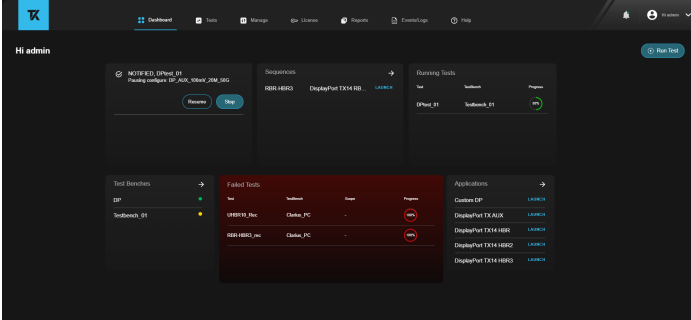


# Clarius Compliance DisplayPort 2.1 Transmitter Test Solution Datasheet



Tektronix provides the most comprehensive solution to serve the need of engineers designing DisplayPort silicon for computer systems and embedded systems, as well as for those who are validating the physical-layer compliance of DisplayPort devices as per the DisplayPort 2.1 compliance Test Specification.

The Tektronix DisplayPort application is compatible with Tektronix DPO/MSO 70000 DX/SX Series oscilloscopes that are designed to meet the challenges of the next generation of display standards.

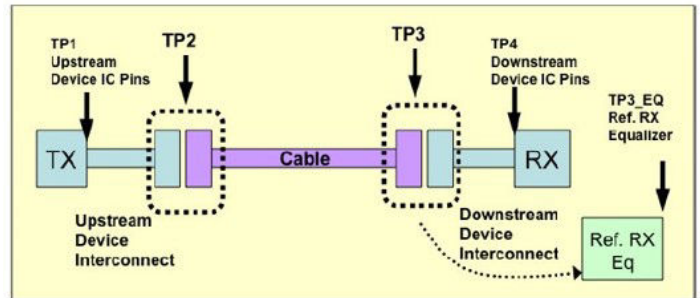
The Clarius compliance platform is a new-generation compliance test automation software platform. The platform offers a range of features and benefits, including:

- Higher asset utilization and faster test times: disaggregated architecture to offload analysis from the oscilloscope.
- Easy workflow integration: leverage REST APIs and SDK for faster automation.
- Integrated data management for results, reports, and waveforms in UI along with dashboard view.

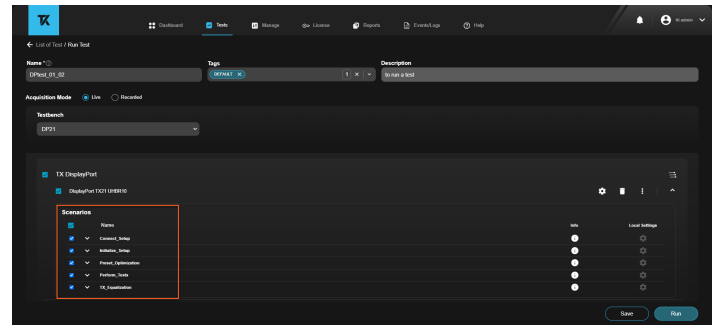
## Key features

- Complete compliance testing of data rates UHBR10, UHBR13.5, and UHBR20 for Display Port 2.1 source devices (Enhanced DP, mDP, and Type-C connectors)
- Supports preset optimization feature to find out separate optimal presets for TP2 and TP3\_EQ Test points for individual data rates
- Supports TX Preset Equalization tests for all data rates
- Supports normative and informative measurements that are mentioned in DisplayPort 2.1 CTS
- Analyze multiple data rates and multiple presets at TP2 and TP3 EQ test points for multiple lanes in one go
- Supports DUT toggle automation using Unigraf UCD-323 device
- Supports P7625 and P7633 differential probes
- Fixture De-embedding in differential and single-ended mode by creating a custom filter file using SDLA software to leverage the channel modelling and receiver equalization functionality
- Support Display Port 2.1 compliance test execution on the best preset as well as all selected presets

- Supports signal validation option to detect anomalies in the signal before analysis
- Supports offline analysis of the saved waveforms in Pre-recorded mode
- Provides a consolidated report for all tests in .pdf, and .csv formats
- Support for non-standard data rates: beyond RBR, HBR, and UHBR.



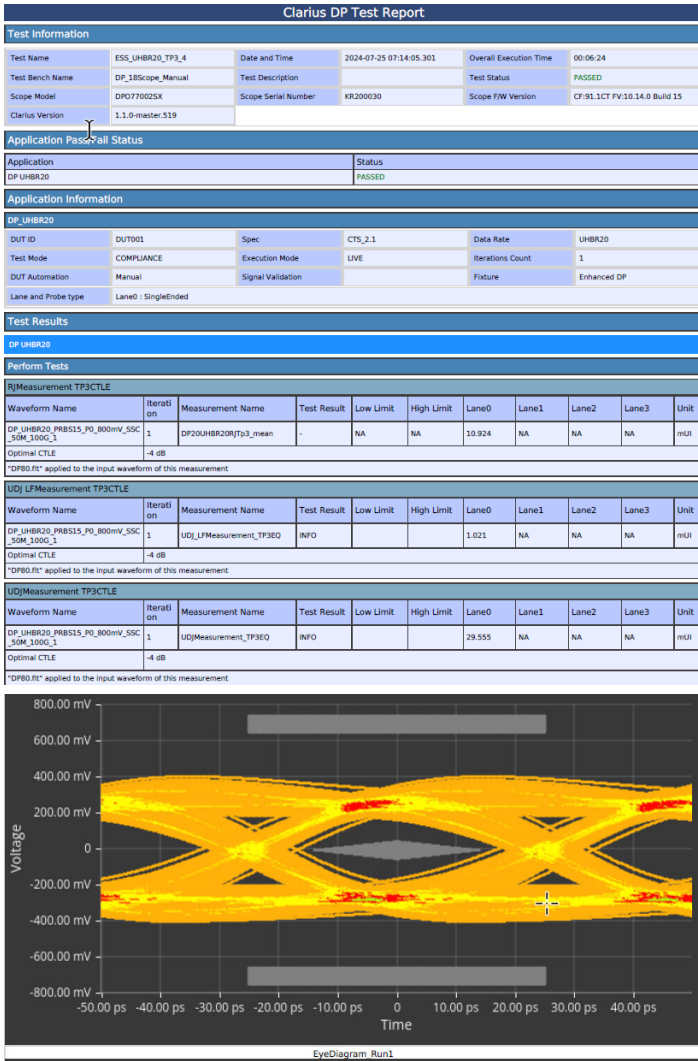
DisplayPort 2.1



## DisplayPort 2.1 compliance testing

DisplayPort sources (transmitters) have state control requirements in order to transmit the data patterns and signal properties required to demonstrate conformance as per the compliance test specification. The following properties and patterns need to be transmitted for full measurement coverage:

- Bit rates: UHBR10, UHBR13.5, and UHBR20
- Data patterns: PRBS15, PRBS31, and SQ128
- Preset: 16 presets as defined
- Output levels: 800 mV
- SSC (spread spectrum): On/Off



Clarius DisplayPort 2.1 Test report

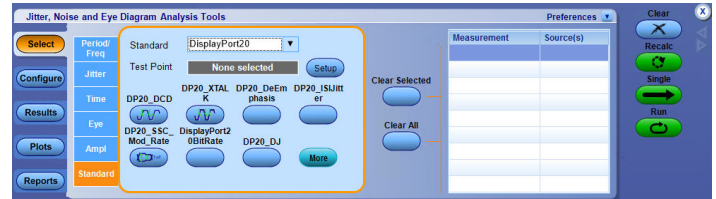
## Compliance to characterization support

DisplayPort 2.1 Compliance and Debug can be used to characterize a DUT and analyze its finer behavior. It serves as an analysis tool when the DUT fails any portion of the compliance tests or you want to take a deeper look into the failures. All the compliance tests which are supported in the application and requires a single acquisition are supported in this package. You can build automation scripts around these measurements to setup a custom test environment. The DisplayPort 2.0 DPOJET solution also supports all measurement for lower data rates for example, RBR, HBR, HBR2, and HBR3.

You can enable this package by running DisplayPort 2.0 from the **Oscilloscope** → **Analyze** menu. The DisplayPort 2.0 DPOJET measurement library helps in characterizing the silicon. Other advantage of this library is the ability to debug the measurement in case of failures. If any of the tests fail during compliance testing, you can tap into the DPOJET DisplayPort measurement library for a deeper dive into the failures such as eye diagram mask hit failures and look at relation between pre-emphasis level vs voltage swing tests to perform root cause analysis. The solution also gives users the flexibility to configure measurements with different settings, make configuration changes in existing

measurements on the fly, and run tests in singleshot or free-run repetitive modes.

DisplayPort 2.0 DPOJET solution comes with setup files. All measurements corresponding to a data rate and a particular pattern are clubbed in a single setup file. Setup files for lower data rates e.g. RBR, HBR, HBR2, and HBR3 are also included. Setup file helps to avoid any manual mistakes while configuring a measurement. This ensures that a non-expert user can also use the debug solution and validate the results.



DPOJET Display Port

## SDLA features

SDLA enables the user to probe and visualize data at the required location (de-embed / embed) using virtual probing through test points. It can remove (de-embed) the effects of the cables, probes, and fixtures to get more accurate measurement results. It can embed user defined channel models to simulate the signal at the end of the link. It can also be used to open a closed eye using receiver equalization, Continuous Time Linear Equalizer (CTLE), Decision Feedback (DFE), or Feed Forward Equalization (FFE). SDLA also has advanced analysis and modeling capabilities. One can view and measure multiple test points using DPOJET Jitter and Eye analysis comprehensive frequency and time domain plots, enable quick verification of S-parameters and test point transfer functions.

For DisplayPort 2.1, SDLA has been enhanced to provide the flexibility of choosing the optimal CTLE. To calculate optimal CTLE based on Eye Area, SDLA selects the appropriate DisplayPort standard from the CTLE dropdown menu and runs the configuration from 0 dB to -9 dB. Optimal CTLE waveforms gets loaded on the oscilloscope and can be configured.

## Specifications

### Proposed measurements

List of supported measurements as per DisplayPort 2.1

List of supported UHBR10, UHBR13.5 and UHBR20 measurements

UHBR10, UHBR13.5 and UHBR20
SSCPhaseDeviation_TP2
SSCDownSpreadRate_TP2
SSCDownSpreadRange_TP2
SSCSlewRate_TP2
UIMeasurement_TP2
BitRateMeasurement_TP2
ACCommonModeMeasurement_TP2
EyeHeightMeasurement_TP2
EyeWidthMeasurement_TP2
TotalJitter_TP2
UJMeasurement_TP2
DDJMeasurement_TP2
UDJMeasurement_TP2
UDJ_LFMeasurement_TP2
RJMeasurement_TP2
EyeHeightMeasurement_TP3EQ
EyeWidthMeasurement_TP3EQ
TotalJitter_TP3EQ
UJMeasurement_TP3EQ
DDJMeasurement_TP3EQ
UDJMeasurement_TP3EQ
UDJ_LFMeasurement_TP3EQ
RJMeasurement_TP3EQ

List of supported Custom measurements

Custom
TotatlJitter_TP2
TotatlJitter_TP2
RJMeasurement_TP2
RJDDMeasurement_TP2
UJMeasurement_TP2
DJMeasurement_TP2
DJDDMeasurement_TP2
DDJMeasurement_TP2
UDJMeasurement_TP2
UDJ_LFMeasurement_TP2
Table continued...

Custom
EyeDiagram_TP2
EyeHeightAtCenterMeasurement_TP2
EyeHeightMaxMeasurement_TP2
EyeWidthCIOMeasurement_TP2
EyeWidthMeasurement_TP2
UIMeasurement_TP2
BitRateMeasurement_TP2
VTXDifffPP_TP2
VTXDCCM_TP2
VTXACCM_TP2
LinkRate_TP2
LinkRateTolerance_TP2
ACCommonModeMeasurement_TP2
SSCPhaseDeviation_TP2
SSCDownSpreadRate_TP2
SSCDownSpreadRange_TP2
SSCSlewRate_TP2
EyeHeightAtCenterMeasurement_TP3EQ
EyeHeightMaxCenterMeasurement_TP3EQ
EyeWidthMeasurement_TP3EQ
EyeWidthCIOMeasurement_TP3EQ
TotalJitter_TP3EQ
UJMeasurement_TP3EQ
DDJMeasurement_TP3EQ
UDJMeasurement_TP3EQ
RJMeasurement_TP3EQ
RJDDMeasurement_TP3EQ
RiseTime_TP2
FallTime_TP2
IntraPairSkew_TP2
VTX-DEEMP-PRE1-RATIO
VTX-DEEMP-POST1-RATIO
EyeMedianToMaxJitter_TP2
DCDMeasurement_TP2
F/2Measurement_TP2
EyeHeightAtCenterMeasurement_TP3EQ
EyeHeightMaxMeasurement_TP3EQ
EyeWidthMeasurement_TP3EQ
EyeWidthCIOMeasurement_TP3EQ
TLFPS
Table continued...

Custom
TLFPS_CYCLE
TSILENCE
VTX-DIFF-SLEEP
VTX-CM-SLEEP-ACTIVE-DELTA
VTX-AC-CM-LFPS
VTX-LFPS-PP
TTX-RISETIME-LFPS
TTX-FALLTIME-LFPS
LFPS_DUTY_CYCLE

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## Ordering Information

### Hardware requirements

Item		Vender	Quantity
Tektronix Digital Phosphor Oscilloscope (DPO) or Mixed Signal Oscilloscope (MSO) Oscilloscopes – 23 GHz and above)	DPO/MSO70000 SX/DX	Tektronix	1
Wilder USB4 Tx plug fixture	USB4-TPA-HS-TxP	Wilder	1
Standard Enhanced DisplayPort 2.1 Plug fixture	ENH-DP-TPA-P	Wilder	1
HDMI & DisplayPort 4K Video Generator & Analyzer	UCD323	Unigraf	1
Cable pair; 2.92 mm to 2.92 mm, Straight, 1.5 ps phase-matched, 1 - meter	PMCABLE1M	Tektronix	1 to 4
25 GHz or 33 GHz active differential probes	P7625 or P7633 Probes	Tektronix	1 to 4
Probe adapters for 2.92 mm cables	P76CA-292 or P76CA-292C or P76CA-SMP or P76TA	Tektronix	1 to 4

### Host System Pre requisite

Item	Description	Vender	Quantity
Host PC/ Laptop	Refer to the <a href="#">system requirements</a> details	Multiple	1

### System requirements

Prerequisites	Recommended requirements
Operating system	Windows 10 Enterprise and Pro (version 21H1 and above) or Windows 11 Enterprise and Pro (version 21H2 and above) <b>Language:</b> English (United States) only
CPU cores	16
RAM	64 GB
Disk space	300 GB HDD/SSD of free disk space
Network speed	1 Gbps
Browser	Google chrome or Microsoft edge
Additional software	<ul style="list-style-type: none"> <li>Python 3.12.x<sup>1</sup></li> <li>MATLAB compiler runtime 9.11</li> <li>Unigraf UCD-323 for all DisplayPort datarate testing</li> </ul>

## Software requirements

### Compliance

Item	Description	Vendor	Quantity
Clarius Display Port 2.1 Tx Compliance Test Application	Refer to the <a href="#">license options</a>	Tektronix	1

<sup>1</sup> Python installation is required for Clarius SDK and DUT control automator.

**Debug**

Item	Description	Vendor	Quantity
Jitter & Eye Diagram software	DJA <sup>2</sup>	Tektronix	1
Serial data link analysis software	SDLA	Tektronix	1

**License options**

Subscription options	
AT-DP21-TX-NS1	1 Year, Node-Locked
AT-DP21-TX-NS3	3 Years, Node-Locked
AT-DP21-TX-FS1	1 Year, Floating
AT-DP21-TX-FS3	3 Year, Floating



**Note:** License can be used for the duration of subscription term.

**License types:**

- Node-Locked: Tied to a specific computer.
- Floating: License can be moved from one computer to another to share between labs/geography.

<sup>2</sup> Contact Tektronix for DJA DisplayPort debug plugin



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

ASEAN / Australasia (65) 6356 3900  
Belgium 00800 2255 4835\*  
Central East Europe and the Baltics +41 52 675 3777  
Finland +41 52 675 3777  
Hong Kong 400 820 5835  
Japan 81 (120) 441 046  
Middle East, Asia, and North Africa +41 52 675 3777  
People's Republic of China 400 820 5835  
Republic of Korea +82 2 565 1455  
Spain 00800 2255 4835\*  
Taiwan 886 (2) 2656 6688

Austria 00800 2255 4835\*  
Brazil +55 (11) 3759 7627  
Central Europe & Greece +41 52 675 3777  
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Luxembourg +41 52 675 3777  
The Netherlands 00800 2255 4835\*  
Poland +41 52 675 3777  
Russia & CIS +7 (495) 6647564  
Sweden 00800 2255 4835\*  
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Balkans, Israel, South Africa and other ISE Countries +41 52 675 3777  
Canada 1 800 833 9200  
Denmark +45 80 88 1401  
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South Africa +41 52 675 3777  
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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](http://www.tek.com).

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