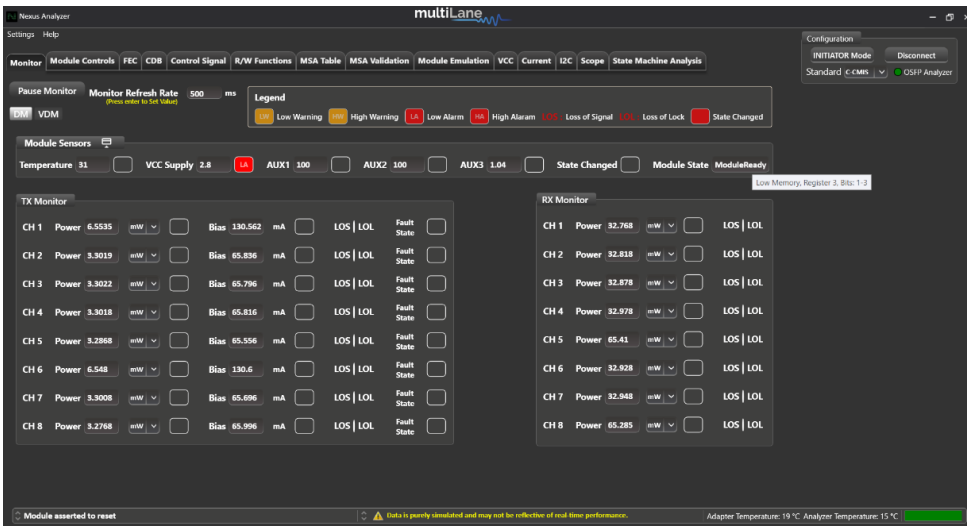
- On the top right of the UI, press on Settings -> Device Info -> Update Firmware
- You will be redirected to FW packages already downloaded with the full Nexus UI setup:
 - OSFP/QDD FW packages will be available
 - Select the corresponding form factor, and select “QDD_FirmwarePackage.hex” or “OSFP_FirmwarePackage.hex”
- Update device
- Please reach out to dcstsupport@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.



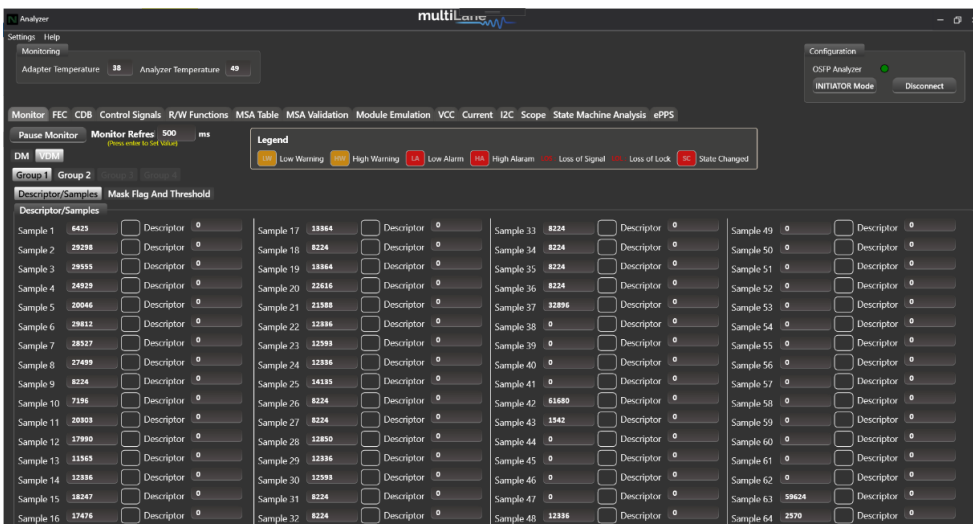
Nexus GUI Features

Monitor



Digital Monitoring

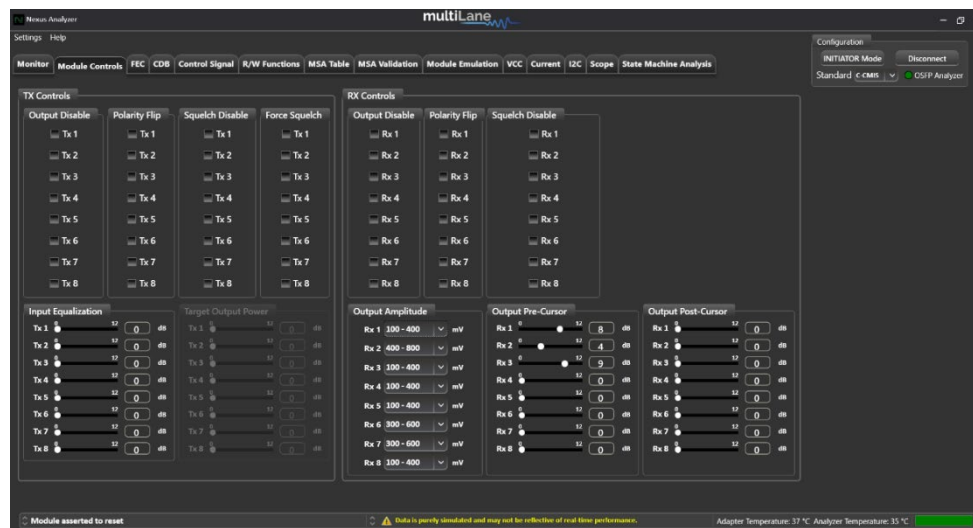
- Operates in initiator mode
- Module monitoring interface
- Color coded high alarms/ high warnings.
- Color coded low alarms/ low warnings.
- Module Sensors can be docked to the top of the GUI by pressing on the docking icon, right side of "Module Sensors"



Versatile Diagnostic Monitoring

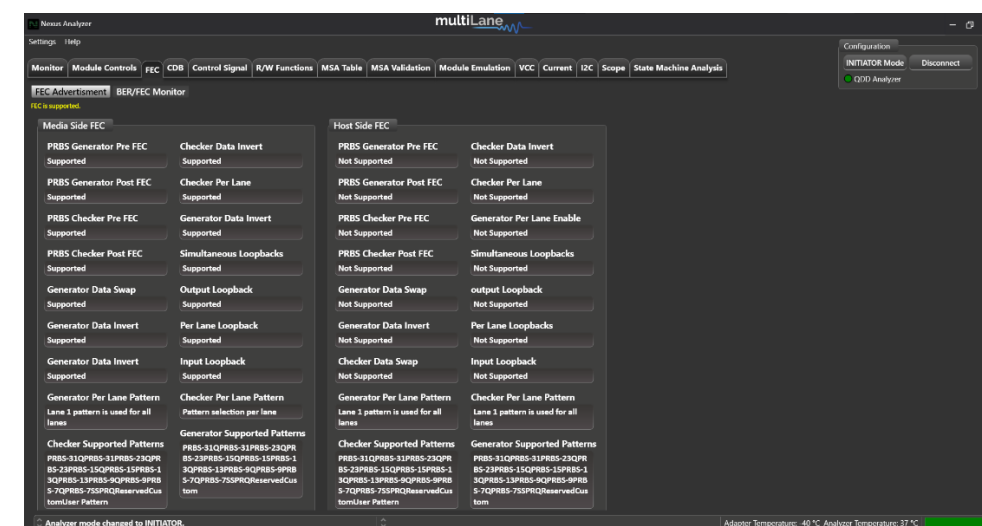
- Operates in initiator mode
- Access to enabled/disabled groups in the module
- Indexing available for module interrupts

Module Controls



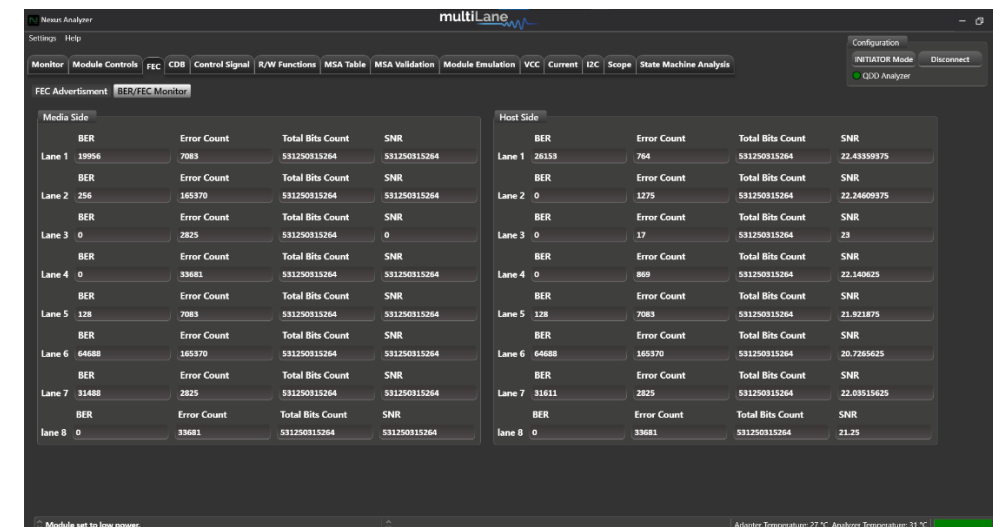
- Initiator Mode
- Gives user access to TX and RX controls
 - Output disable
 - Polarity flip
 - Squelch disable
 - Force squelch
- Control and monitoring over TX equalization techniques.

FEC



FEC Advertisement

- Operates in initiator mode
- FEC advertisement for 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

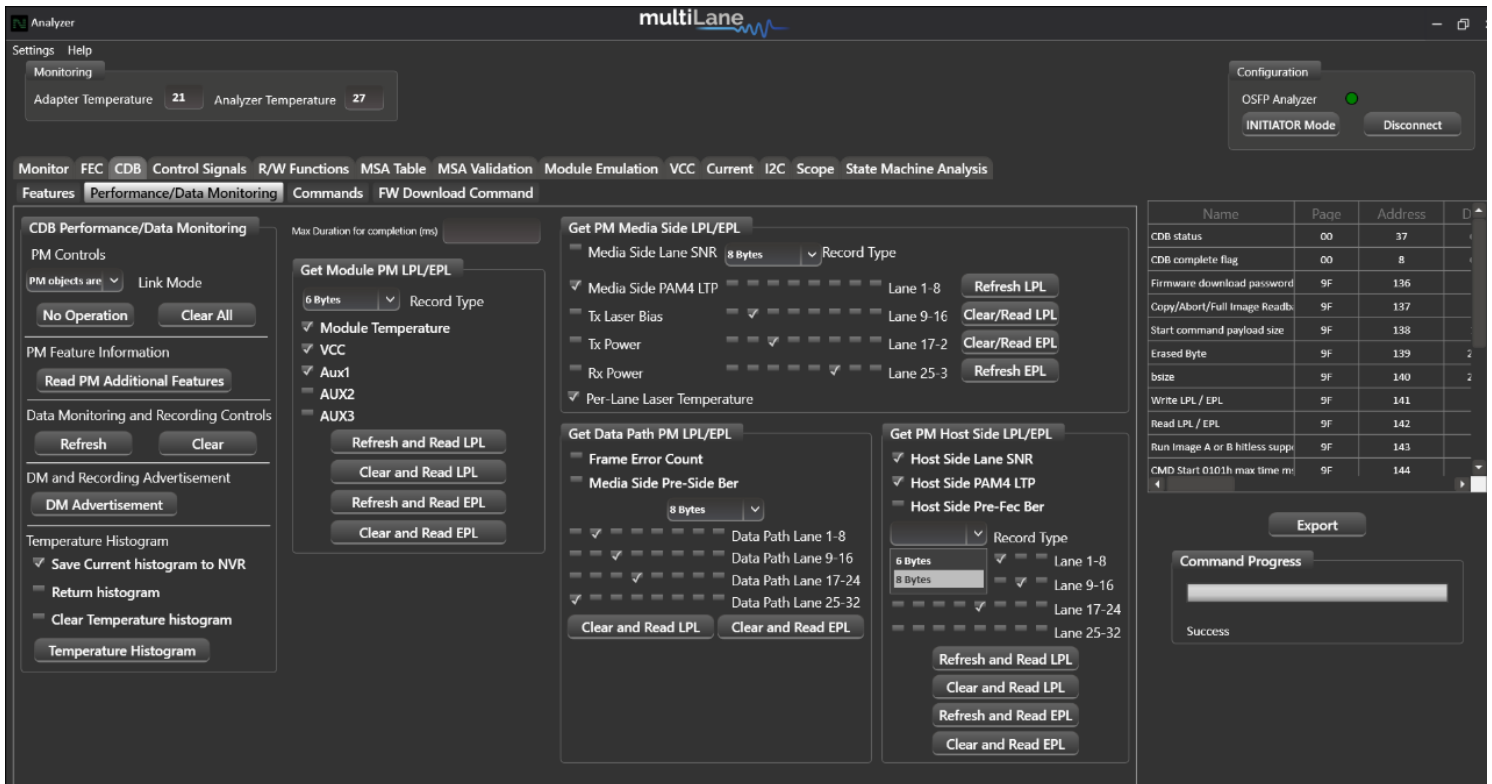


FEC Monitor

- 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

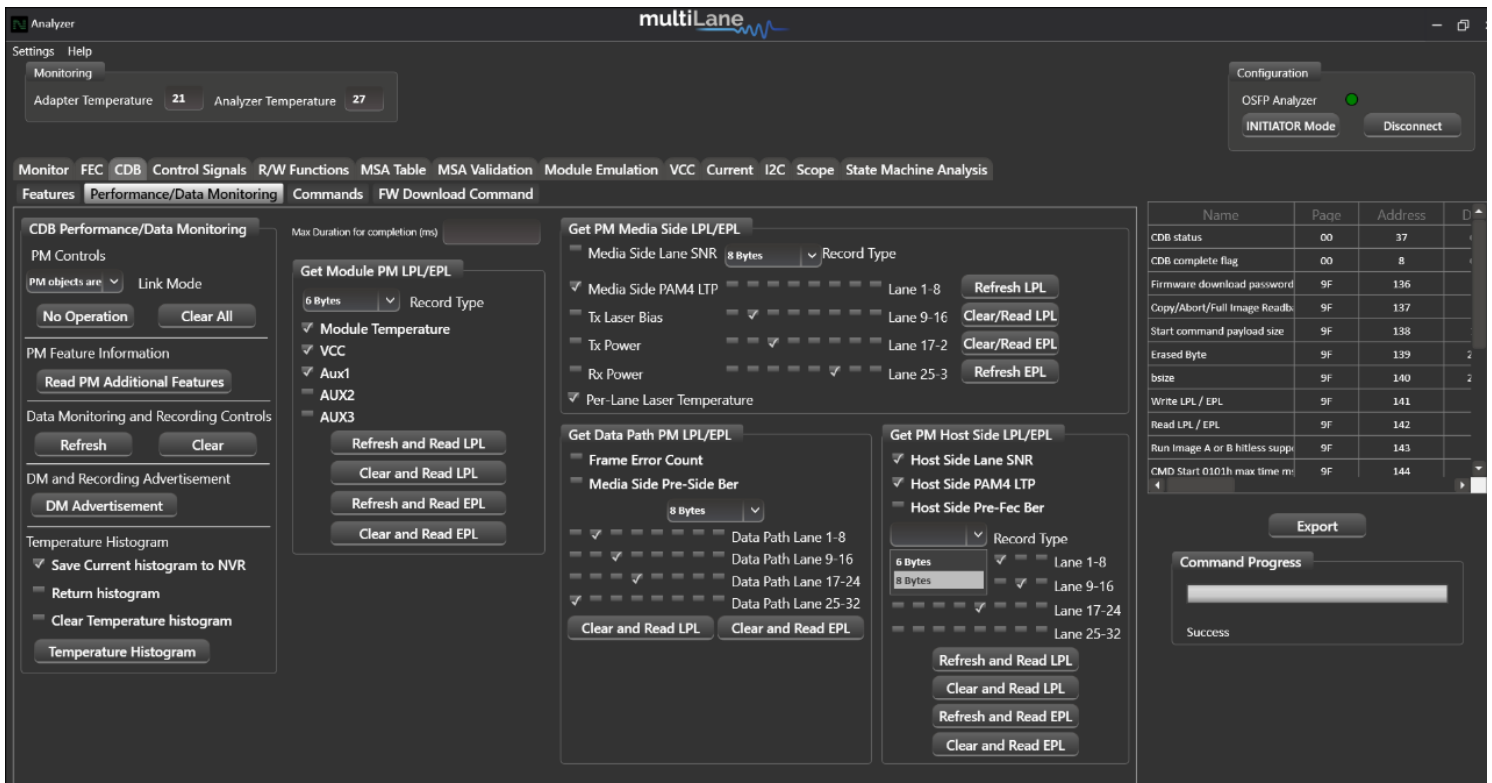
Common Data Management (CDB)

CDB operates in initiator mode



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.



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

The screenshot shows the multiLane Analyzer interface. The 'Features' tab is active, displaying 'CDB Feature and capabilities Support' and 'Firmware Update Features Implemented'. The 'CDB Feature and capabilities Support' section has three sub-tabs: 'Module Features', 'Performance Monitoring', and 'Bert And Diagnostic'. A table lists various CDB commands (0000h to 00FFh) with columns for supported features (0, 3, 4, 7, B, B, C, F). Green dots indicate supported commands. The 'Firmware Update Features Implemented' section has a 'Read FW Features' button. On the right, a table shows command details:

Name	Page	Address	Data	Description
CDB status	00	37	01	Command completed successfully
CDB complete flag	00	8	00	CDB complete flag assertion
Firmware download password	9F	136	0	00h: Download unlocked by vendor passw
Copy/Abort/Full Image Readback	9F	137	1	Bit0: Abort Support, Bit1: Copy Support, B
Start command payload size	9F	138	16	Start command payload size in bytes
Erased Byte	9F	139	255	The default erased byte value
bsize	9F	140	255	Block size = (bsize + 1) * B, E.g. bsize= 0.Bio
Write LPL / EPL	9F	141	3	Firmware upgrade supported mechanism
Read LPL / EPL	9F	142	0	Firmware read / readback support mechar
Run Image A or B hitless support	9F	143	0	0: CMD Run A or B causes a reset. Traffic i
CMD Start 0101h max time mt	9F	144	3	This is the maximum execution time for a

Below the table is a 'Command Progress' window showing a progress bar and the word 'Success'.

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.

The screenshot shows the multiLane Analyzer interface with the 'FW Download Command' sub-tab selected. The 'CDB Firmware Download Commands' section includes options to load a binary file (C:\Users\elbrahim\Downloads\FW_3_8.bin), download new firmware (Program LPL, Program EPL), abort firmware download, run downloaded firmware (Run Image), switch to the new firmware image (Commit Image), and copy firmware images (Copy Image A to B, Copy Image B to A). The 'Firmware Info' section shows 'Get FW Version' and 'Current Firmware Image Version' (02.03). On the right, a table shows command details:

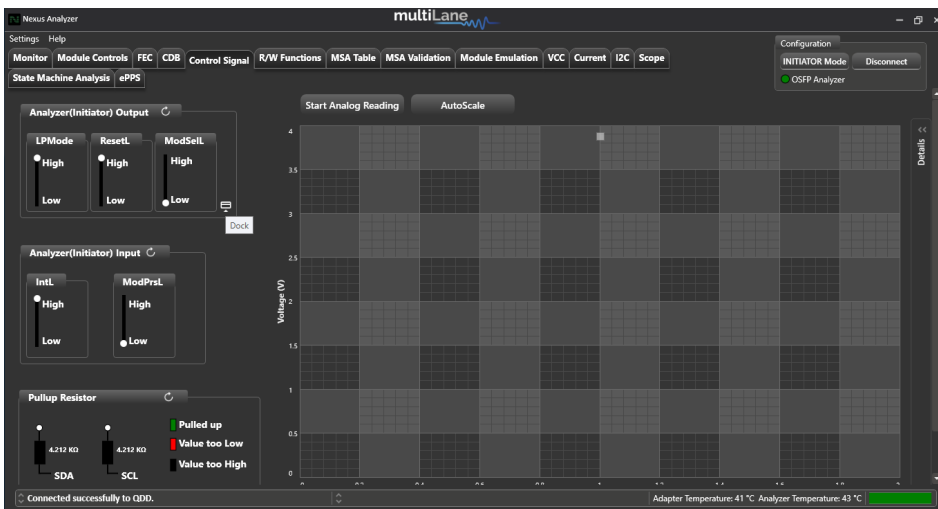
Name	Page	Address	Data	Description
CDB status	00	37	41	Command ID unknown
CDB complete flag	00	8	01	CDB complete flag assertion

Below the table is a 'Command Progress' window showing a progress bar and the word 'Success'.

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:

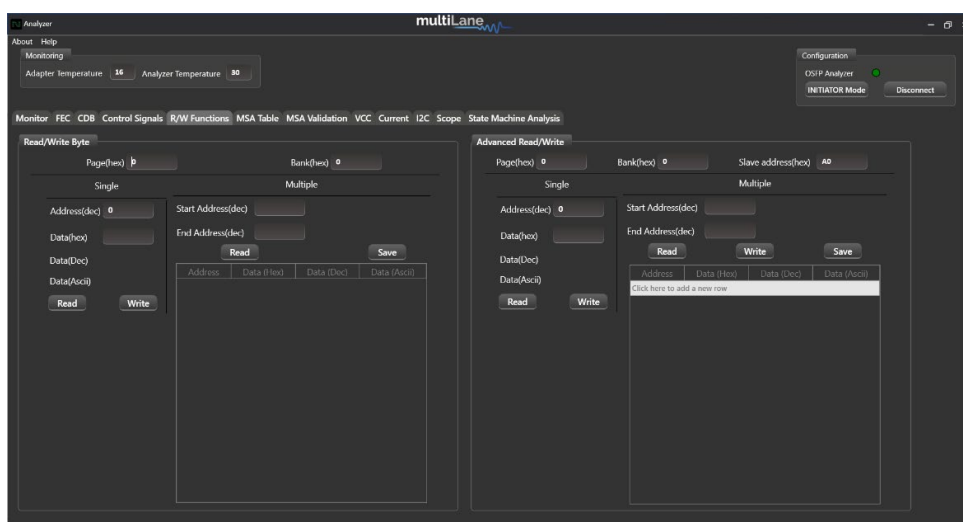
Signals / Modes	LWPN	RSTn	INTn	PRSn
Initiator	Output signal	Output signal	Input signal	Input signal
Bypass*	No control	No control	No control	No control
Target	Input signal	Input signal	Output signal	Output signal

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

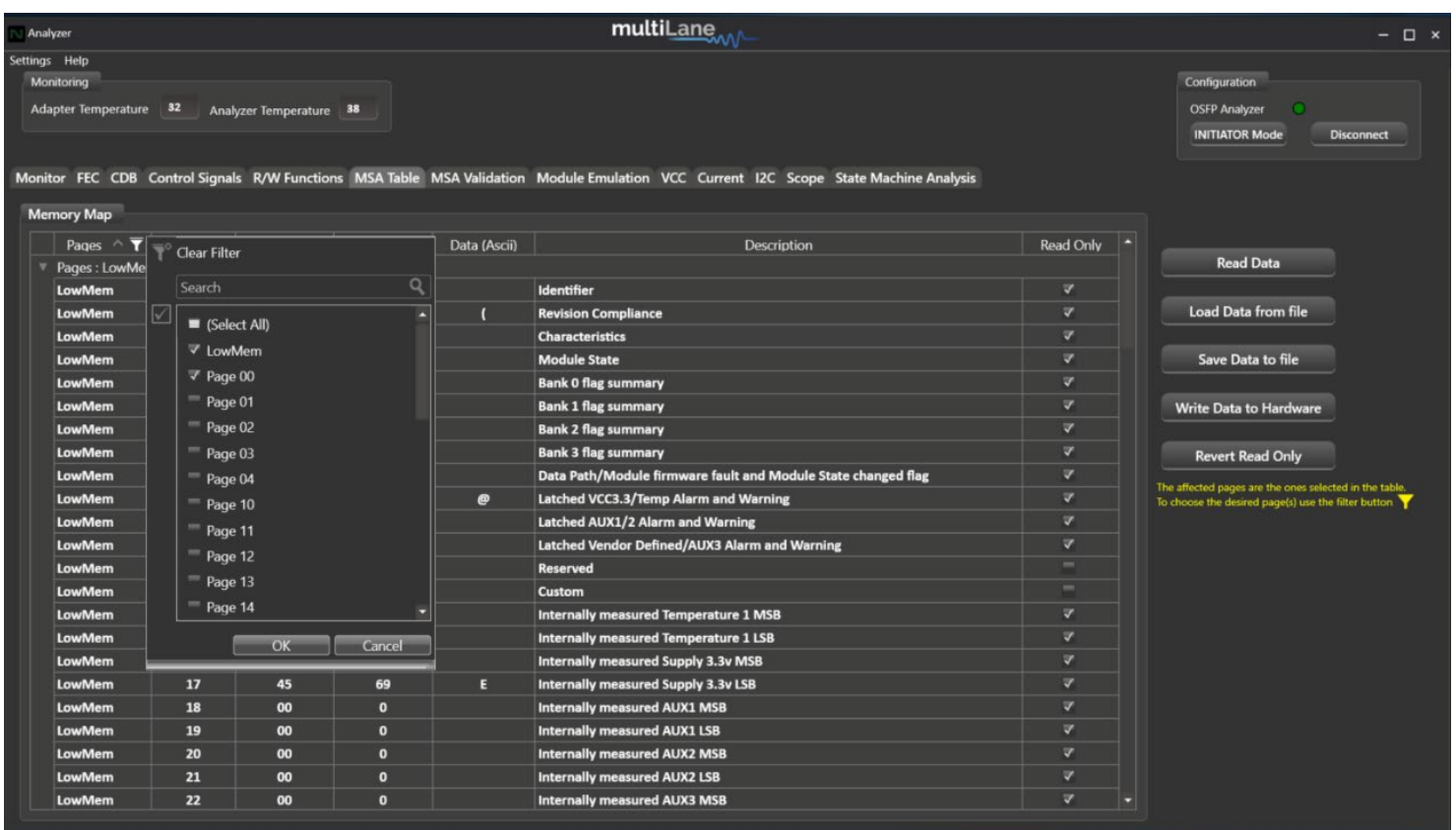
*In bypass mode, Nexus only samples the signal between host and module.

I2C Read/Write Operations



- 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

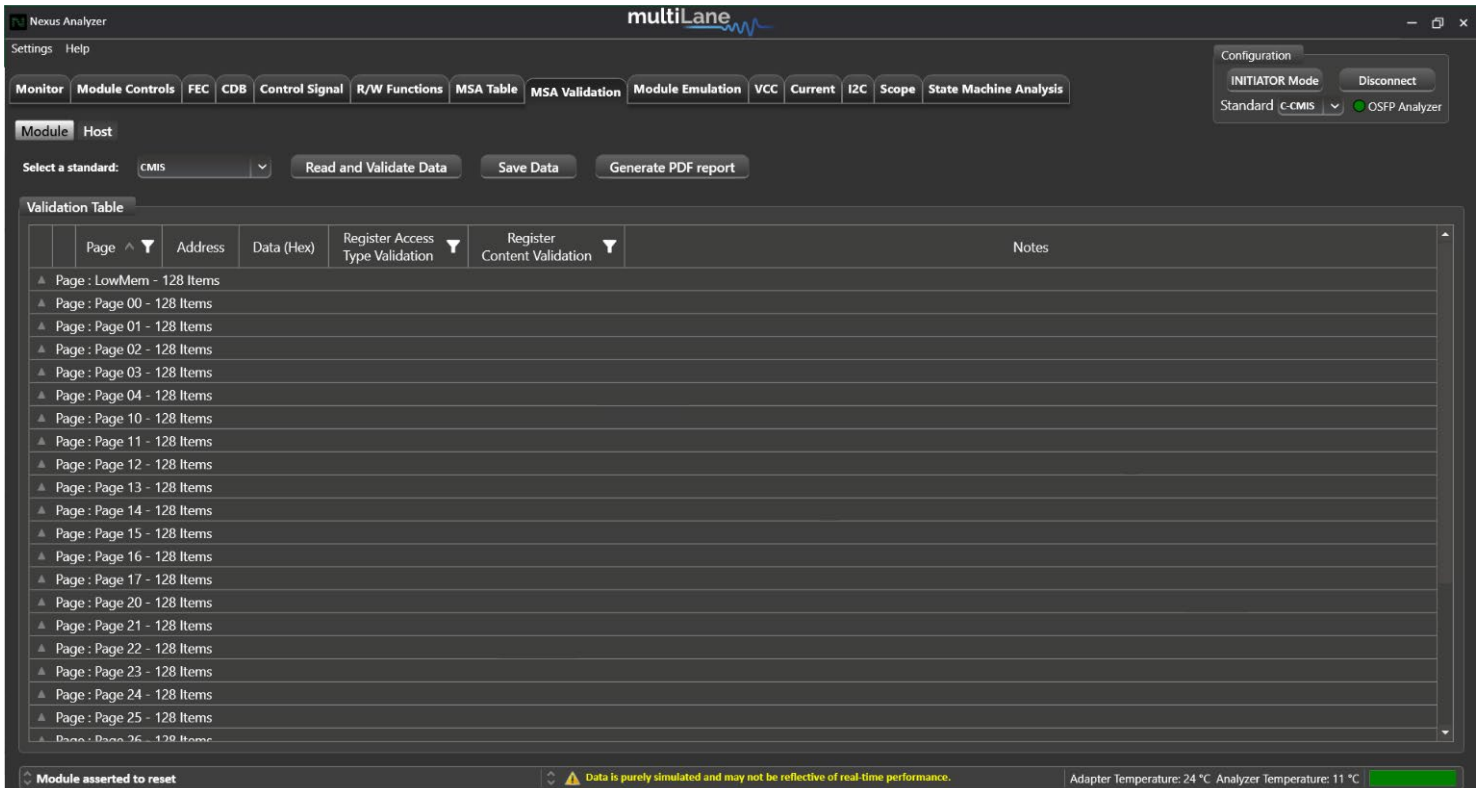
MSA Table



- 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

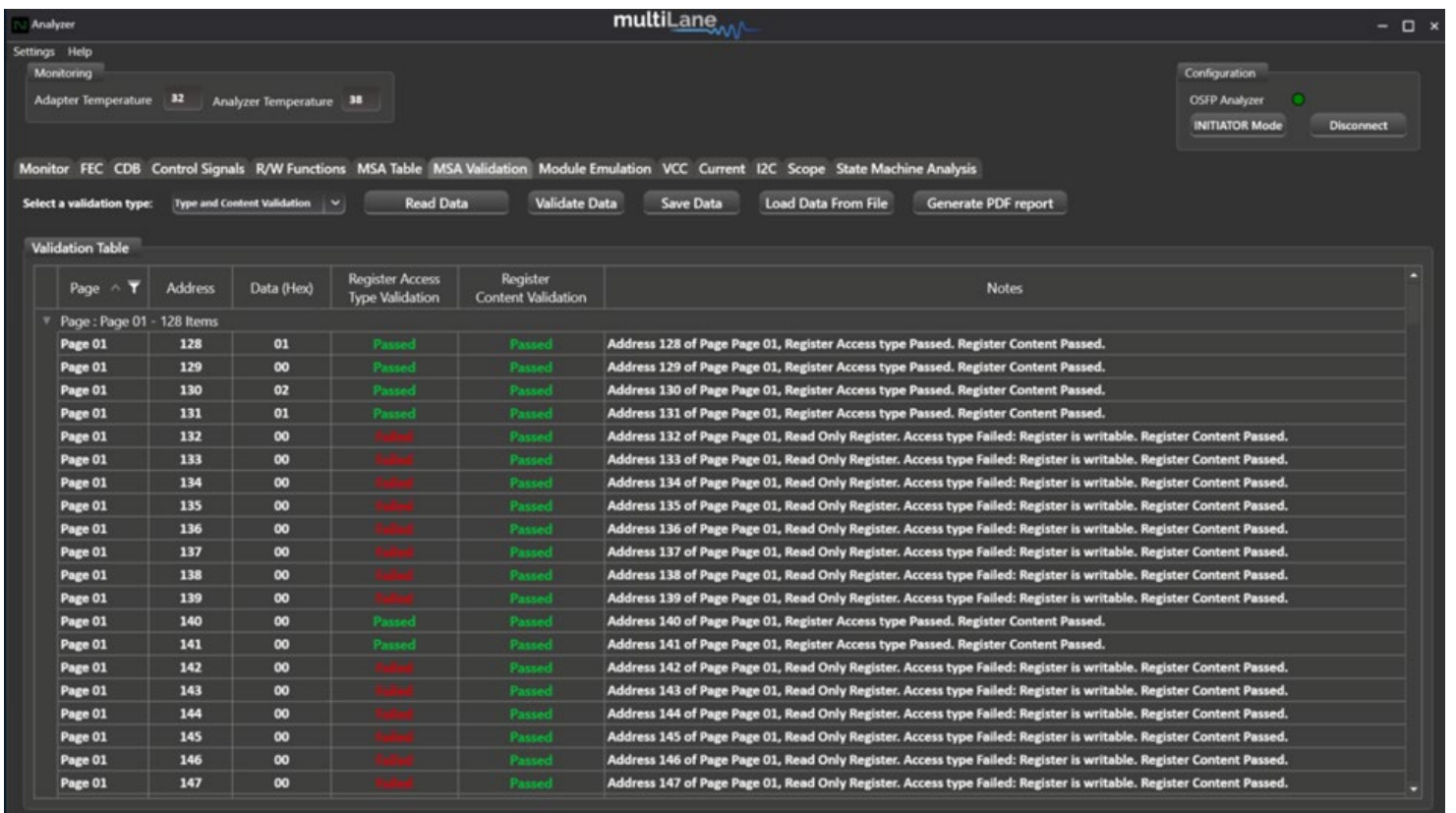
Module side



- 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.



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

One example reads:

LowMem, Address 2-

Register Access Type Validation: Failed

Register Content Validation: Passed

Expand for more details:

Bits	Type	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.

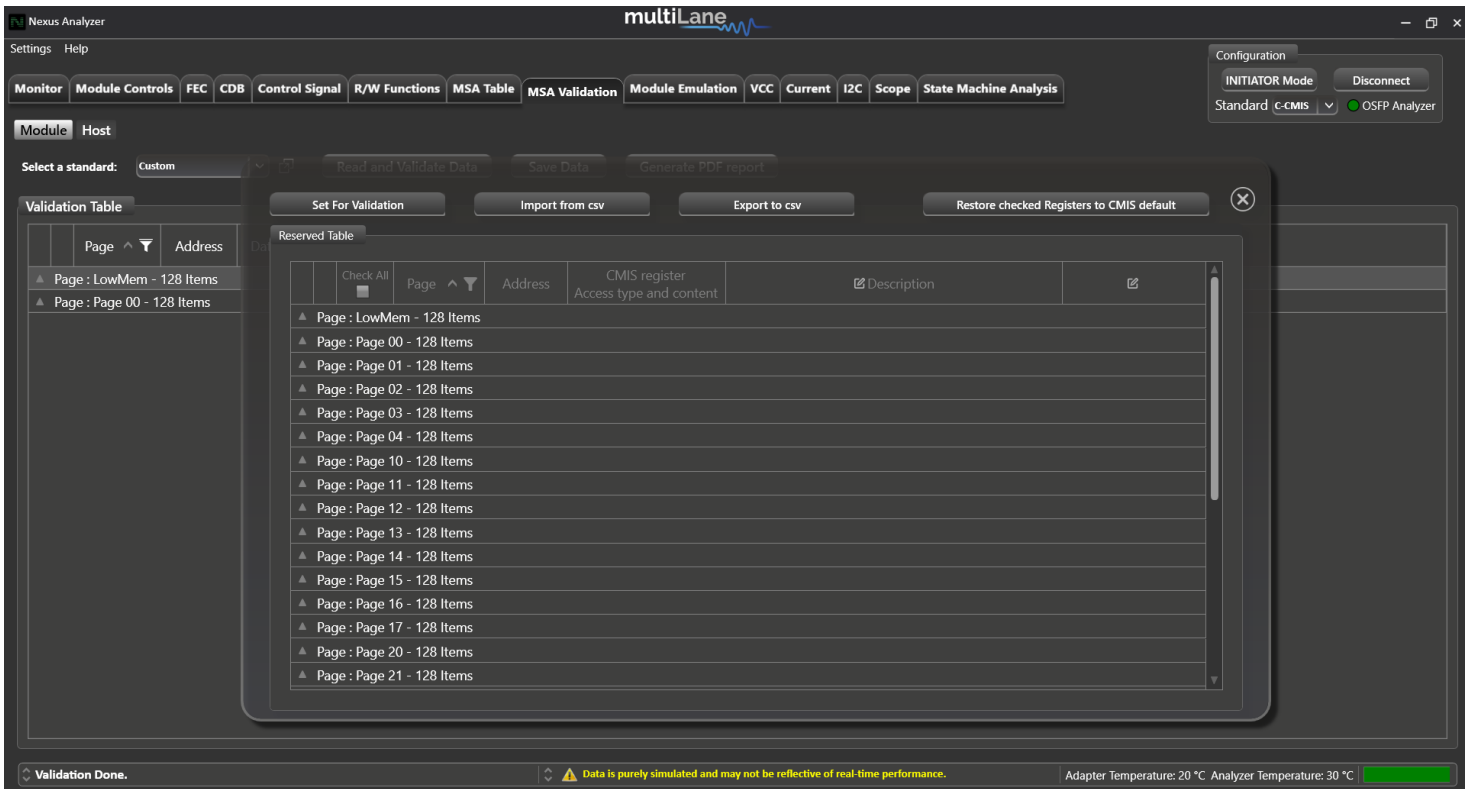
Otherwise, each bit or pair of bits are validated against their Type, and Content specifications as per CMIS.

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.

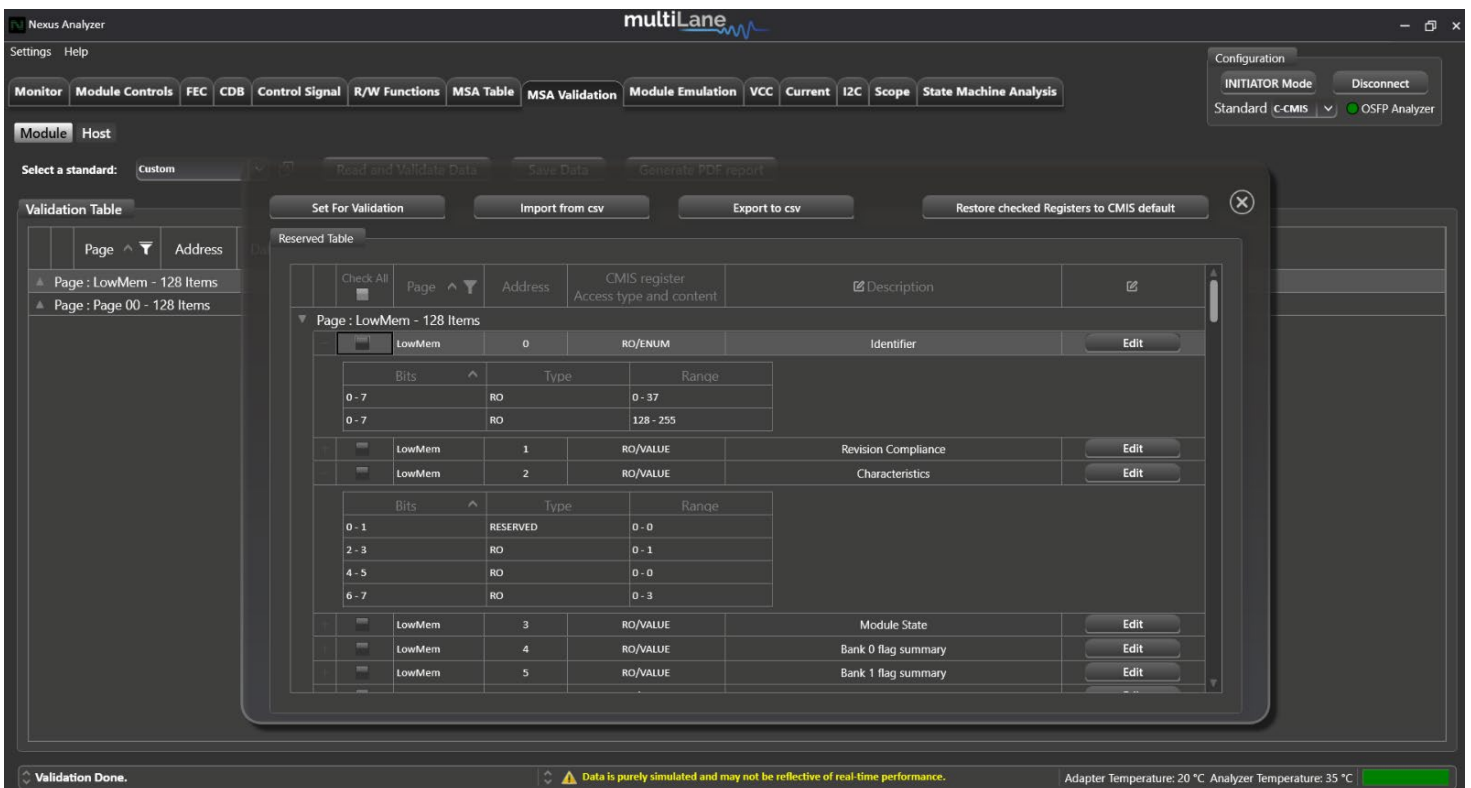
In this case, Nexus allows users to upload their own standards as .CSV files, or allows them to edit the CMIS memory map directly on the software, as shown in the example above and to follow.

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

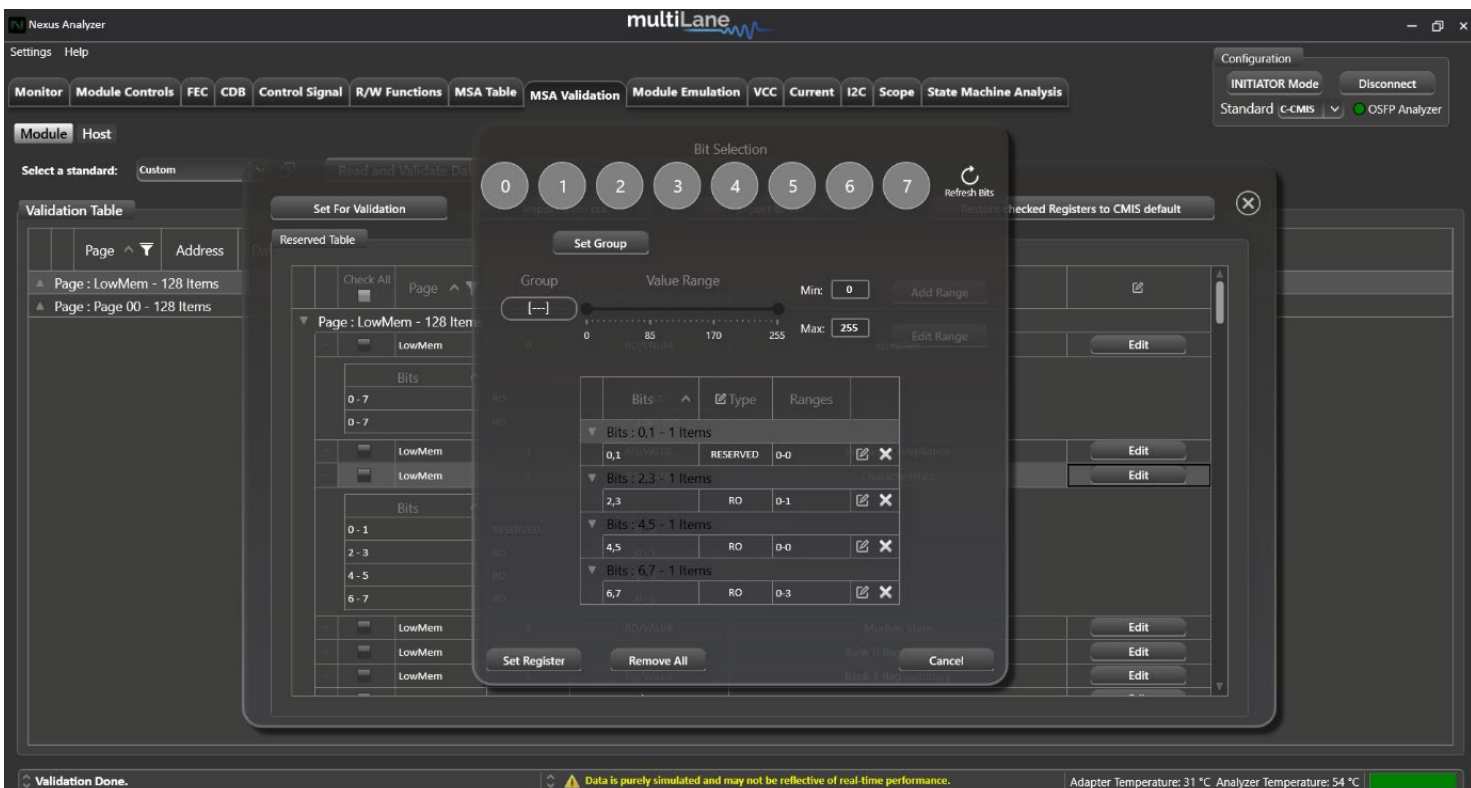


Follow the example below:

Select LowMem as shown below, to start with:



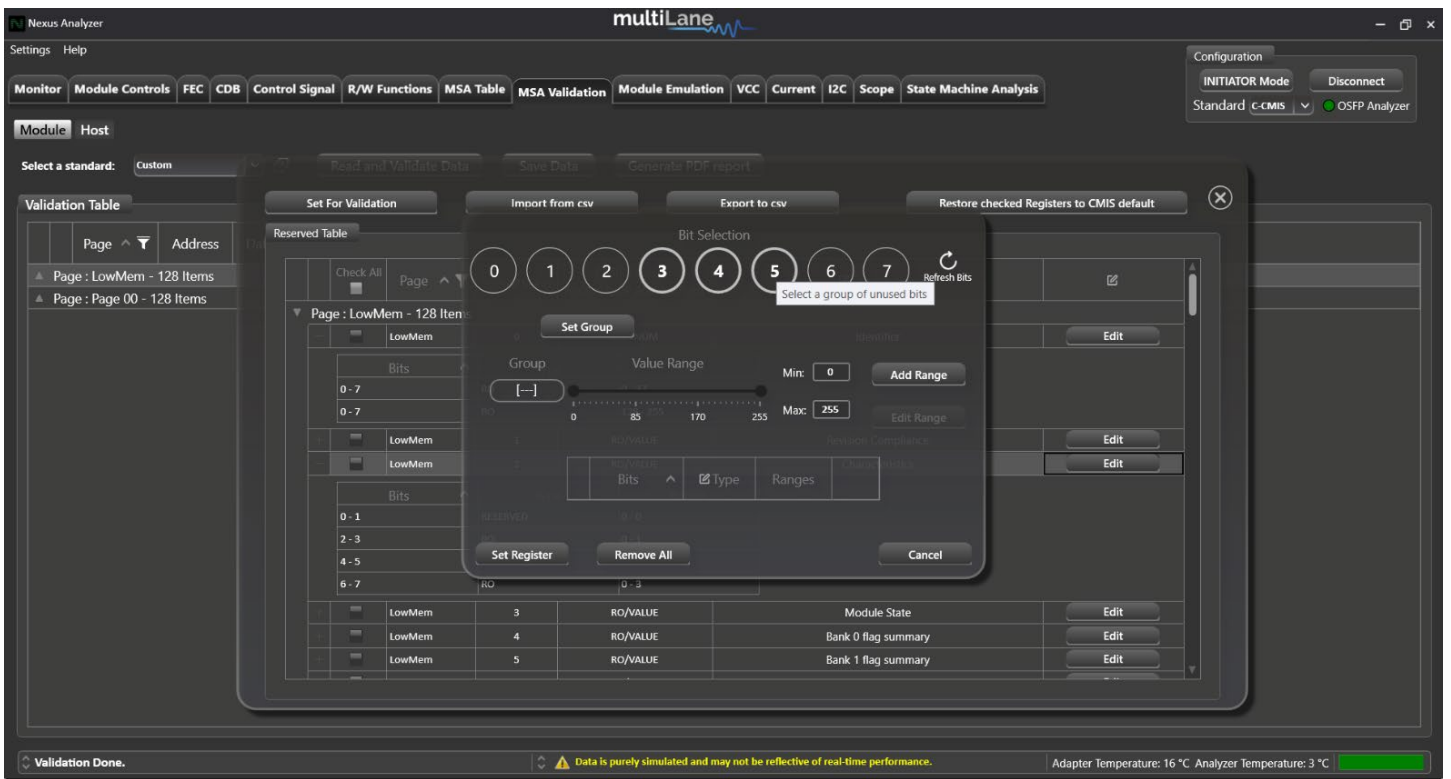
Selecting LowMem, address 2 to edit and customize as shown below:



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



Select range of values for selected bits



Edit access type and range through the table



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



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

Host Side

Slave Address	Pages	Address	Operation	MSA Validation	
				MSA Access Type	Status
A0	Page 11h	140	Read	RO	Passed
A0	Page 11h	141	Read	RO	Passed
A0	Page 11h	142	Read	RO	Passed
A0	Page 11h	143	Read	RO	Passed
A0	Page 11h	144	Read	RO	Passed
A0	Page 11h	145	Read	RO	Passed
A0	Page 11h	146	Read	RO	Passed
A0	Page 11h	147	Read	RO	Passed
A0	Page 11h	148	Read	RO	Passed
A0	Page 11h	149	Read	RO	Passed
A0	Page 11h	150	Read	RO	Passed
A0	Page 11h	151	Read	RO	Passed
A0	Page 11h	152	Read	RO	Passed
A0	Page 11h	153	Read	RO	Passed
A0	Page 11h	154	Read	RO	Passed
A0	Page 11h	155	Read	RO	Passed
A0	Page 11h	156	Read	RO	Passed
A0	Page 11h	157	Read	RO	Passed
A0	Page 11h	158	Read	RO	Passed
A0	Page 11h	159	Read	RO	Passed
A0	Low Memory	1	Read	RO	Passed
A0	Low Memory	2	Read	RO	Passed
A0	Low Memory	1	Write	RO	Failed
A0	Low Memory	1	Write	RO	Failed
A0	Low Memory	1	Read	RO	Passed
A0	Low Memory	2	Read	RO	Passed
A0	Low Memory	1	Write	RO	Failed
A0	Low Memory	10	Read	RO	Passed
A0	Low Memory	11	Read	RO	Passed
A0	Low Memory	10	Write	RO	Failed

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.

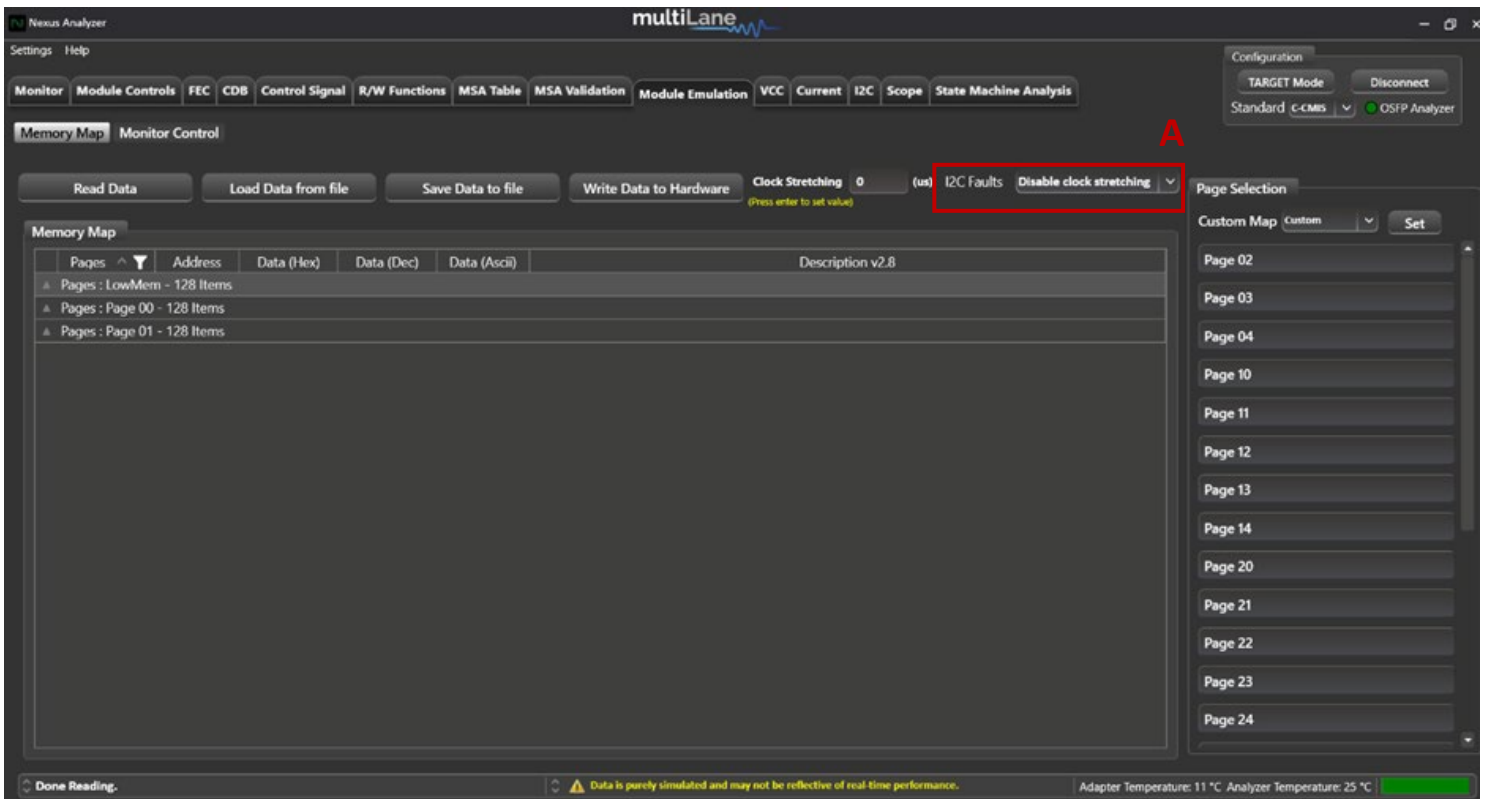
Press on “Stop Analysis” once testing is done.

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



Emulate Module Memory:

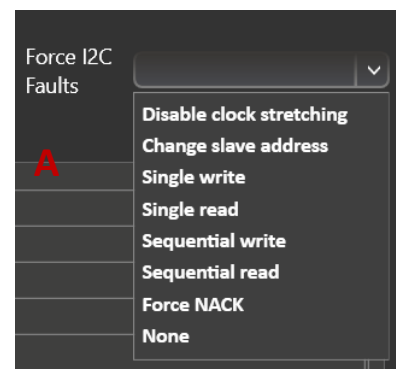
- LowMem, Page00 and Page01 are emulated by default
- User can add a maximum of three extra pages to emulate by dragging and dropping, or simply clicking on the page.
 - Once user adds a page to the emulated module memory, the Nexus FW will continue emulating the pages added until or unless the page/pages 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



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.

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”.

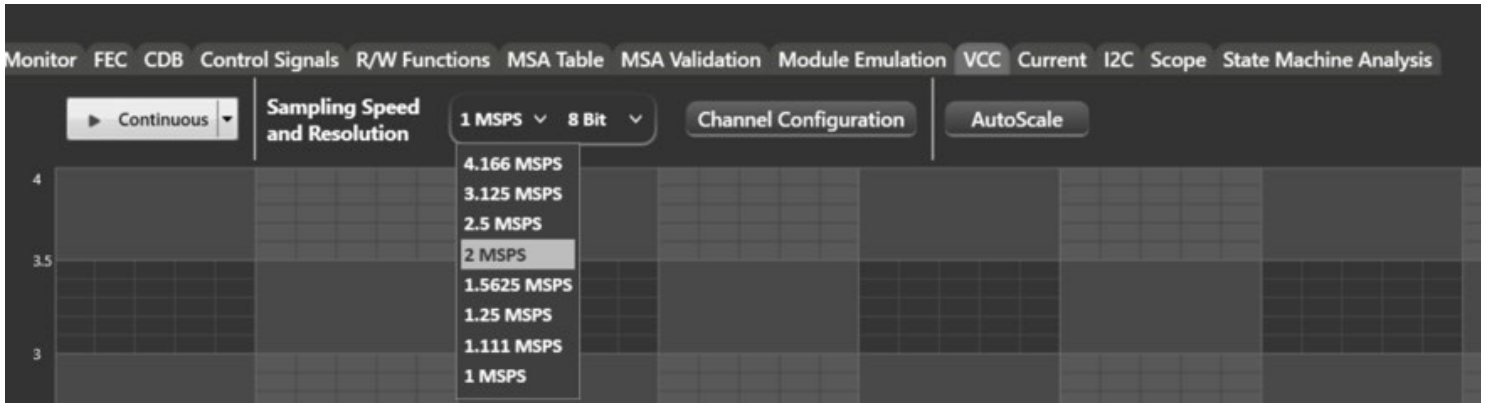
Graphs and Measurements

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:

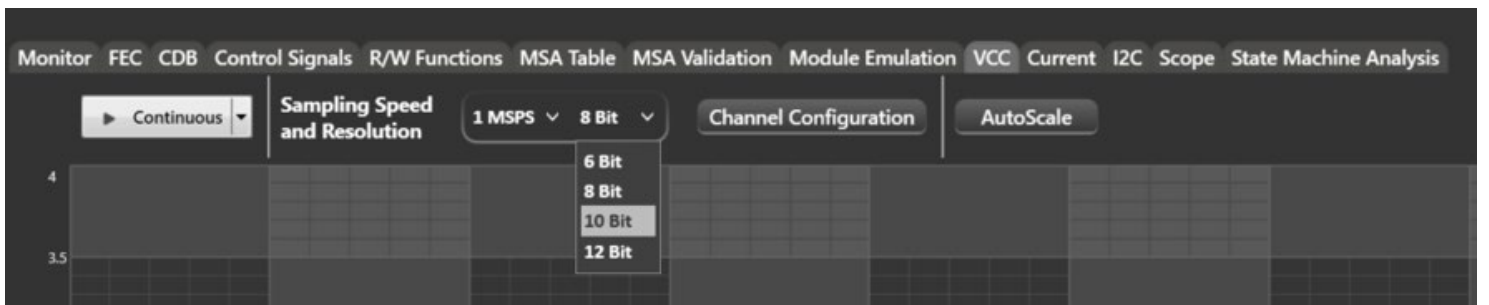
The below example was done on the VCC tab, and applies to the Current tab, I2C Tab, and Scope Mode tab.

Data Configuration

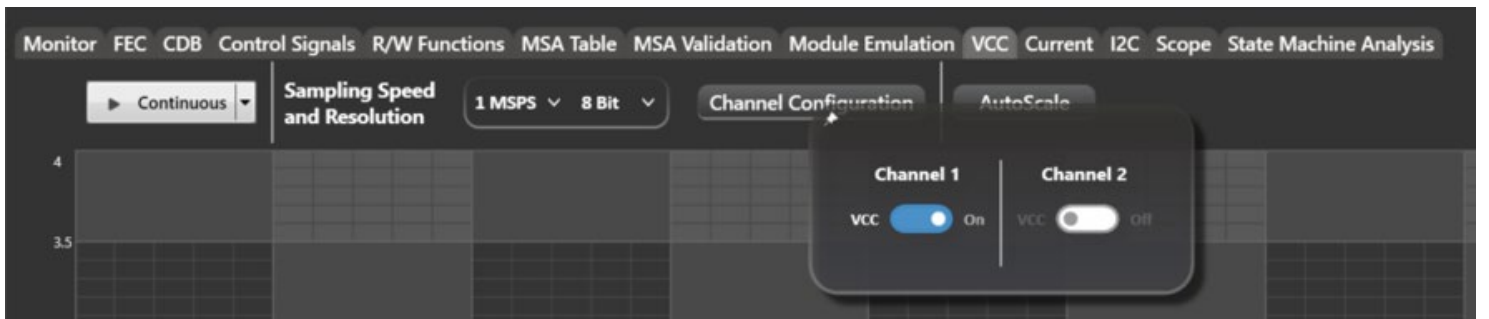
- Set your required sampling speed



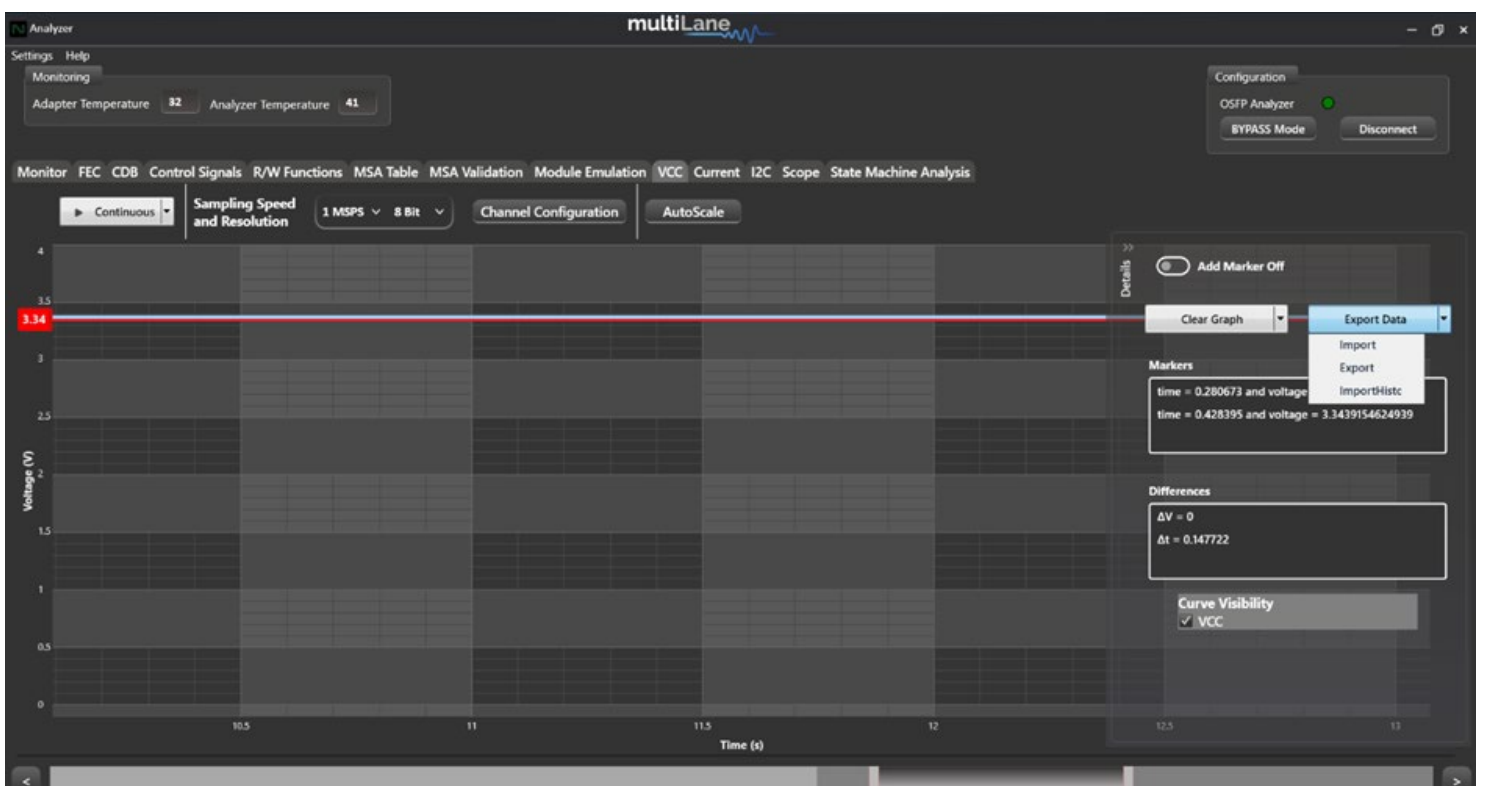
- Set your required sampling resolution



- Set your channel configuration



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



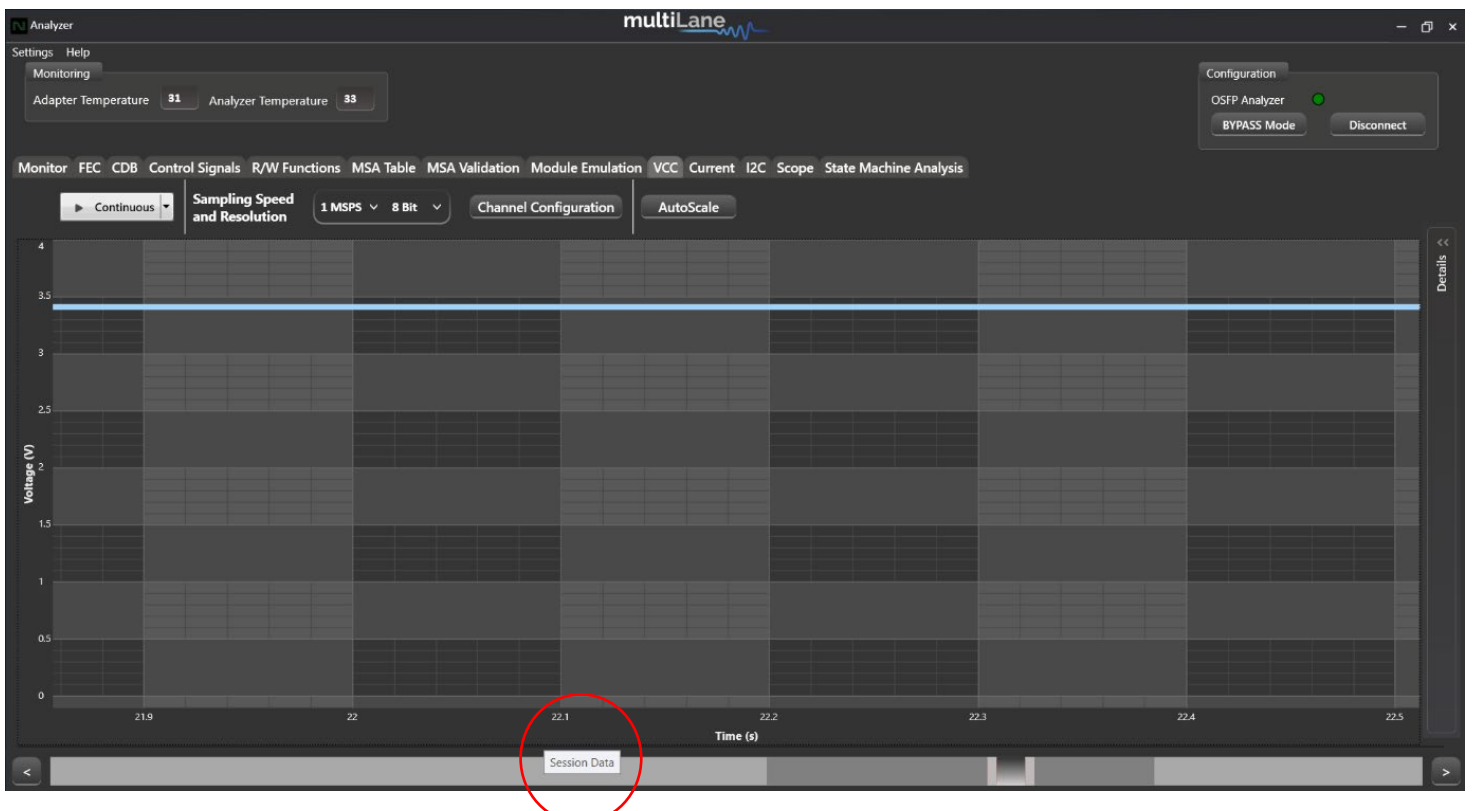
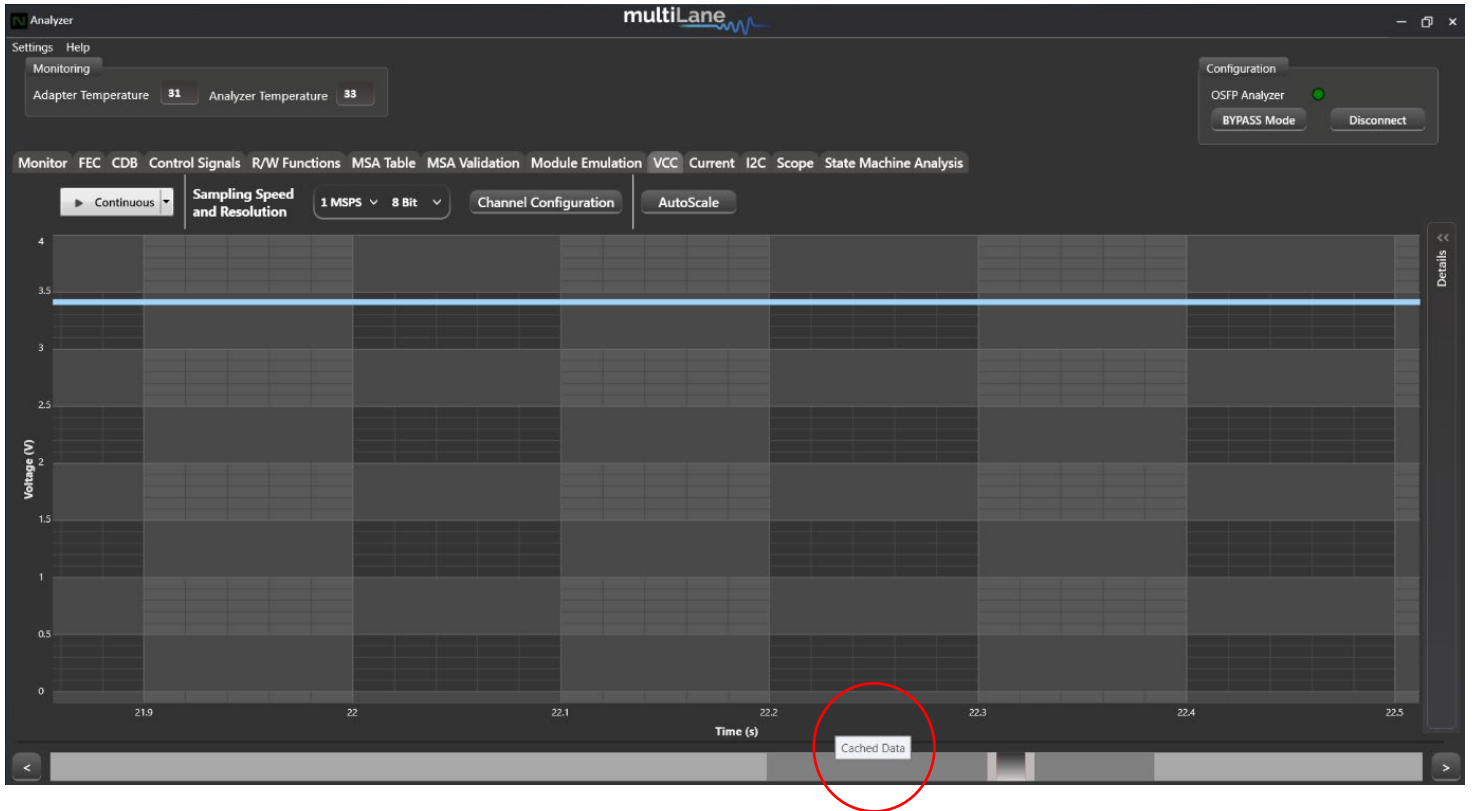
- Add Marker: go back to the graph and press on any point directly onto it to add your marker.
- “Markers” box indicates the time and voltage marker values
- “Differences” box indicates the difference by voltage and time between markers
- Clear graph:
 - Data: clear all markers
 - Graph: clear all captured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

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.

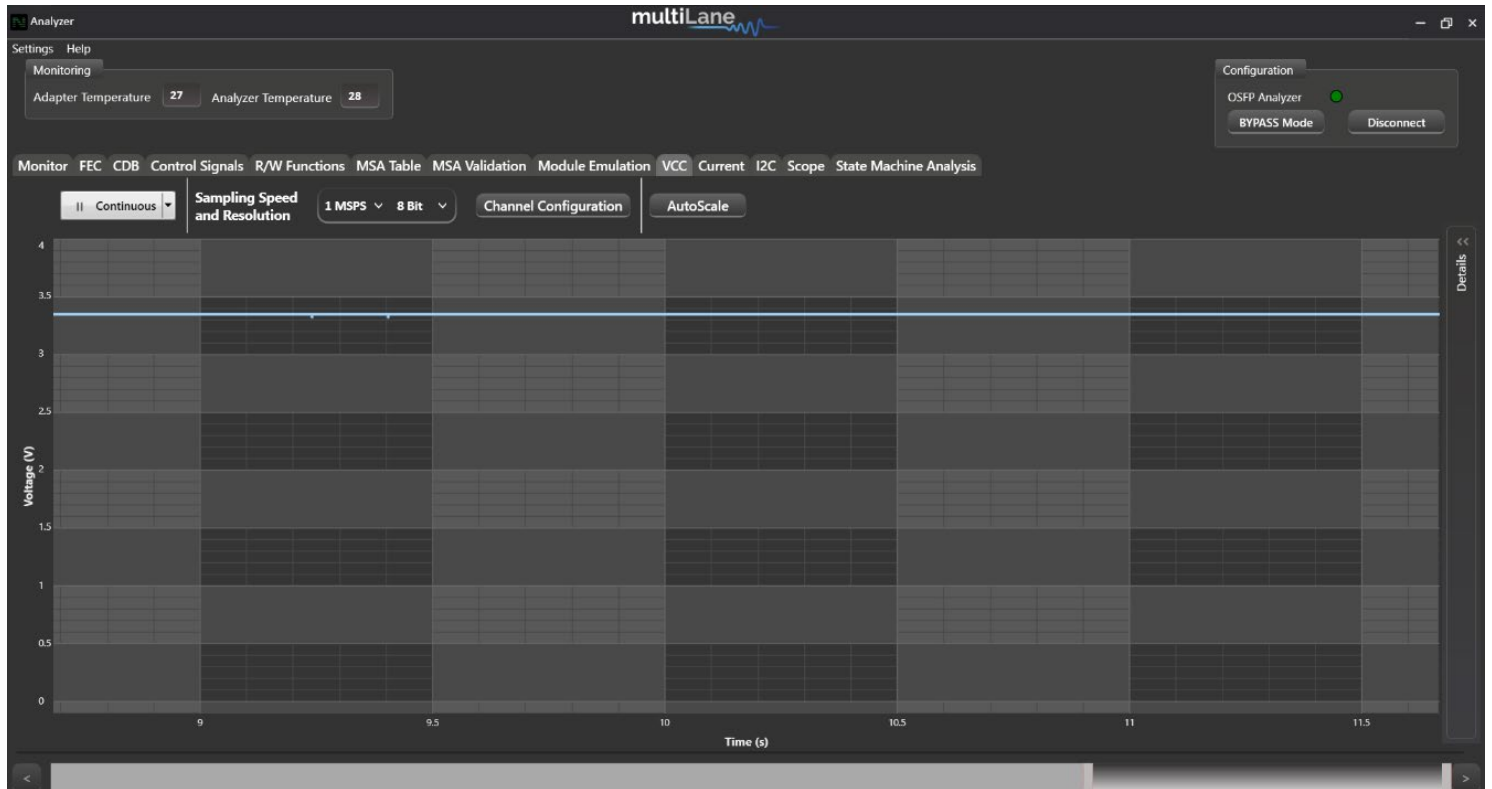
Hovering over the timeline you will see the data is categorized into cached data, and session data.

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

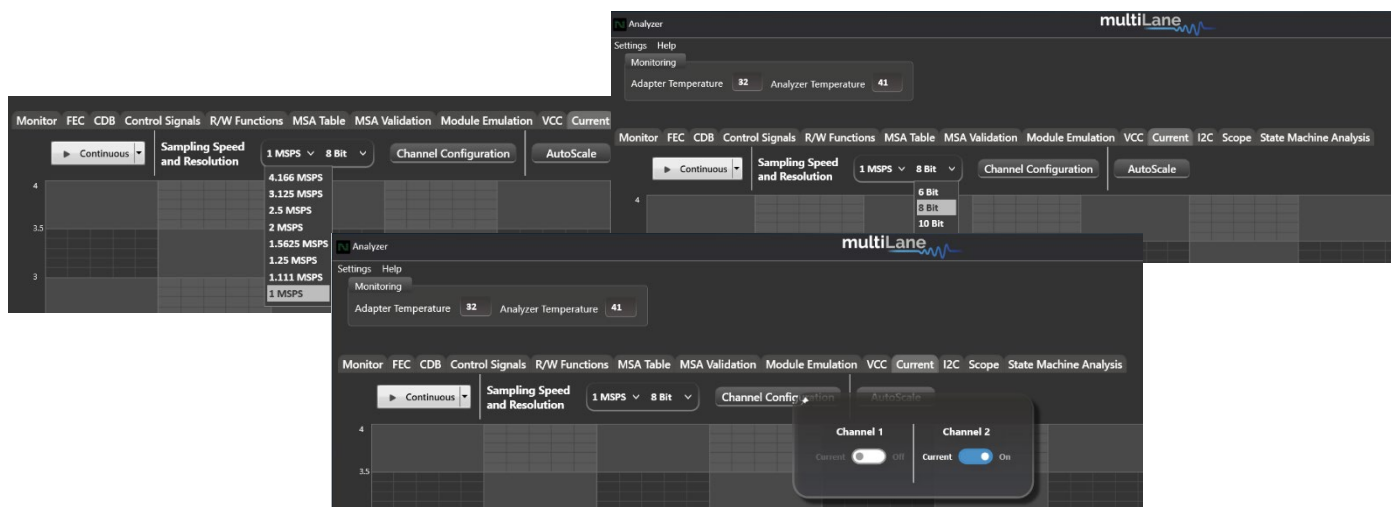


VCC Measurements

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



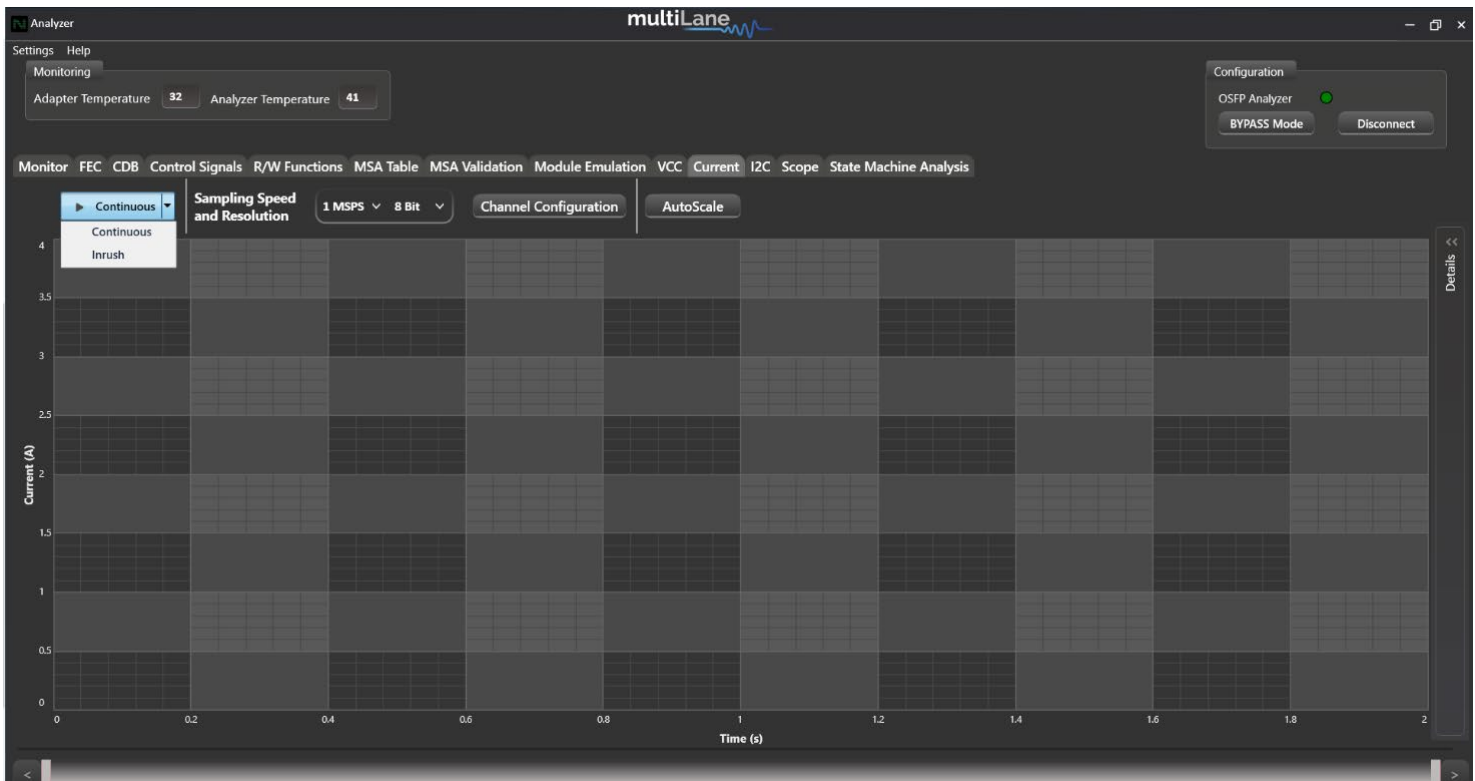
Measure VCC in continuous mode, or measure VCC spikes, by configuring the sampling speed and resolution, as well as the channels:



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

Current Measurements

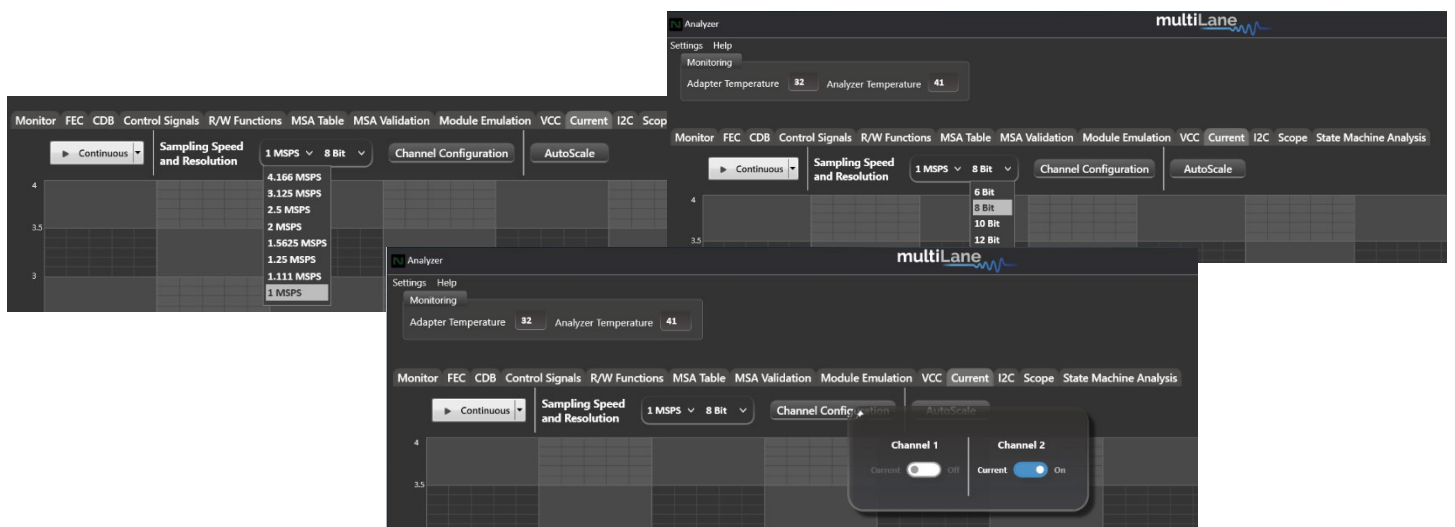
Current Measurements can be done in initiator, bypass or target modes.



Choose your required current measurement:

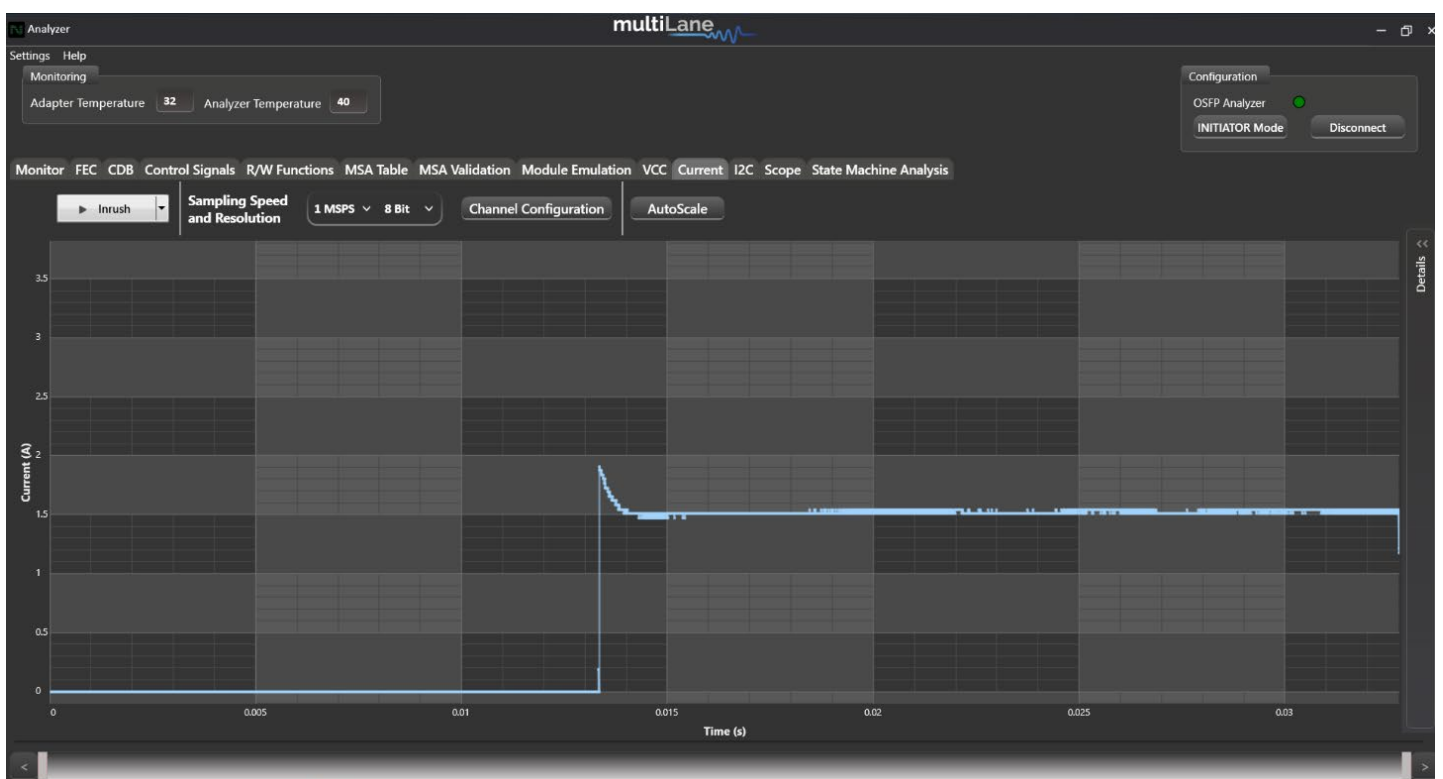
- Continuous current measurements
- In-rush current measurements

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

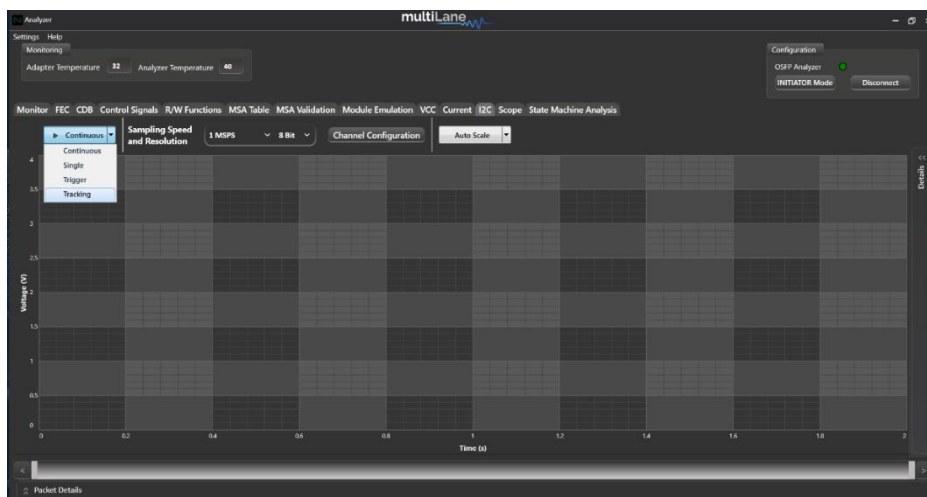


In-rush current measurements

- 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)

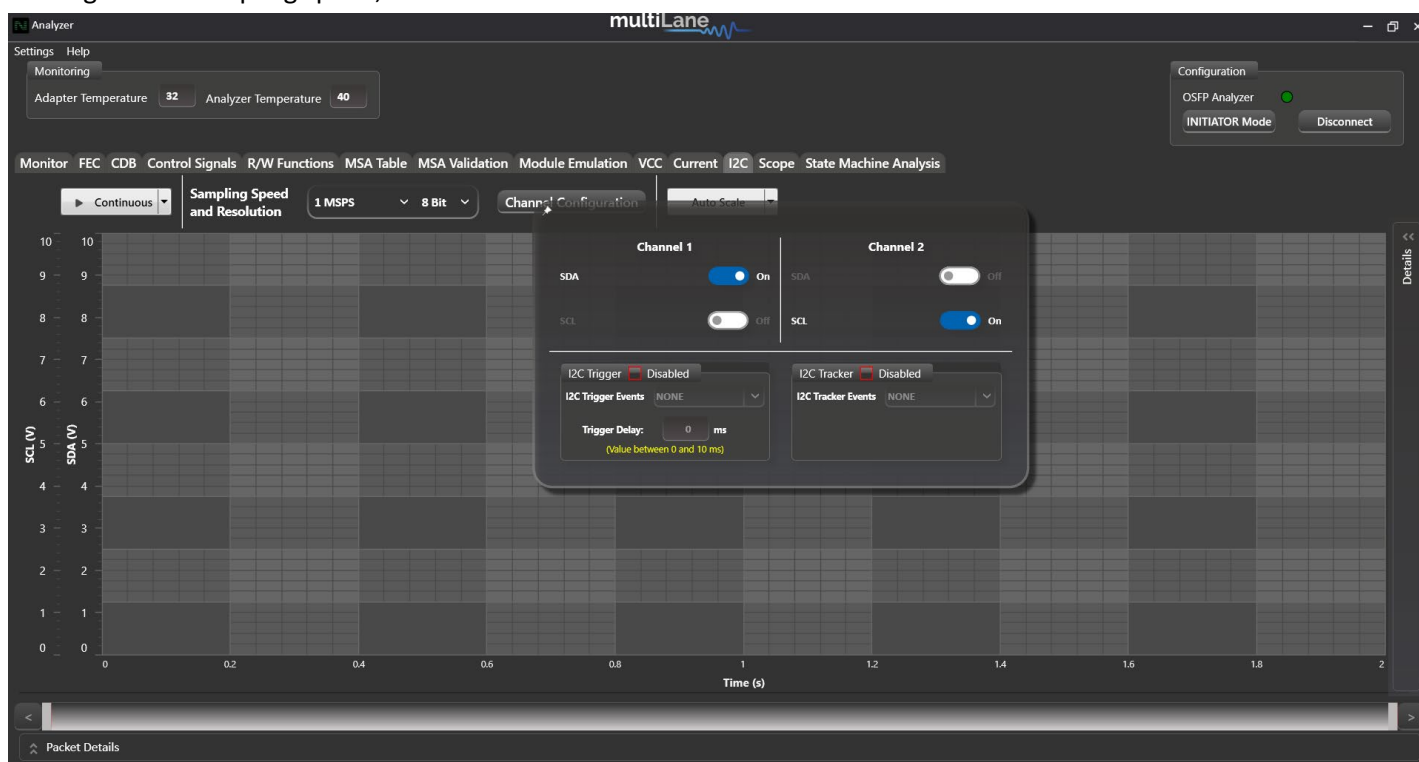


I2C Packet Analysis

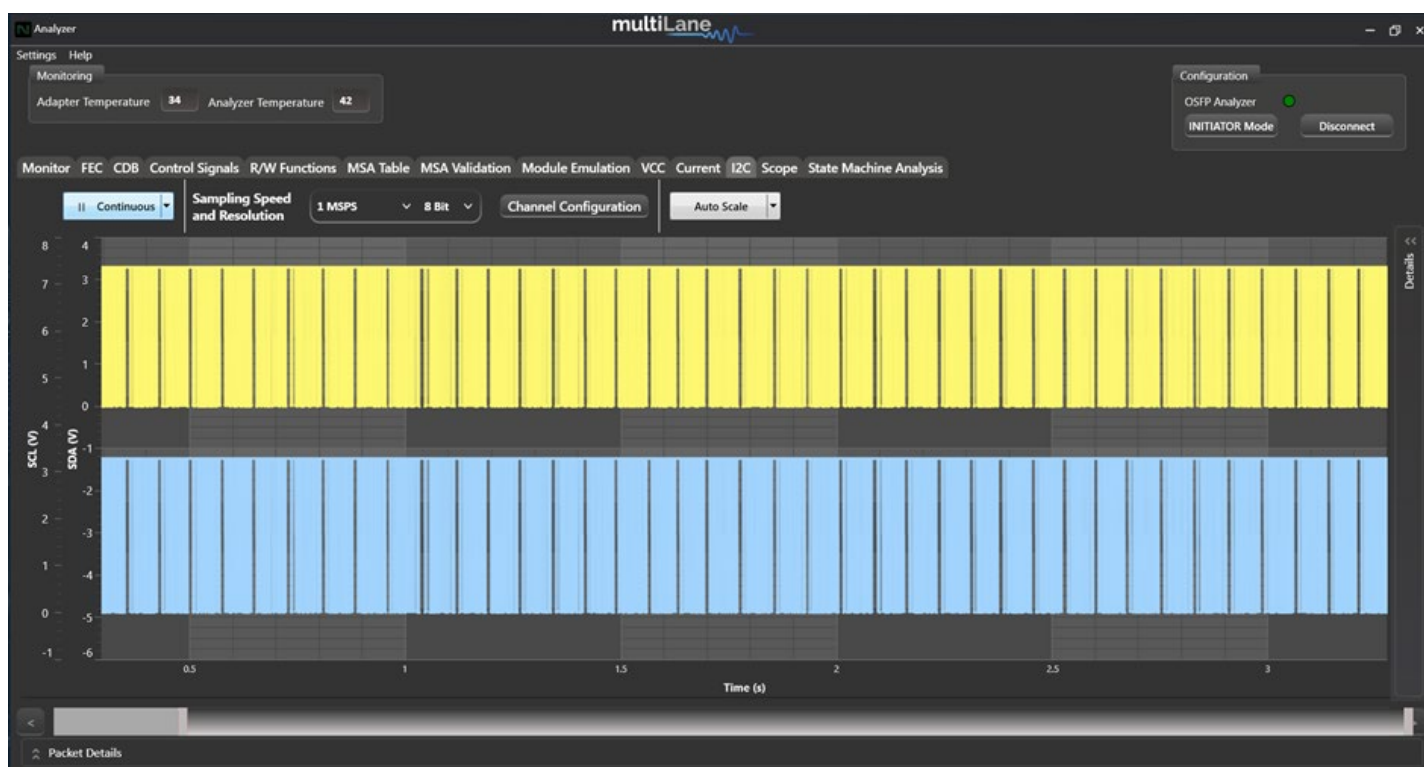


- I2C Captures can be done in initiator, bypass or target modes
- Single and continuous captures
- I2C trigger and tracking events
- Different sampling speeds available
- Represent SCL, SDA, ACK/NACK, and I2C edges graphically

Configure the sampling speed, resolution and choose channels:

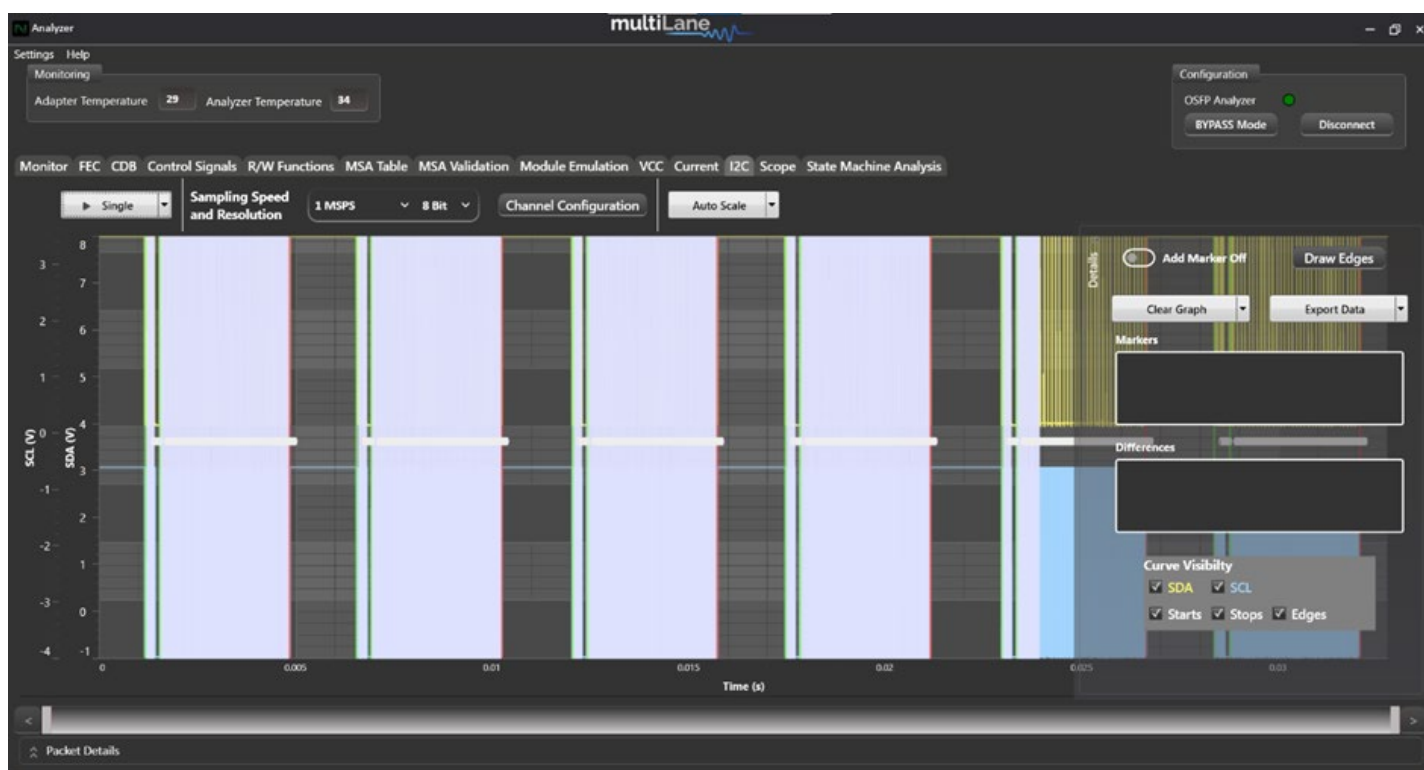


Continuous Capture



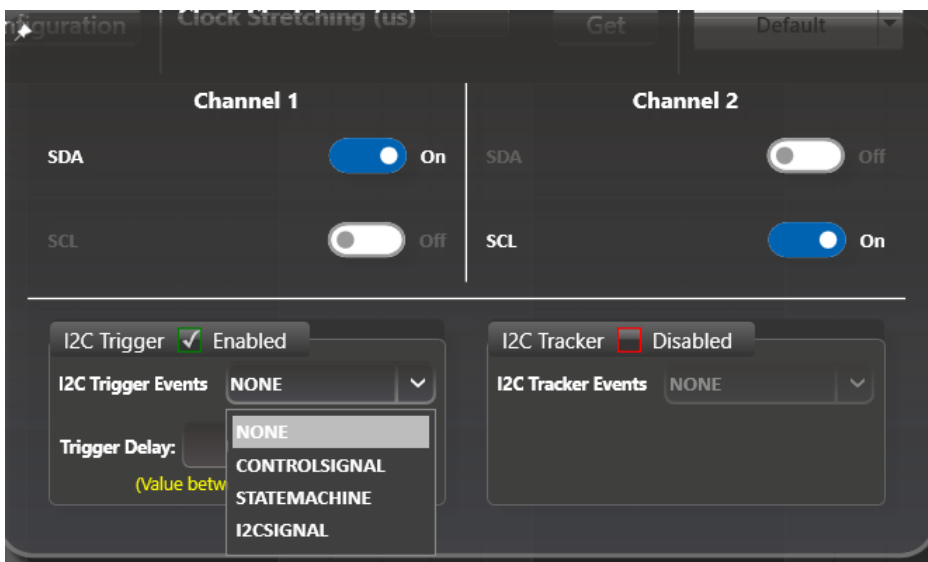
I2C continuous capture shows SDA and SCL data.

Single Capture



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

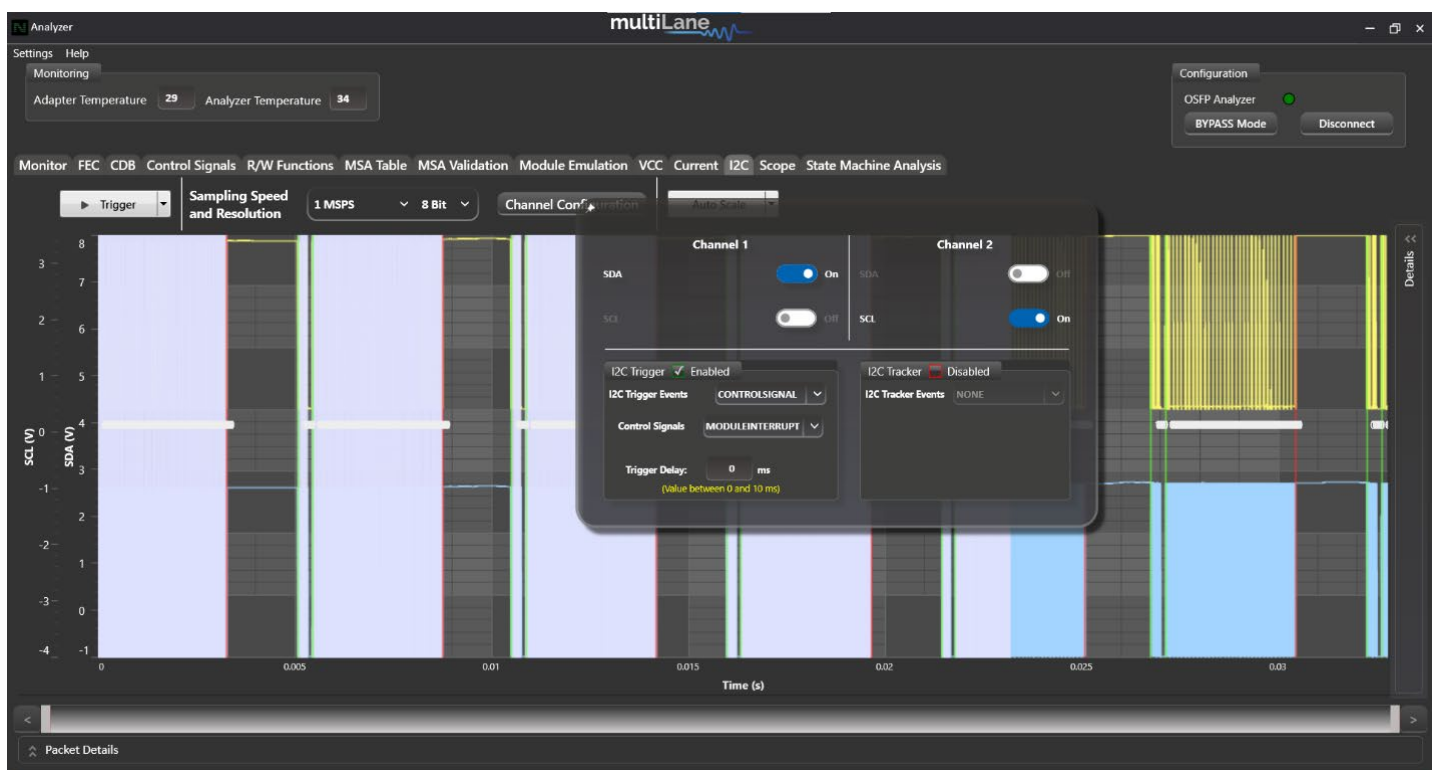
I2C Trigger Capture



Trigger I2C with:

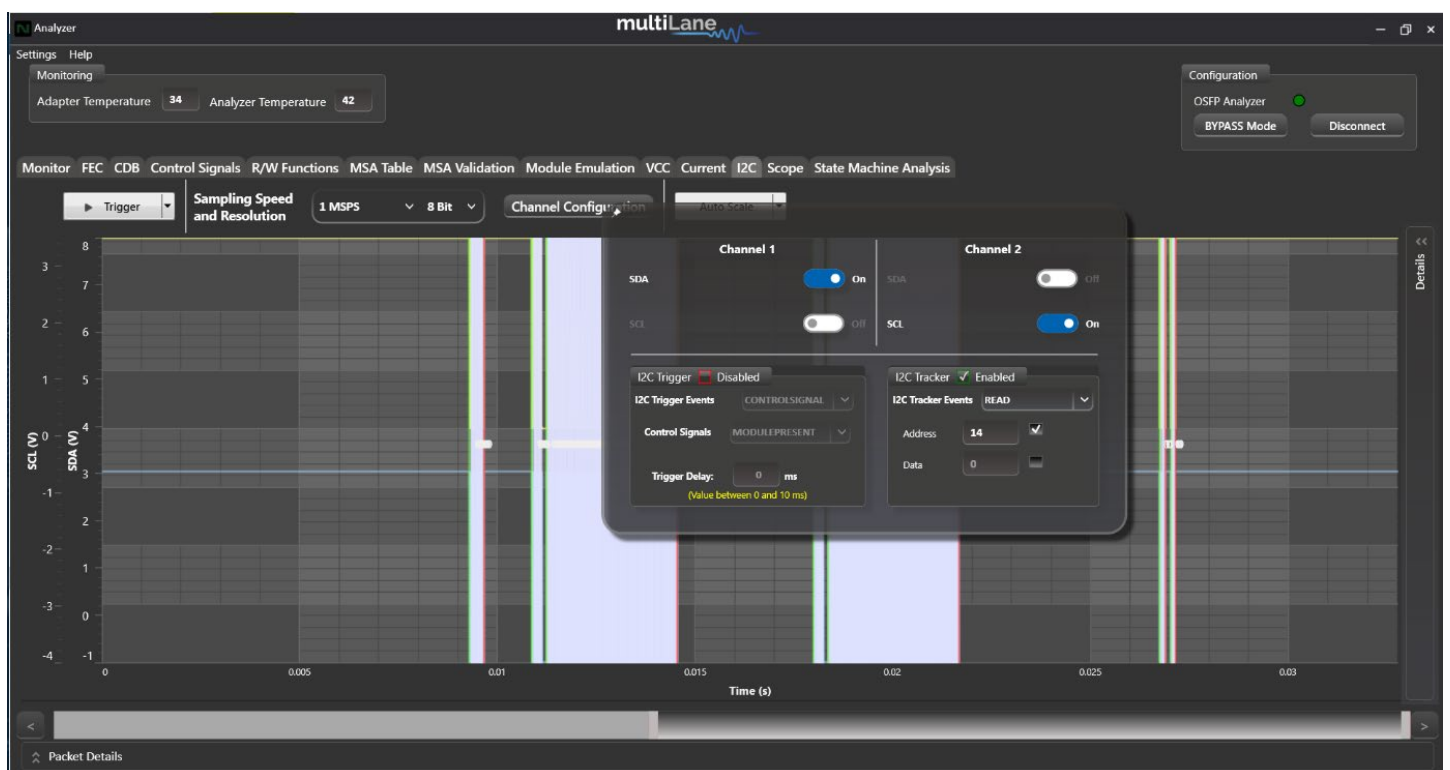
- Control Signals:
 - Module Interrupt
 - Module Present
 - Reset
 - Low Power
- State Machine
- I2C Signal:
 - Start
 - Stop

Choose the trigger required and measure the data:

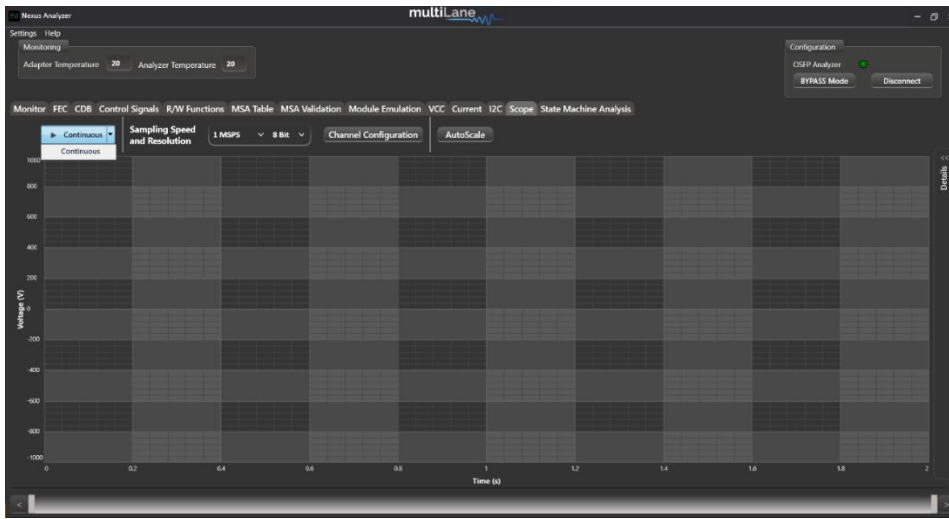


I2C Tracking Capture

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



Scope Mode



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

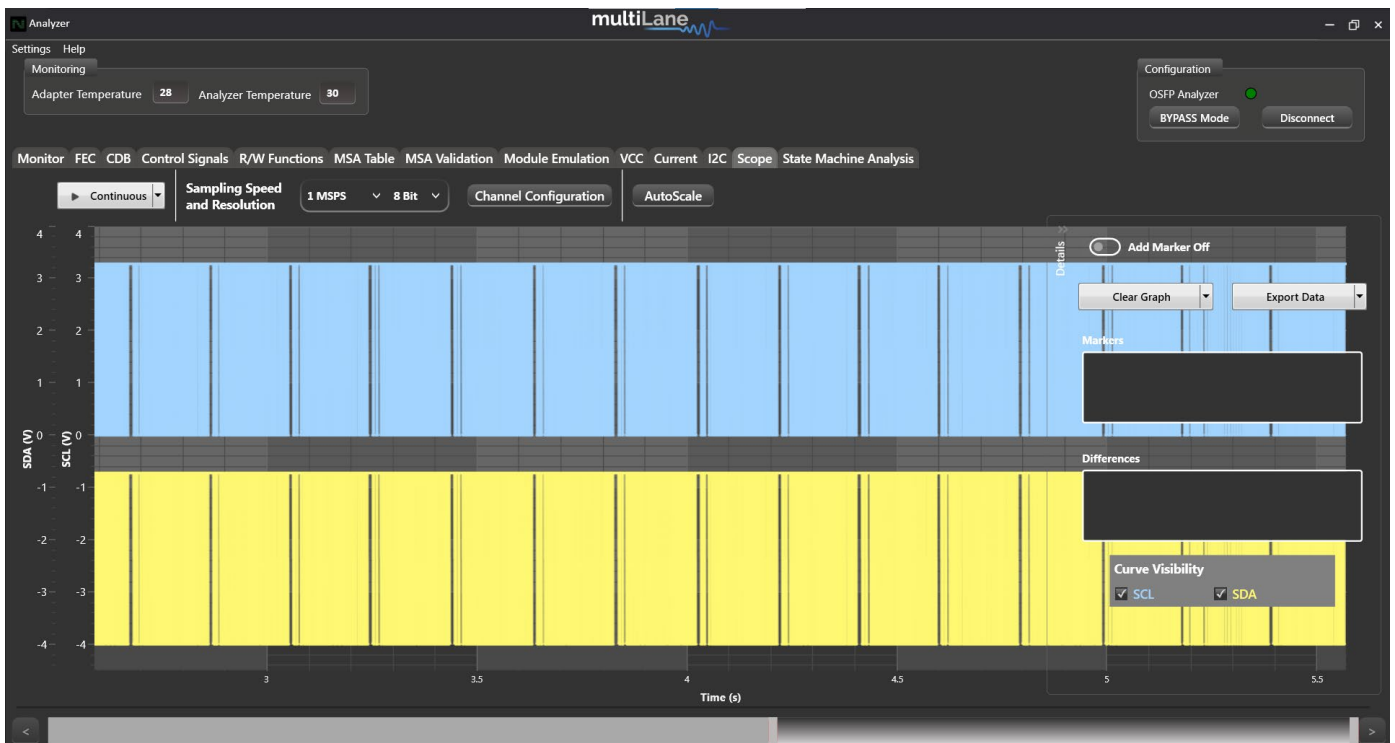
Configure your sampling speed and resolution, and move on to the channel configuration:



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

- SDA
- SCL
- 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.

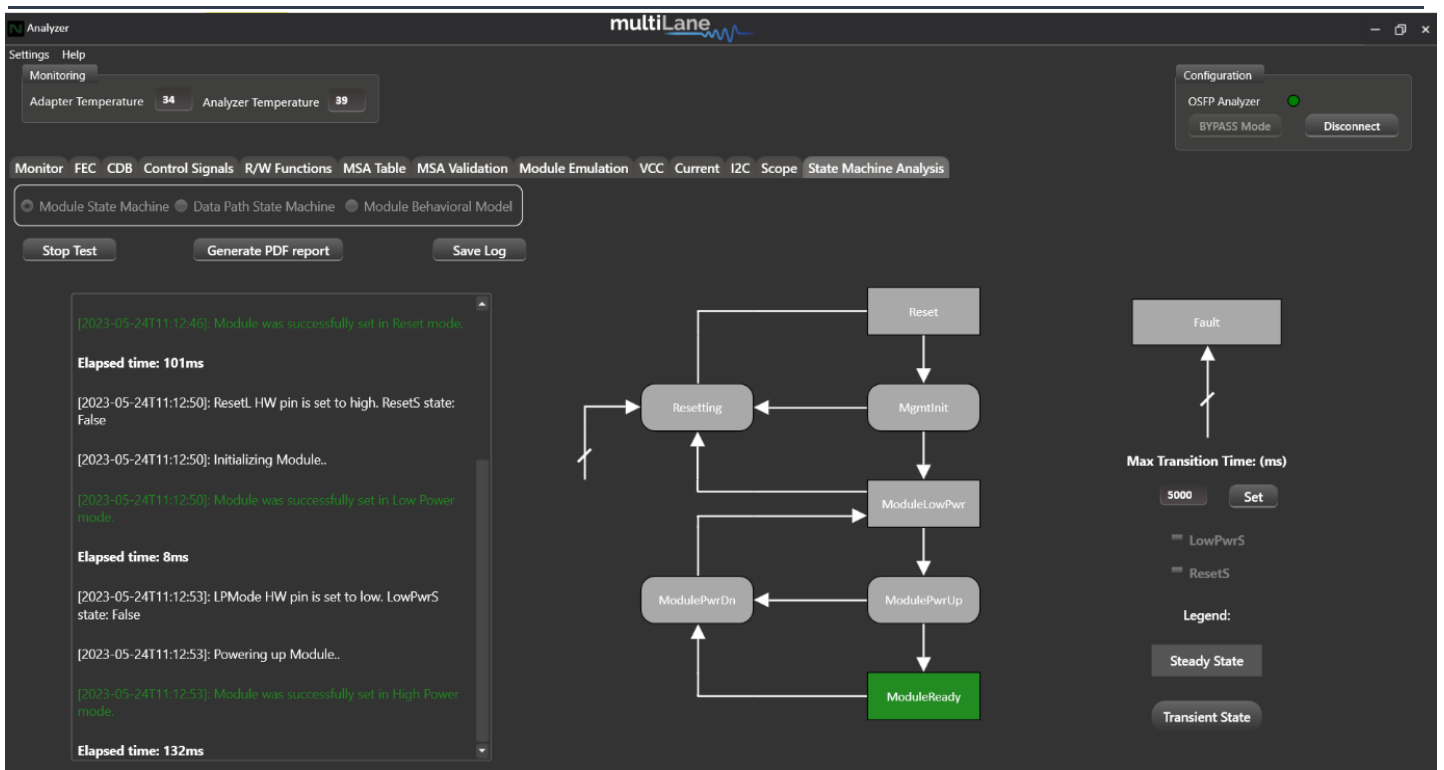


Module Side

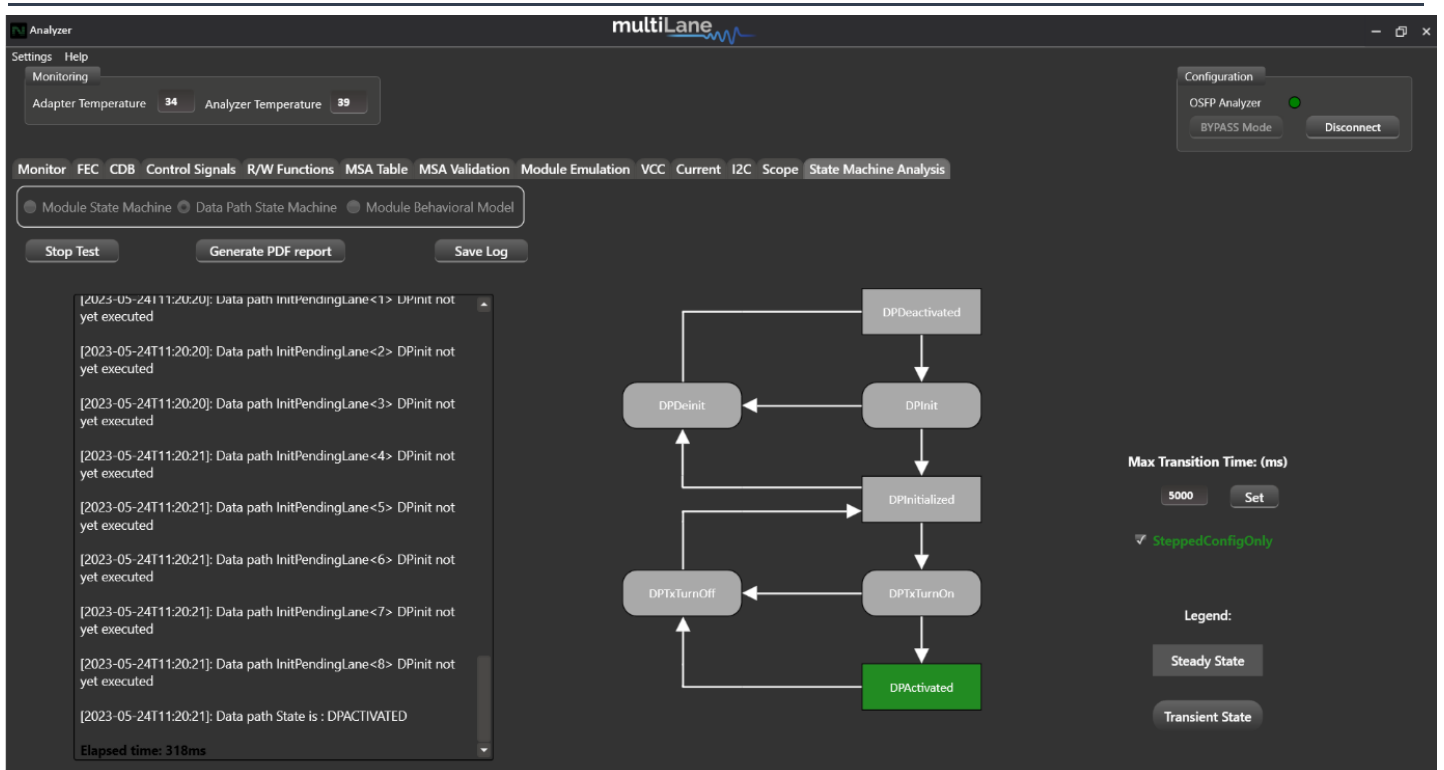
The below tests are all automatically done in initiator mode

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

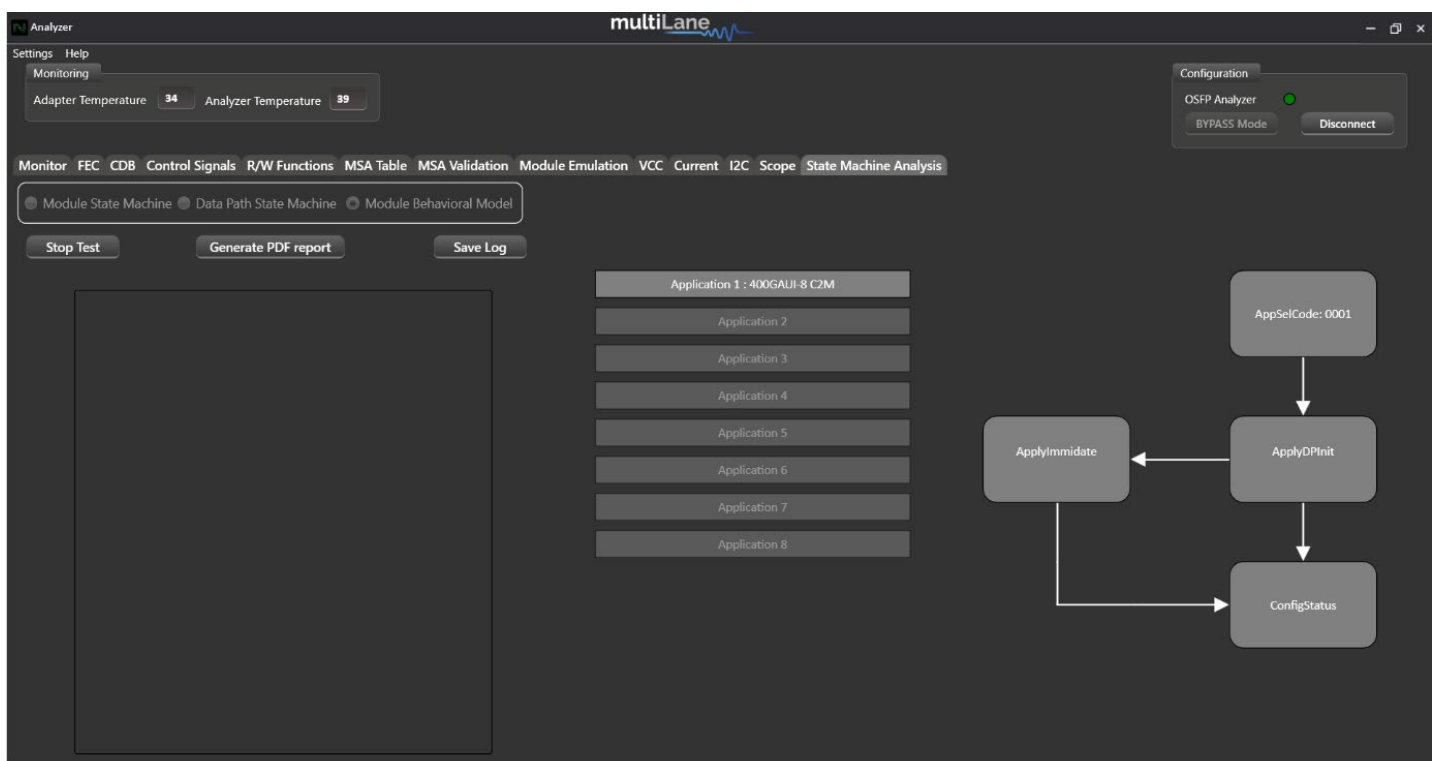


Data path state machine test



Module Behavioral Model

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



Network Path State Machine Test

Host Side

Module State Machine

Press on “Begin Analysis”, and manually trigger state transitions from your host which will be reflected here, validating host to module communication.

Data Path State Machine

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

The screenshot shows the Nexus Analyzer software interface. The main workspace displays a state machine diagram with the following states and transitions:

- NPDeactivated** transitions to **NPInit**.
- NPInit** transitions to **NPDefault** and **NPInitialized**.
- NPDefault** transitions to **NPInitialized**.
- NPInitialized** transitions to **NPTxTurnOn**.
- NPTxTurnOn** transitions to **NPTxTurnOff** and **NPActivated**.
- NPTxTurnOff** transitions to **NPDefault**.
- NPActivated** transitions to **NPDeactivated**.

A log window on the right displays the following state transition data:

```

State: Reset - HW
Time: 191 ms
State: Deasserted reset - SW/HW
Time: 63271 ms
State: High power - SW/HW
Time: 63271 ms
State: NPInitialized
Time: 152970 ms
State: NPActivated
Time: 152970 ms
State: NPInitialized - NPTxDisableT
Time: 221365 ms
    
```

At the bottom of the interface, a status bar indicates: "Analyzer mode changed to TARGET." and "Adapter Temperature: 40 °C Analyzer Temperature: 43 °C".

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 style="list-style-type: none"> • Management Interface • FEC • CDB • Control Signals • R/W • MSA Table • MSA Validation • VCC • Current • I2C • Scope Mode • State Machine Test 	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 style="list-style-type: none"> • Network Path State Machine • Detection of power spikes • Management interface host side • State machine tests host side • MSA Validation host side 	
V0.7		<ul style="list-style-type: none"> • Module Behavioral Model host side • Updated Module Emulation • Updated State Machine Tests • Changes in UI 	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



North America

47073 Warm Springs Blvd.,
Fremont, CA 94539, USA
+1 510 573 6388

Worldwide

Houmal Technology Park
Askarieh Main Road
Houmal, Lebanon
+961 81 794 455

UAE

Building 4WA, Office 420
Dubai Airport Freezone Authority,
Dubai, UAE
+971 4 548 7 547