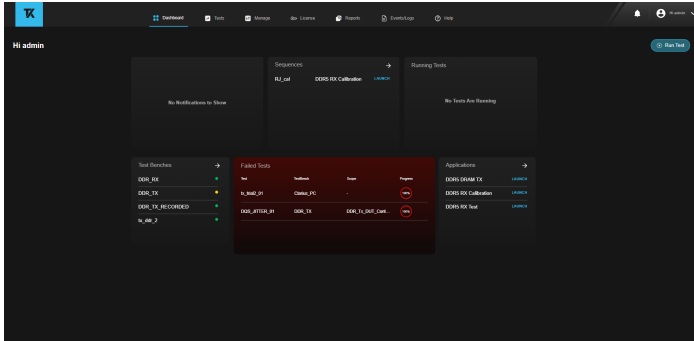


Clarius Compliance DDR5 DRAM Receiver Test Solution

Datasheet



The DDR (Dual Data Rate) is a dominant and fast-growing memory technology. It offers high data transfer rates required for virtual computing applications, from consumer products to the most powerful servers. The high speed of these signals requires high-performance measurement tools. The Tektronix Clarius compliance DDR5 DRAM Receiver solution is an automated test application used to validate and debug the DDR5 designs of the DUT (Device Under Test) as per the JEDEC specifications. The solution enables you to achieve new levels of productivity, efficiency, and measurement reliability.

The Clarius compliance is a new-generation compliance test automation software platform that offers a range of features and benefits as follows:

- High asset utilization and faster test times - Disaggregated architecture to offload analysis from the oscilloscope.
- Easy workflow integration – Leverage REST API's and SDK for faster automation.
- Unified user interface for all technology standards across Transmitter and Receiver.
- Integrated data management for results, reports, and waveforms in UI along with dashboard view.

Key features

- Supports measurements of DDR5 DRAM receiver tests as per JEDEC specifications:
 - DQ Voltage Sensitivity Test
 - DQS Volage Sensitivity Test
 - DQS Jitter Sensitivity Test
 - DQ Rx Stressed Eye Test
- Streamline test setup and remotely manage all instruments for simplified operation.
- Leverage pre-built loopback scripts, edit, or even use your own for specific DUT (Device Under Test) setups.
- Automate DUT configuration, calibration, and testing for increased efficiency.
 - Adaptive DFE optimization during the calibration.
 - Supports de-embedding for all measurements.

- Automated calibration/test of multiple data rates in a single run.
- Perform calibrations using Astek's PTF fixture and replica channel cards for flexible calibration and test setups.
- Simulate real-world channel impairments using external ISI channels for ultimate reliability.
- Gain immediate insights with clear, concise results – no BERT or DDR5 expertise is required.
- Perform comprehensive sweeps, generate bathtub plots, and analyze margins for in-depth optimization.
- Automate complex testing routines and recall them for consistent, time-saving execution.
- Supports single rank and dual rank devices.
- Enhanced debug capability for DUT initialization, Skip Loopback and pause before Phase change.
- BERT offset calibration for VRef DQ settings.
- Offset calculation methods support both the average offset across all phases and individual phase offset calculations.

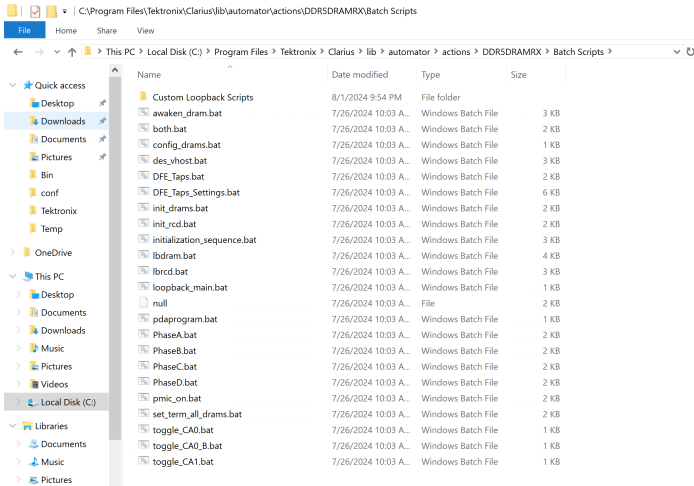
Effortless test setup

Simplified measurement setup

- User-friendly configuration options streamline the setup process for all receiver measurements.
- **Remote instrument control:** Remotely control all test instruments including *Anritsu's MP1900A BERT*, Astek's fixtures for simplified operation.
- **Automated DUT (Device Under Test) management:** The Clarius DDR5 DRAM Rx compliance software automatically programs your DUT into the appropriate loopback mode for each test by saving your valuable time.

Customizable loopback scripts

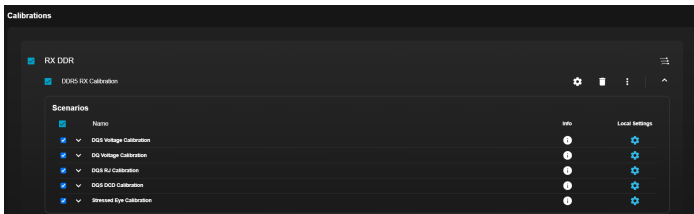
- **Pre-built script library:** Leverage our library of pre-configured loopback scripts to quickly match common DUT configurations. Save time and effort by starting with a tested foundation.
- **Effortless customization:** Easily modify these pre-built scripts to perfectly align with your specific DUT requirements.
- **Ultimate control:** For highly specialized DUTs, take full control by loading and running your custom loopback scripts within the Clarius DDR5 DRAM Rx compliance framework.



Custom loopback scripts

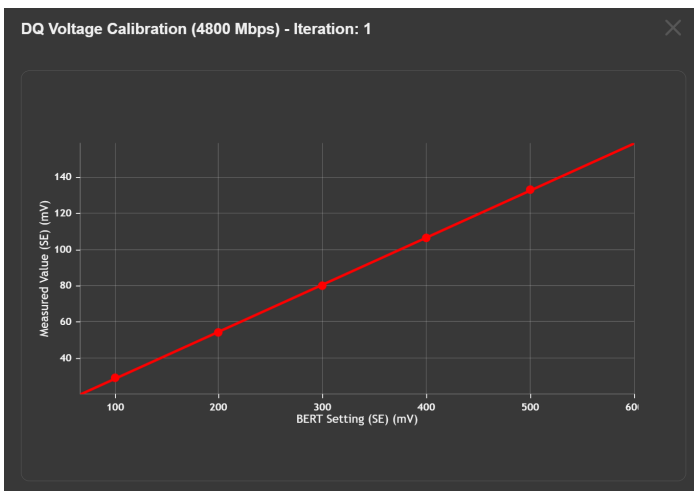
Seamless calibrations

The Clarius DDR5 DRAM Rx compliance solution streamlines the calibration process, ensuring efficient and accurate testing. **Automated calibration procedures** guide you through the setup for both Astek's PTF fixture and replica channel cards.



DDR5 DRAM Rx Calibration

Calibration results are conveniently stored within the software, readily accessible for current and future DDR5 receiver DUT testing.



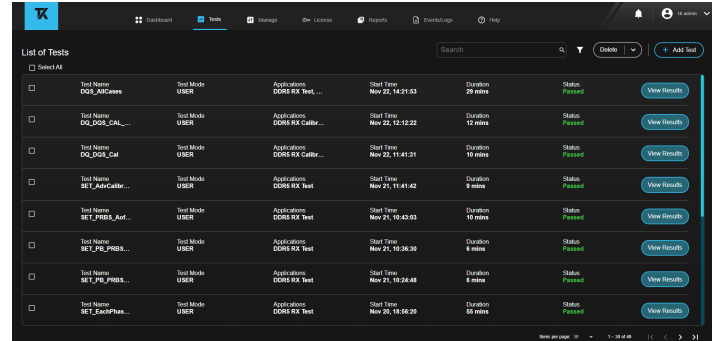
DQ Voltage Calibration plot

DDR5 DRAM RX Tests

The Clarius DDR5 DRAM Rx solution streamlines the compliance testing process for DDR5 systems and devices, empowering user to achieve faster time-to-market with several innovative features.

Experience a user-friendly, step-by-step interface that accelerates test setup. Effortlessly configure key settings such as data rate, calibration, and test in a single intuitive global configuration window.

The interface groups tests logically by category like DQS Voltage sensitivity, DQ voltage sensitivity, DQS Jitter sensitivity and Stressed eye test and allows for individual test selection.

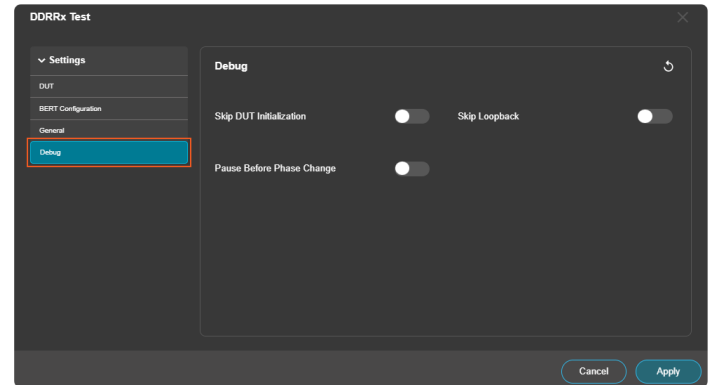


List of Tests

DUT (Device Under Test) Initialization: This option allows the user to enable/disable the Skip DUT Initialization. When enabled, it Pauses test execution for the user to manually initialize the DUT and continues with Loopback and tests.

Skip Loopback: This option allows the user to enable/disable the Skip Loopback. When enabled, it Pauses test execution for the user to manually put DUT into Loopback and continues with tests.

Pause Before Phase Change: This option allows the user to enable/disable the Pause Before Phase Change. When enabled, it Pauses test execution before running each phase.

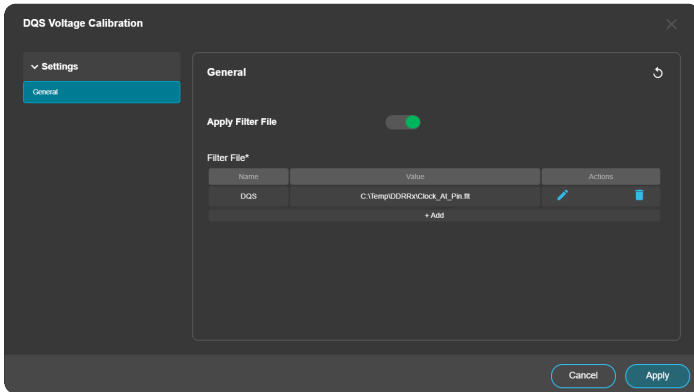


DRAM RX Debug

Embed and De-embed filters

The Clarius DDR5 DRAM Rx compliance solution simplifies de-embedding filter management, allowing you to incorporate filter files (created by Tektronix's SDLA software) to account for PCB trace, package model, cable, and a portion

of the PTF trace. This ensures the most accurate characterization of your DDR receivers, delivering reliable results for confident decision-making.



De-embedded filters

Specifications

Results and Report

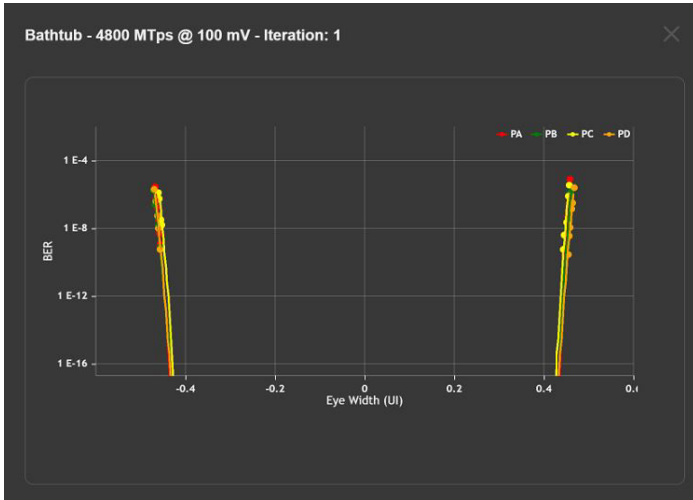
The Carius DDR5 DRAM Rx compliance solution simplifies result analysis, saving your valuable time and effort.

Automated configuration: The software automatically applies the correct measurement configurations and JEDEC pass/fail limits based on your chosen memory specification and speed grade.

Clear & Concise results: Gain immediate insights with easy-to-understand measurement results; no specialized BERT or DDR5 expertise is required.

Actionable insights at a glance: Quickly visualize performance through comprehensive graphical reports, including bathtub and sweep curves.

Detailed documentation: Generate in-depth reports with all plots, data tables, and relevant information for clear documentation and analysis.



Stressed Eye - Bathtub curve

Tektronix

Clarius DDR5 RX Calibration Report			
Test Information			
Test Name	SDK_BGN5-17801	Scope Model Number	DPO73304DX
Calibration Fixture	CTC2 + Parametric Test Card	Scope Serial Number	B260189
Date/Time	2024-11-19, 06:31:09	SPC; Factory Calibration	PASS
Overall Test Result	PASSED	Scope F/W Version	10.14.1 Build 20
Overall Execution Time	00:56:29	Clarius Version	2.0.0-master.819
Execution Mode	LIVE	App Version	1.1.0
DQ Lane	DQL3	BERT Manufacturer	ANRITSU
BERT Model	MP1900A	BERT Series Number	6272521788
BERT F/W Version	10.03.04		
Additional Comments	Stressed Eye Cal for DDR5-3200 data rate for Golden Reference Channel 1		

Summary Of Results			
Total Measurements Executed	5	Skipped	0
Pass	5	Errors	0
Fail	0		

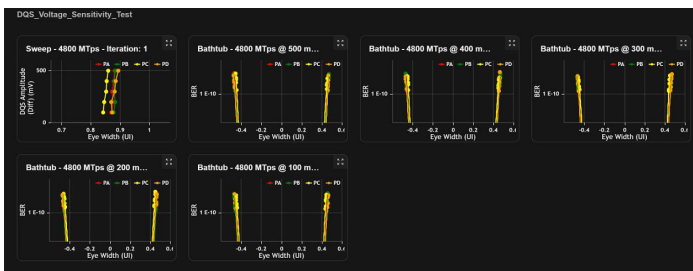
Test Summary	
Test Name	Status
Vswing Calibration	Completed
Vnoise Calibration	Completed
SJ Calibration	Completed
RJ Calibration	Completed
Stressed Eye Convergence	Completed

Measurement report

Advanced analysis and margin optimization

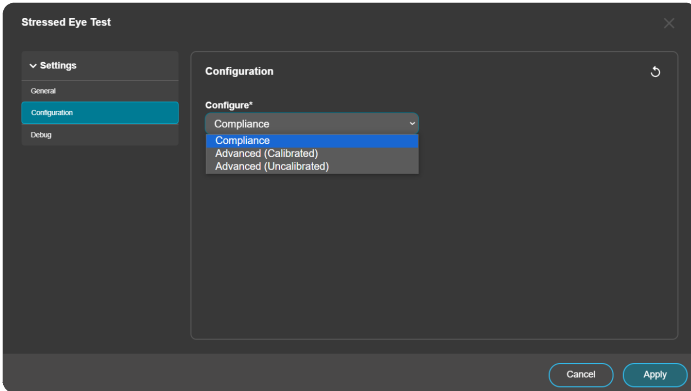
The Clarius DDR5 DRAM Rx compliance solution empowers you to go beyond basic compliance testing and unearth valuable insights for optimizing your designs.

Advanced analysis: Leverage our **advanced mode** for comprehensive parameter sweeps on all measurements, including stressed eye testing. Generate insightful bathtub plots to pinpoint issues and identify areas for margin improvements.



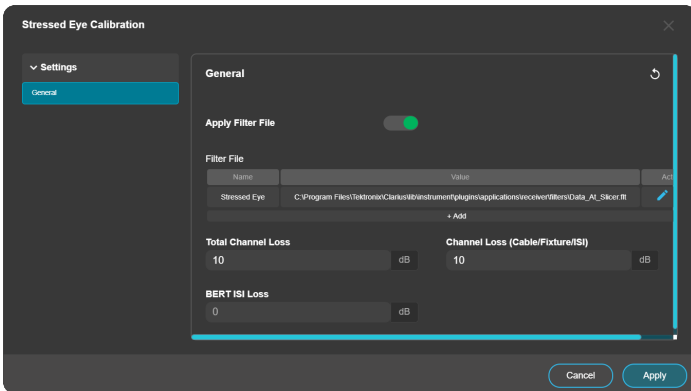
Bathtub plot for sweep amplitude

Seamless switching: Effortlessly switch between compliance and advanced modes within the same application, allowing you to efficiently perform standard testing and in-depth analysis as needed.



Configuration: Advanced mode

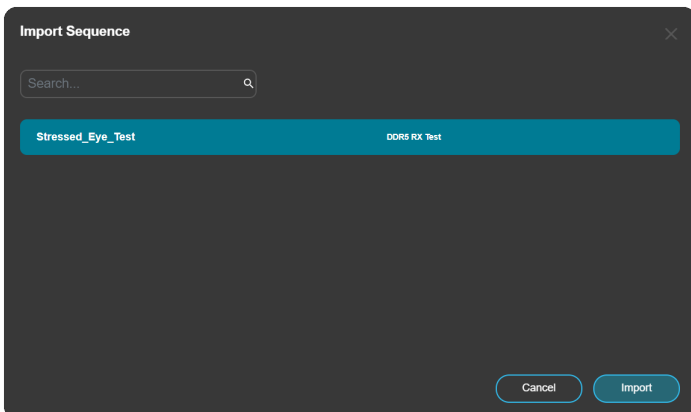
Real-world margin analysis: Take your testing a step further by incorporating external ISI channels. This simulates real-world channel impairments, providing a more accurate assessment of receiver margins for ultimate reliability.



Stressed eye calibration: ISI channels

Import sequence

Save time and effort by creating reusable sequences that automate complex testing routines. Run receiver calibration and tests at various data rates, all in one go. Simply recall the sequence whenever needed, streamlining your testing process, and ensuring consistency.



Import sequence

Ordering information

Hardware requirements

Item	Description	Quantity	Type	Vendor	Requirement
DPO72304DX or MSO72304DX or DPO72304SX	Real Time Oscilloscope with Bandwidth \geq 23 GHz, Windows 10 OS	1	Equipment	Tektronix	Required
Bit Error Rate Tester (BERT)	MP1900A	1	Equipment	Anritsu	Required
3 Channel Programmable Power Supply for powering fixtures	2230-30-3	1	Equipment	Keithley	Required
Host PC or Laptop	Refer to system requirements for configuration	-	PC or Laptop	-	Required
USB Vector Network Analyzer, 1 MHz - 8 GHz	MS46122B	1	Equipment	Anritsu	Recommended

Test fixtures and accessories

Item	Description	Quantity	Type	Vendor	Requirement
CTC2 Test Fixture	A9-CTC2-01	1	Fixture	Astek	Required
Parametric Test Fixture (PTF) for calibration	A9-DIMM5-01	1	Fixture	Astek	Required
Astek Reset Automation Kit	A9-AUTO-01	1	Fixture	Astek	Required
DDR5 Replica Channel Card	A9-RPLC-01	1	Fixture	Astek	Required
SMA-SMA, 1-meter, phase matched cable pair	PMCABLE1M	4	Accessory	Tektronix	Required
SMA-SMP adaptor, right angle (pair)	174-6657-01	4	Accessory	Tektronix	Required
ISI board	J1800A/J1758A	1	Fixture	Anritsu	Optional
Precision Fixed Attenuator, 41 Series, DC to 26.5 GHz, 6 dB attenuation	41KC-6	3	Accessory	Antirsu	Required

Software requirements

Compliance

Item	Description	Quantity	Type	Vendor	Requirement
Clarius compliance DDR5 DRAM Rx software. Refer to License options.	DDR5 DRAM RX	1	Option	Tektronix	Required

Debug

Item	Description	Quantity	Type	Vendor	Requirement
Serial Data Link Analysis for Windows 64-bit oscilloscopes.	SDLA64	1	Option	Tektronix	Required
DPOJET Jitter Analysis.	DJA	1	Option	Tektronix	Required

System requirements

The following table shows the minimum system requirements to install and run the Clarius compliance DDR5 Rx.

Pre-requisites	Recommended requirements
Operating system	<ul style="list-style-type: none"> Windows 10 Enterprise and Pro (version 21H1 and above) or Windows 11 Enterprise and Pro (version 21H2 and above) Language: English (United States) only.
CPU cores	16
RAM	64 GB
Disk space	300 GB HDD/SSD of free disk space
Internet speed	≥ 50 Mbps
Browser	Google Chrome or Microsoft Edge
Additional software	<ul style="list-style-type: none"> Python 3.12.x ¹ BERT Firmware version MX190000A_VER_10_01_02 or above.

License options

Clarius DDR5 DRAM Rx software options

License terms	License option	Description
Subscription	AT-DDR5-Rx-NS1	Clarius DDR5 Rx Automation; Node-locked, Subscription, 1 Year
	AT-DDR5-Rx-NS3	Clarius DDR5 Rx Automation; Node-locked, Subscription, 3 Years
	AT-DDR5-Rx-FS1	Clarius DDR5 Rx Automation; Floating, Subscription, 1 Year
	AT-DDR5-Rx-FS3	Clarius DDR5 Rx Automation; Floating, Subscription, 3 Years



Tektronix is ISO 14001:2015 and ISO 9001:2015 certified by DEKRA.

¹ Python installation is required for Clarius SDK automation only.

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* European toll-free number. If not accessible, call: +41 52 675 3777

For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit www.tek.com.

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