quantumdata Product Family
980 48G Video Analyzer/Generator Product Overview

March – 2021

TELEDYNE LECROY
Everywhereyoulook™

980 Test System showing 48G Protocol Analyzer/ Video Generator module for HDMI 2.1 Testing

quantumdata Product Family…Our Mission:

Help silicon and product developers bring their next-generation video solutions to market—faster, without interoperability problems and at reduced cost

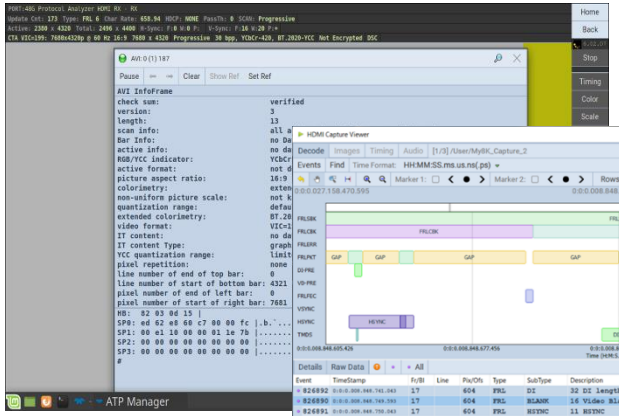
Our solutions quicken Time-to-Insight

TIME TO INSIGHT™

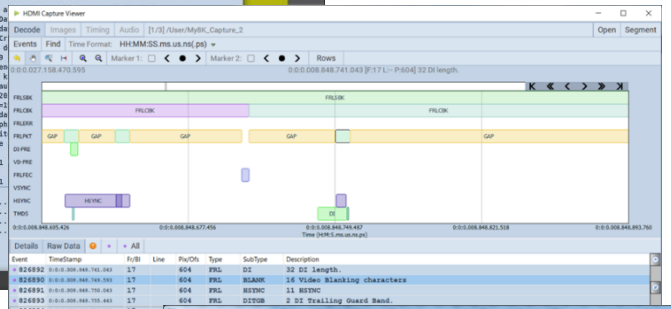
What is Time-to-Insight?

TIME TO INSIGHT™

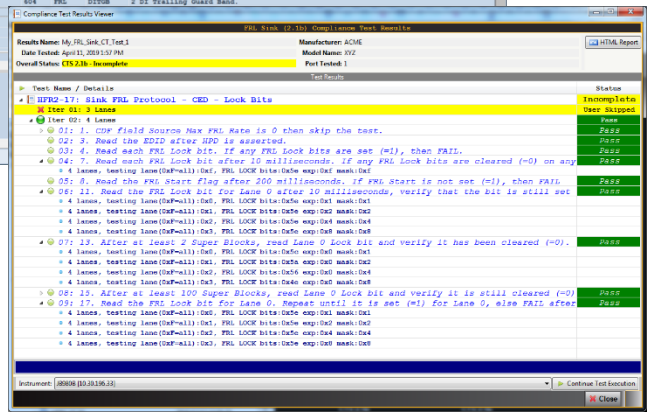
- Time-to-Insight **saves time and money**. It involves the following:
  - **Quick Insight:** Provides at-a-glance information—insight—into the basic functioning of an HDMI video device or system.
  - **Deep Insight:** Provides full visibility—insight—into the low level protocol to verify the proper functioning of an HDMI device to improve interoperability.
  - **Compliance Tests:** Provides required test suites for HDMI, Logo program.



Quick Insight



Deep Insight



Compliance

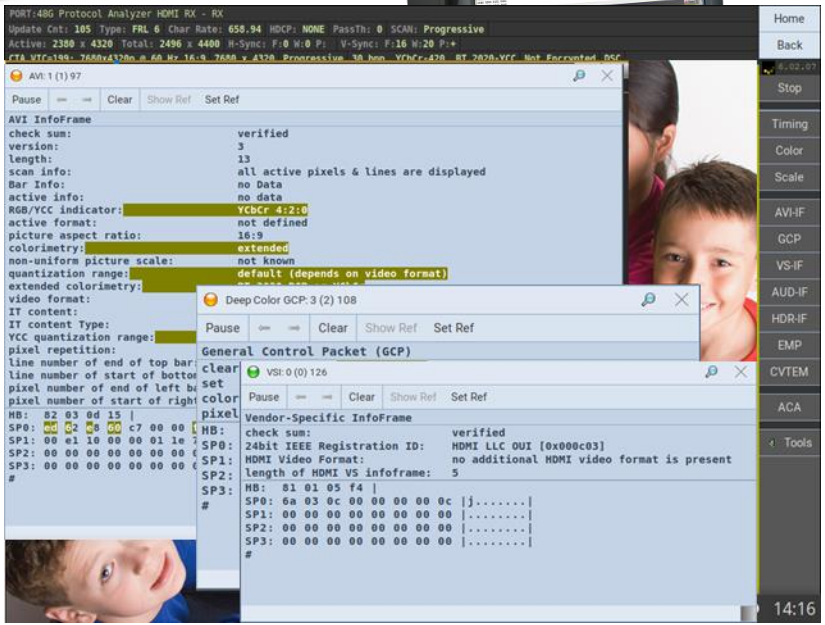
Quick Insight

TIME TO INSIGHT™

- Quick Insight Solutions Include:
  - Real Time analysis views of incoming videos streams.
  - Essential status information on dashboards, and status panels.
  - Device emulation of sources and sinks (displays).
- A Few Examples:
  - HDMI Real Time view w/ status bar at top. Shows incoming video and metadata from a source device.→
  - DisplayPort link training control & status with connected display.→
  - HDMI EDID and SCDC data view of connected sink device.→

HDMI 2.1 source development board

980B w/ 48G HDMI Protocol Analyzer / Video Generator module



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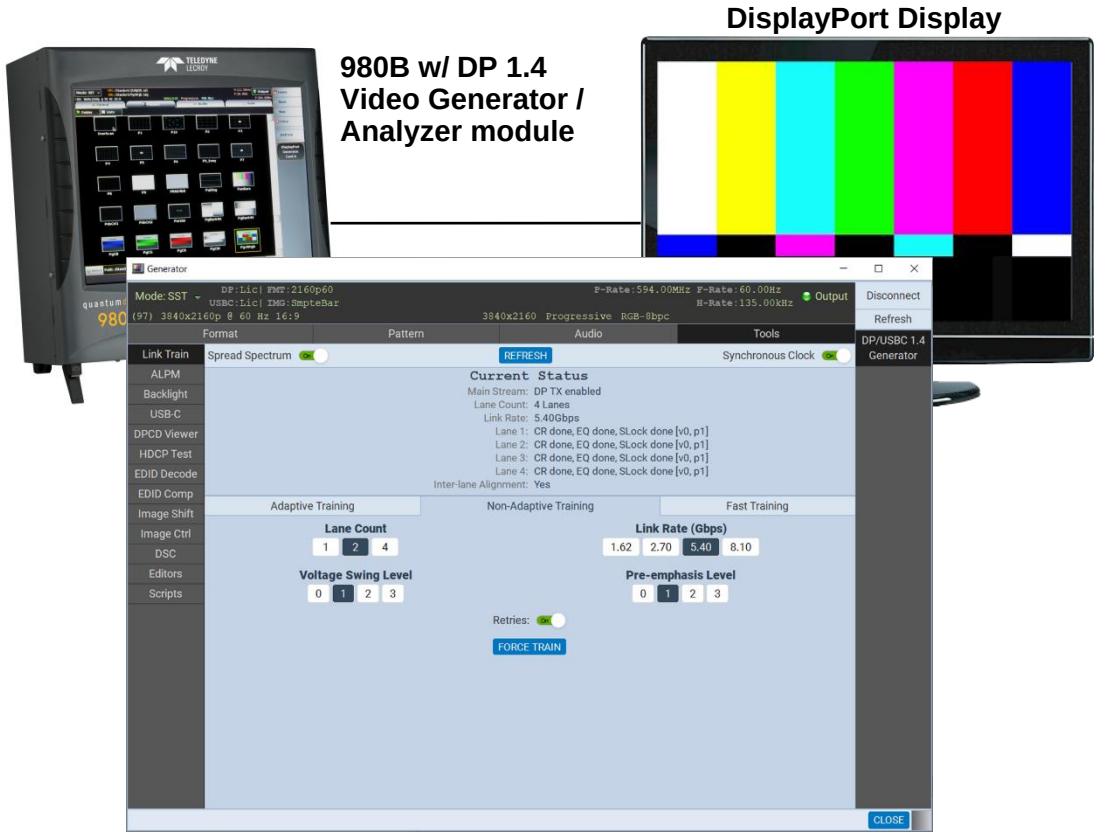

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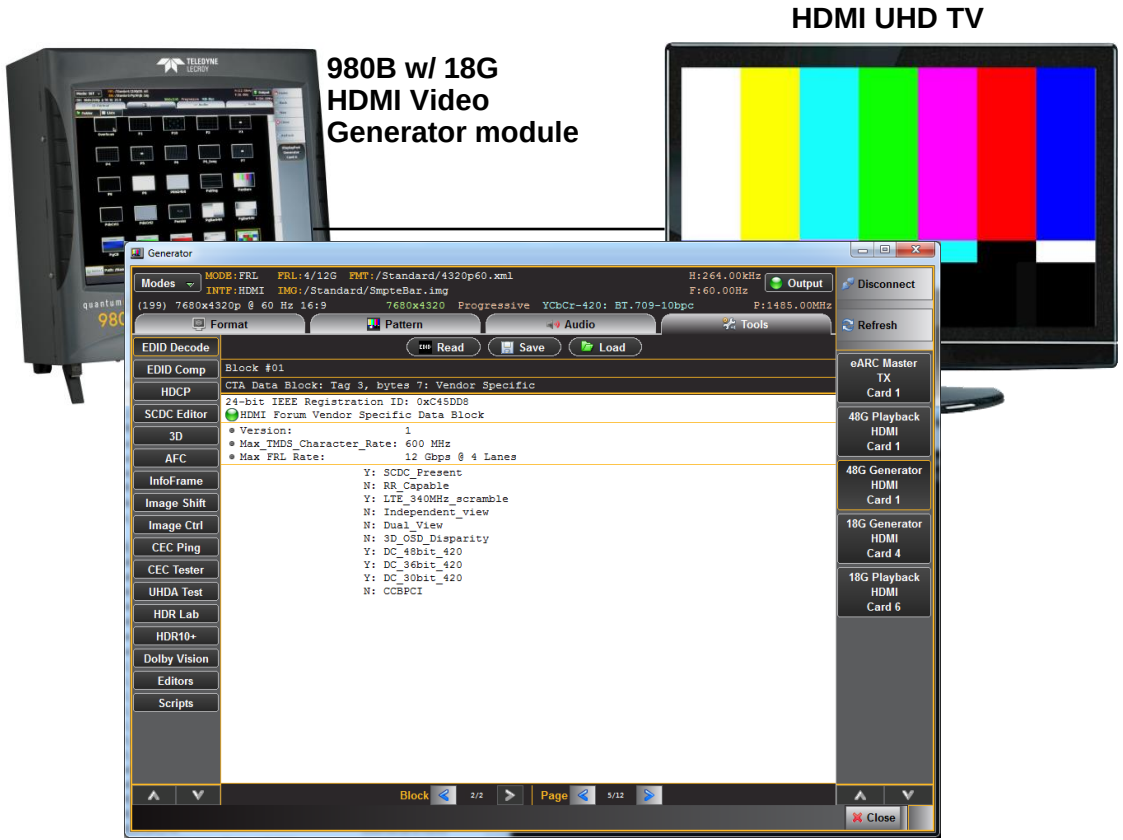
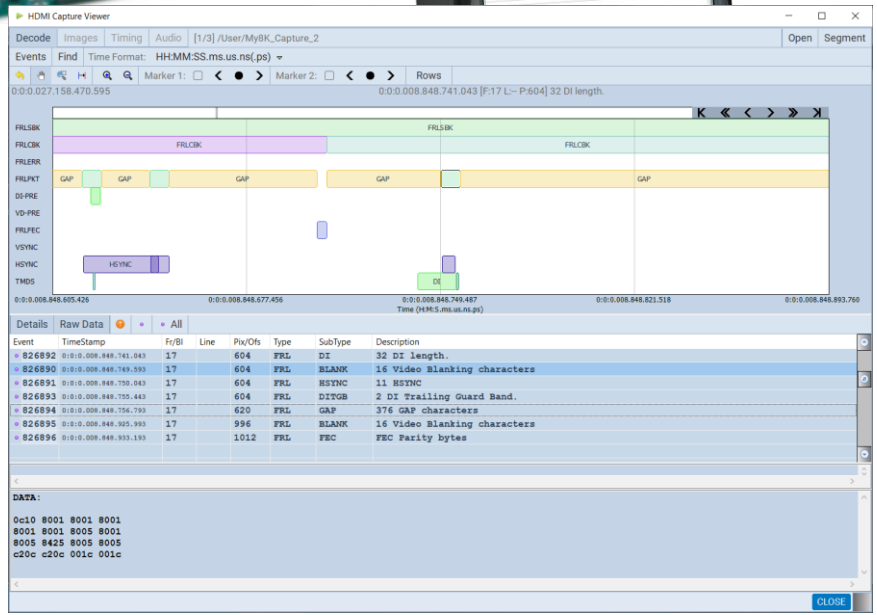


Deep Insight

- Deep Insight offers:
  - In depth analysis of the low level protocol operation over the main video transmission link.
  - Analysis of connection sequence protocol transactions over the auxiliary channel.
- A Few Examples:
  - HDMI capture & analysis of HDMI 2.1 Fixed Rate Link (FRL) transmission providing full visibility into the FRL and TMDS protocol stream.→
  - DisplayPort 1.4 capture & analysis of 8.1Gb/s main stream.→
  - Analysis of HDMI 2.1 FRL Link Training transactions.→

HDMI 2.1 source development board

980B w/ 48G HDMI Protocol Analyzer / Video Generator module



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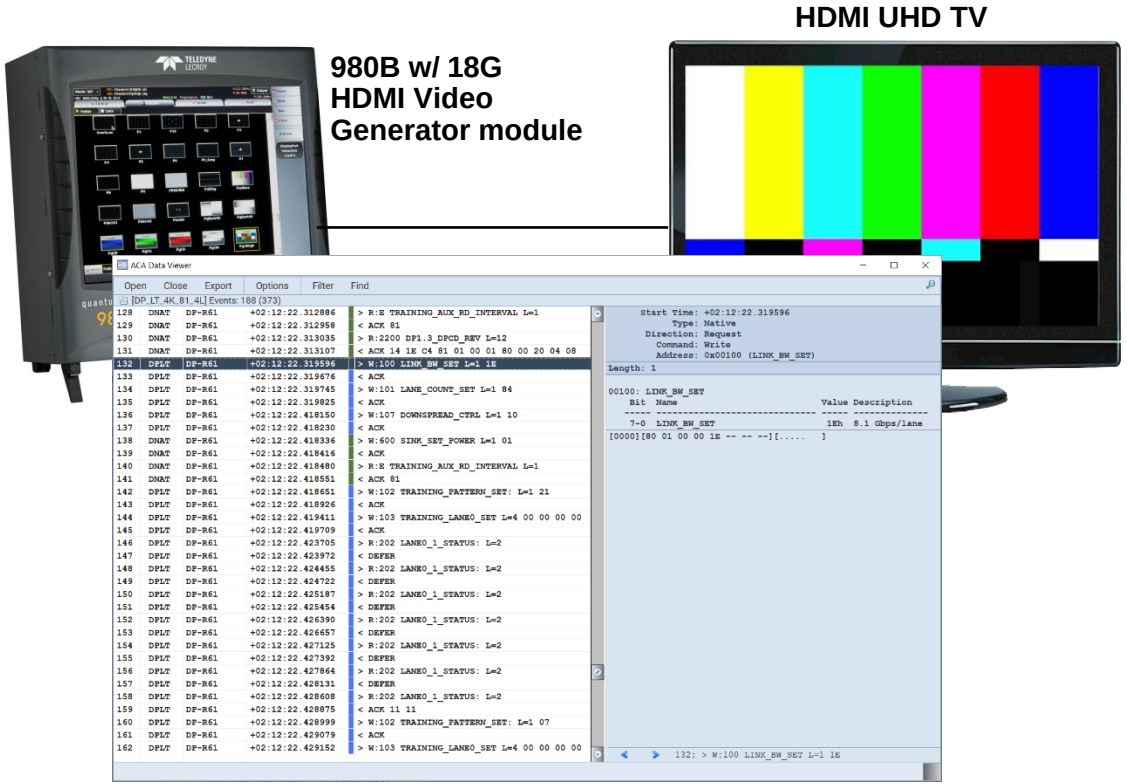

Deep Insight – Example 1

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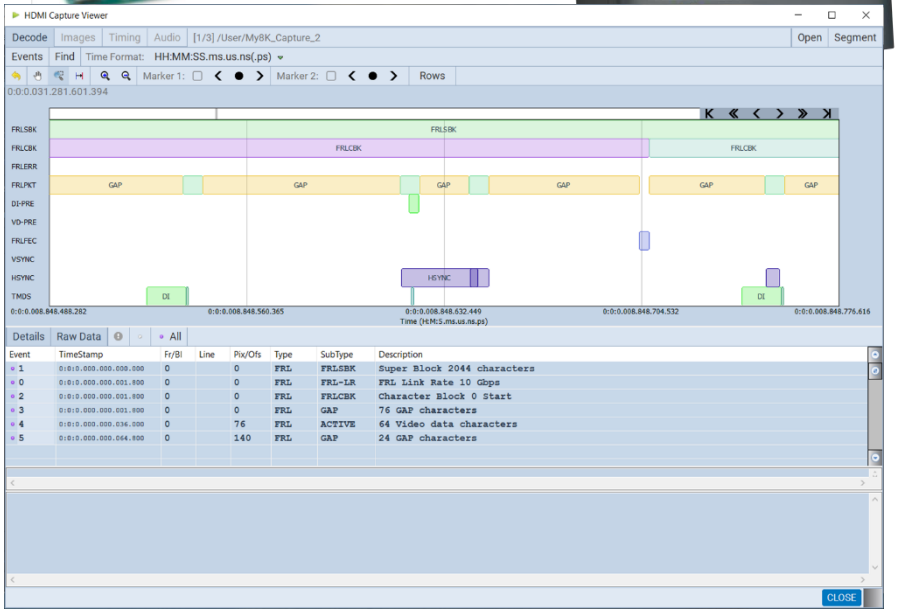
HDMI 2.1 source development board

980B w/ 48G HDMI Protocol Analyzer / Video Generator module



Deep Insight – Example 2

TIME TO INSIGHT™

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- A Few Examples:
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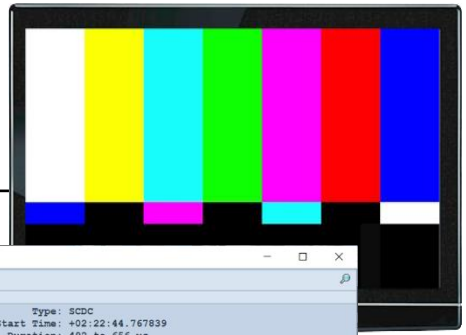
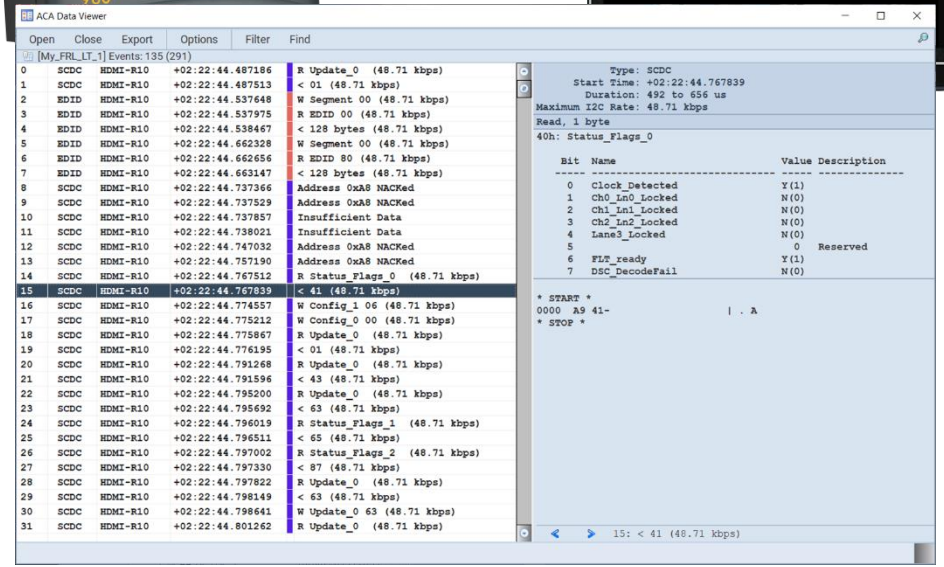
980B w/ 48G HDMI Protocol Analyzer/ Video Generator module

HDMI UHD TV

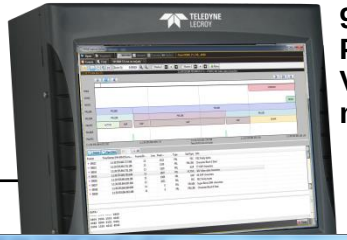




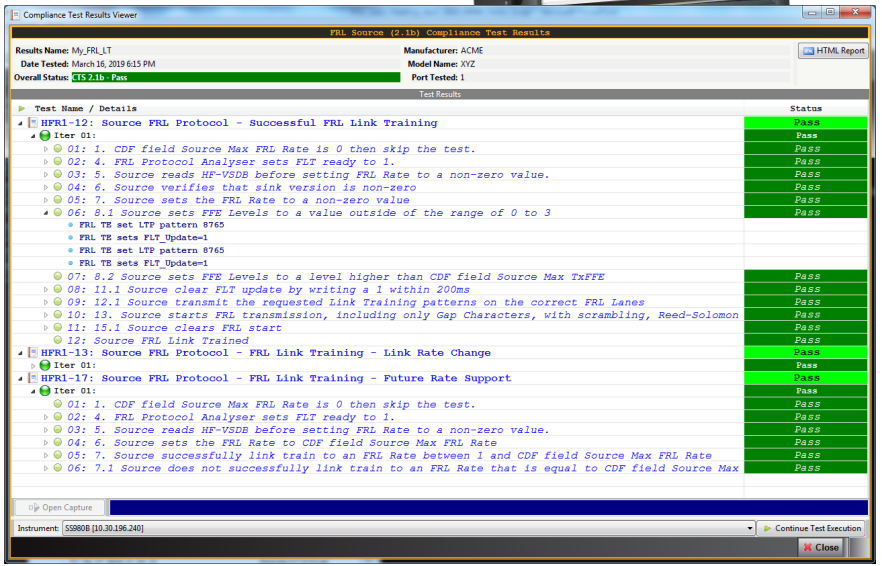
Compliance Testing

- Compliance Testing Provides:
  - Required test suites to obtain industry logo.
  - Detailed test results and logs that provide insight into the cause of failures.
- A Few Examples:
  - HDMI 2.1 Fixed Rate Link (FRL) source compliance test suite.→
  - DisplayPort 1.4 sink compliance for Display Stream Compression (DSC).→
  - HDCP 2.2 compliance for HDMI source devices.→

HDMI 2.1 source development board



980B w/ 48G HDMI Protocol Analyzer / Video Generator module



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980B w/ 48G module
Video Generator / Analyzer module

DP DSC Display

Compliance Test Results Viewer

DP 1.4a DSC Sink (R1.0) Compliance Test Results

Results Name: DSC_sink_test
Date Tested: May 21, 2019 4:26 PM
Overall Status: CTS R1.0 - Pass
Manufacturer:
Model Name:
Port Tested: 1
HTML Report

Test Results

Test Name / Details	Status
5.6.1.1: DSC capability verification	Pass
Iter 01:	Pass
01: Verify DSC capability.	Pass
DSC and FEC both supported by Sink DUT.	
All DSC capability registers (60h-6Fh) are valid and as per specs.	
5.6.1.2: DSC RGB color depth test	Pass
Iter 01:	Pass
5.6.1.4: DSC RGB bits-per-pixel test	Pass
Iter 01:	Pass
01: Initial Link Training at maximum link rate and lane count success	Pass
02: For Timing 1920x1080p@30Hz bpc 8 bpp 8.0 CRC check or Visual check verification	Pass
03: For Timing 1920x1080p@30Hz bpc 8 bpp 8.125 CRC check or Visual check verification	Pass
04: For Timing 1920x1080p@30Hz bpc 8 bpp 8.250 CRC check or Visual check verification	Pass
05: For Timing 1920x1080p@30Hz bpc 8 bpp 8.375 CRC check or Visual check verification	Pass
06: For Timing 1920x1080p@30Hz bpc 8 bpp 10.0 CRC check or Visual check verification	Pass
07: For Timing 1920x1080p@30Hz bpc 8 bpp 10.125 CRC check or Visual check verification	Pass
08: For Timing 1920x1080p@30Hz bpc 8 bpp 10.250 CRC check or Visual check verification	Pass
After Sending DSC image 2kClrSq.dpx, Timing 1920x1080p@30Hz, Color RGB	
Slice-Width=960, Slice-Height=1080, Bits-per-component=8, Bits-per-pixel=10.250000, Block-Prediction=Enable	
TEST_CRC_R_Cr 0xE098 matched with expected value.	
TEST_CRC_G_Y 0x886F matched with expected value.	
TEST_CRC_B_Cb 0xA475 matched with expected value.	
DSC_CRC_0 0xC455 matched with expected value.	
DSC_CRC_1 0x0A23 matched with expected value.	
DSC_CRC_2 0x417D matched with expected value.	
09: For Timing 1920x1080p@30Hz bpc 8 bpp 10.375 CRC check or Visual check verification	Pass
10: For Timing 1920x1080p@30Hz bpc 10 bpp 8.0 CRC check or Visual check verification	Pass
11: For Timing 1920x1080p@30Hz bpc 10 bpp 8.125 CRC check or Visual check verification	Pass
12: For Timing 1920x1080p@30Hz bpc 10 bpp 8.250 CRC check or Visual check verification	Pass
13: For Timing 1920x1080p@30Hz bpc 10 bpp 8.375 CRC check or Visual check verification	Pass

Open ACA Data | 5.6.1.1: DSC capability verification

Instrument: SS980B [10.30.196.240] | Continue Test Execution | Close

Compliance Testing

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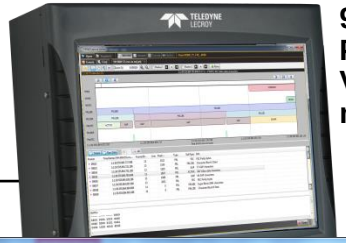
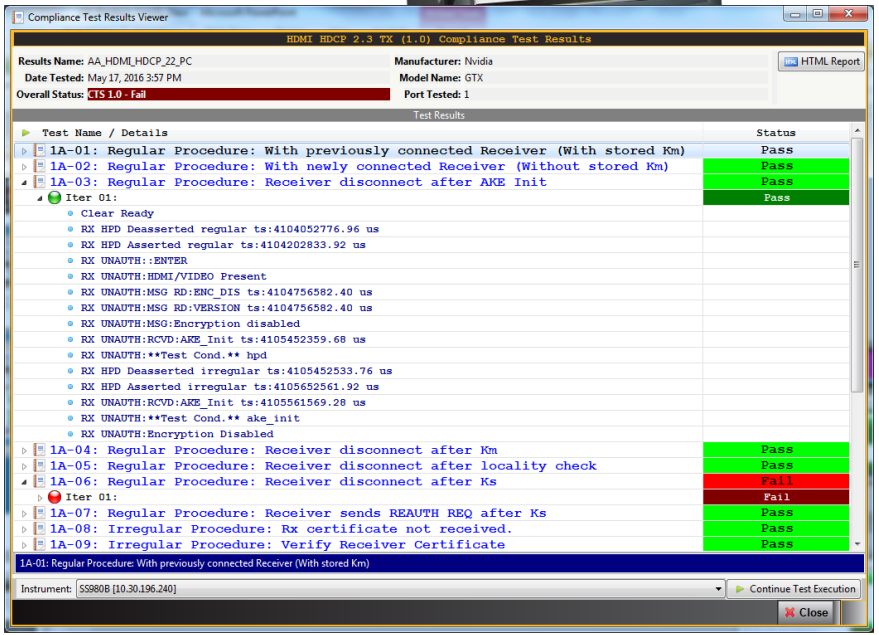
HDMI 2.1 source



980B w/ 48G HDMI Protocol Analyzer / Video Generator module



Compliance Test Results Viewer

HDMI HDCP 2.3 TX (1.0) Compliance Test Results

Results Name: AA_HDMI_HDCP_22_PC
Date Tested: May 17, 2016 3:57 PM
Overall Status: CTS 1.0 - Fail
Manufacturer: Nvidia
Model Name: GTX
Port Tested: 1
HTML Report

Test Results

Test Name / Details	Status
1A-01: Regular Procedure: With previously connected Receiver (With stored Km)	Pass
1A-02: Regular Procedure: With newly connected Receiver (Without stored Km)	Pass
1A-03: Regular Procedure: Receiver disconnect after AKE Init	Pass
Iter 01:	Pass
Clear Ready	
RX HPD Deasserted regular ts:4104052776.96 us	
RX HPD Asserted regular ts:4104202833.92 us	
RX UNAUTH::ENTER	
RX UNAUTH:HDMI/VIDEO Present	
RX UNAUTH:MSG RD:ENC_DIS ts:4104756582.40 us	
RX UNAUTH:MSG RD:VERSION ts:4104756582.40 us	
RX UNAUTH:MSG:Encryption disabled	
RX UNAUTH:RCVD:AKE_Init ts:4105452359.68 us	
RX UNAUTH:**Test Cond.** hpd	
RX HPD Deasserted irregular ts:4105452533.76 us	
RX HPD Asserted irregular ts:4105652561.92 us	
RX UNAUTH:RCVD:AKE_Init ts:4105561569.28 us	
RX UNAUTH:**Test Cond.** ake_init	
RX UNAUTH:Encryption Disabled	
1A-04: Regular Procedure: Receiver disconnect after Km	Pass
1A-05: Regular Procedure: Receiver disconnect after locality check	Pass
1A-06: Regular Procedure: Receiver disconnect after Ks	Fail
Iter 01:	Fail
1A-07: Regular Procedure: Receiver sends REAUTH_REQ after Ks	Pass
1A-08: Irregular Procedure: Rx certificate not received.	Pass
1A-09: Irregular Procedure: Verify Receiver Certificate	Pass

1A-01: Regular Procedure: With previously connected Receiver (With stored Km)

Instrument: SS980B [10.30.196.240]
Continue Test Execution
Close

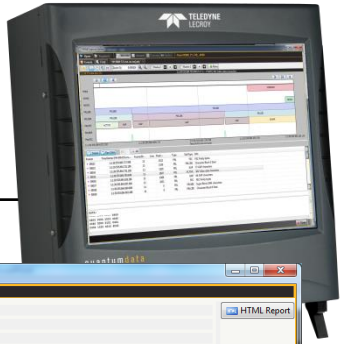
HDMI Compliance Tests – Example 1

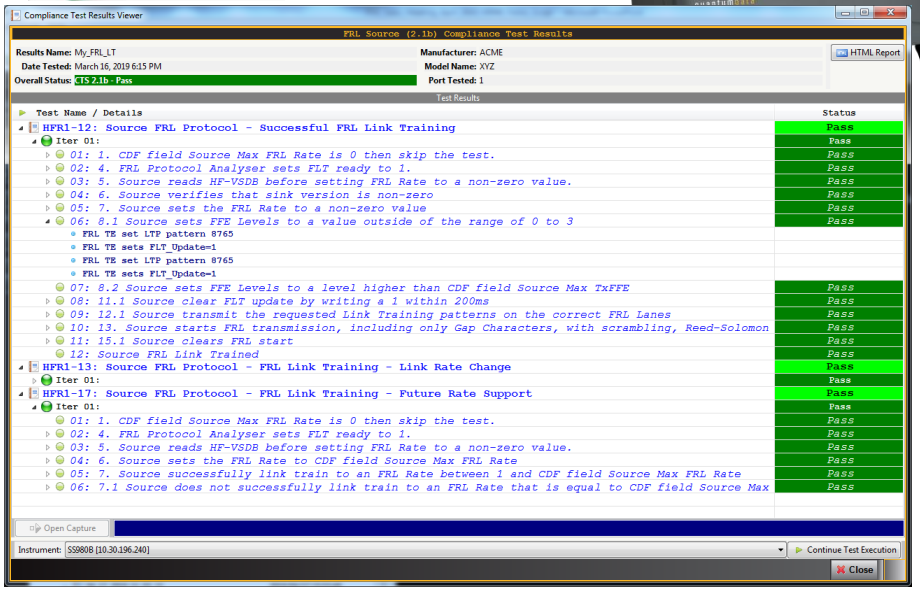
TIME TO INSIGHT™

- Compliance Testing Provides:
  - Required test suites to obtain industry logo.
  - Detailed test results and logs that provide insight into the cause of failures.
- A Few Examples:
  - HDMI 2.1 Fixed Rate Link (FRL) source compliance test suite.

HDMI 2.1 source development board

980B w/ 48G HDMI Protocol Analyzer / Video Generator module

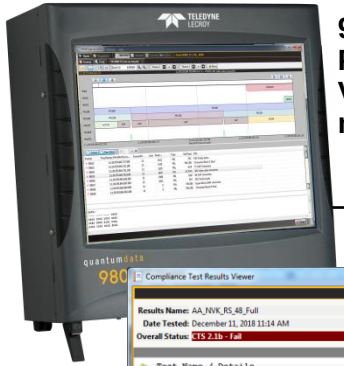




HDMI Compliance Tests – Example 2

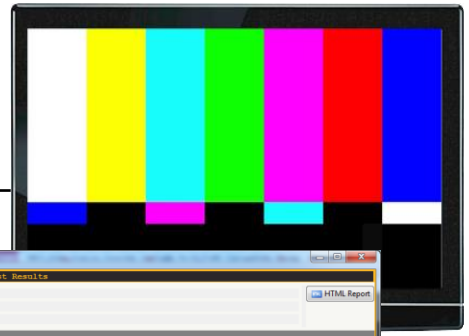
TIME TO INSIGHT™

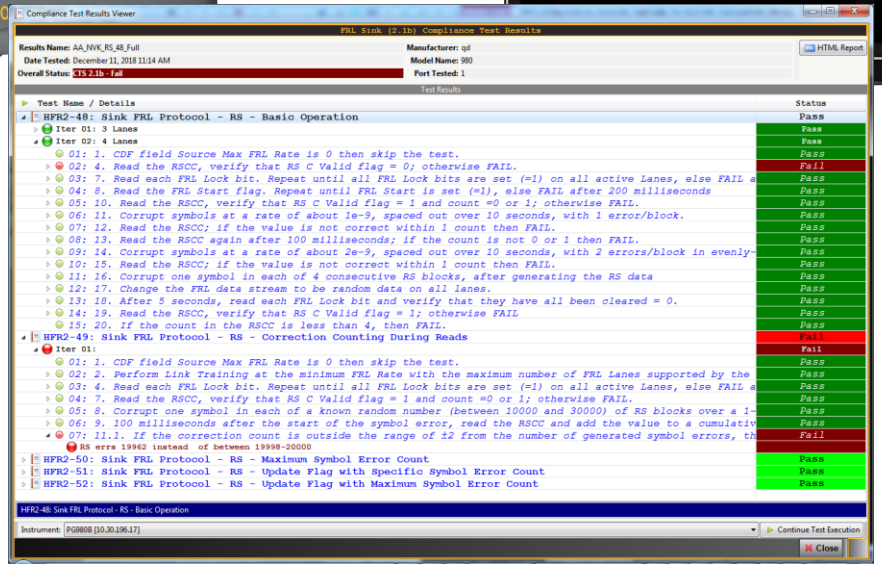
- Compliance Testing Provides:
  - Required test suites to obtain industry logo.
  - Detailed test results and logs that provide insight into the cause of failures.
- A Few Examples:
  - HDMI sink compliance for Forward Error Correction (FEC).



980B w/ 48G HDMI Protocol Analyzer / Video Generator module

HDMI FRL UHD Display





HDMI Compliance Tests – Example 3

TIME TO INSIGHT™

- Compliance Testing Provides:
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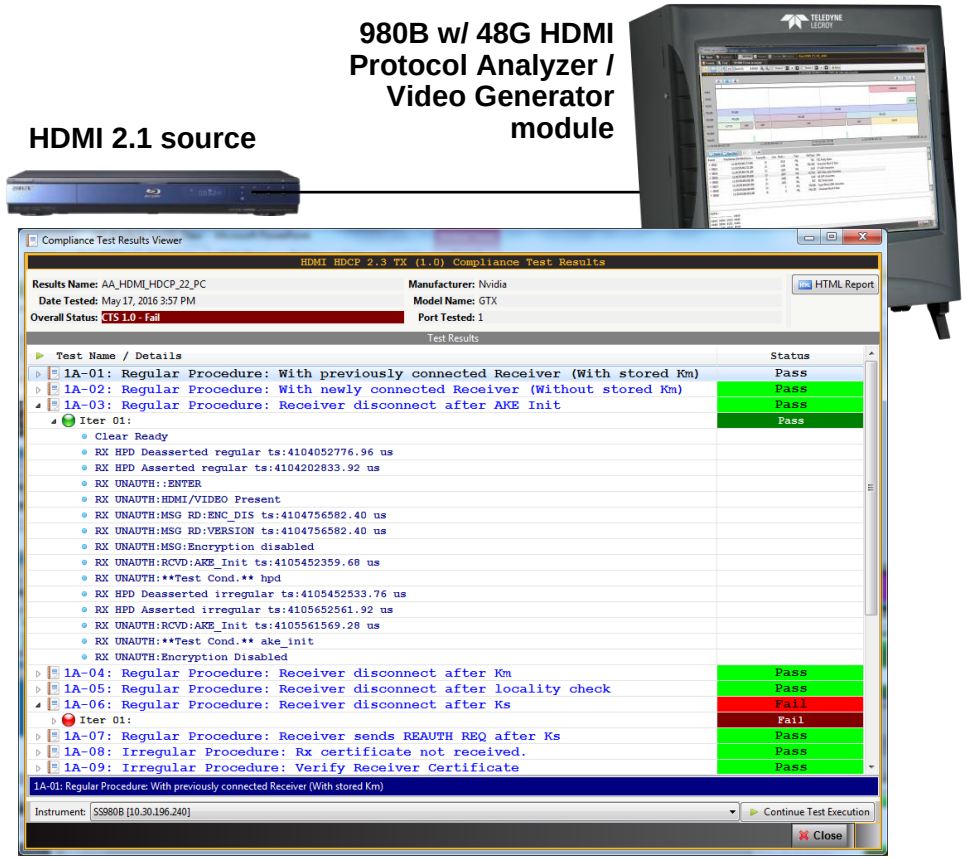
- A Few Examples:
  - HDCP 2.2 compliance for HDMI source devices.



quantumdata 980 48G module Video Analyzer/Generator Test Setups

November - 2019

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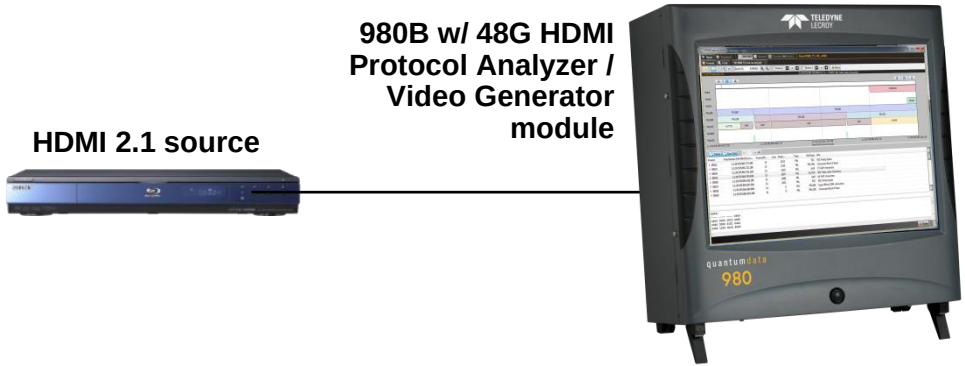
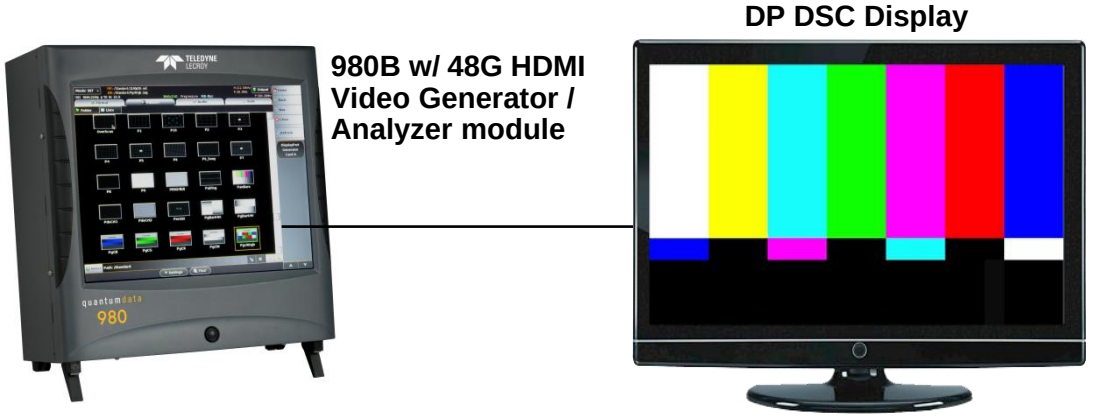
980 48G module Test Setup – HDMI Source Testing

- Source testing
  - Use connected HDCP 2.3 compatible display to view 980 48G module ATP Manager Graphical User Interface.
  - Connection either to DisplayPort or HDMI port on back of 980 48G module.
  - Use Keyboard and mouse to control ATP Manager GUI running on the connected display.



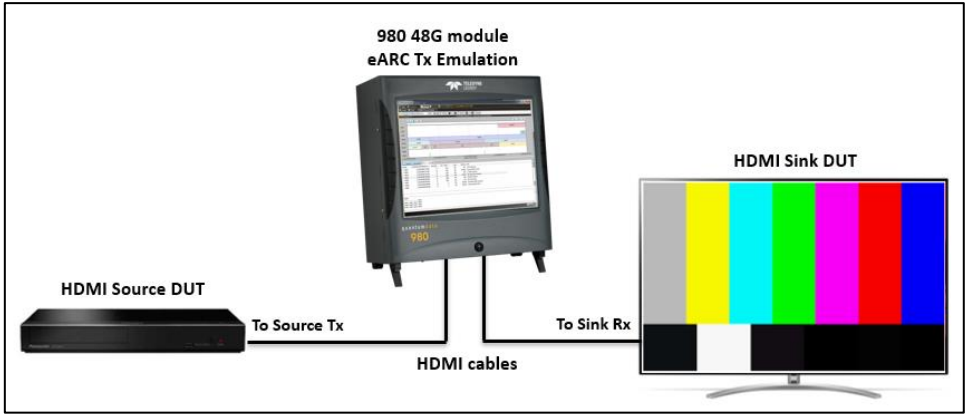
980 48G module Test Setup – HDMI Sink Testing

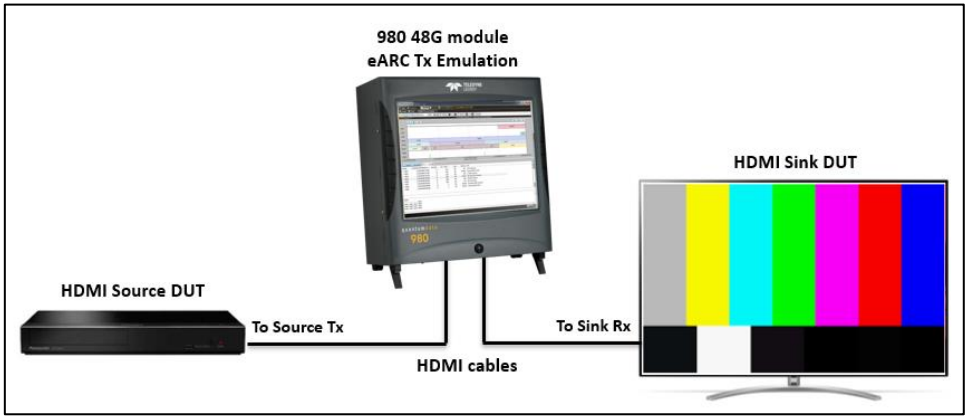
- Sink testing
  - Use connected 980 48G module ATP Manager graphical user interface installed on host PC.
  - Use Keyboard and mouse to control ATP Manager GUI running on the connected display.
  - Connect Host PC to 980 48G module via Ethernet cable, either direct or through corporate LAN.



980 48G module Test Setup – Passive Monitoring TMDS and FRL

- Passive monitoring of DDC
  - You can monitor the DDC channel passively in the ***TMDS*** mode by connecting a source to the 980 48G module Rx port and a sink to the 980 48G module Tx port.
  - You can optionally monitor the DDC channel passively in the ***FRL*** mode using a custom cable.
  - The DDC passive monitoring enables you to diagnose interoperability problems between a source and a display.
  - The ability to passively monitor the DDC channel in the FRL mode with the custom cable is especially important for FRL link training and HDCP authentication interoperability.





quantumdata 980 48G Module
Video Analyzer/Generator for HDMI Testing
Product Details

November - 2019

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980 48G Module Video Analyzer / Generator for HDMI 2.1 Testing

- Provides both Protocol Analysis for FRL / TMDS source testing and Video Generation for FRL / TMDS sink testing.
- Supports Real Time view of incoming video and essential video parameters.
- Protocol Analyzer provides deep visibility into the HDMI 2.1 Fixed Rate Link (FRL), FRL with Display Stream Compression (DSC) and TMDS video, audio, metadata, control data and protocol data.
- Monitors DDC activity: EDID, HDCP and FRL link training with Aux Channel Analyzer (ACA) utility.
- Video Generator supports HDMI 2.1 FRL and TMDS outputs up to 1485MHz pixel rate for 8K.
- Supports HDMI 2.1 FRL and TMDS compliance testing for HDMI sources and sinks up to 8K format resolutions.
- Supports testing of eARC Tx and Rx devices including full compliance testing for both Common mode and Differential mode.

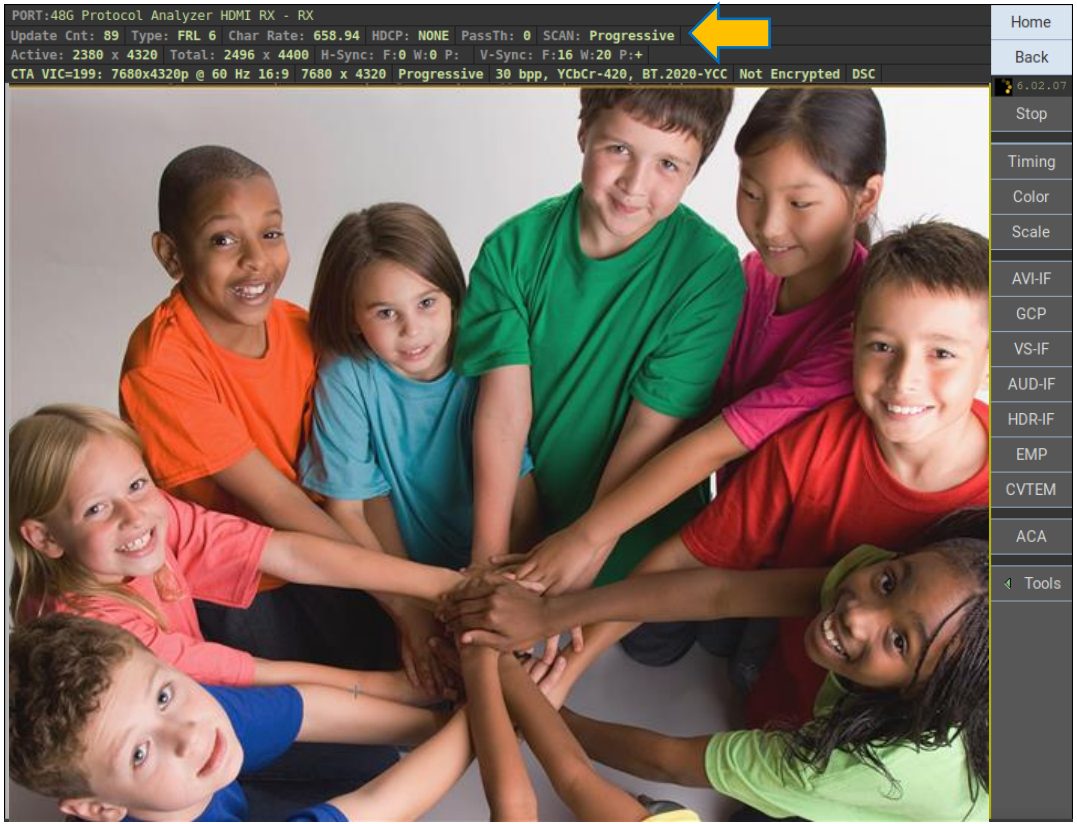
Table of Contents – Link to Sections

- **Source Testing**
  - Real Time Analysis.
  - Deep Capture Analysis.
  - DDC (Aux Chan) Monitoring.
  - FRL and TMDS Compliance.
  - HDCP Compliance.
  - eARC Rx Testing.
  - DDC (Aux Chan) Monitoring.
  - Passive DDC Monitoring.
- **Sink Testing**
  - Video Generation.
  - InfoFrame/Data Island Editing.
  - Audio Generation.
  - EDID and SCDC.
  - FRL and TMDS Compliance.
  - HDCP Compliance.
  - eARC Tx Testing.

HDMI 2.1 Source Testing
Real Time Analysis

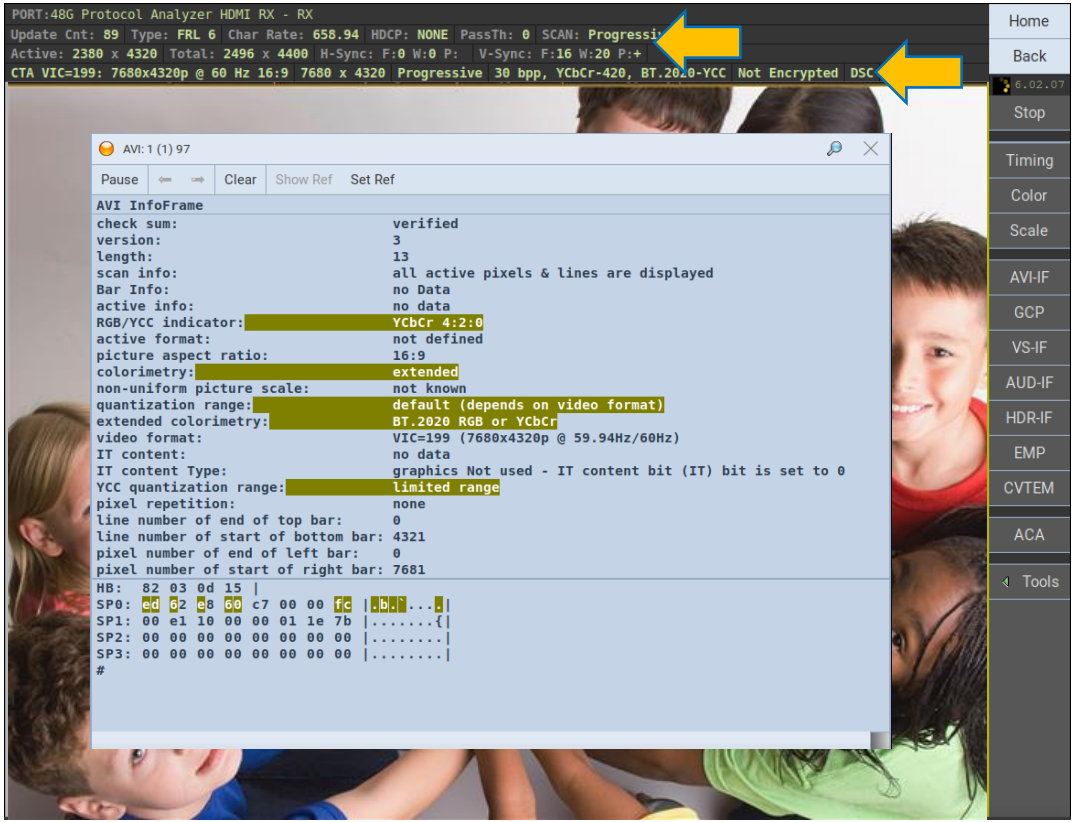
HDMI Protocol Analyzer – Real Time Analysis

- HDMI FRL & TMDS Real Time Analysis:
  - Enables viewing of the incoming video frames.
  - Shows essential video metadata and timing data and FRL link configuration on status bar.



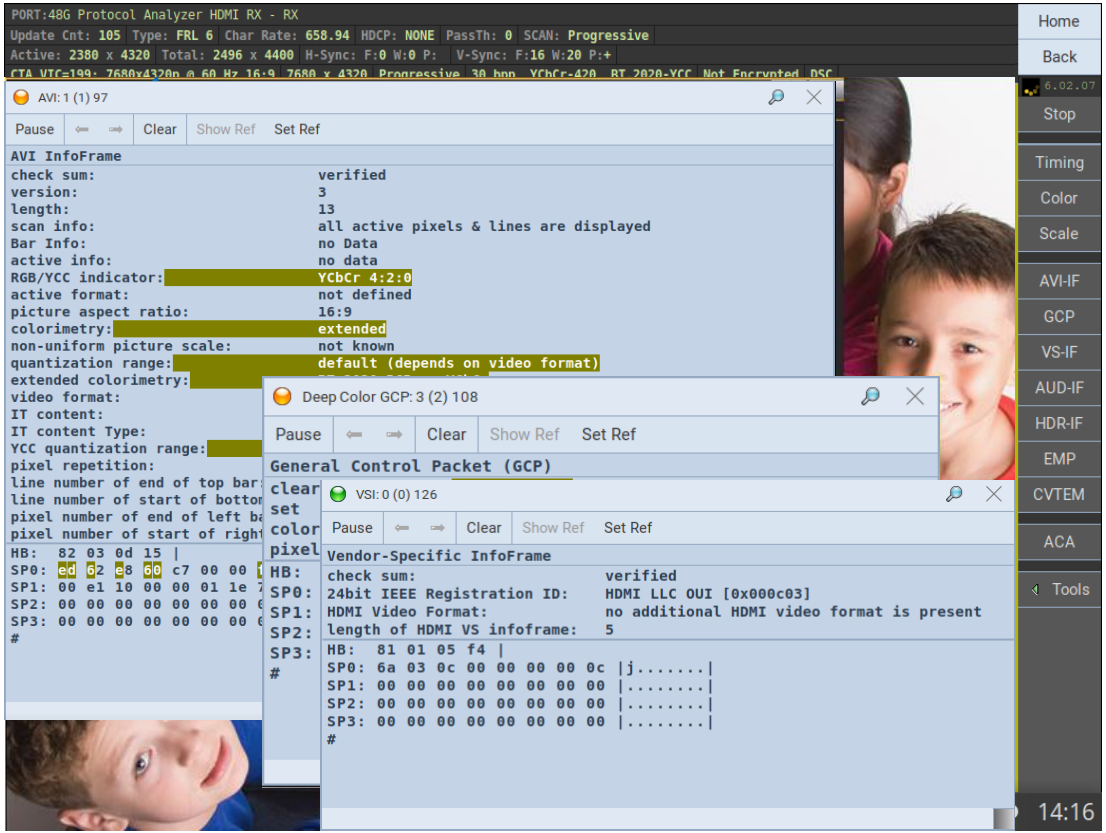
HDMI Protocol Analyzer – Real Time Analysis

- HDMI FRL & TMDS Real Time Analysis:
  - Enables viewing of the incoming video frames.
  - Shows essential video metadata and timing data and FRL link configuration on status bar.
  - Shows incoming Display Stream Compression (DSC) frame and indicates if DSC is active.



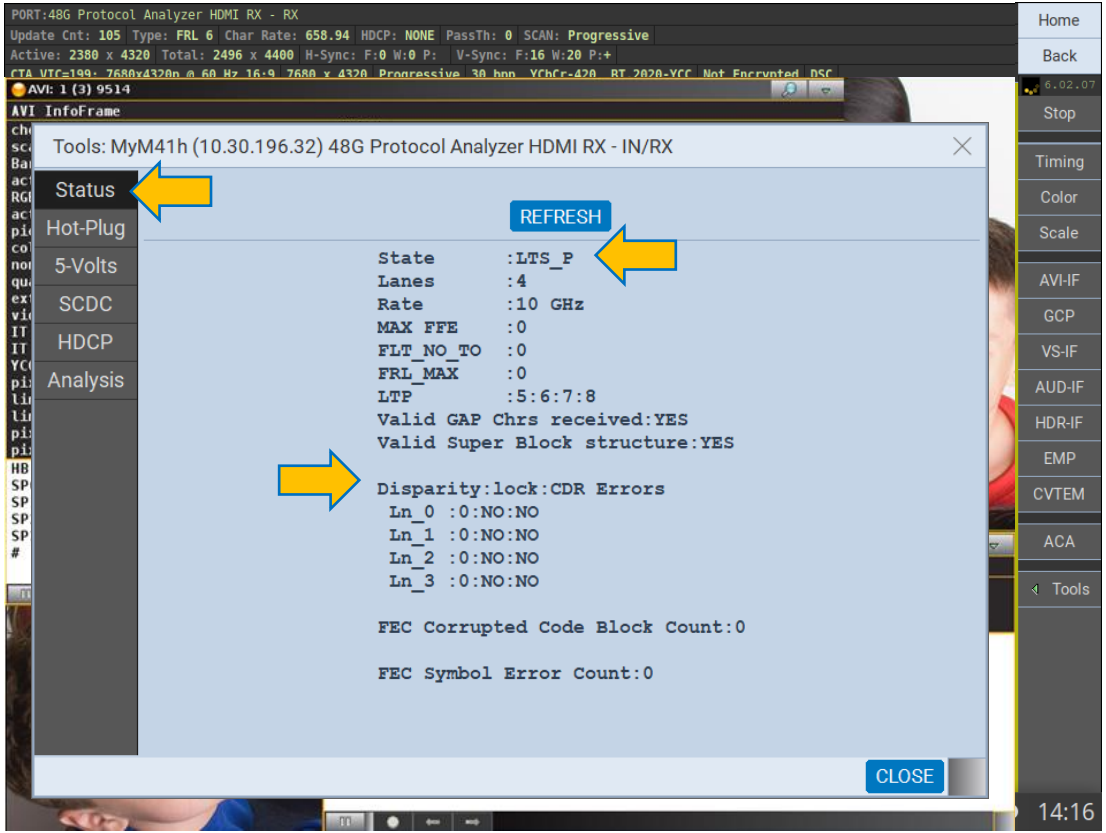
Protocol Analyzer – Real Time Analysis

- HDMI FRL & TMDS Real Time Analysis:
  - Enables viewing of the incoming video frames.
  - Shows essential video metadata and timing data and FRL link configuration on status bar.
  - Provides a real time view of each metadata packet type and the values and change history for each parameter.



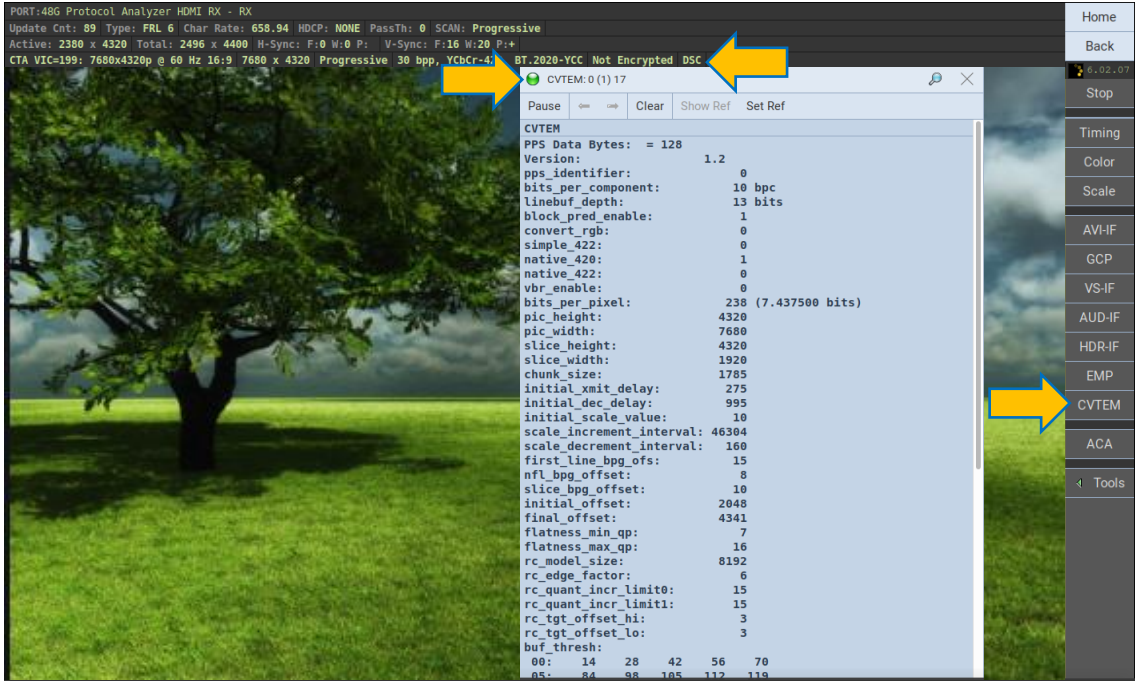
Protocol Analyzer – Real Time Analysis

- HDMI FRL & TMDS Real Time Analysis:
  - Enables viewing of the incoming video frames.
  - Shows essential video metadata and timing data and FRL link configuration on status bar.
  - Provides a real time view of each metadata packet type and the values and change history for each parameter.
  - Emulate a variety of EDIDs and SCDC capability configurations to test an HDMI source's response.



Protocol Analyzer – Real Time Analysis with DSC

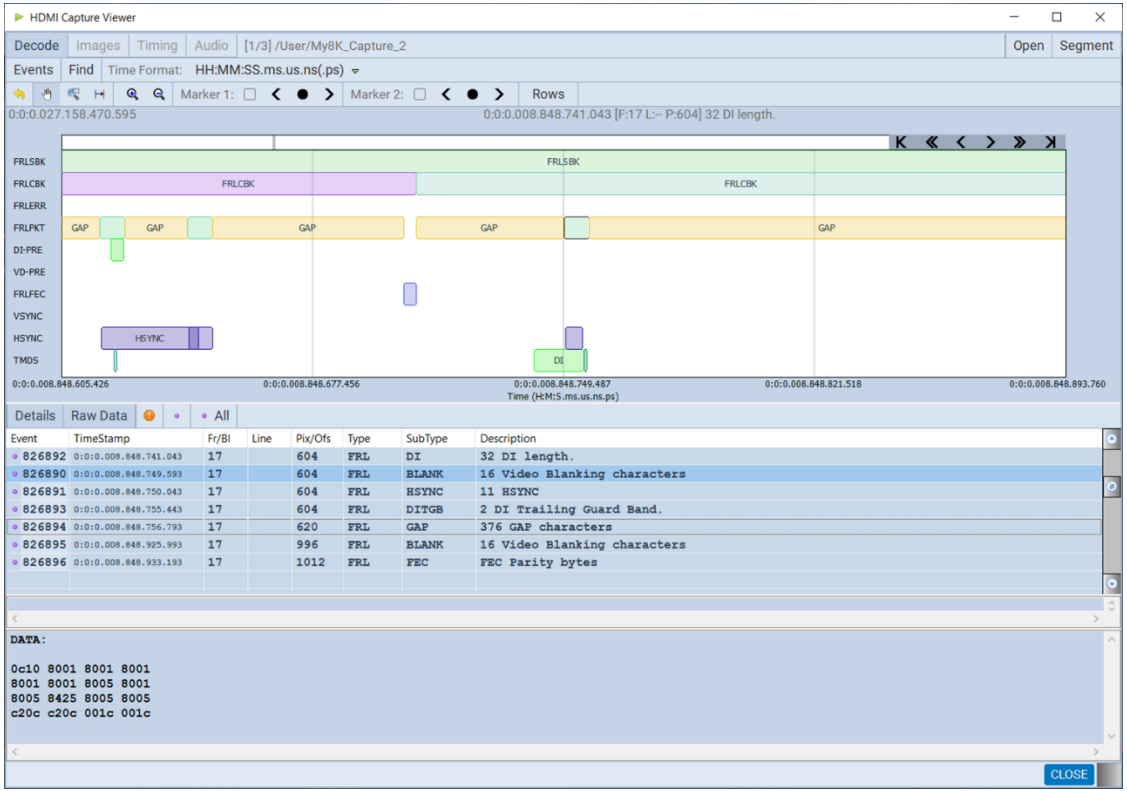
- HDMI FRL & TMDS Real Time Analysis:
  - Enables viewing of the incoming Display Stream Compression (DSC) video frames.
  - Indicates that DSC is active on the status bar.



HDMI 2.1 Source Testing
Capture Analysis

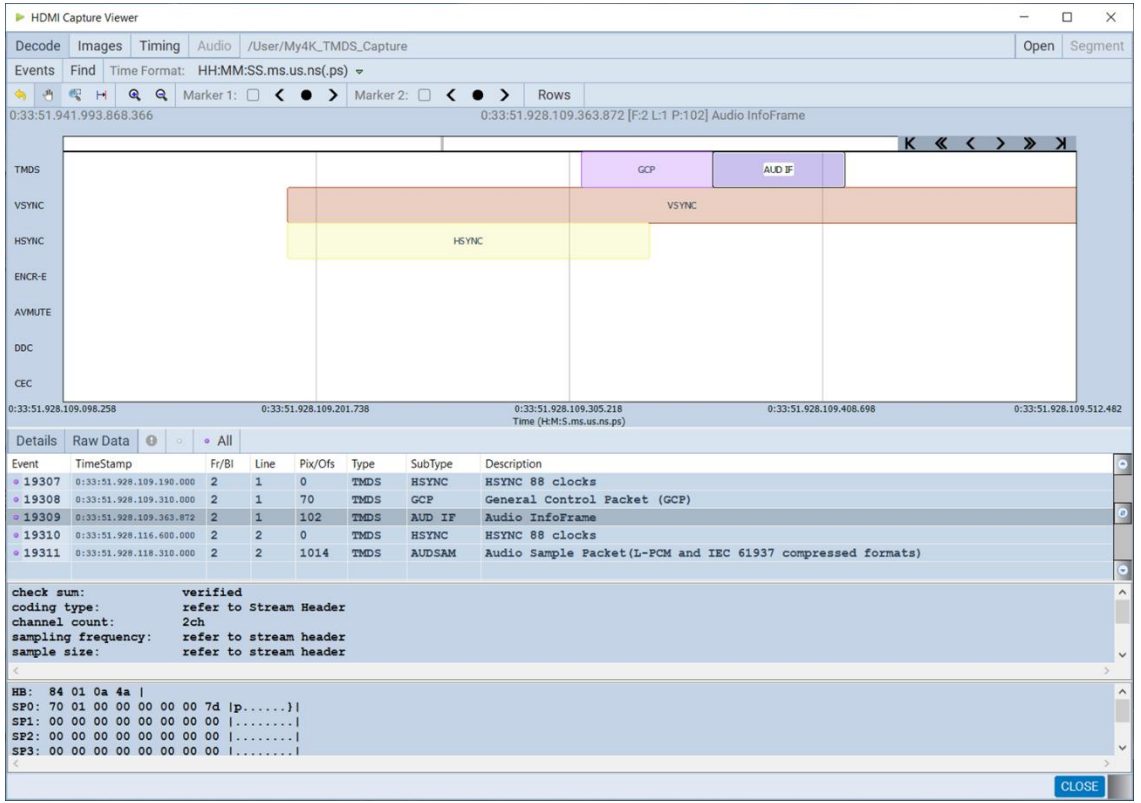
HDMI FRL Protocol Analysis

- HDMI FRL Capture & Store for Protocol Analysis:
  - Provides graphical view of video, audio, protocol elements in a timeline and in table form.
  - Shows details of all video and protocol elements.
  - Assigns precise timestamps to video / protocol elements.
  - Zoom in and out to get high view or specific view.
  - Provides view of embedded TMDS captured data.
  - Supports searching & filtering of data.
  - Enables export of capture data for sharing with colleagues.
  - View captured video frames.



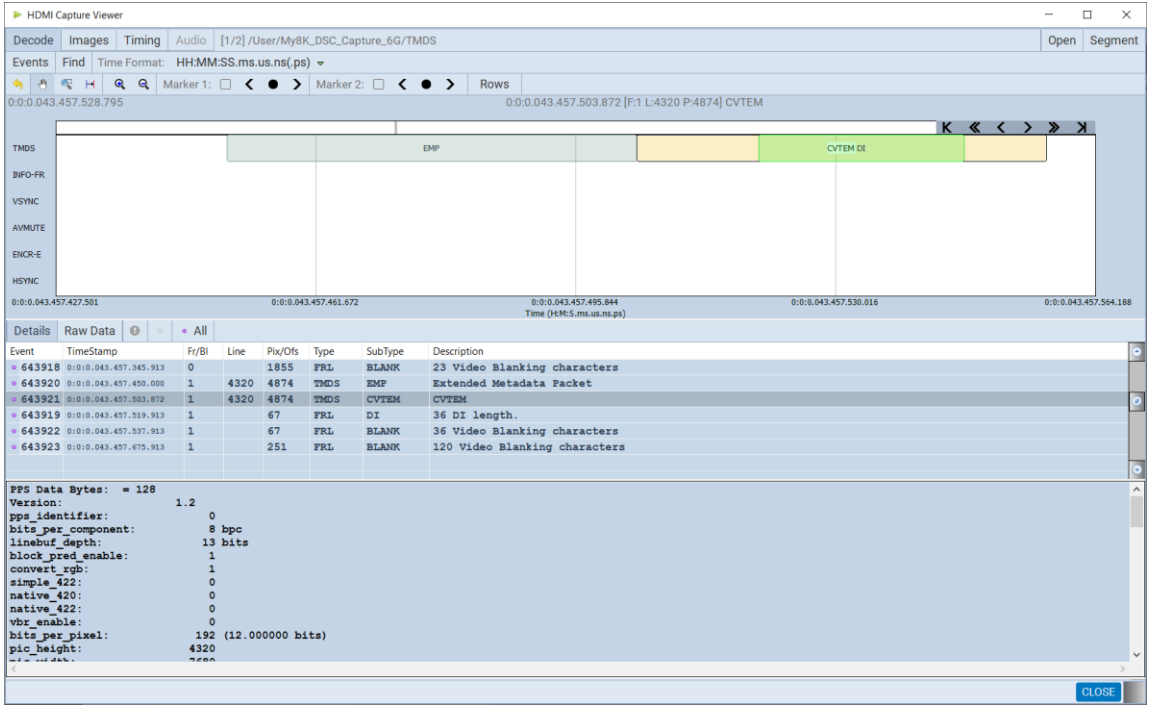
HDMI TMDS Protocol Capture Analysis

- HDMI TMDS Capture & Store for Protocol Analysis:
  - Depicts graphical view of video, audio & protocol elements in a timeline.
  - TMDS Capture shows details of all video & metadata elements.
  - Protocol Capture view shows details of low level protocol such as guard bands and preambles.
  - You can zoom in / out to get a high level view or specific view.
  - Assigns precise timestamps to video / protocol elements.
  - Supports search and filtering.
  - Enables export of capture data for sharing with colleagues.



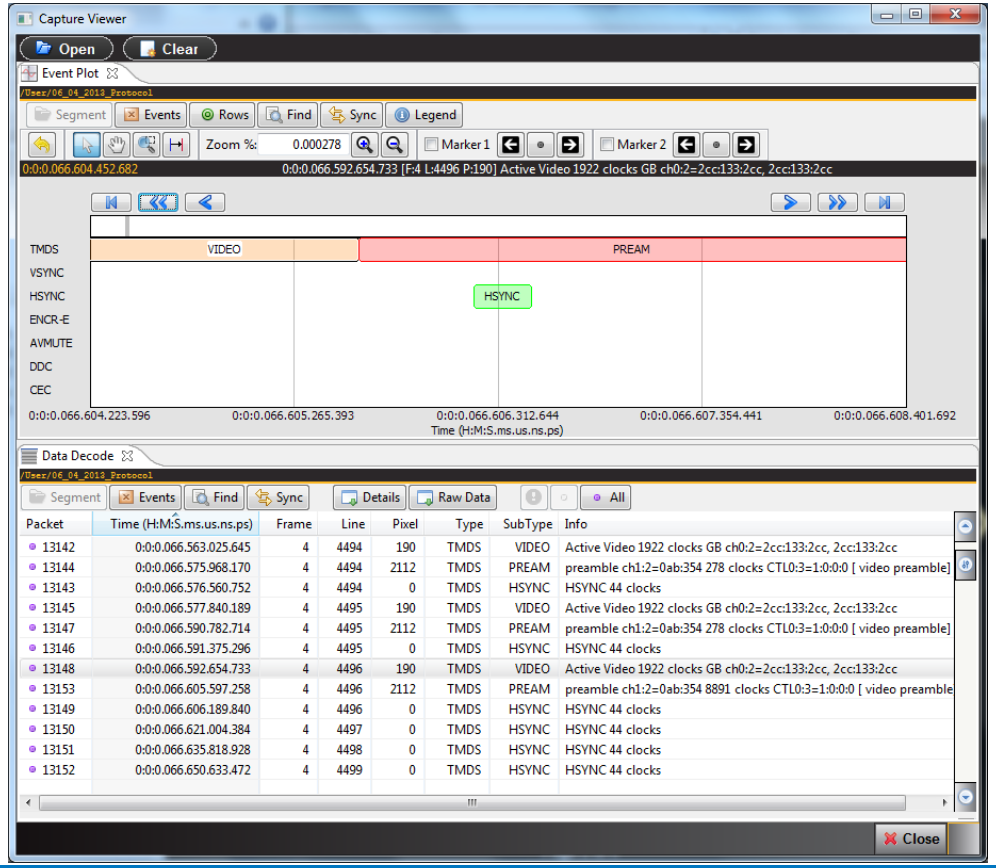
HDMI TMDS Protocol Capture Analysis - DSC

- HDMI TMDS Capture & Store for Protocol Analysis:
  - Depicts graphical view of video, audio & protocol elements in a timeline.
  - TMDS DSC Capture shows details of the video & the DSC metadata, the Picture Parameter Set (PPS) indicated as the CVTEM packet (right).



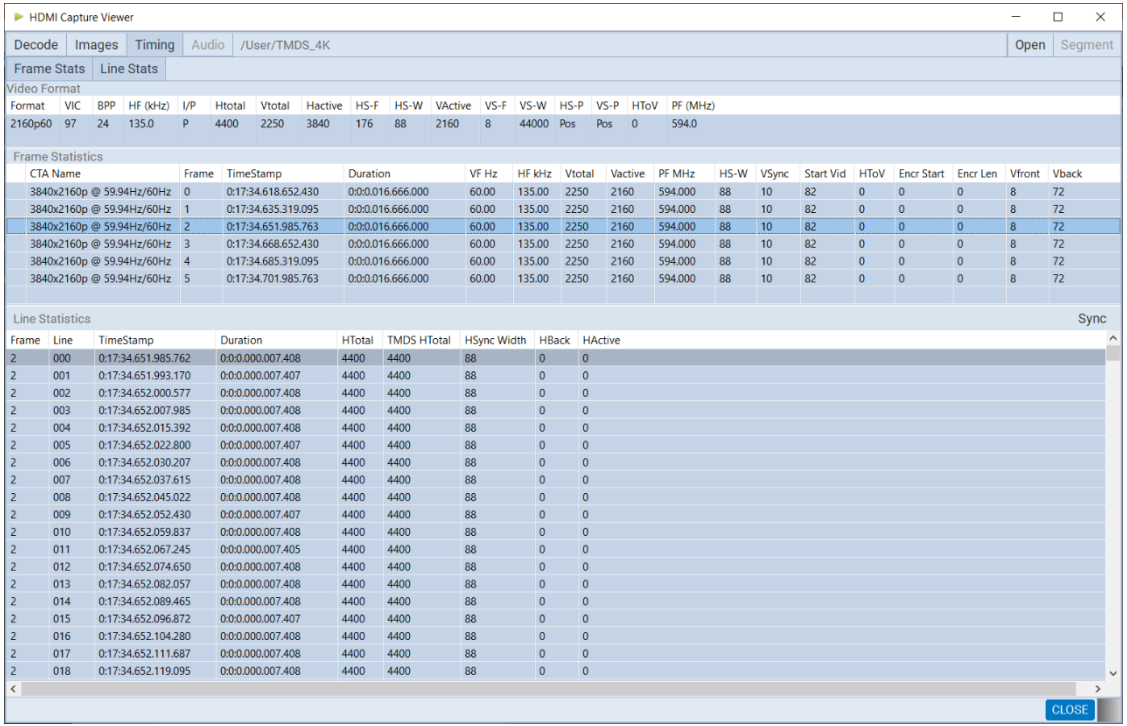
HDMI TMDS Protocol Capture Analysis

- HDMI TMDS Capture & Store for Protocol Analysis:
  - Depicts graphical view of video, audio & protocol elements in a timeline.
  - TMDS Capture shows details of all video & metadata elements.
  - Protocol Capture view shows details of low level protocol such as guard bands and preambles.
  - You can zoom in / out to get a high level view or specific view.
  - Assigns precise timestamps to video / protocol elements.
  - Supports search and filtering.
  - Enables export of capture data for sharing with colleagues.
  - Timing analyzer shows Line and Frame timing parameters.



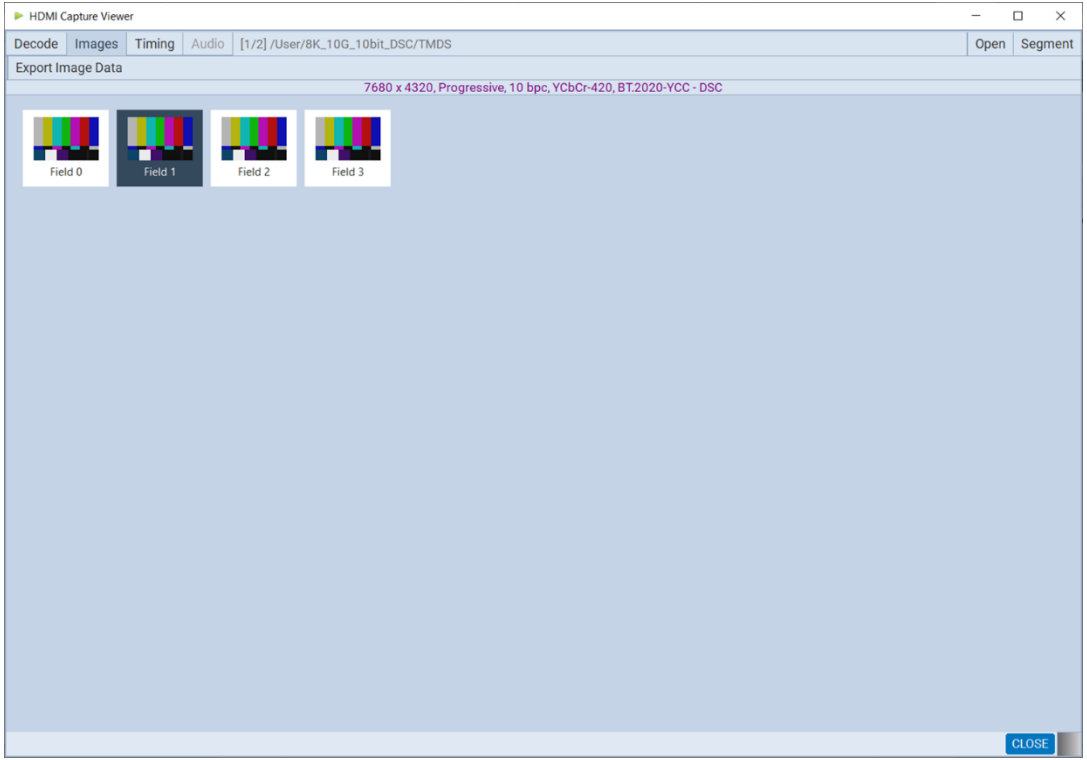
HDMI TMDS Protocol Capture Analysis

- HDMI TMDS Capture & Store for Protocol Analysis:
  - Depicts graphical view of video, audio & protocol elements in a timeline.
  - TMDS Capture shows details of all video & metadata elements.
  - Protocol Capture view shows details of low level protocol such as guard bands and preambles.
  - You can zoom in / out to get a high level view or specific view.
  - Assigns precise timestamps to video / protocol elements.
  - Supports search and filtering.
  - Enables export of capture data for sharing with colleagues.
  - Timing analyzer shows Line and Frame timing parameters.



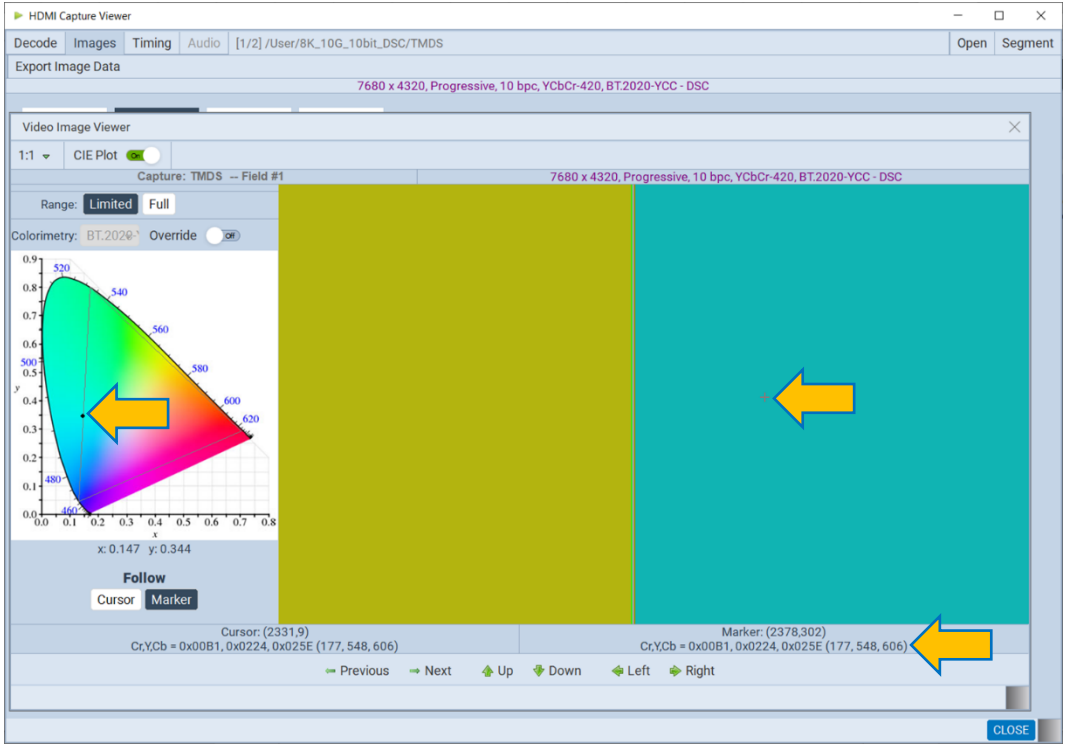
HDMI Capture Viewer – View Captured Video Frames

- HDMI Capture Viewer Video Frames:
  - View capture video frames to check for artifacts.



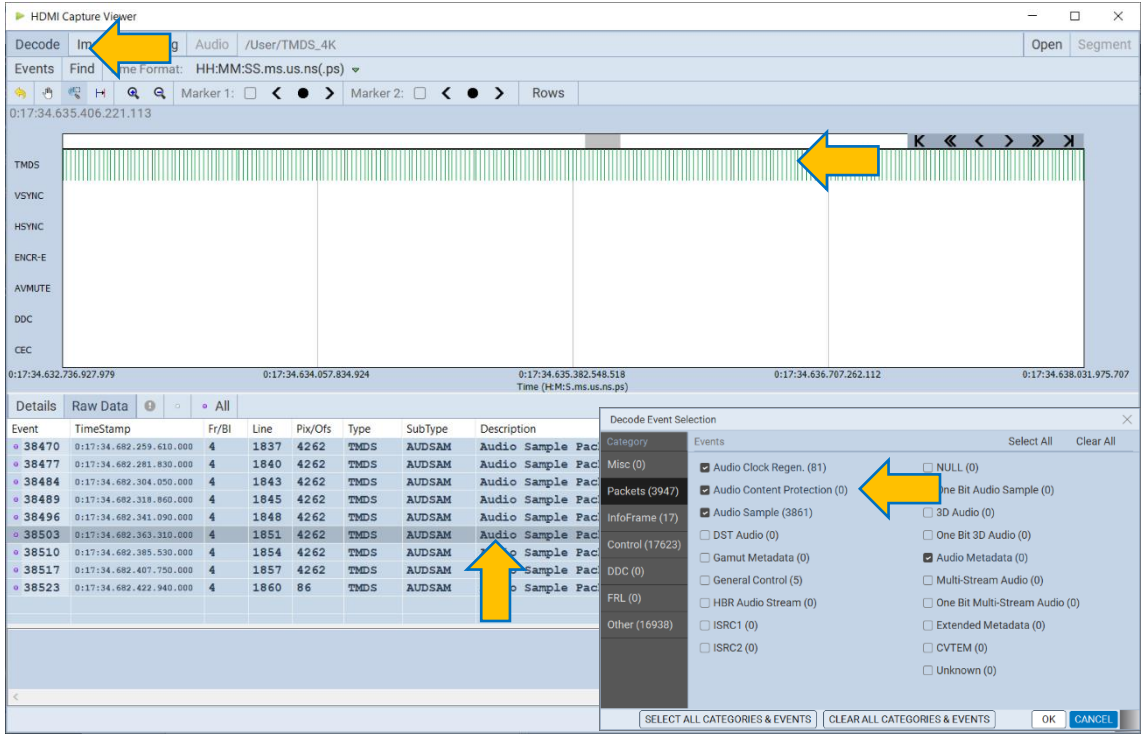
HDMI Capture Viewer – View Captured Video Frames

- HDMI Capture Viewer Video Frames:
  - View capture video frames to check for artifacts.
  - Verify colorimetry parameters.
  - View pixel values.
  - Check colors against CIE chart.



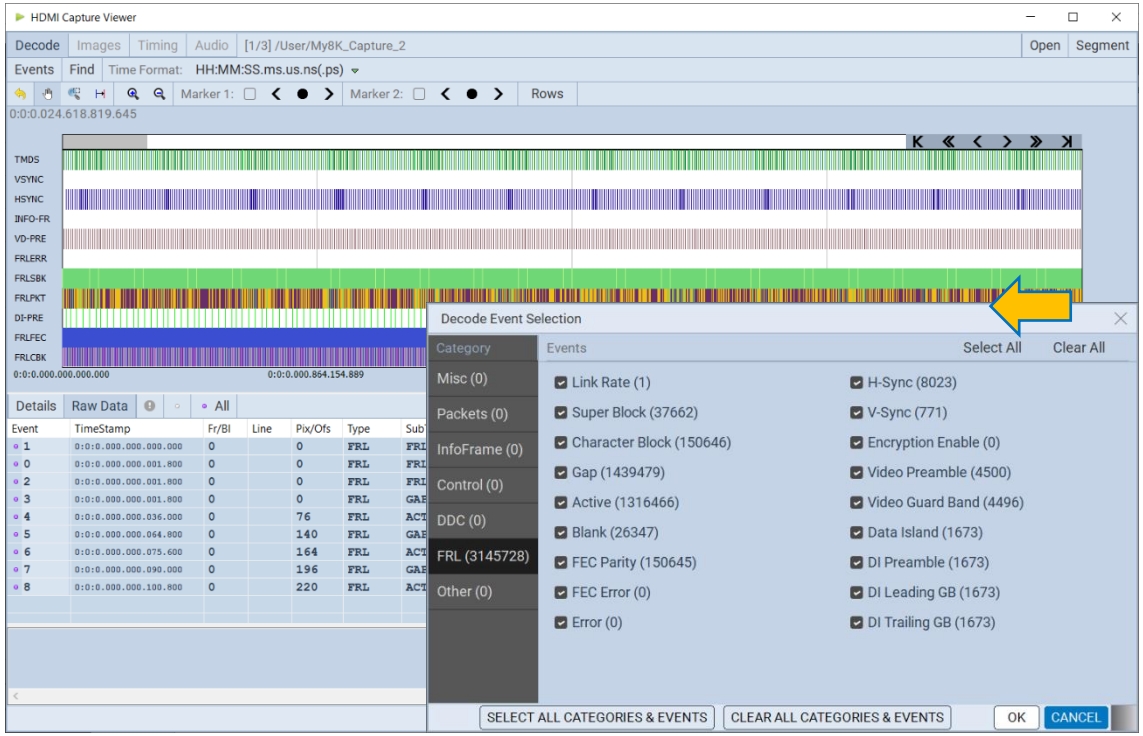
HDMI Capture Viewer - Searching and Filtering

- HDMI Capture Viewer Searching and Filtering:
  - Filter view to show only specific protocol or control elements (example shows audio packets).
  - View number of packets of each element type for quick at a glance insight into the integrity of the capture.



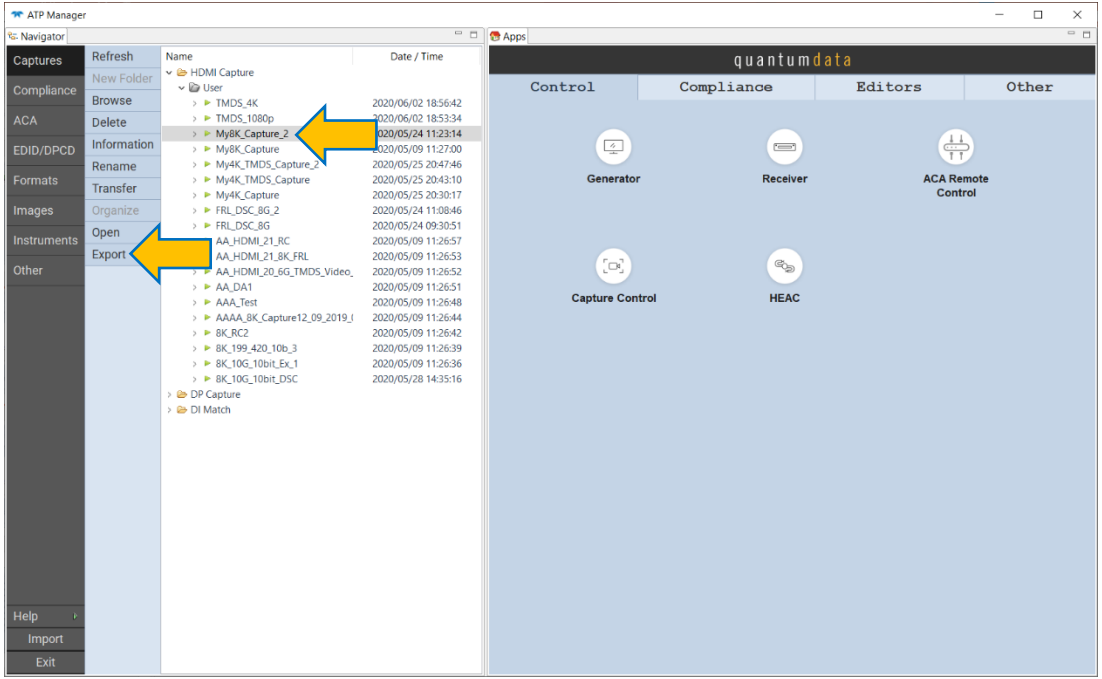
HDMI Capture Viewer - Searching and Filtering

- HDMI Capture Viewer Searching and Filtering:
  - Filter view to show only specific protocol or control elements (example shows audio packets).
  - Search for any type of video, protocol or control element (example shows searching for a variety of HDMI FRL packets.)
  - View number of packets of each element type for quick at a glance insight into the integrity of the capture.



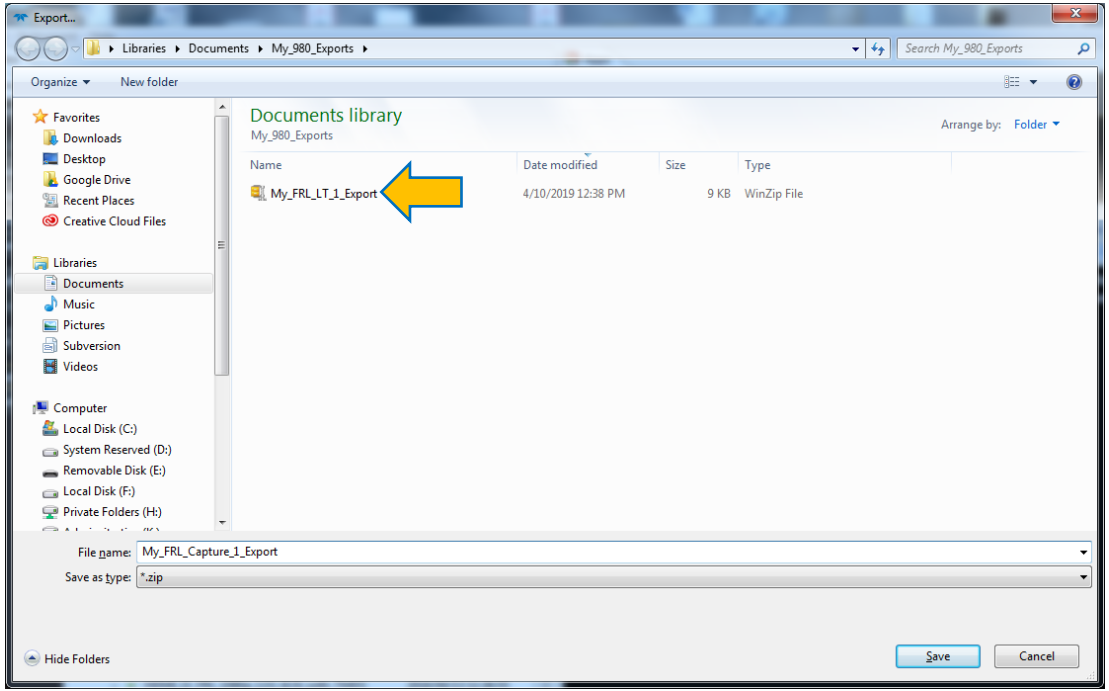
HDMI Capture Viewer – Export Capture Data

- HDMI Capture Viewer Export:
  - Export capture data to disseminate to colleagues, other subject matter experts or Teledyne Customer Support.
  - Exported capture does not require an 980 48G module instrument to view; viewing exported/imported capture only requires ATP Manager which is available on the quantumdata website.



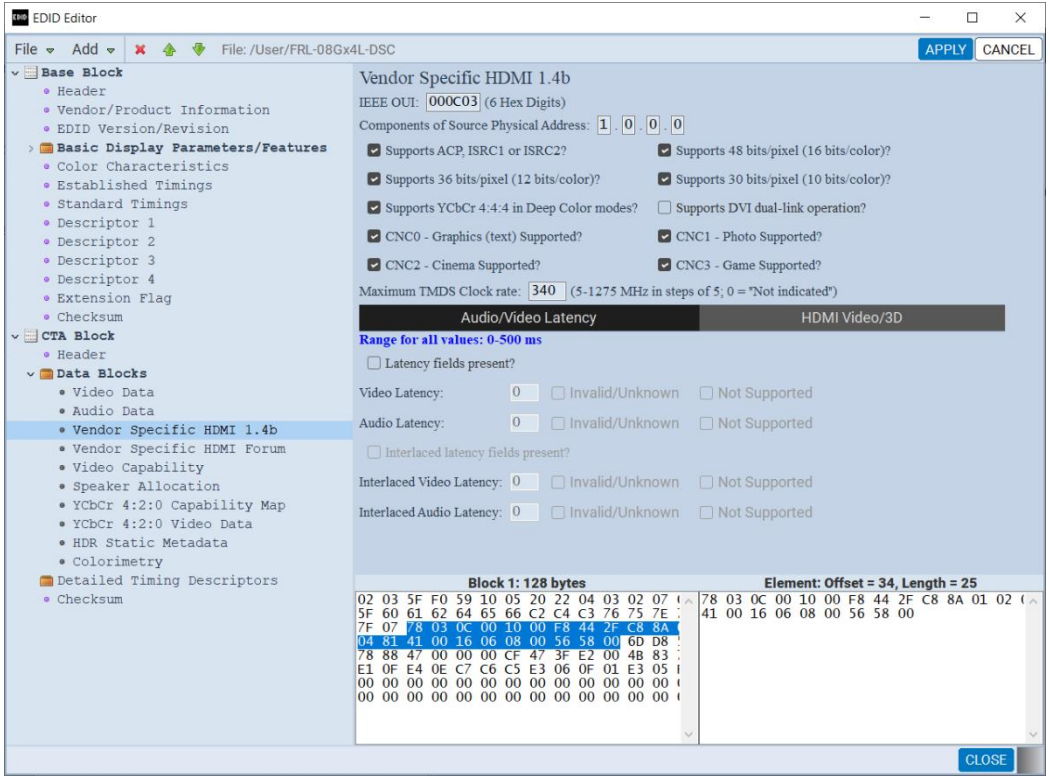
HDMI Capture Viewer – Export Capture Data

- HDMI Capture Viewer Export:
  - Export capture data to disseminate to colleagues, other subject matter experts or Teledyne Customer Support.
  - Exported capture does not require an 980 48G module instrument to view; viewing exported/imported capture only requires ATP Manager which is available on the quantumdata website.
  - Transfer to PC to save and recall later for analysis.



HDMI Sink Emulation – Emulate EDIDs and Sink Capability Registers

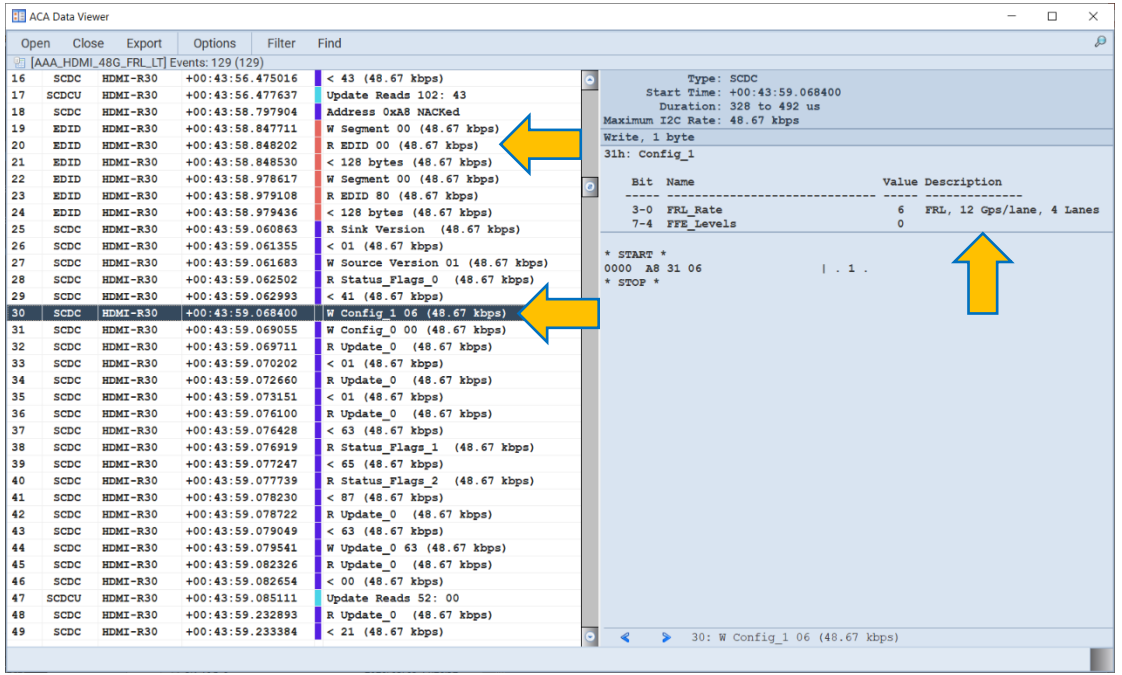
- HDMI EDID and Register Emulation:
  - Create custom EDIDs with the EDID Editor for emulation and verify source response to changing video parameters.
  - Create custom HDMI SCDC register values for emulation and verify source response to link configurations.



HDMI DDC Source Testing
Aux Channel Analyzer

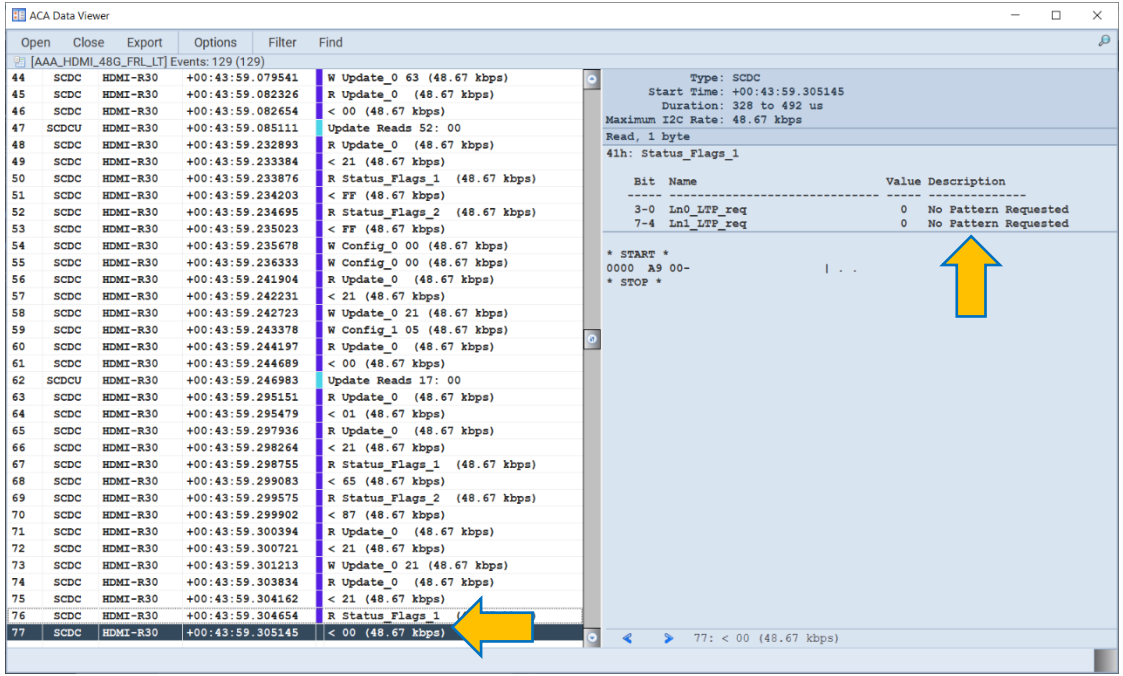
Aux Channel Analyzer (ACA) – HDMI FRL Link Training

- HDMI Aux Channel Analyzer (ACA) for DDC monitoring:
  - Enables monitoring and analysis of the HDMI connection sequence.
  - Verify EDID exchange, HDCP authentication (not shown).
  - View FRL link training transactions.
  - Assigns precise timestamps for each transaction; provides user controls to associate events.
  - Supports search and filtering functions.
  - Enables export of transaction logs to share with colleagues.



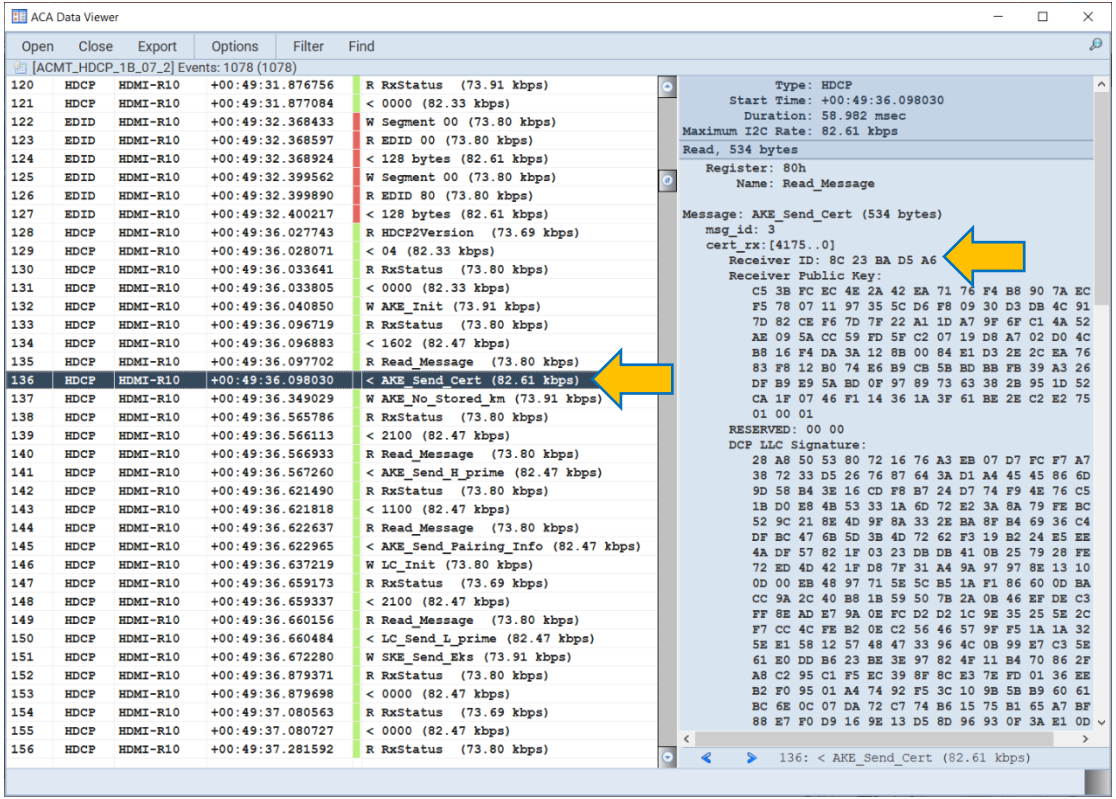
Aux Channel Analyzer (ACA) – HDMI FRL Link Training

- HDMI Aux Channel Analyzer (ACA) Export:
  - Save ACA log as an HTML file.
  - Export capture data to disseminate to colleagues, other subject matter experts or Teledyne Customer Support.
  - Exported capture does not require 980 48G module instrument; only requires ATP Manager.
  - Transfer to PC to save and recall later for analysis.



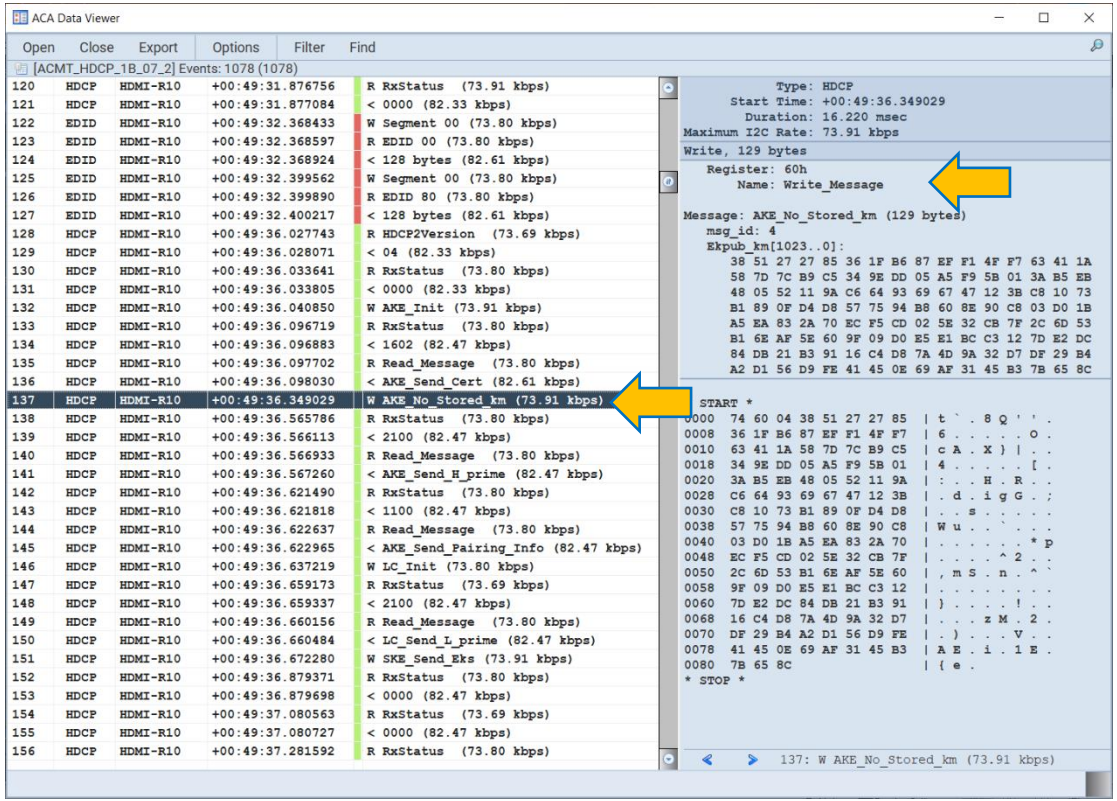
Aux Channel Analyzer (ACA) – HDCP 2.3 Authentication

- HDMI Aux Channel Analyzer (ACA) for DDC monitoring:
  - Enables monitoring and analysis of the HDMI connection sequence.
  - Verify EDID exchange, HDCP authentication.



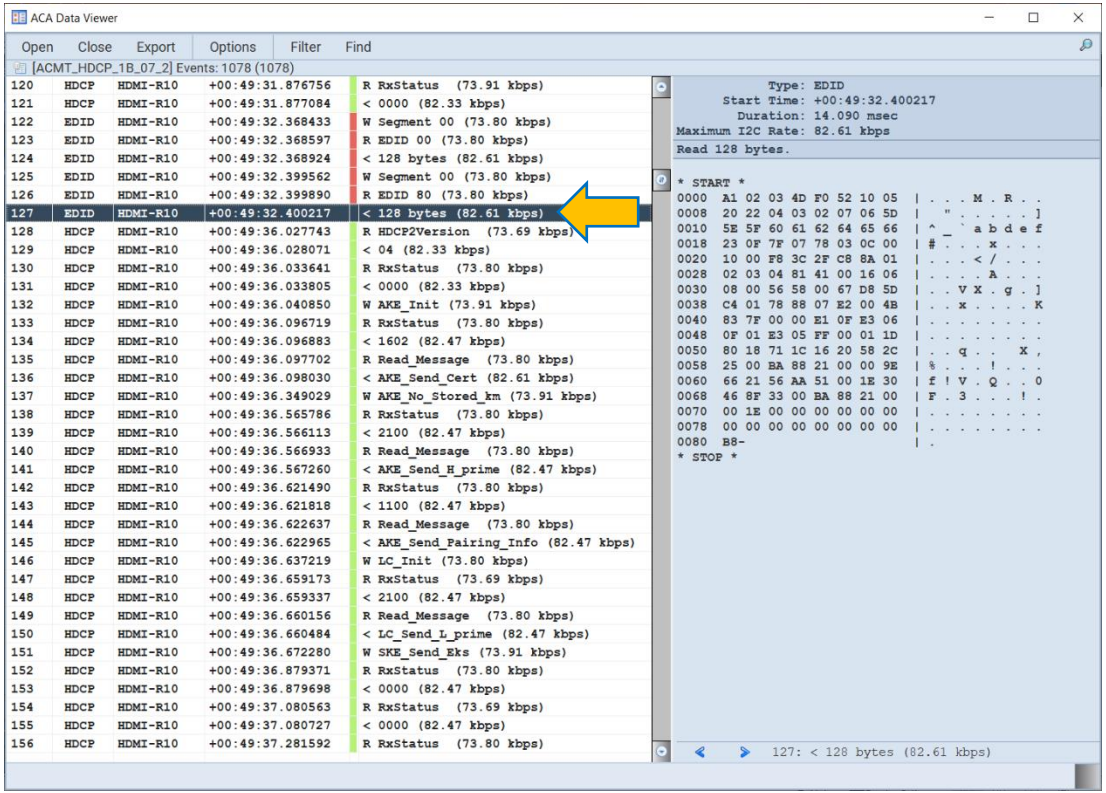
Aux Channel Analyzer (ACA) – HDCP 2.3 Authentication

- HDMI Aux Channel Analyzer (ACA) for DDC monitoring:
  - Enables monitoring and analysis of the HDMI connection sequence.
  - Verify EDID exchange, HDCP authentication.



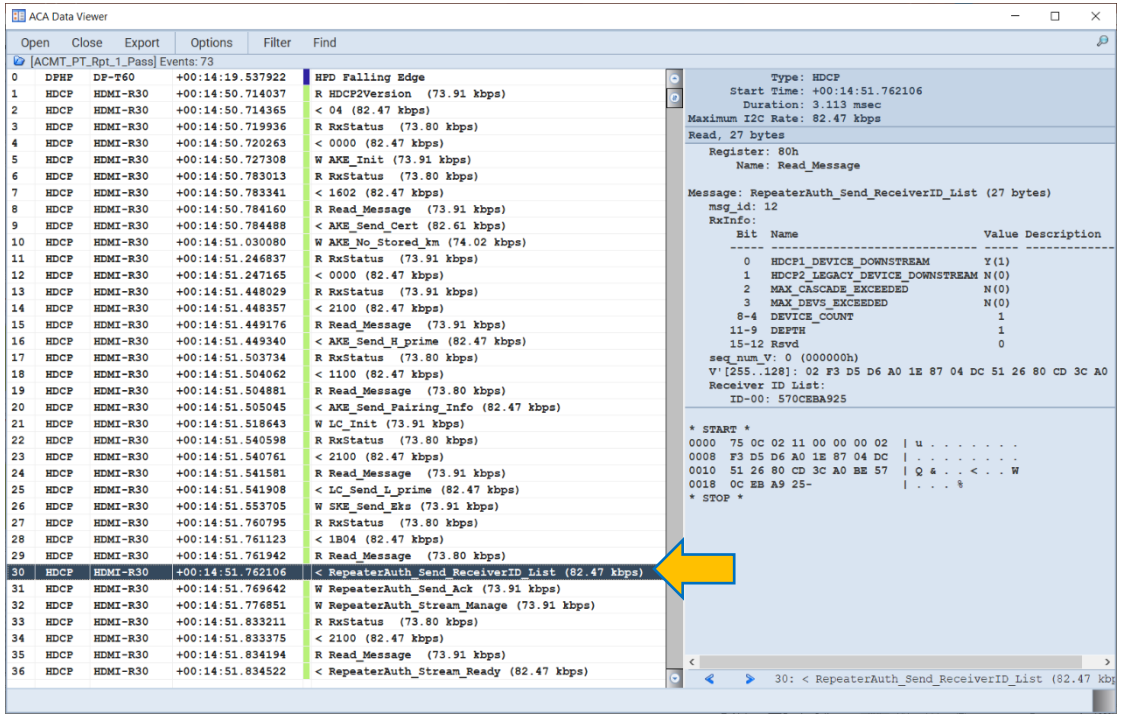
Aux Channel Analyzer (ACA) – EDID Exchange HDCP 1.4

- HDMI Aux Channel Analyzer (ACA) for DDC monitoring:
  - Enables monitoring and analysis of the HDMI connection sequence.
  - Verify EDID exchange, HDCP authentication transactions.
  - Supports search and filtering functions.
  - Assigns precise timestamps for each transaction; provides user controls to associate events.
  - Enables export of transaction logs to share with colleagues.



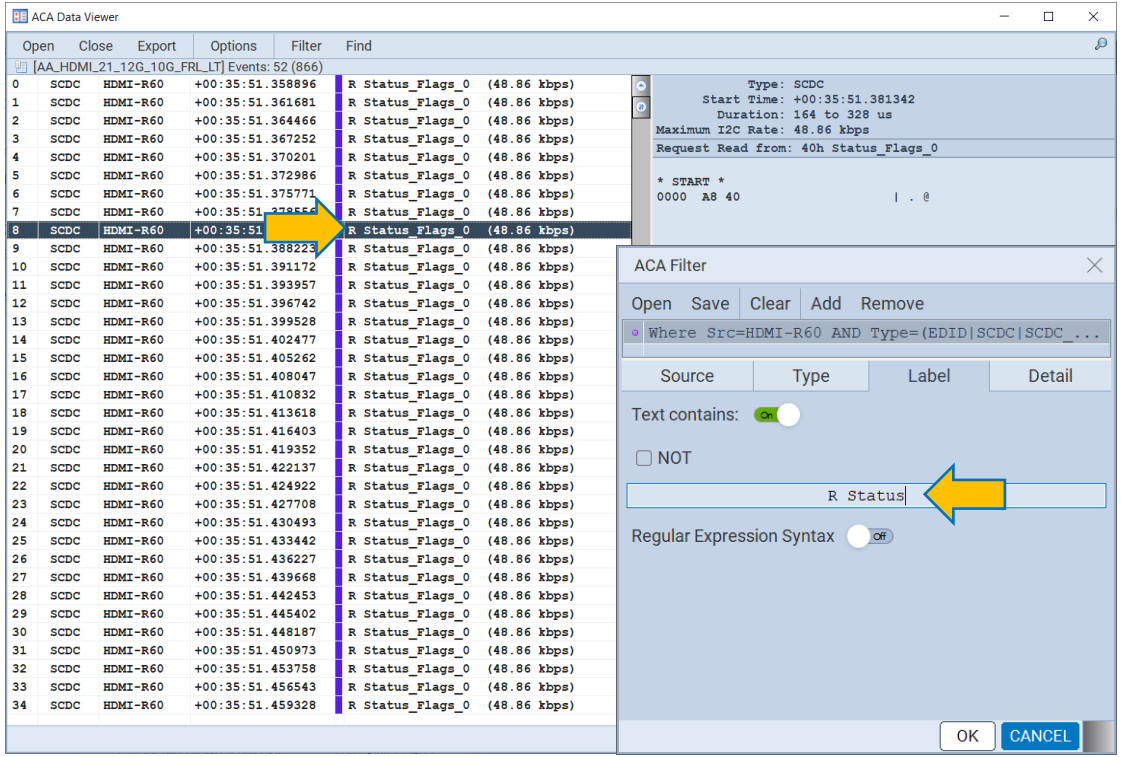
Aux Channel Analyzer (ACA) – HDCP Repeater Authentication

- HDMI Aux Channel Analyzer (ACA) for DDC monitoring:
  - Enables monitoring and analysis of the HDMI connection sequence.
  - Verify EDID exchange, HDCP authentication transactions.
  - Supports search and filtering functions.
  - Assigns precise timestamps for each transaction; provides user controls to associate events.
  - Enables export of transaction logs to share with colleagues.



Aux Channel Analyzer (ACA) – Filtering

- HDMI Aux Channel Analyzer (ACA) Export:
  - Filter the transaction list by interface, by type of transaction or by text strings.
  - Search for specific transactions by text in the label text in the details of the message.



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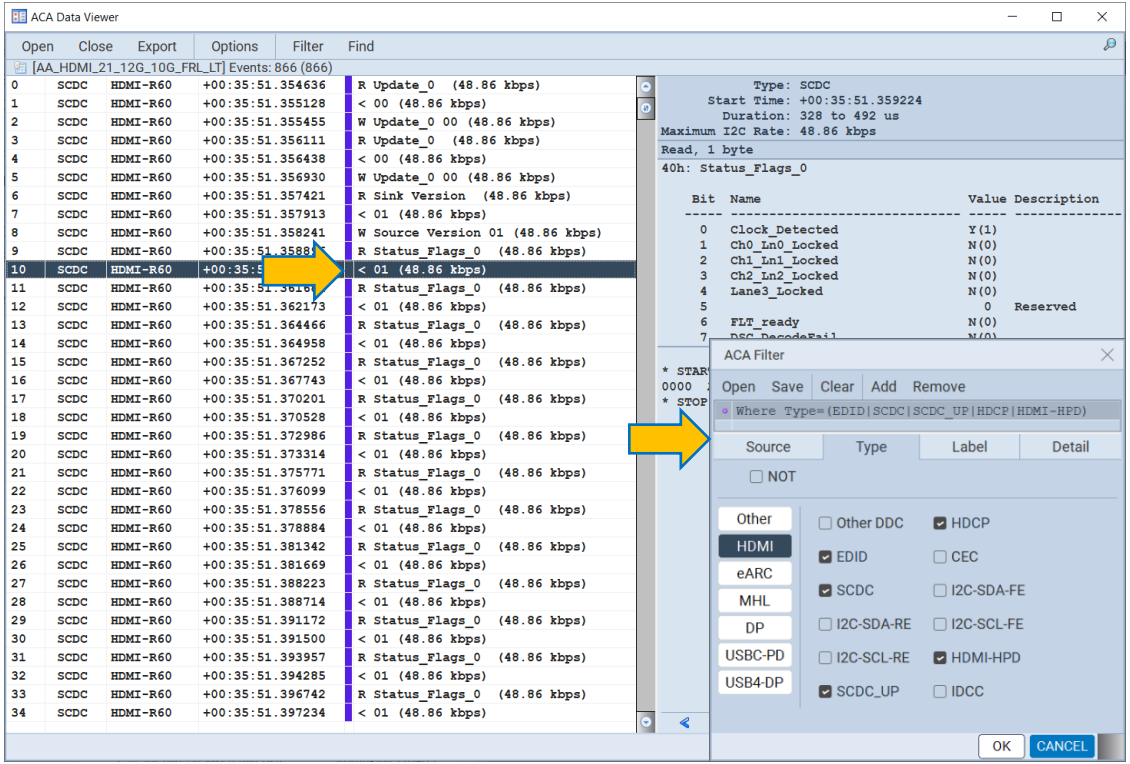
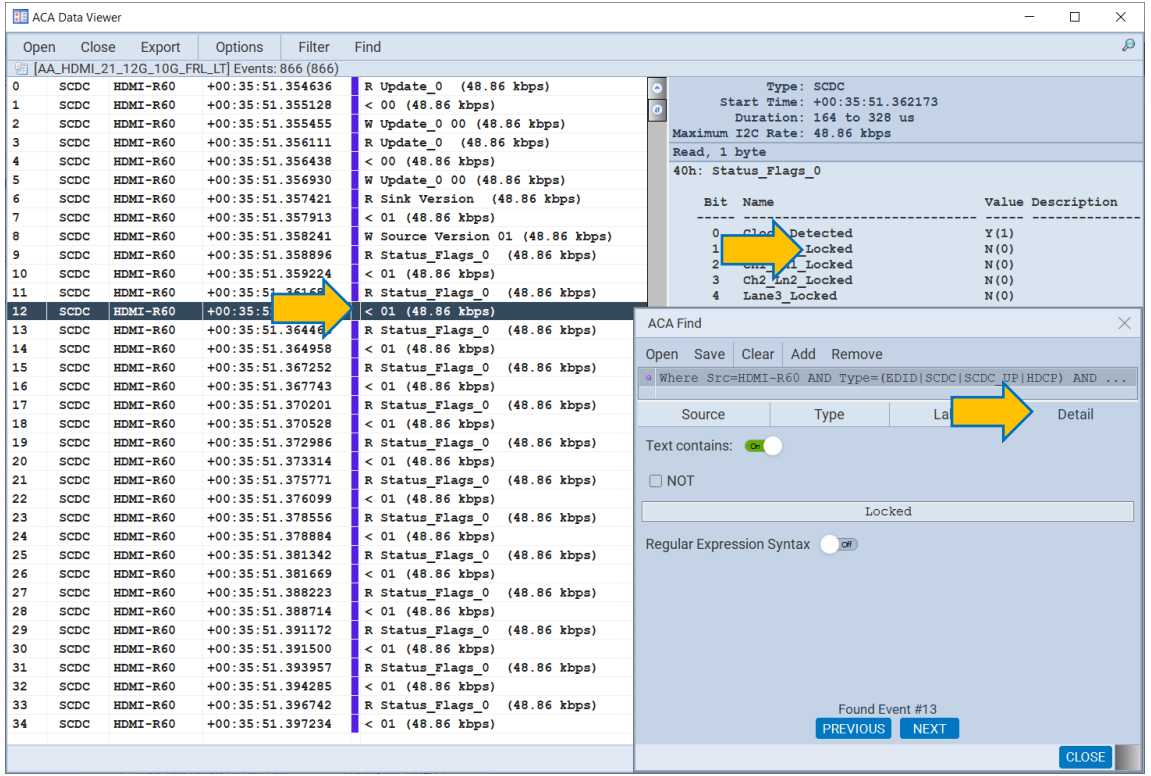


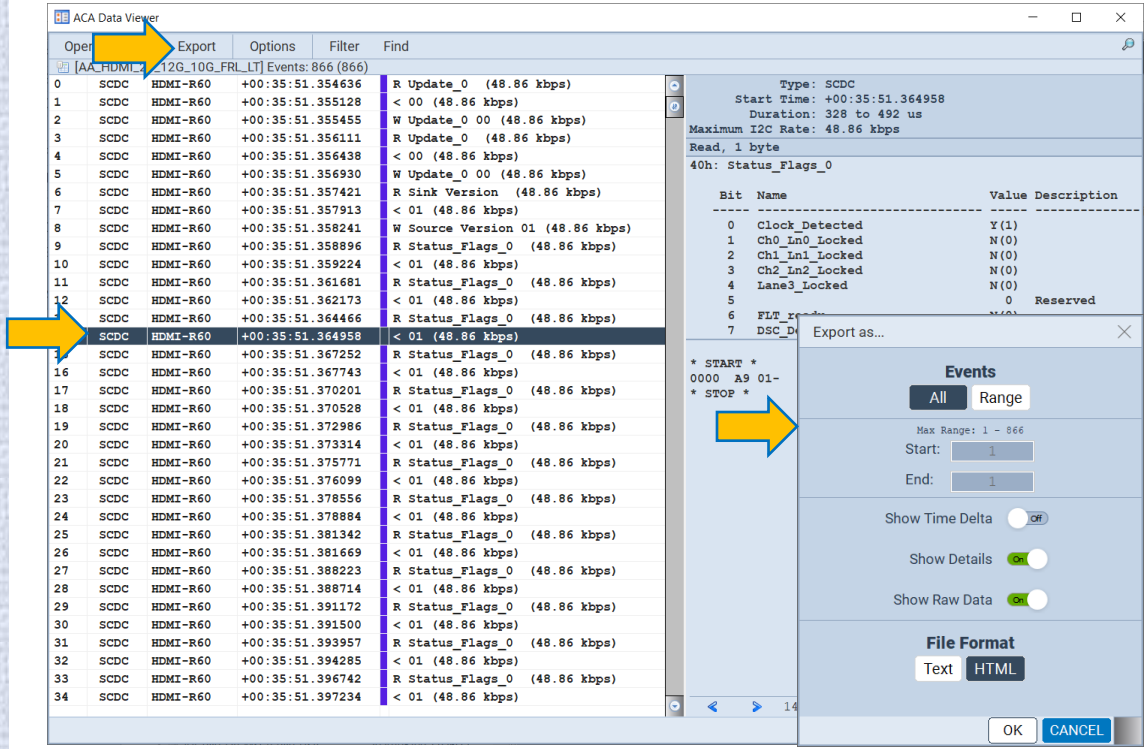
Aux Channel Analyzer (ACA) – Searching

- HDMI Aux Channel Analyzer (ACA) Export:
  - Filter the transaction list by interface, by type of transaction or by text strings.
  - Search for specific transactions by text in the label text in the details of the message.



Aux Channel Analyzer (ACA) – Export Transaction Data

- HDMI Aux Channel Analyzer (ACA) Export:
  - Save ACA log as an HTML file.
  - Export capture data to disseminate to colleagues, other subject matter experts or Teledyne Customer Support.
  - Exported capture does not require 980 48G module instrument; only requires ATP Manager.
  - Transfer to PC to save and recall later for analysis.



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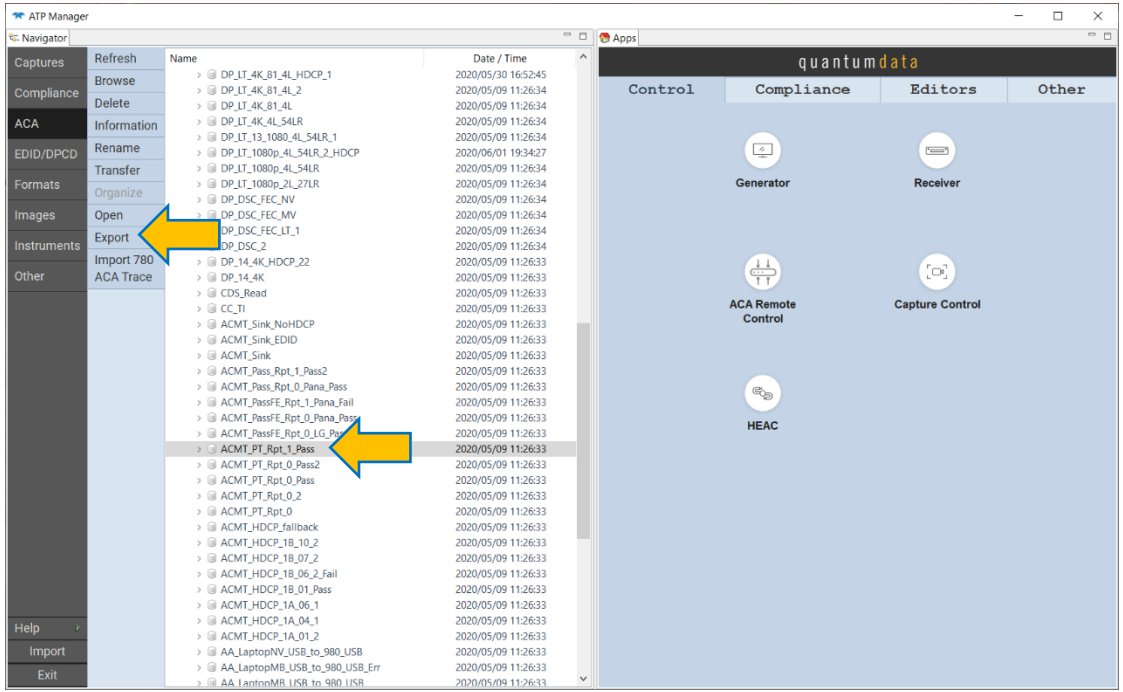
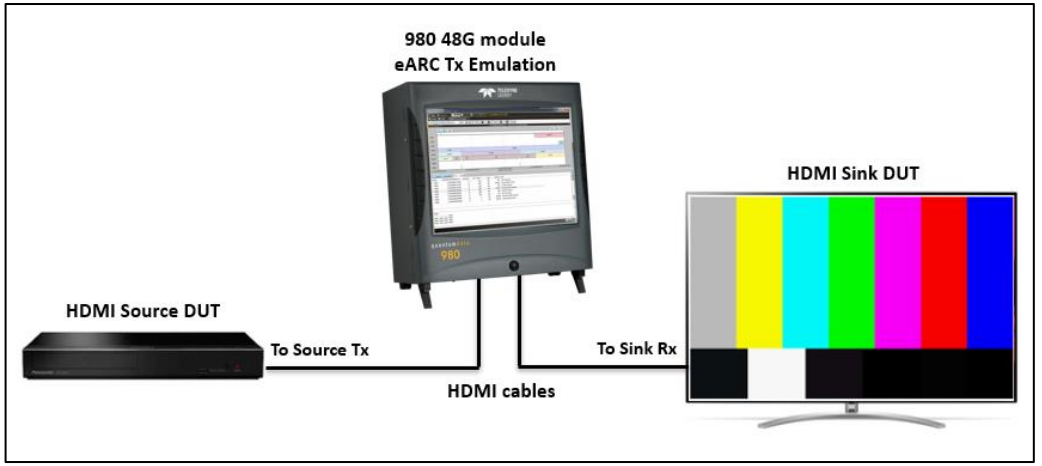


HDMI DDC Passive Monitoring TMDS and FRL modes

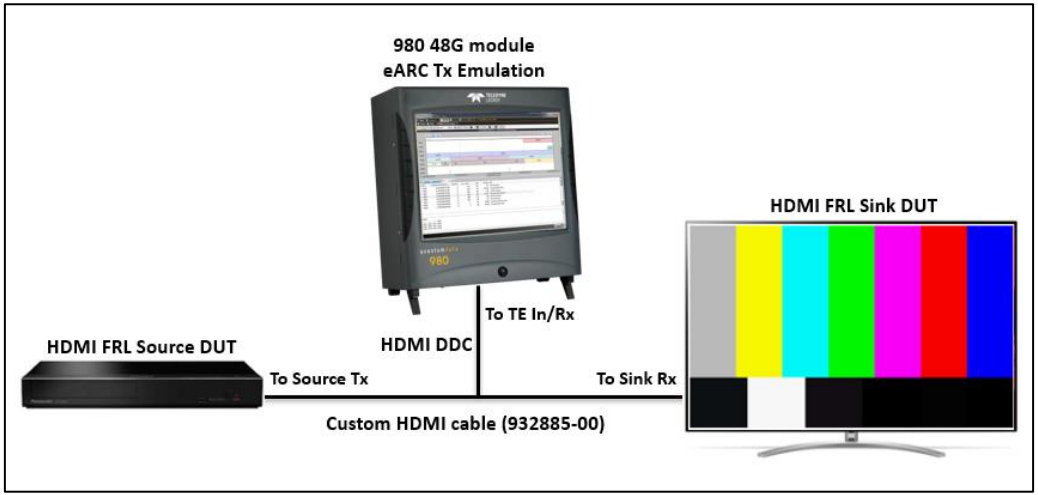
HDMI DDC Passive Monitoring – TMDS Mode

- Passive monitoring of DDC channel
  - You can monitor the DDC channel passively in the ***TMDS*** mode by connecting a source to the 980 48G module Rx port and a sink to the 980 48G module Tx port.
  - The ability to passively monitor the DDC channel in the TMDS mode is important for EDID and HDCP authentication interoperability.



HDMI DDC Passive Monitoring – FRL Mode

- Passive monitoring of DDC channel
  - You can optionally monitor the DDC channel passively in the ***FRL*** mode using a custom cable (setup right).
  - The DDC passive monitoring enables you to diagnose interoperability problems between a source and a display.
  - The ability to passively monitor the DDC channel in the FRL mode with the custom cable is especially important for FRL link training, EDID and HDCP authentication interoperability.



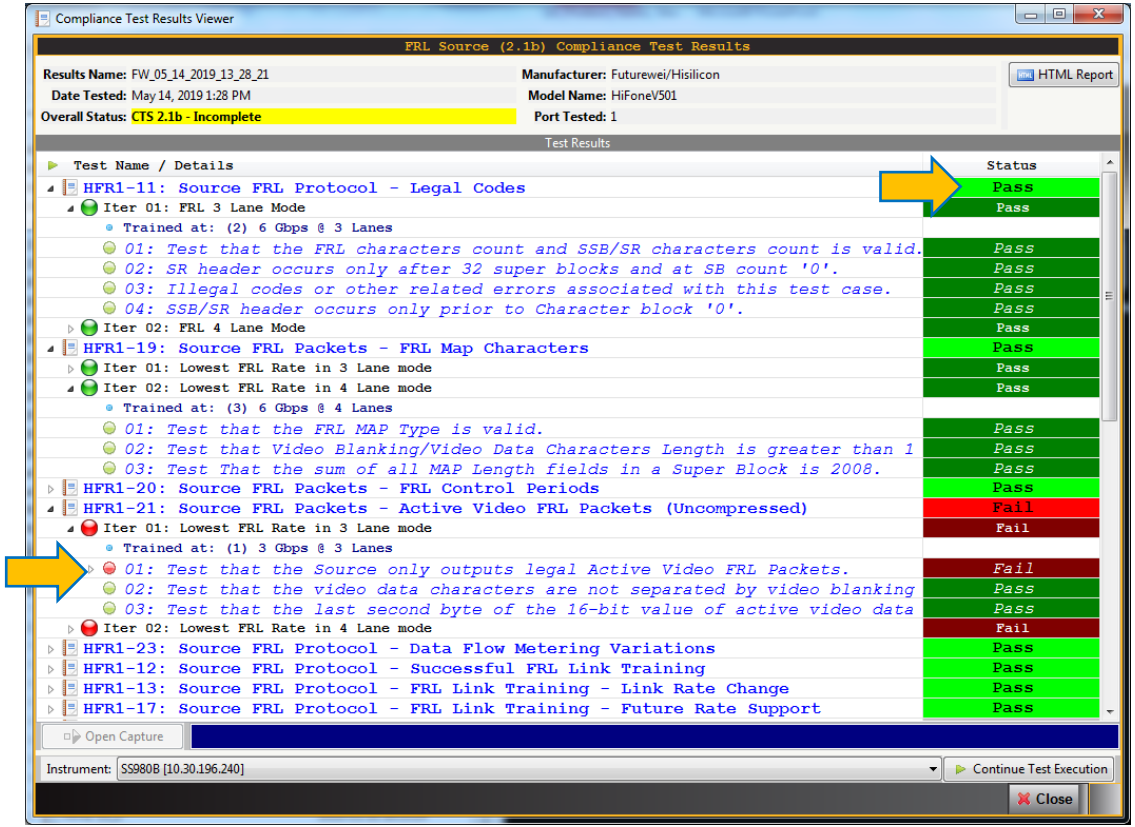
HDMI 2.1 Source Testing
Compliance Testing

HDMI Fixed Rate Link (FRL) Source Compliance Test

- HDMI 2.1 FRL source compliance Testing:
  - Run FRL source compliance tests. Full list of tests supported (only partial list shown right).

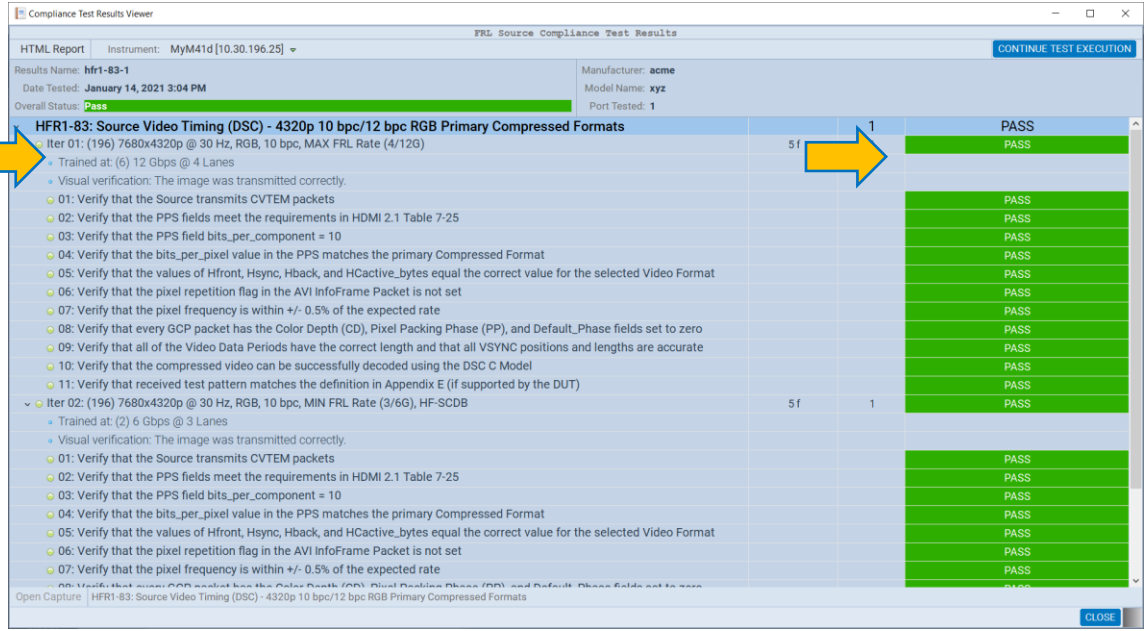
HDMI Fixed Rate Link (FRL) Source Compliance Test

- HDMI 2.1 FRL source compliance Testing:
  - Run FRL source compliance tests. Full list of tests supported.
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of FRL devices.
  - Enables export of compliance test results to share with colleagues.



HDMI FRL Display Stream Compression Source Compliance Test

- HDMI 2.1 FRL source compliance Testing:
  - Run FRL DSC source compliance tests. Full list of tests supported.
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of FRL DSC devices.
  - Enables export of compliance test results to share with colleagues.

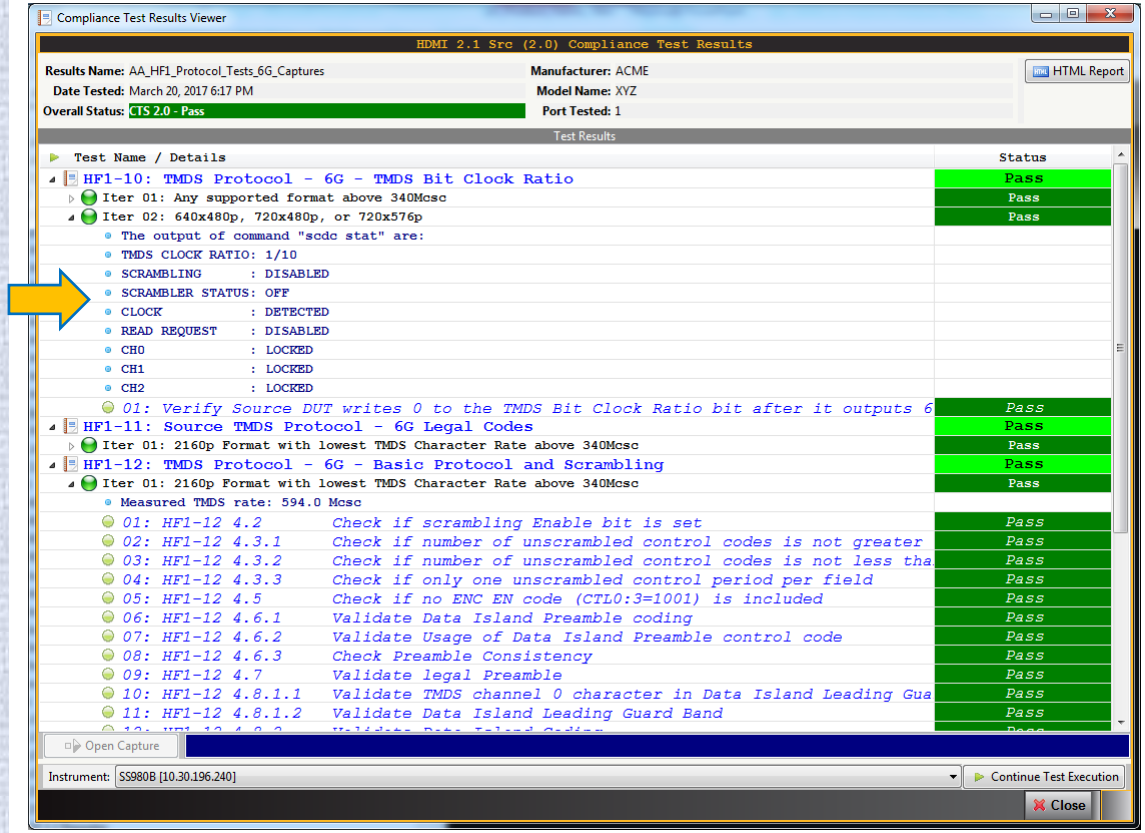


HDMI TMDS Source Compliance Testing

- HDMI TMDS compliance Testing:
  - Run TMDS source compliance tests. Full list of tests supported (only partial list shown right).
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of HDMI TMDS devices.
  - Enables export of compliance test results to share with colleagues.

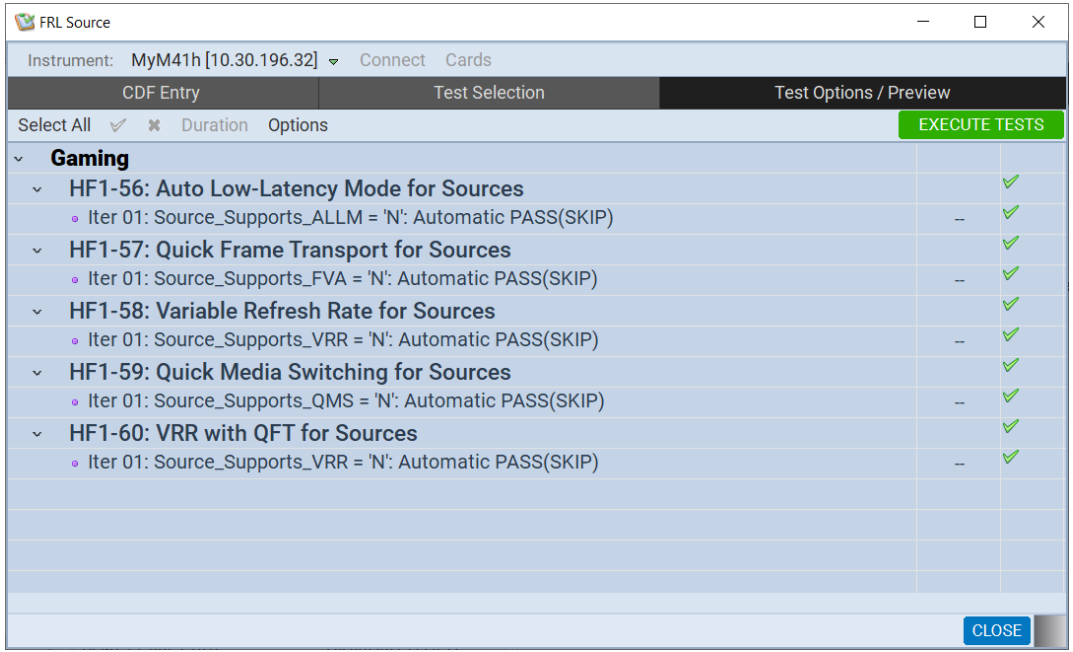
HDMI TMDS Source Compliance Testing

- HDMI TMDS compliance Testing:
  - Run TMDS source compliance tests. Full list of tests supported.
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of HDMI TMDS devices.
  - Enables export of compliance test results to share with colleagues.



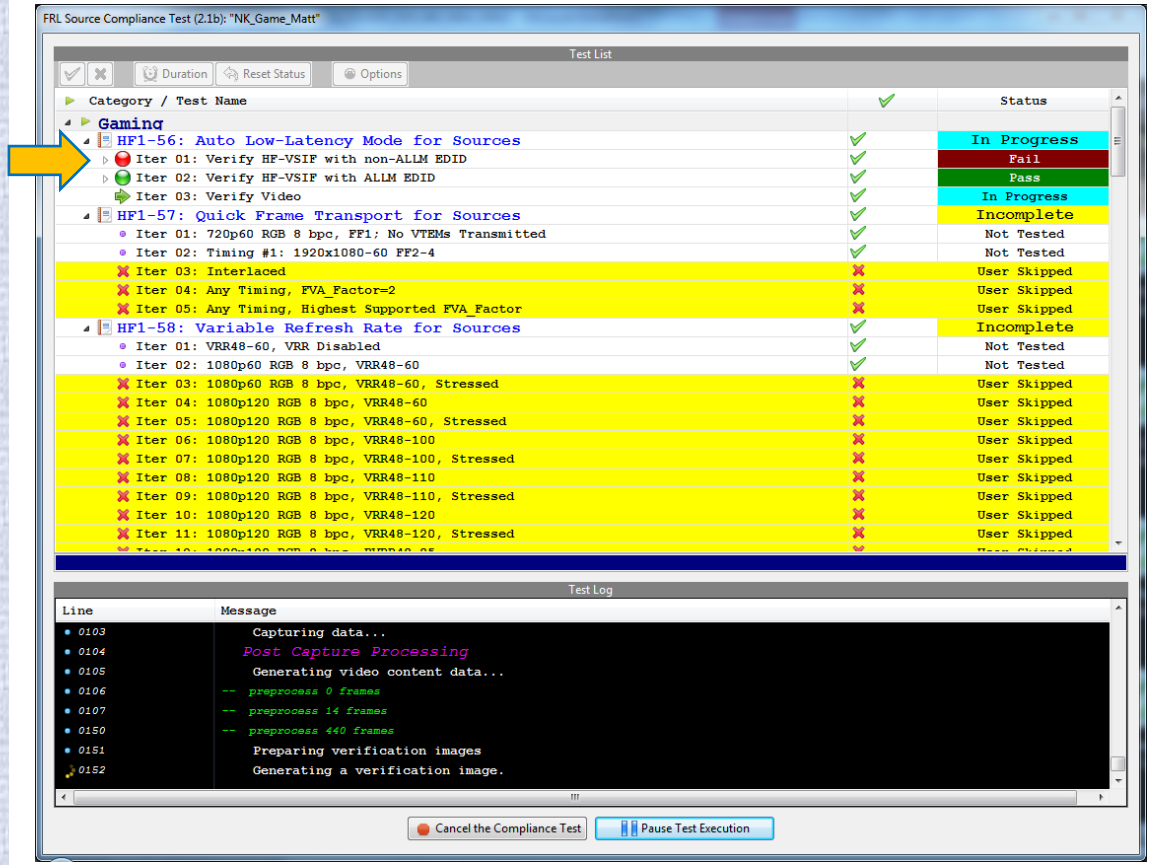
HDMI TMDS Gaming Source Compliance Test

- HDMI 2.1 TMDS Gaming sink compliance Testing:
  - Run TMDS Gaming sink compliance tests:
    - Quick Frame Transport (QFT).
    - Variable Refresh Rate (VRR).
    - Quick Media Switching (QMS).
    - VRR with QFT.
    - ALLM – (Future)
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of TMDS Gaming-capable devices.
  - Enables export of compliance test results to share w/ colleagues.



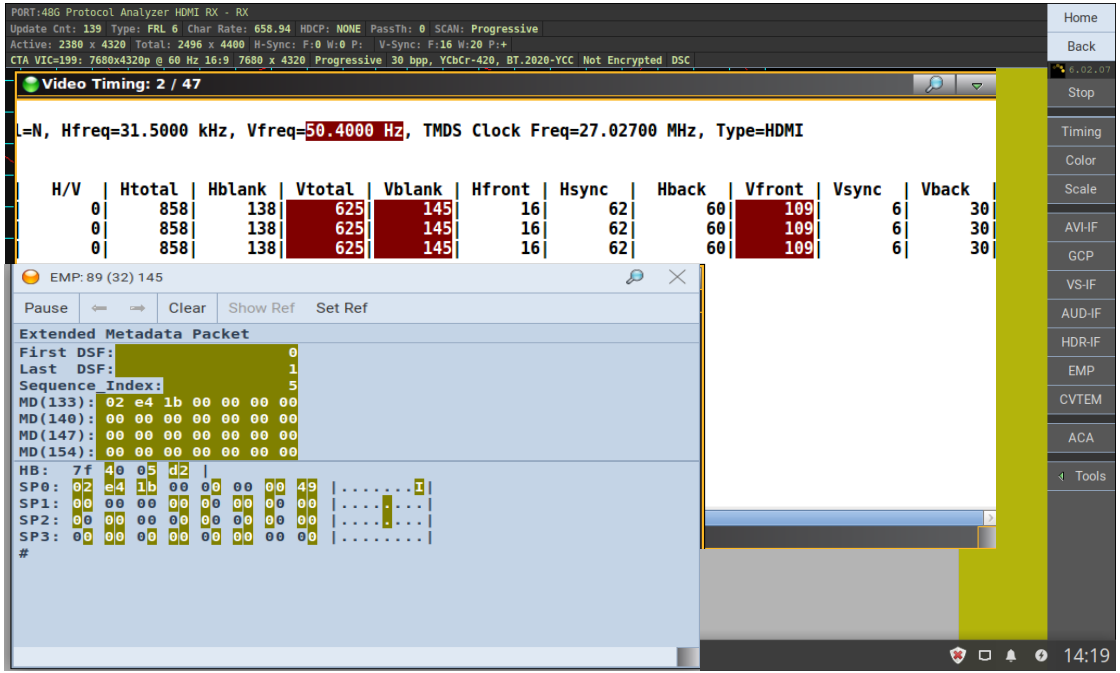
HDMI TMDS Gaming Source Compliance Test

- HDMI 2.1 TMDS Gaming sink compliance Testing:
  - Run TMDS Gaming sink compliance tests:
    - Quick Frame Transport (QFT).
    - Variable Refresh Rate (VRR).
    - Quick Media Switching (QMS).
    - VRR with QFT.
    - ALLM – (Future)
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of TMDS Gaming-capable devices.
  - Enables export of compliance test results to share w/ colleagues.



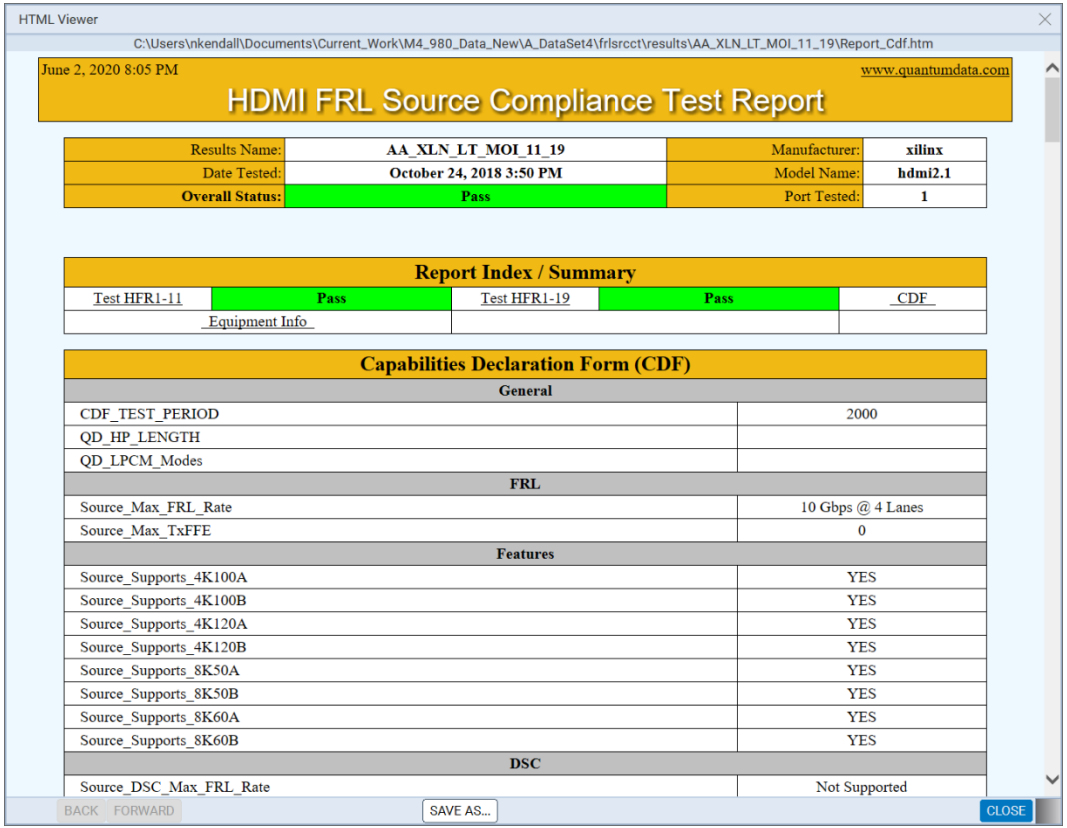
HDMI TMDS Gaming Source Compliance Test

- HDMI 2.1 TMDS Gaming sink compliance Testing:
  - Run TMDS Gaming sink compliance tests:
    - Quick Frame Transport (QFT).
    - Variable Refresh Rate (VRR).
    - Quick Media Switching (QMS).
    - VRR with QFT.
    - ALLM – (Future)
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of TMDS Gaming-capable devices.
  - Enables export of compliance test results to share w/ colleagues.



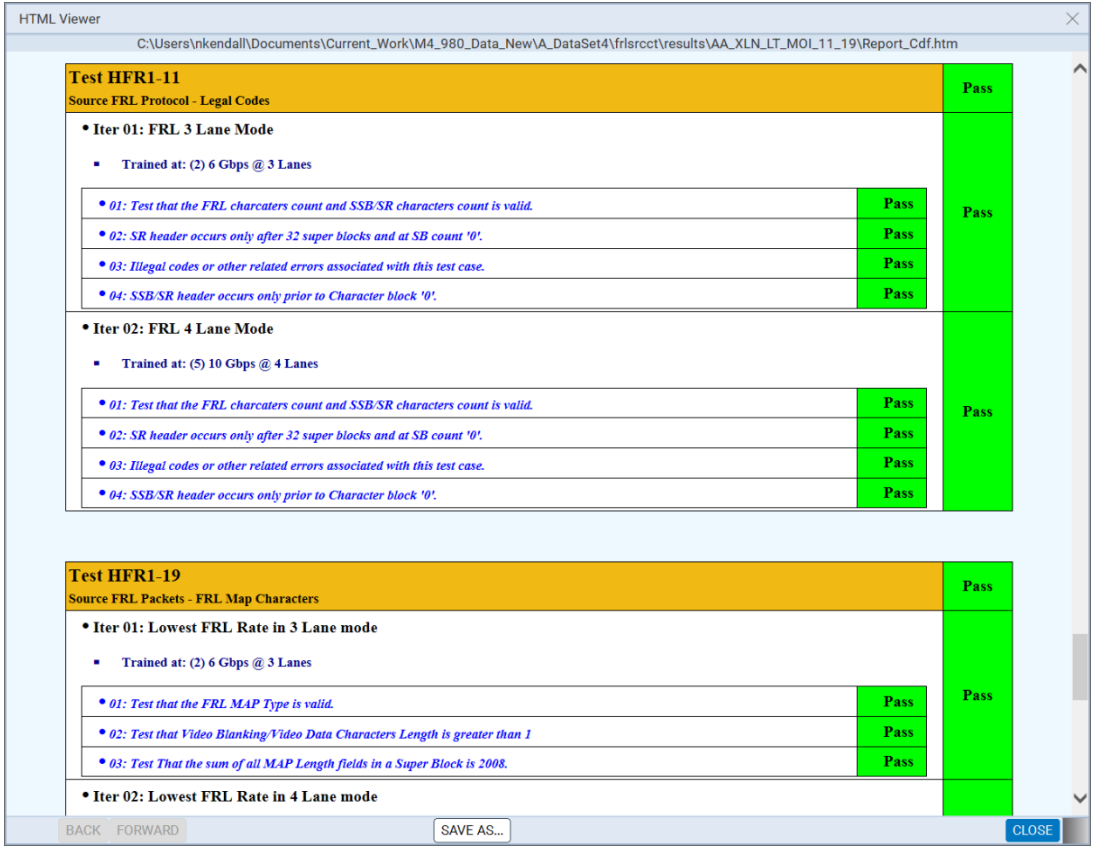
Compliance Testing – Export Compliance Test Results

- HDMI Aux Compliance Test Results Export:
  - Save compliance test results and HTML file for easy and universal viewing through browser.



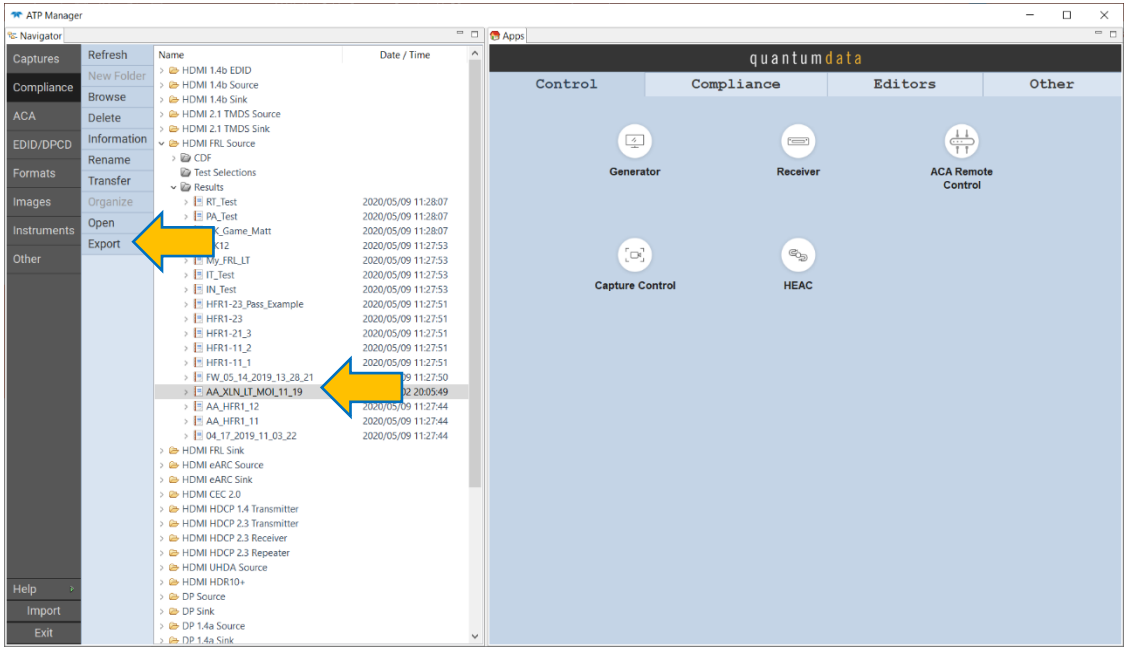
Compliance Testing – Export Compliance Test Results

- HDMI Aux Compliance Test Results Export:
  - Save compliance test results and HTML file for easy and universal viewing through browser.



Compliance Testing – Export Compliance Test Results

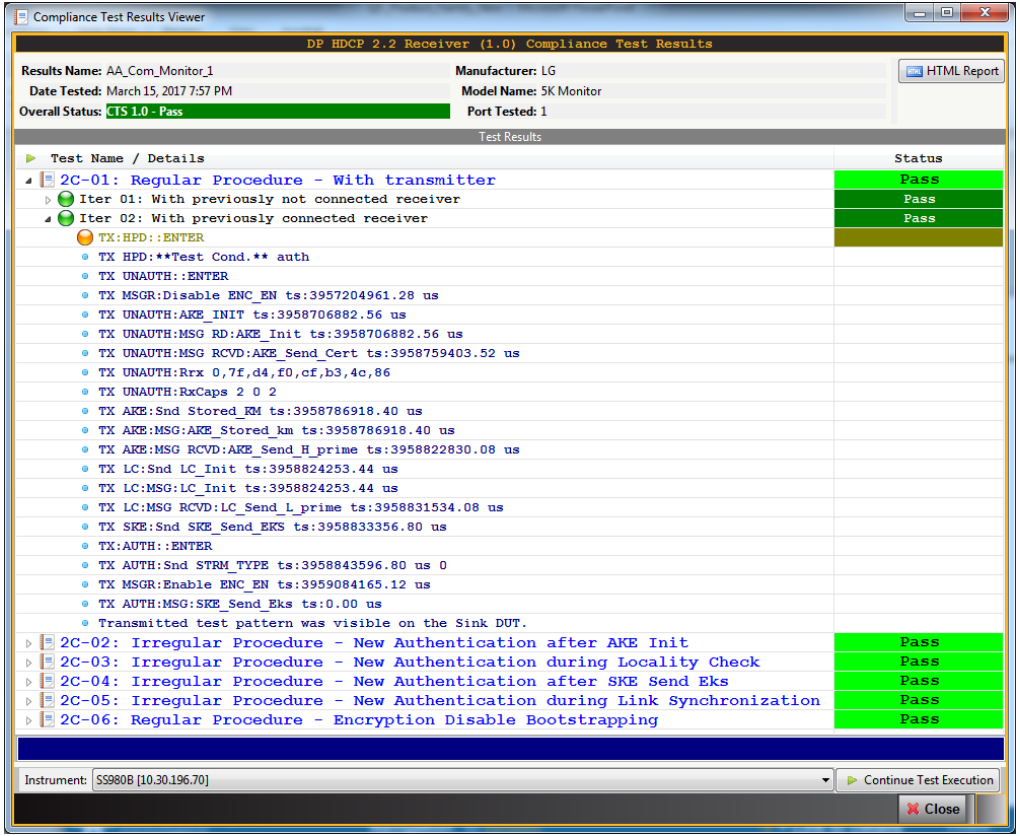
- HDMI Aux Compliance Test Results Export:
  - Save compliance test results and HTML file for easy and universal viewing through browser.
  - Export compliance test results for dissemination to colleagues, other subject matter experts or Teledyne Customer Support.



HDMI 2.1 Source Testing
HDCP Compliance Testing

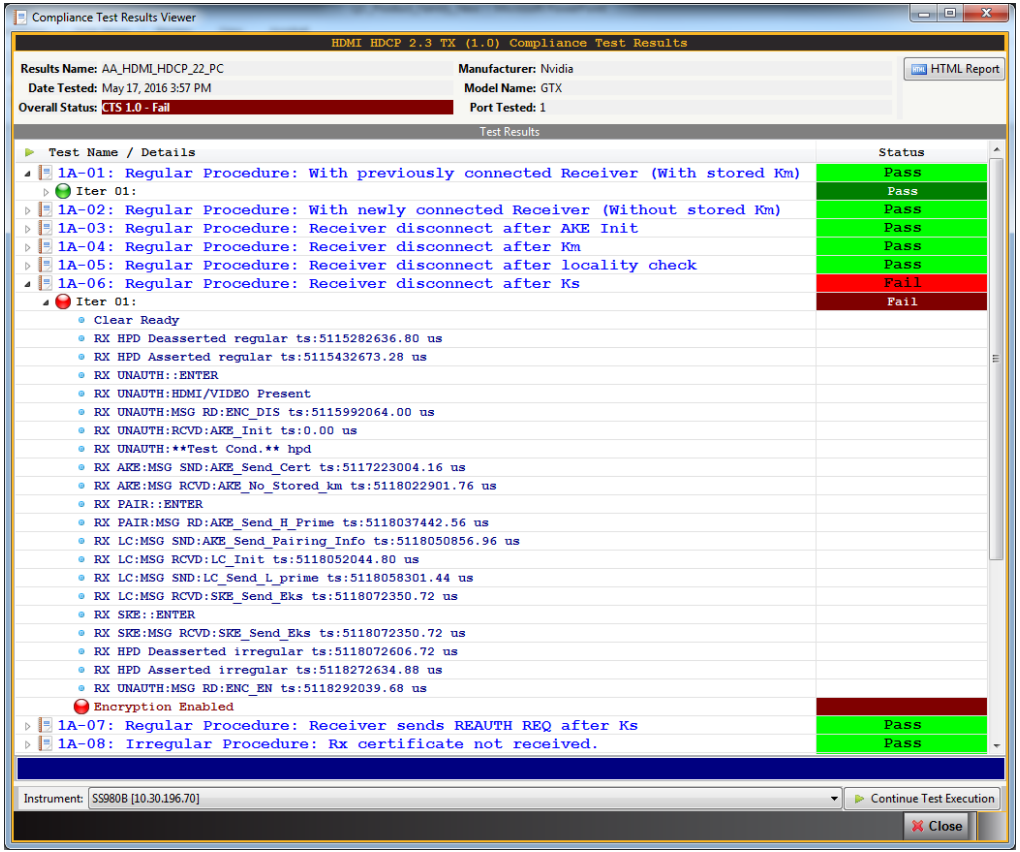
HDMI - HDCP 2.3 Source Compliance Testing

- HDMI HDCP 2.3 compliance Testing:
  - Run HDCP 2.3 source compliance tests. All tests supported.
  - Run HDCP 2.3 repeater tests. All tests supported.
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of HDMI devices.
  - Enables export compliance test results to share with colleagues.



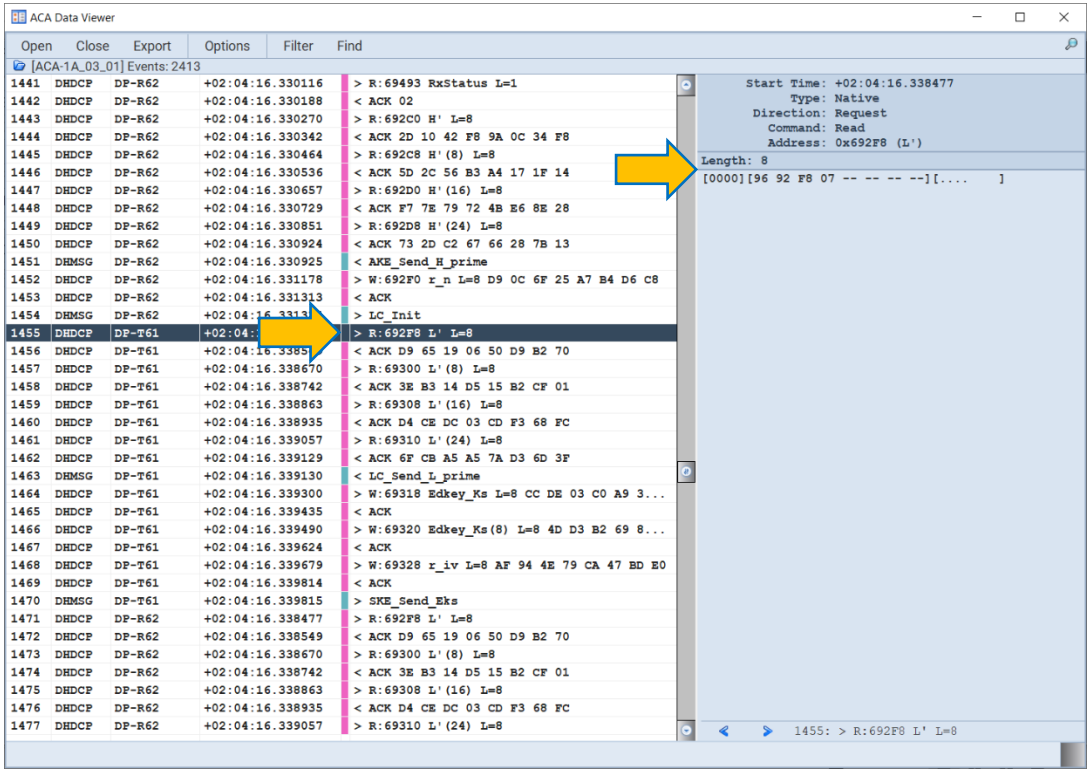
HDMI HDCP 2.3 Source Compliance Testing

- HDMI HDCP 2.3 source compliance Testing:
  - Run HDCP 2.3 source compliance tests. All tests supported.
  - Run HDCP 2.3 repeater tests. All tests supported.
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of HDMI devices.
  - Enables export compliance test results to share with colleagues.



HDMI HDCP 2.3 Source Compliance Test - ACA Test Capture Logs

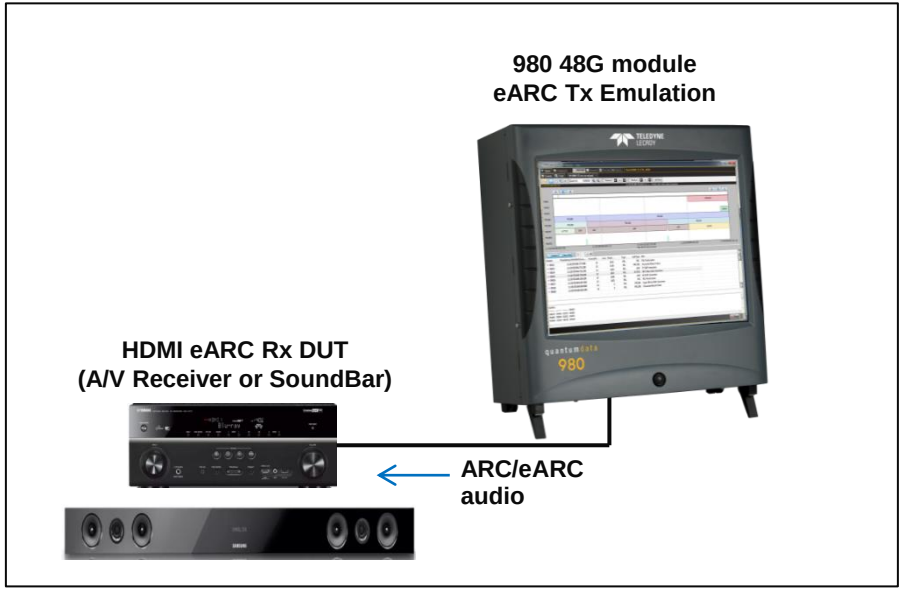
- HDMI Aux Channel Analyzer Timestamp control:
  - View the ACA transaction files for each HDCP test to confirm failures.
  - View details of any transaction.
  - View time stamps.



HDMI 2.1 eARC Rx Testing
Enhanced Audio Return Channel

HDMI eARC Rx Testing

- HDMI 2.1 eARC Testing:
  - Verify eARC Rx (e.g. Sound Bar) for common mode and differential mode operation.
  - Run eARC common and differential mode compliance tests for Rx devices. Full list of tests.

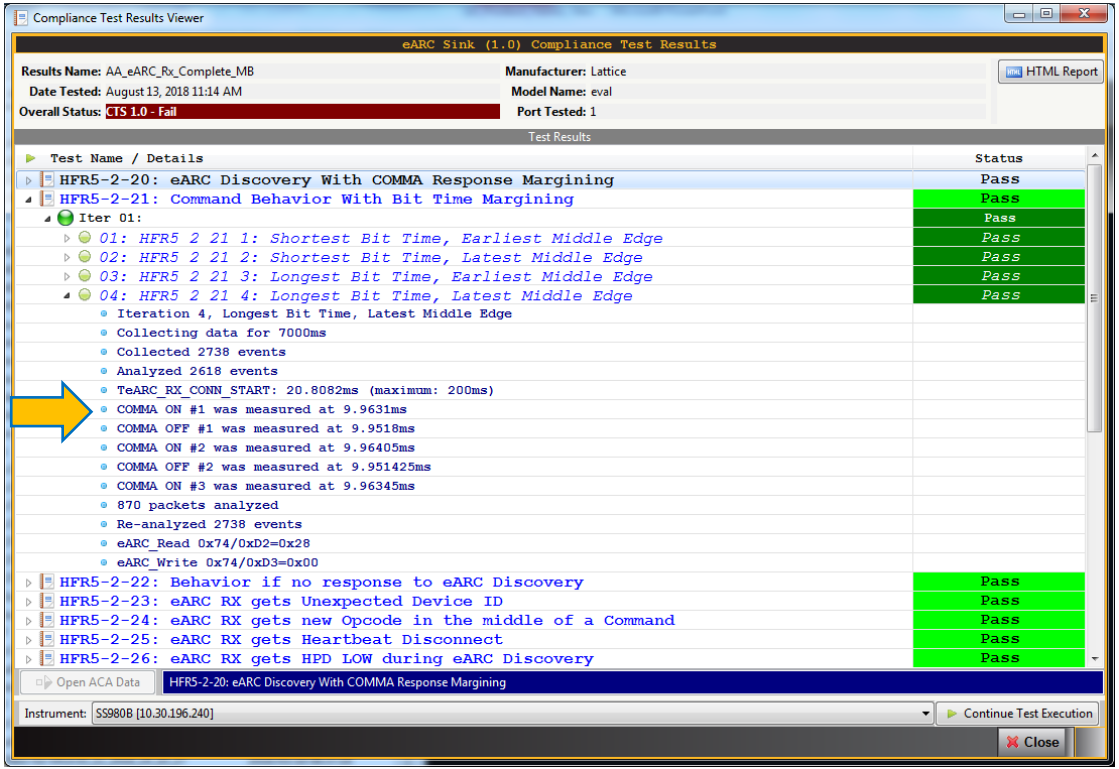


HDMI eARC Rx Testing

- HDMI 2.1 eARC Testing:
  - Verify eARC Rx (e.g. Sound Bar) for common mode and differential mode operation.
  - Run eARC common and differential mode compliance tests for Rx devices. Full list of tests supported (only partial list shown right).

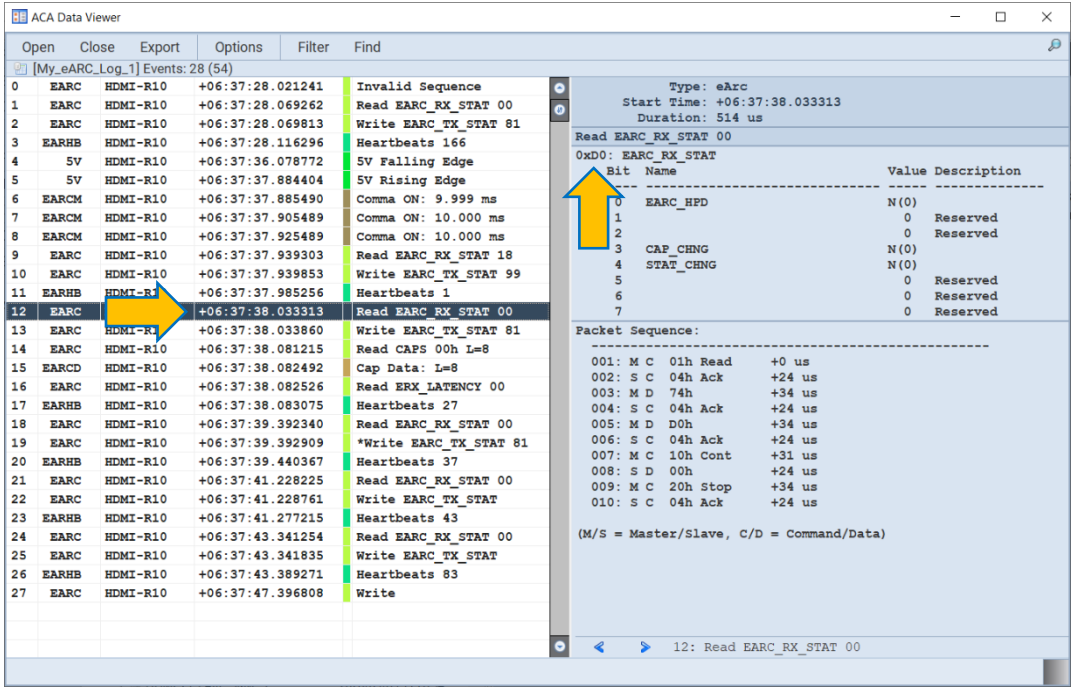
HDMI eARC Rx Testing

- HDMI 2.1 eARC Testing:
  - Verify eARC Rx (e.g. Sound Bar) for common mode and differential mode operation.
  - Run eARC common and differential mode compliance tests for Rx devices. Full list of tests supported.
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of eARC devices.
  - Enables export of compliance test results to share w/ colleagues.



HDMI eARC Common Mode Configuration Sequence

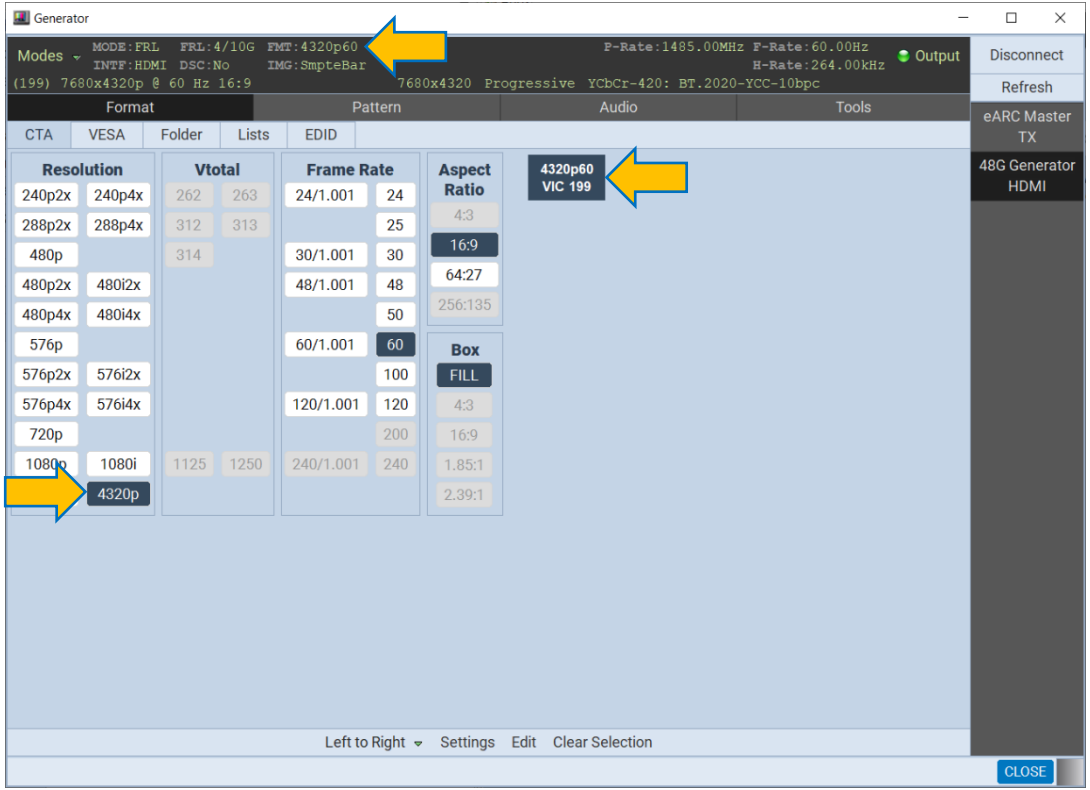
- HDMI 2.1 eARC Testing:
  - Verify eARC common mode connection sequence using Aux Channel Analyzer (ACA) utility.
  - Enables export of ACA eARC Common Mode transactions to share w/ colleagues.



HDMI 2.1 Sink Testing
Video Generation

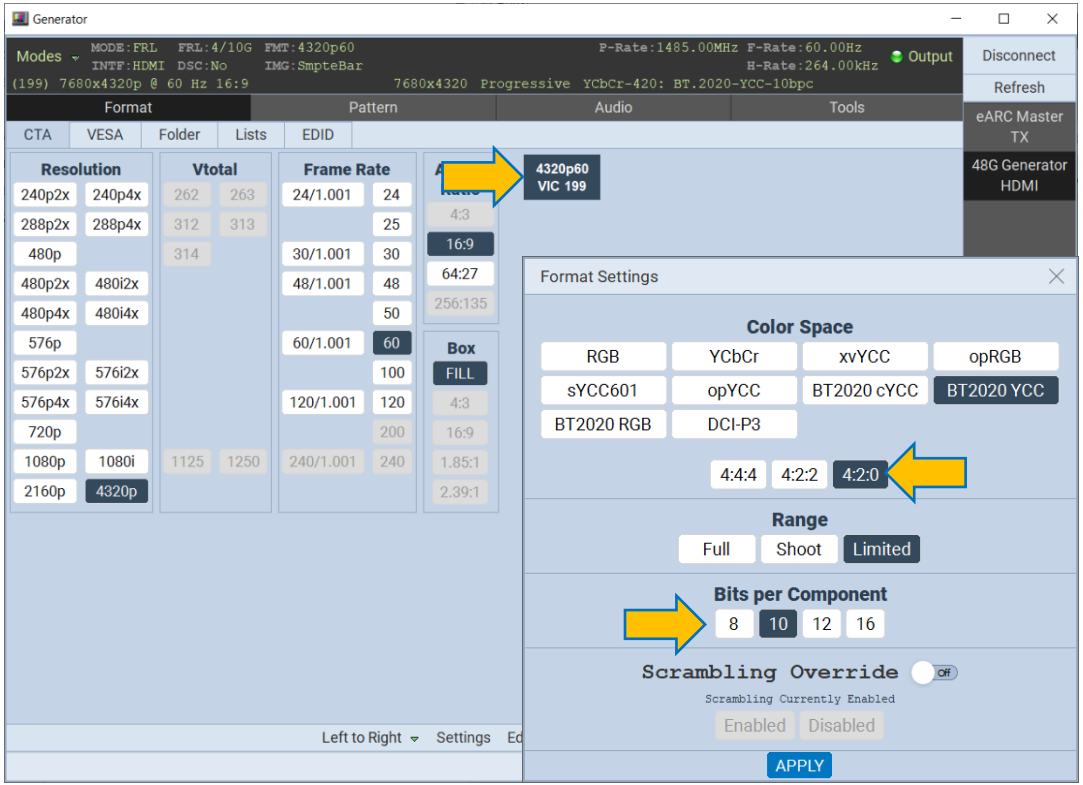
HDMI 2.1 Video Generator Function – Select Resolution and Color Parameters

- HDMI Video Generator:
  - Test 4K and 8K UHD TVs with a variety of video formats and colorimetry settings.



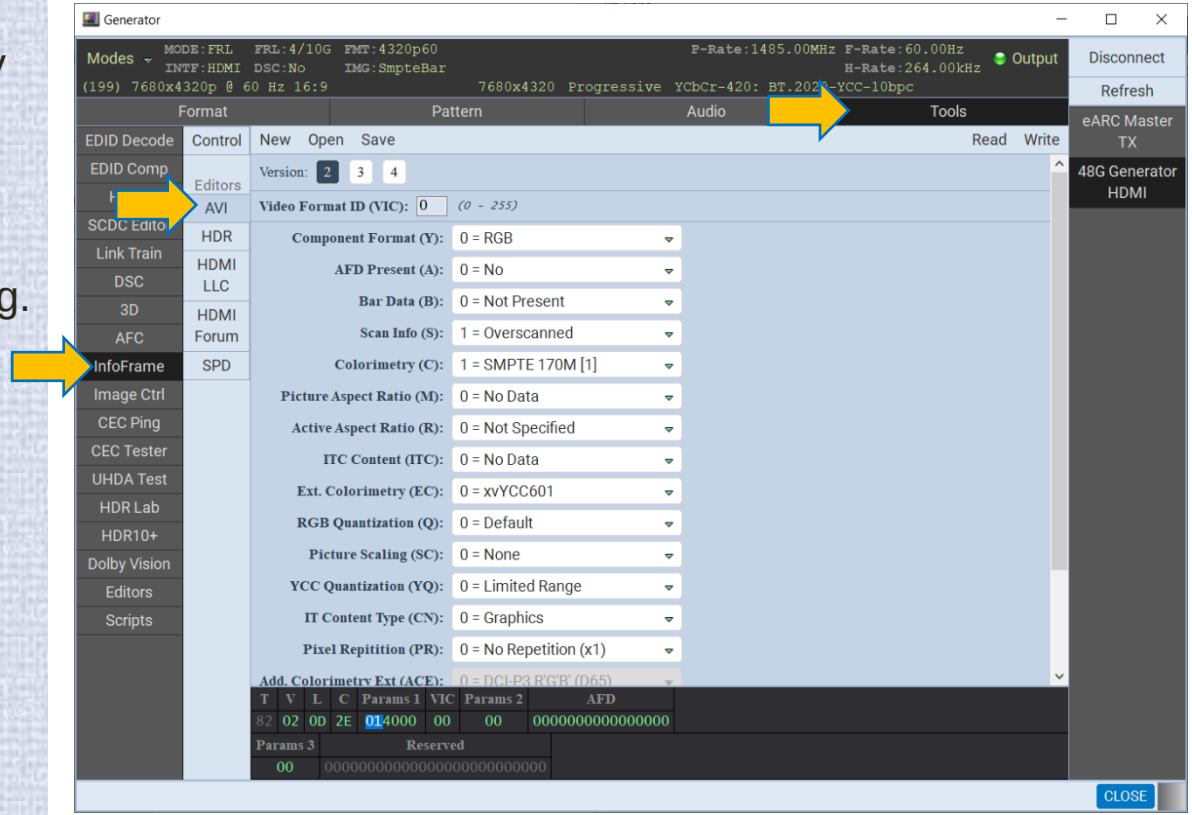
HDMI 2.1 Video Generator Function – Select Resolution and Color Parameters

- HDMI Video Generator:
  - Test 4K UHD TVs with a variety of video formats and video parameters.
  - Use variety of test patterns including moving patterns to check motion artifacts.
  - Extensive video format library with the ability to create custom formats.



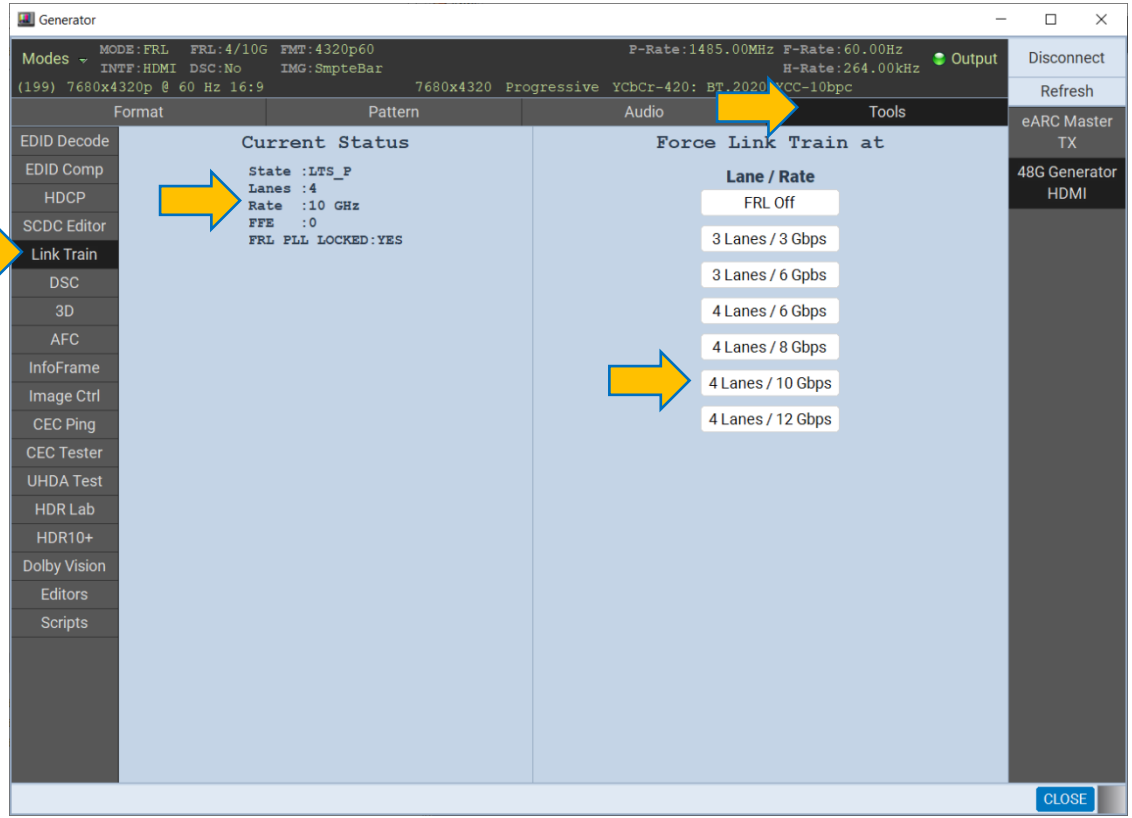
HDMI TMDS Video Generation – Configure Outgoing Metadata

- HDMI Video Generator:
  - Test 4K UHD TVs with a variety of video formats and video parameters.
  - Enables user control over Infoframe and data island transmission for irregular testing.



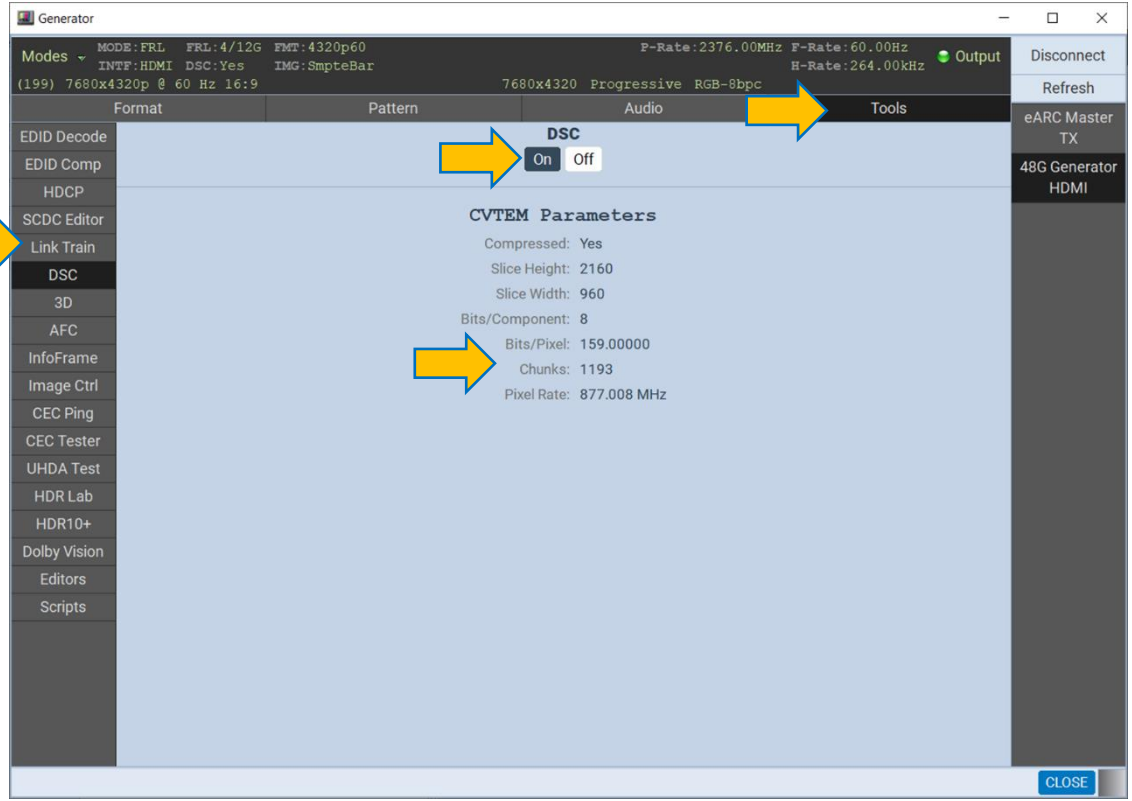
HDMI Video Generator Function

- HDMI Video Generator:
  - Test 4K and 8K UHD TVs with a variety of video formats and colorimetry settings.
  - Configure Link settings with Lane rate & number of Lanes.
  - Turn FRL Off to test TMDS.



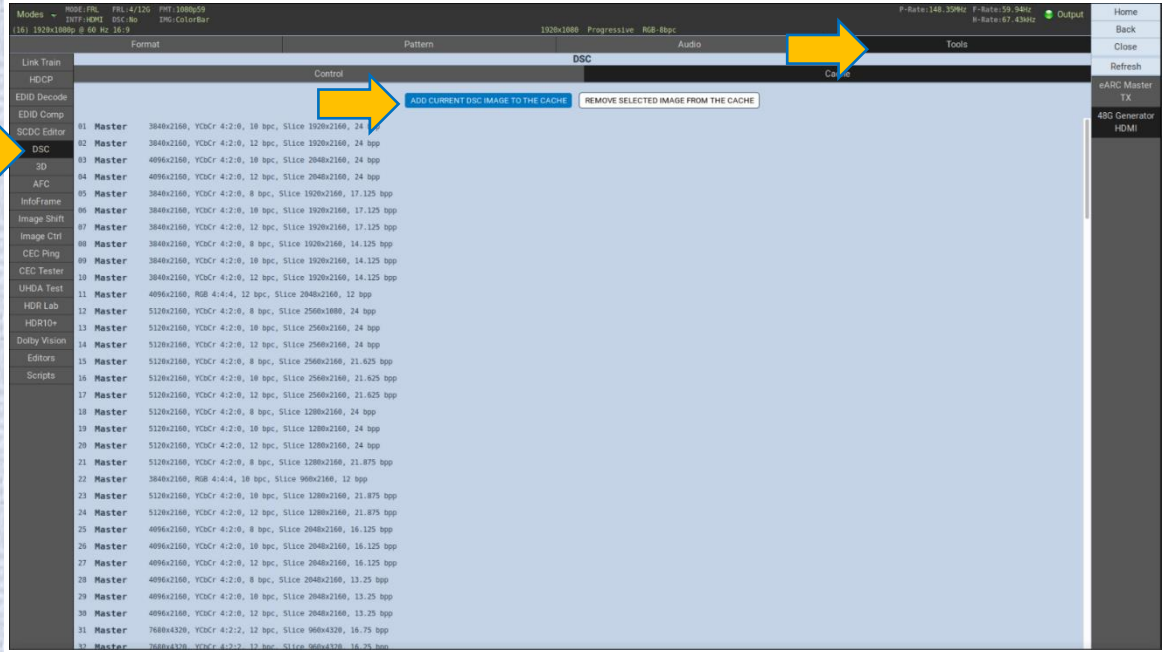
HDMI Video Generator Function – Selecting DSC

- HDMI Video Generator:
  - Test 4K and 8K UHD TVs with a variety of video formats and colorimetry settings.
  - Configure Link settings with Lane rate & number of Lanes.
  - Turn FRL Off to test TMDS.
  - You can active Display Stream Compression (DSC) when the 980 48G module is in the FRL video generation mode.



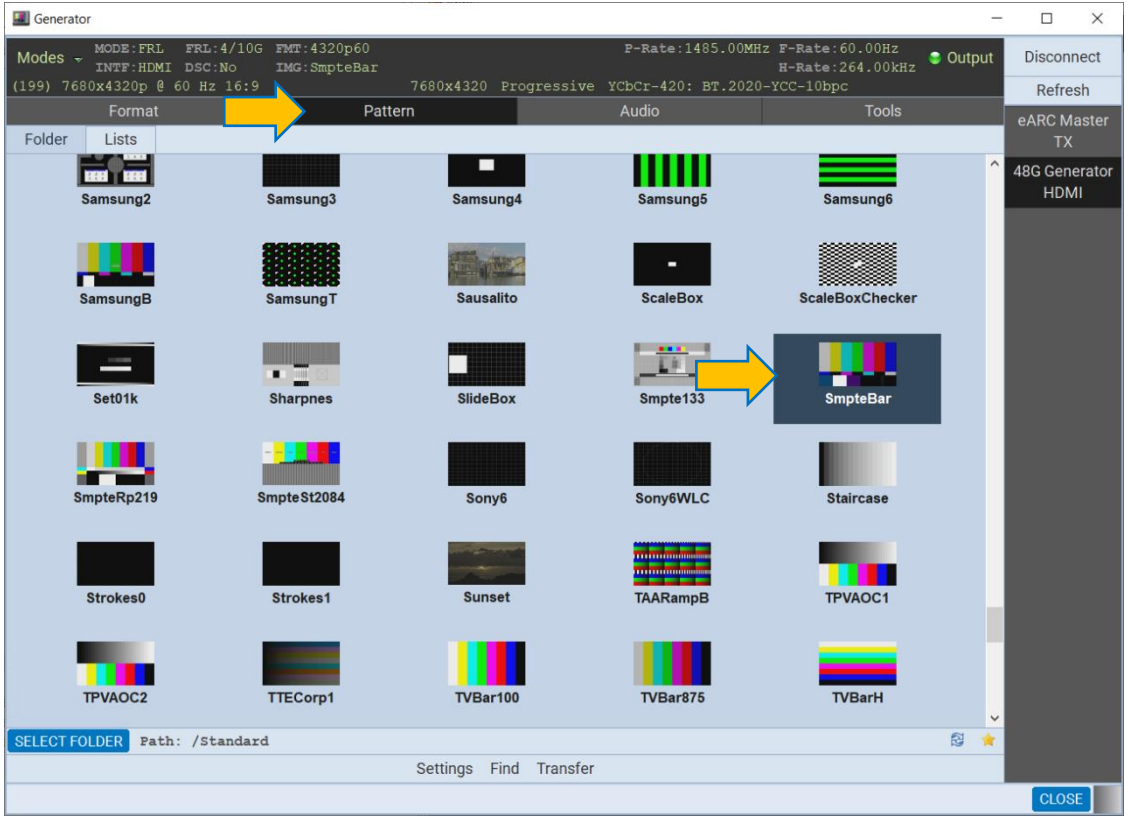
HDMI Video Generator Function – DSC Image Caching

- HDMI Video Generator – DSC Image Caching:
  - Install or create cached, pre-compressed DSC images for quick rendering.



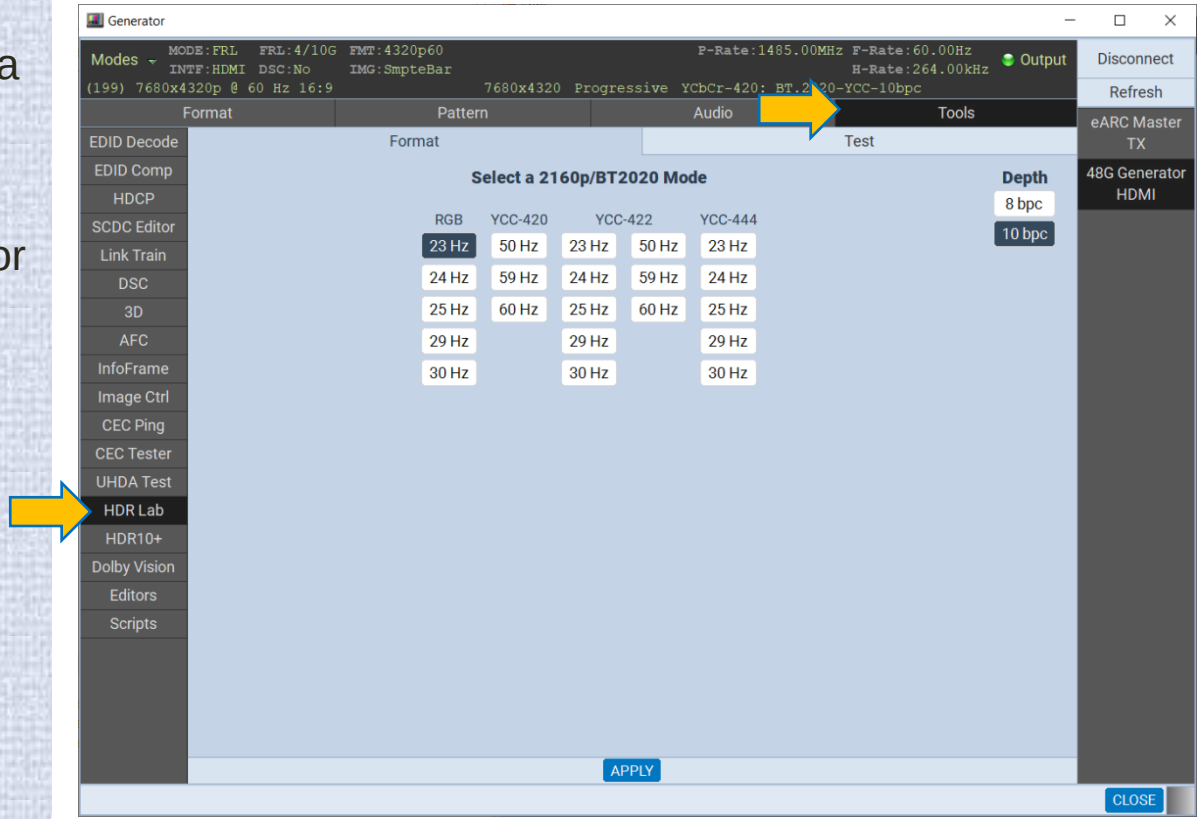
HDMI Video Generator Function – Test Pattern Selection

- HDMI Video Generator:
  - Test 4K and 8K UHD TVs with a variety of video formats and colorimetry settings.
  - Includes a variety of test patterns and special patterns for testing UHD displays.
  - Verify HDR rendering capabilities of a 8K UHD TV.



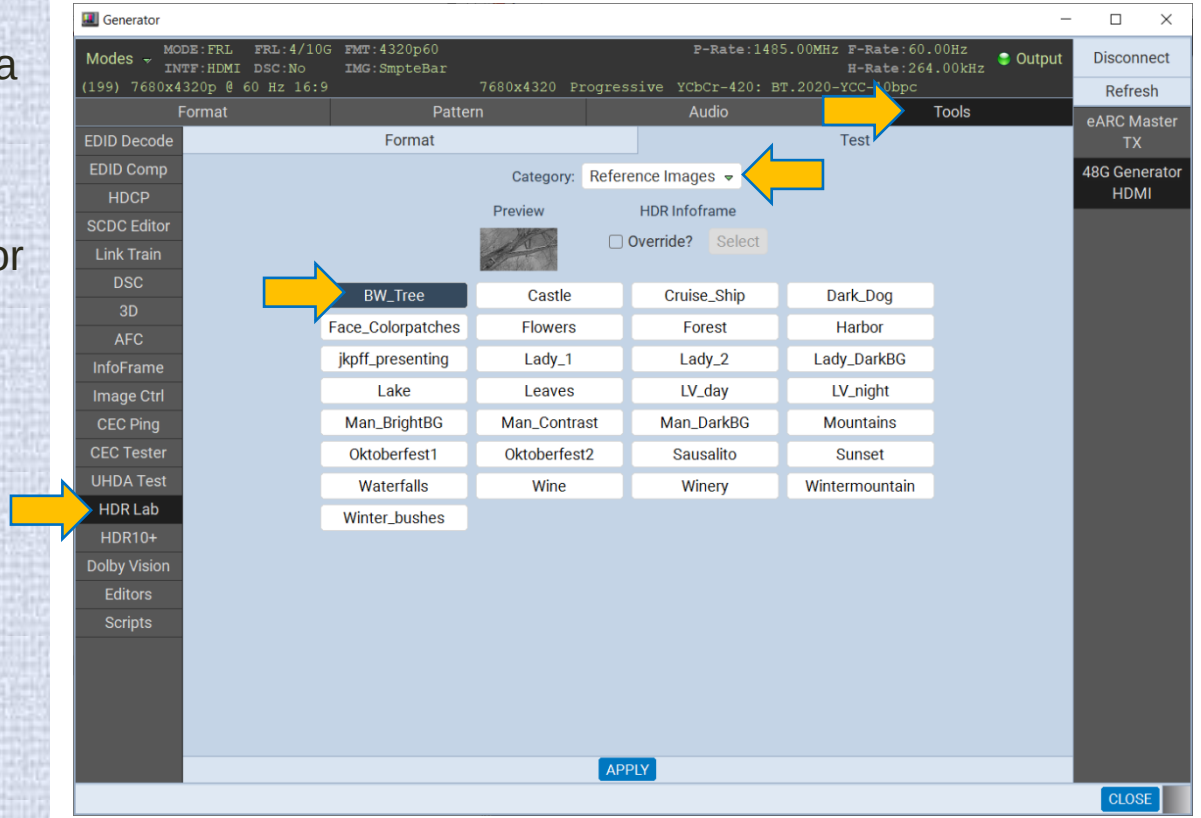
HDMI Video Generator Function – HDR Test Patterns

- HDMI Video Generator:
  - Test 4K and 8K UHD TVs with a variety of video formats and colorimetry settings.
  - Includes a variety of test patterns and special patterns for testing UHD displays.
  - Verify HDR rendering capabilities of a 8K UHD TV.



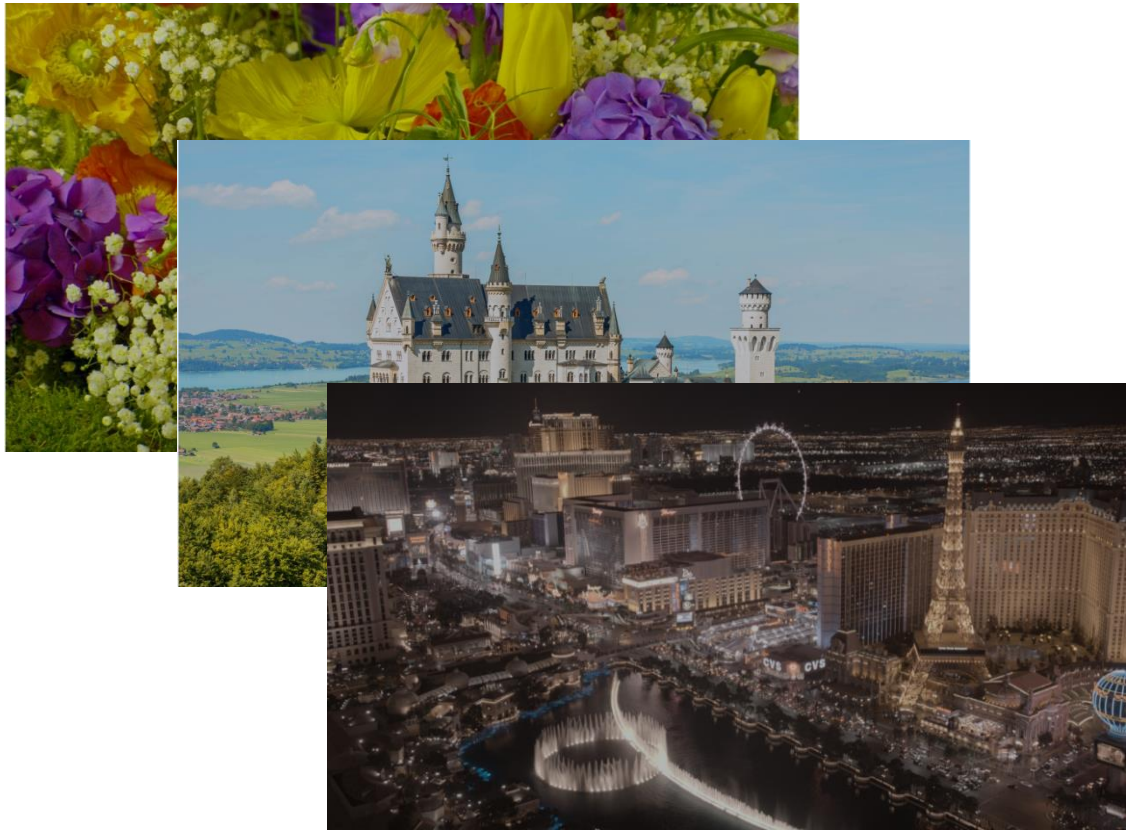
HDMI Video Generator Function – HDR Test Patterns

- HDMI Video Generator:
  - Test 4K and 8K UHD TVs with a variety of video formats and colorimetry settings.
  - Includes a variety of test patterns and special patterns for testing UHD displays.
  - Verify HDR rendering capabilities of a 8K UHD TV.



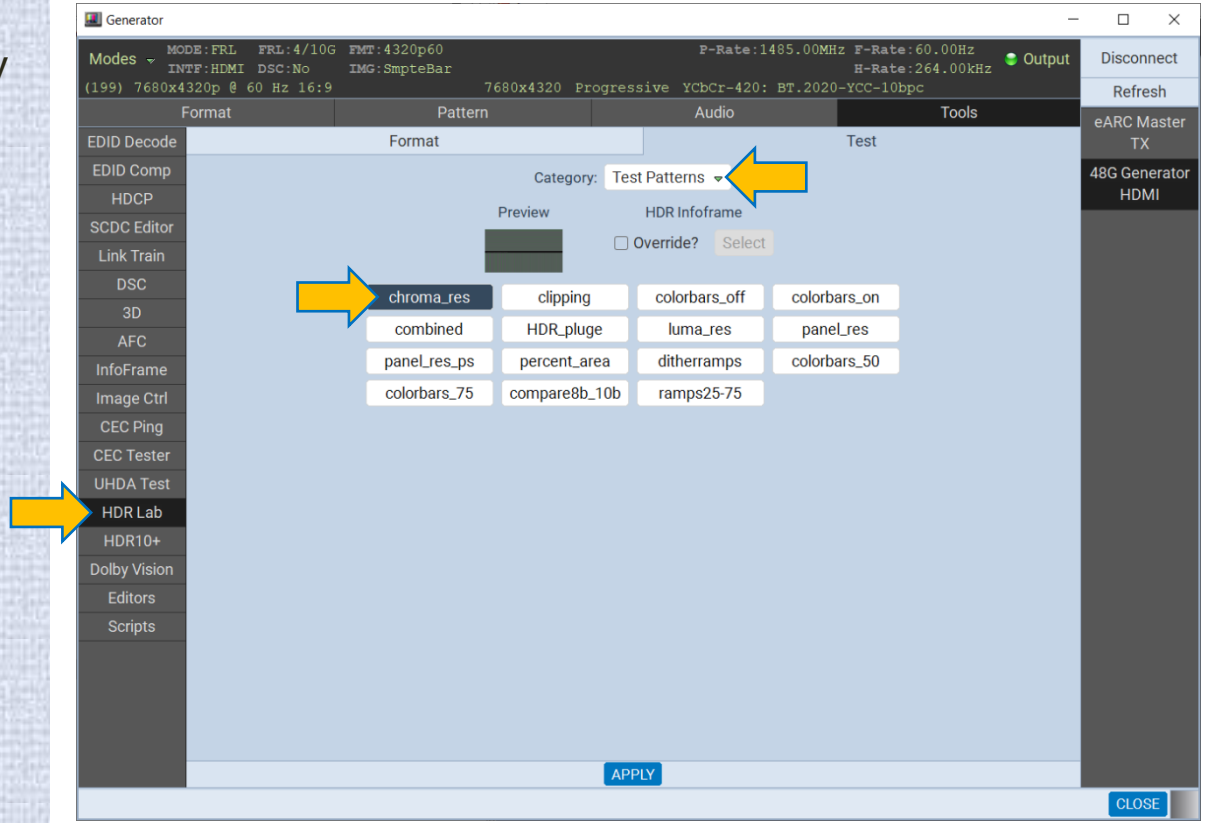
HDMI Video Generator Function – HDR Test Patterns

- HDMI Video Generator:
  - Test 4K and 8K UHD TVs for HDR10 with a variety of video formats and colorimetry settings.
  - Includes a variety of test patterns and special natural images (shown) for testing UHD displays.
  - Verify HDR rendering capabilities of 4K and 8K UHD TV for HDR10 subjectively.



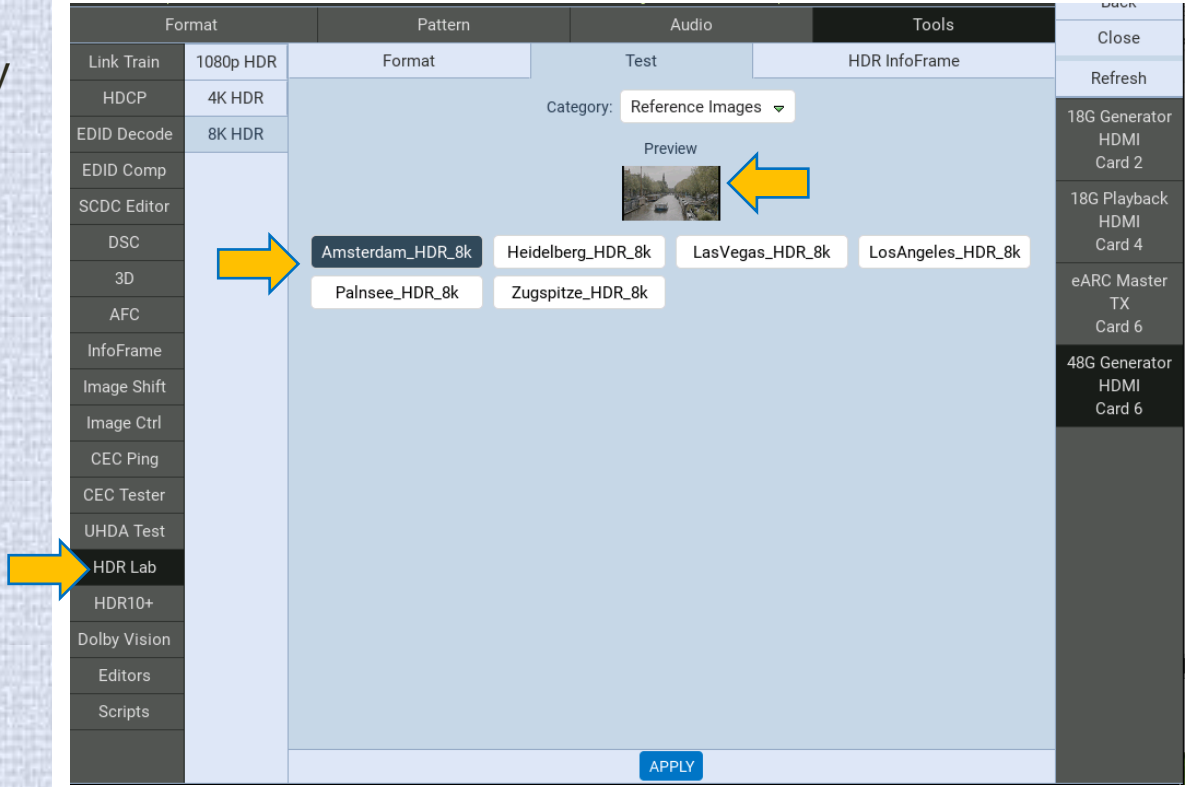
HDMI TMDS and FRL Video Generation – HDR Lab

- HDMI Video Generator:
  - Test 4K UHD TVs with a variety of video formats and video parameters.
  - Verify HDR rendering capabilities of a 4K UHD TV.



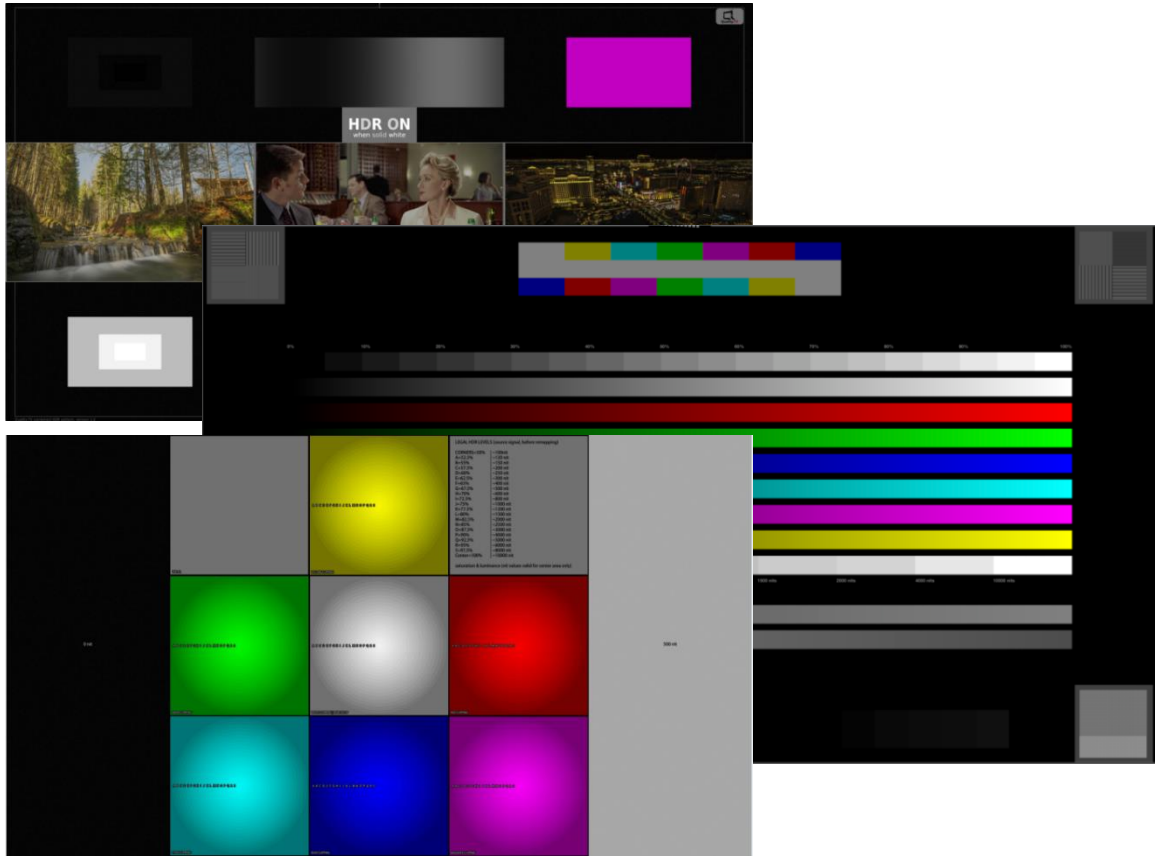
HDMI FRL Video Generation – HDR Lab

- HDMI Video Generator:
  - Test 8K UHD TVs with a variety of video formats and video parameters.
  - Verify HDR rendering capabilities of a 8K UHD TV.



HDMI 2.1 Video Generator Function – HDR Test Patterns

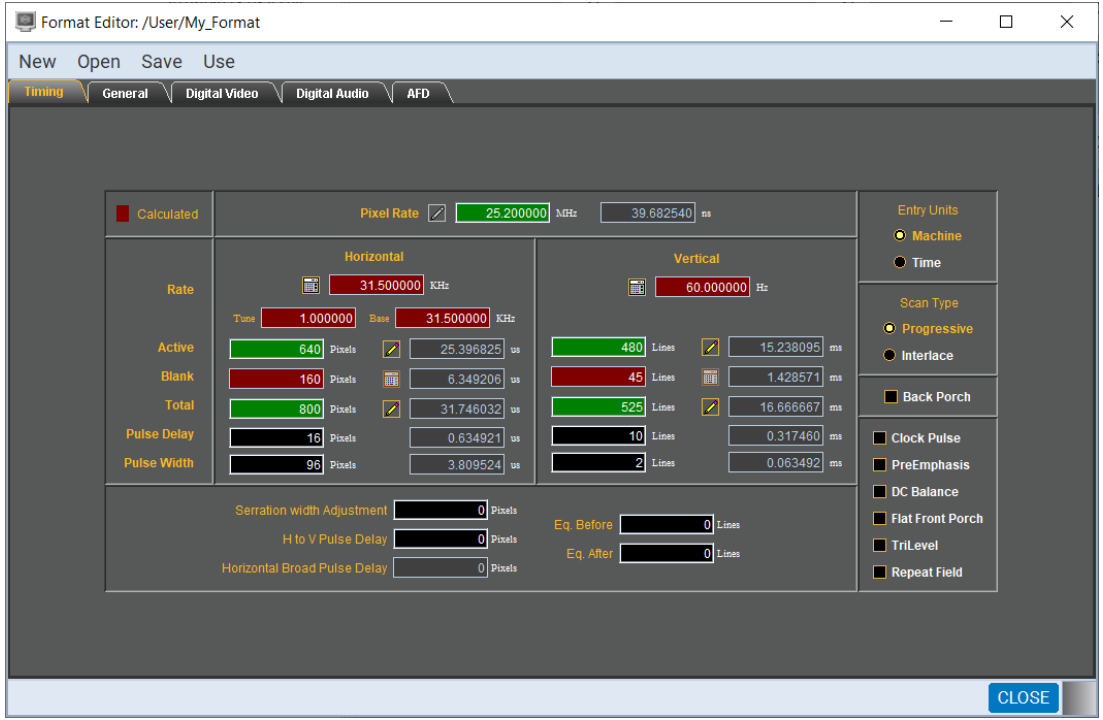
- HDMI Video Generator:
  - Test 4K and 8K UHD TVs for HDR10 with a variety of video formats and colorimetry settings.
  - Includes a variety of HDR test patterns (shown) and special natural images for testing UHD displays.
  - Verify HDR rendering capabilities of 4K and 8K UHD TV for HDR10 objectively.



HDMI Sink Testing
Custom Formats and Format Lists

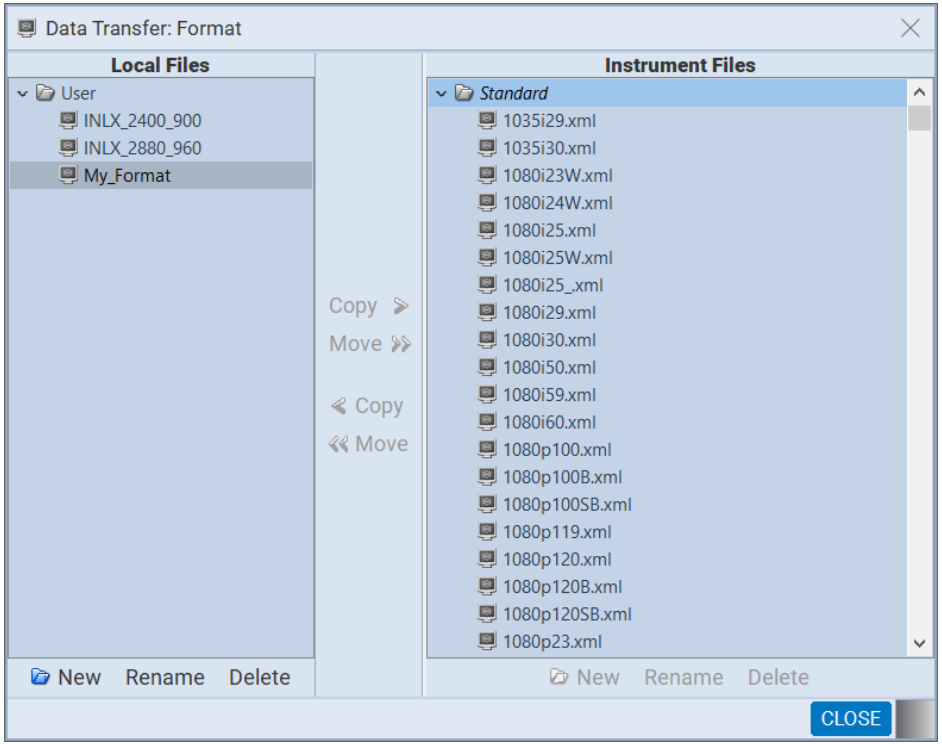
Video Generator – Custom Format Timing

- HDMI Video Generator:
  - Create custom video timings for testing a display's response to a variety of standard and non-standard or irregular timings.
  - Save custom timings in separate list for easy access and testing.
  - Create custom format lists of standard formats, e.g. 8K formats.



Video Generator – Custom Format Timing

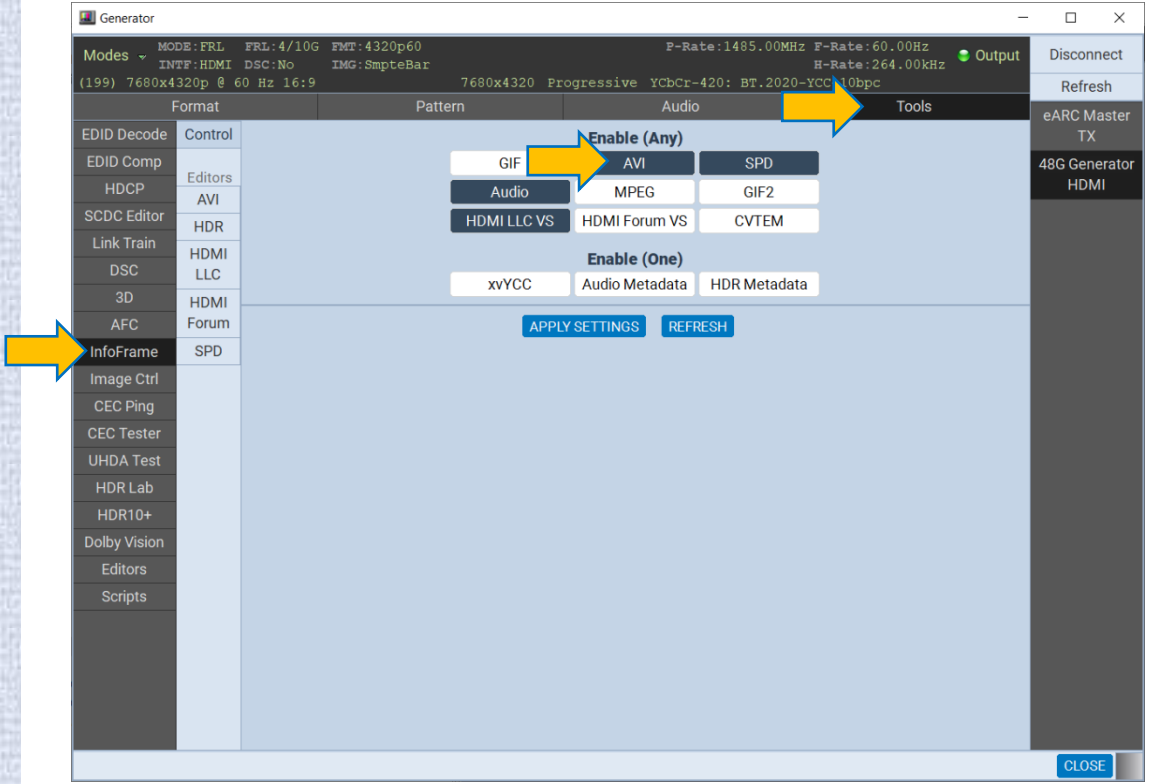
- HDMI Video Generator:
  - Create custom video timings for testing a display's response to a variety of standard and non-standard or irregular timings.
  - Save custom timings in separate list for easy access and testing.
  - Create custom format lists of standard formats, e.g. 8K formats.



HDMI Sink Testing
InfoFrame and Data Island Editor

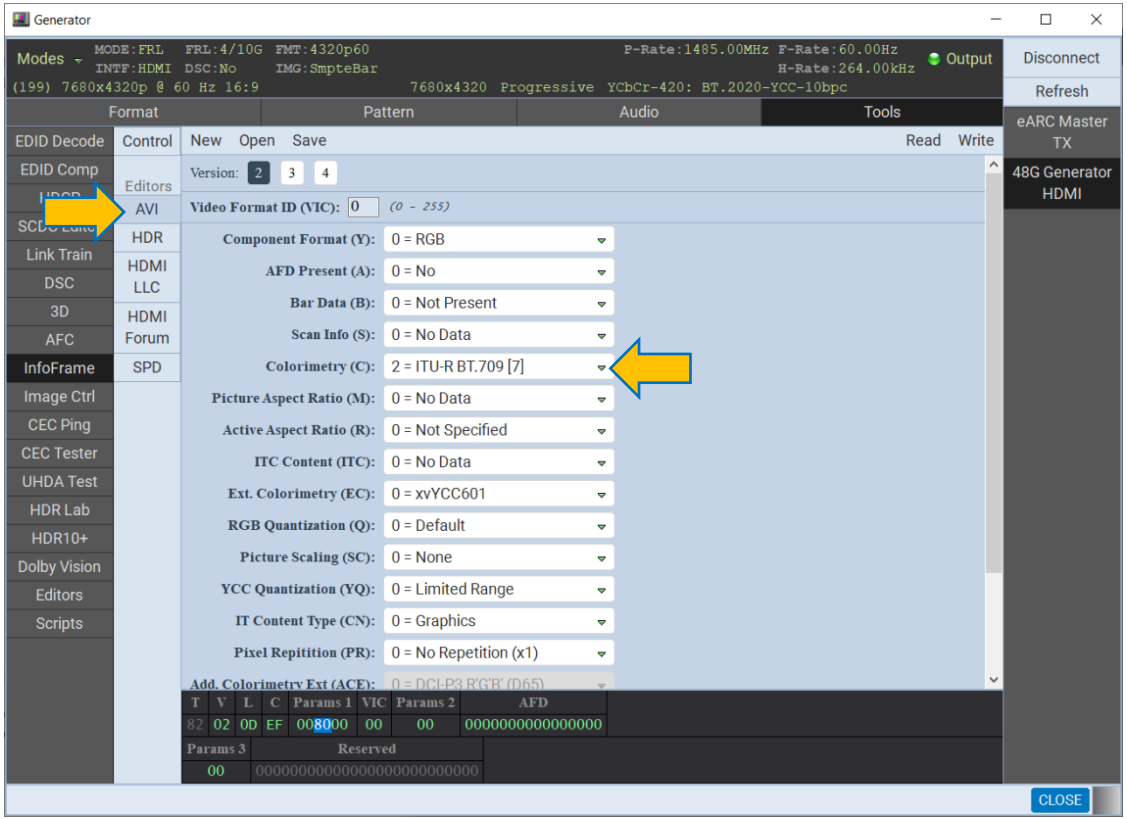
HDMI Video Generator – Infoframe Output Control

- HDMI Video Generator:
  - Configure HDMI InfoFrame parameter values to test sink response to irregular conditions.
  - Examples show AVI InfoFrame and HDR InfoFrame.



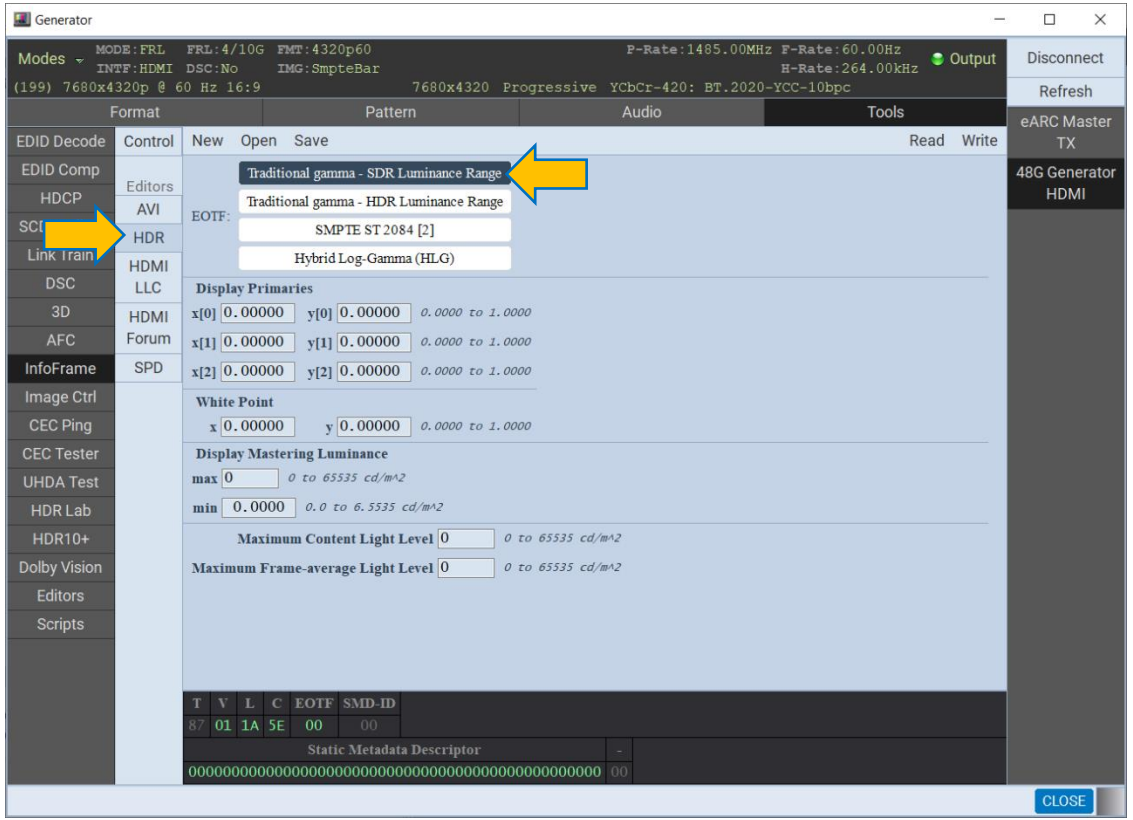
HDMI Video Generator – Infoframe Output Control

- HDMI Video Generator:
  - Configure HDMI InfoFrame parameter values to test sink response to irregular conditions.
  - Example shows AVI InfoFrame.
  - Use Pull-Down menus to make changes to outgoing AVI InfoFrame.



Video Generator – HDMI Infoframe Output Control

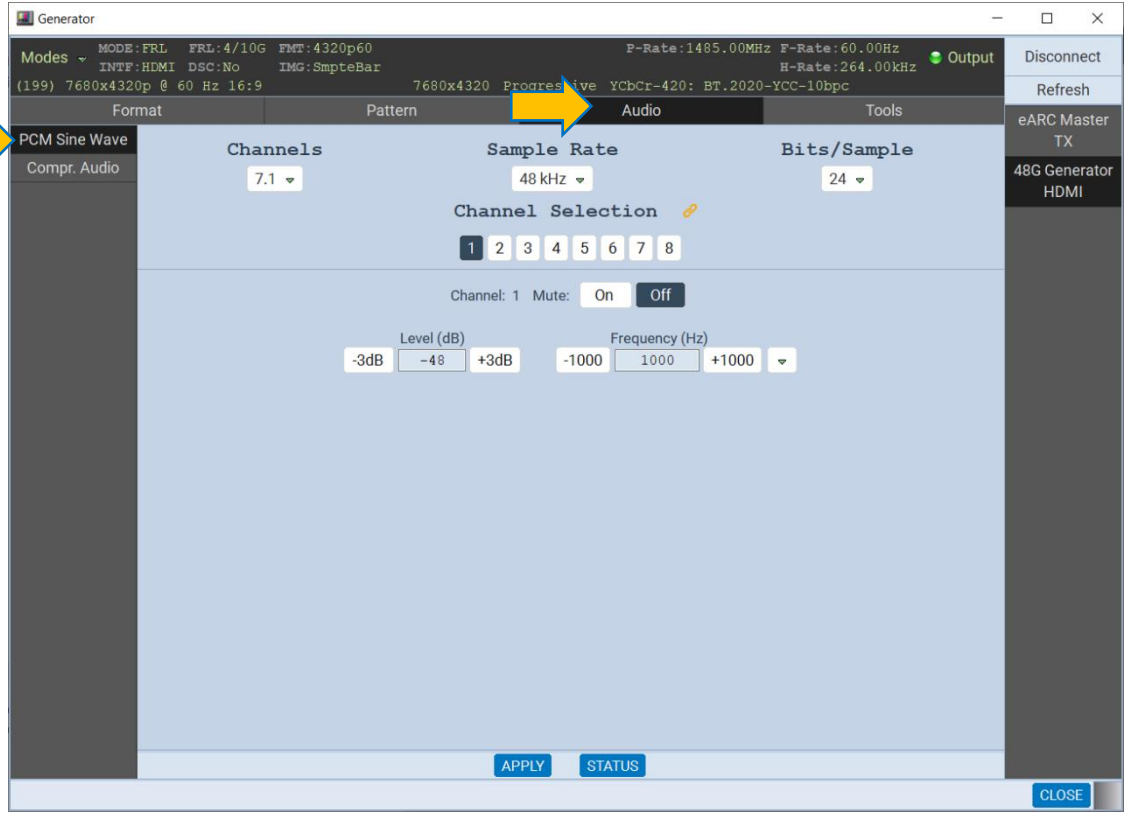
- HDMI Video Generator:
  - Configure HDMI InfoFrame parameter values to test sink response to irregular conditions.
  - Examples shows HDR InfoFrame.
  - Use fields to enter HDR parameters to outgoing HDR InfoFrame.



HDMI 2.1 Sink Testing
Audio Generation

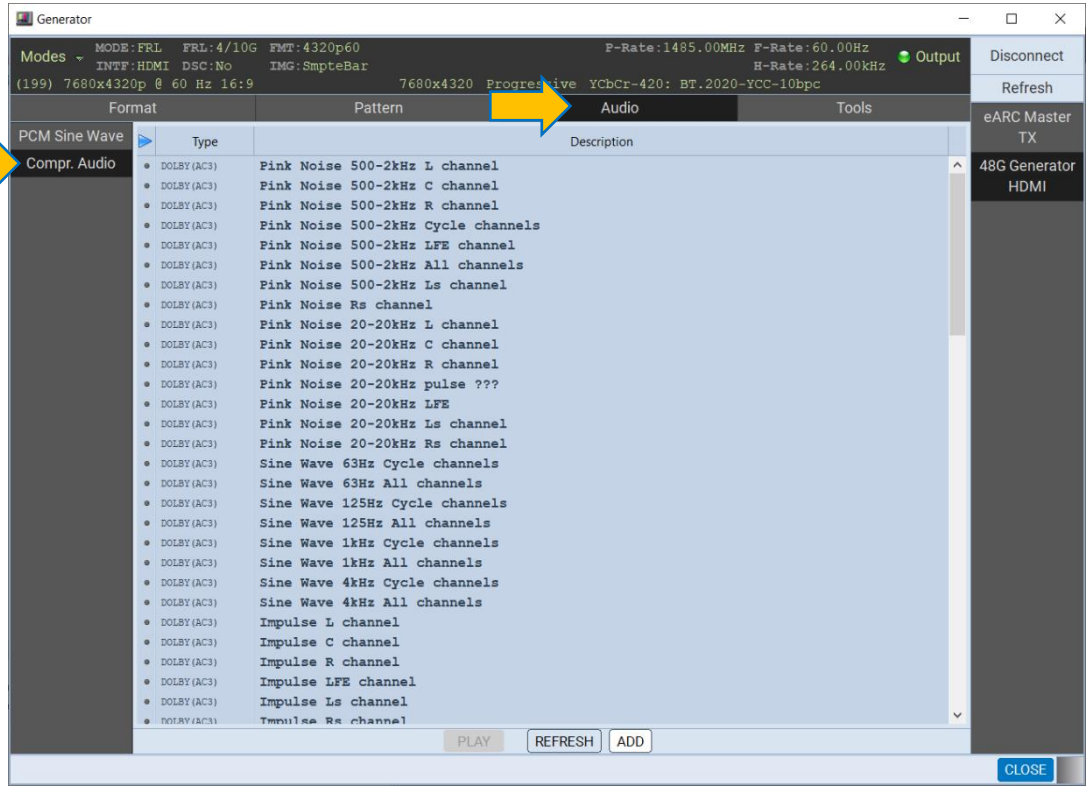
HDMI Audio Generator – LPCM Configuration

- HDMI Audio Generator:
  - Test UHD TVs and A/V receivers with a variety of audio formats.
  - Specify LPCM audio parameters in the sine wave such as number of channels, sampling rate, bits per pixel, and sine wave amplitude and frequency.



HDMI Audio Generator – Compressed Formats

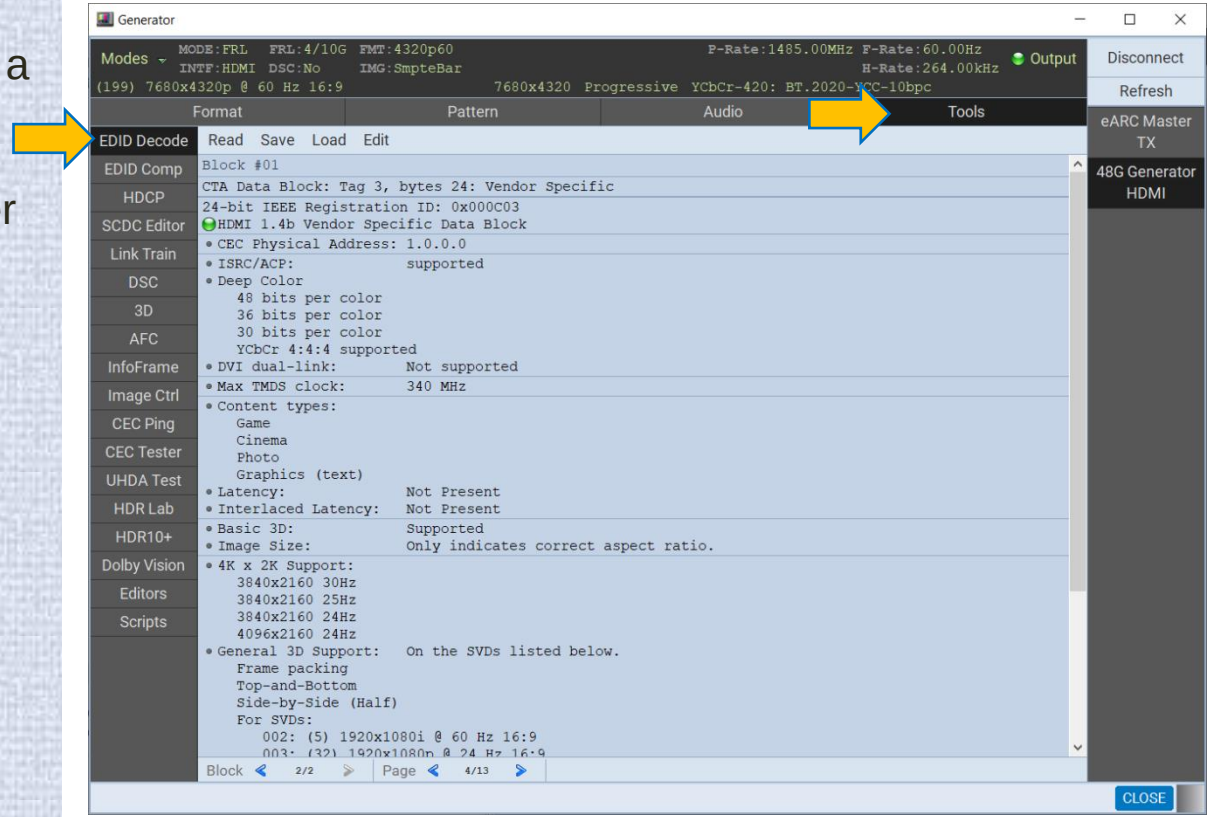
- HDMI Audio Generator:
  - Test UHD TVs and A/V receivers with a variety of audio formats.
  - Select from a variety of compressed audio clips.
  - Provides Dolby and DTS audio clips for replay.



HDMI 2.1 Sink Testing
EDID and SCDC Testing

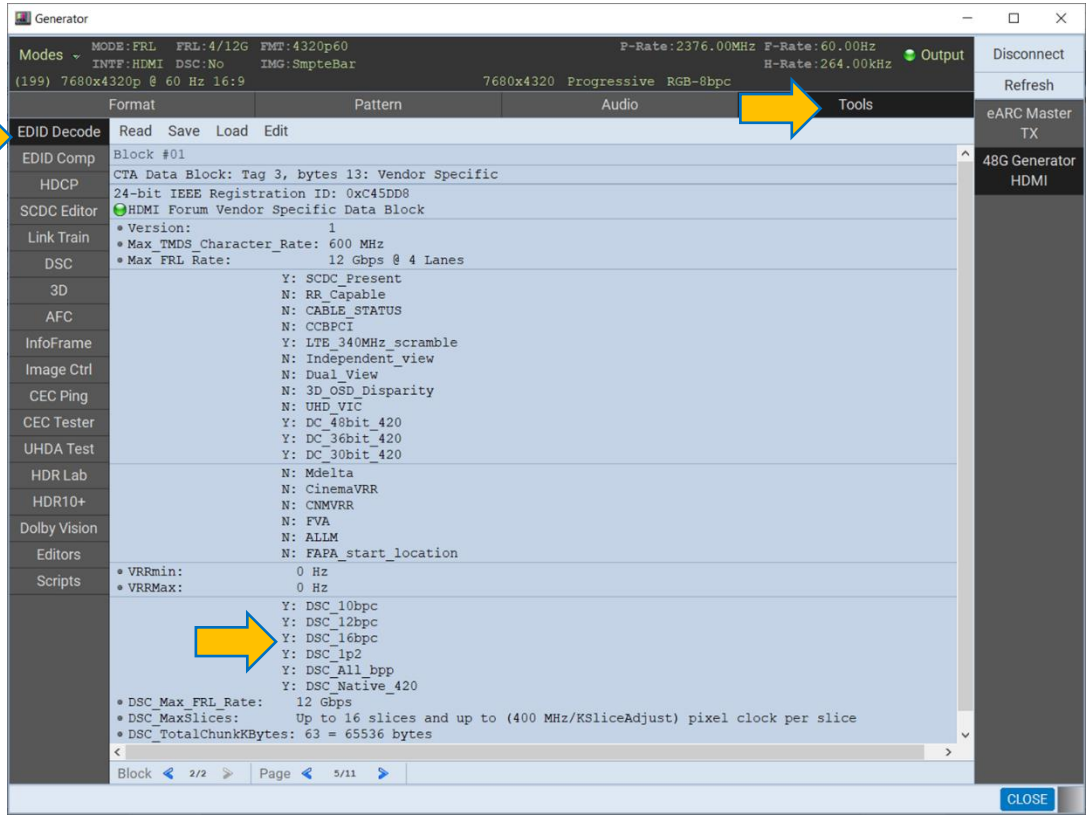
HDMI Video Generator – EDID Decode and Verification

- HDMI Video Generator:
  - Test 4K and 8K UHD TVs with a variety of video formats and colorimetry settings.
  - Verify EDID and SCDC register content of connected display.



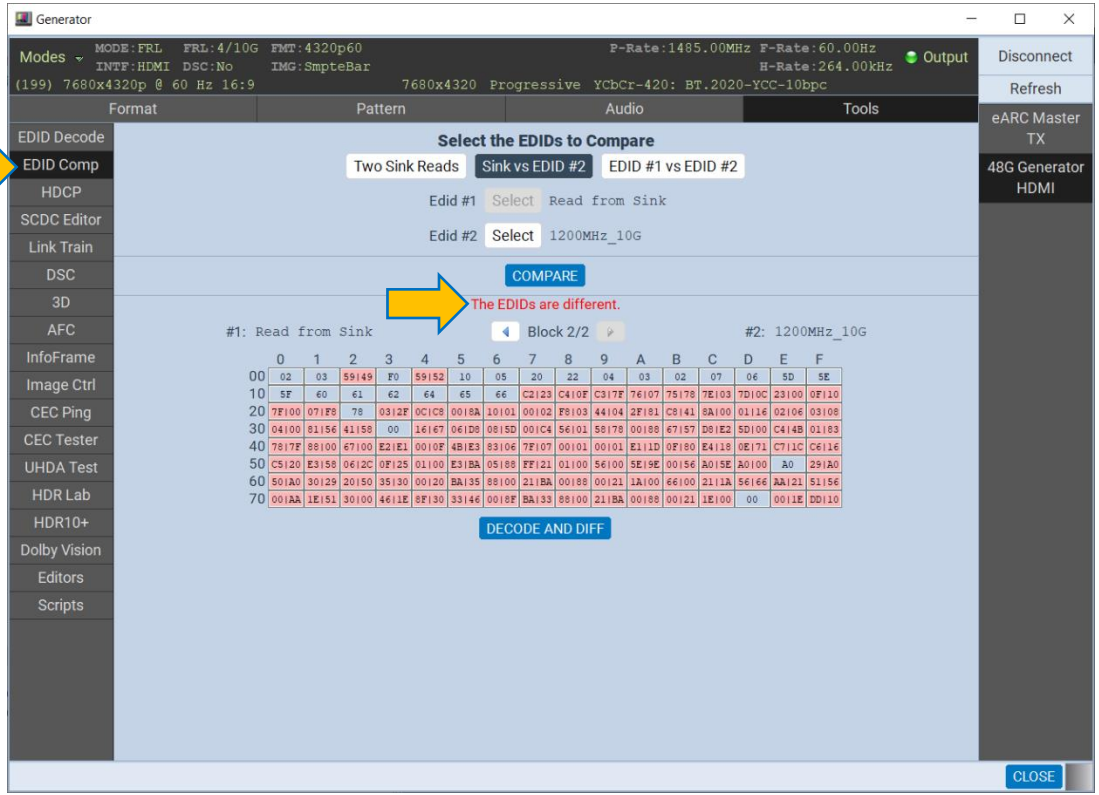
HDMI Video Generator – EDID Decode with DSC

- HDMI Video Generator:
  - Test 4K and 8K UHD TVs with a variety of video formats and colorimetry settings.
  - Verify EDID and SCDC register content of connected display.
  - The example shows that the sink EDID is showing support for Display Stream Compression (DSC).



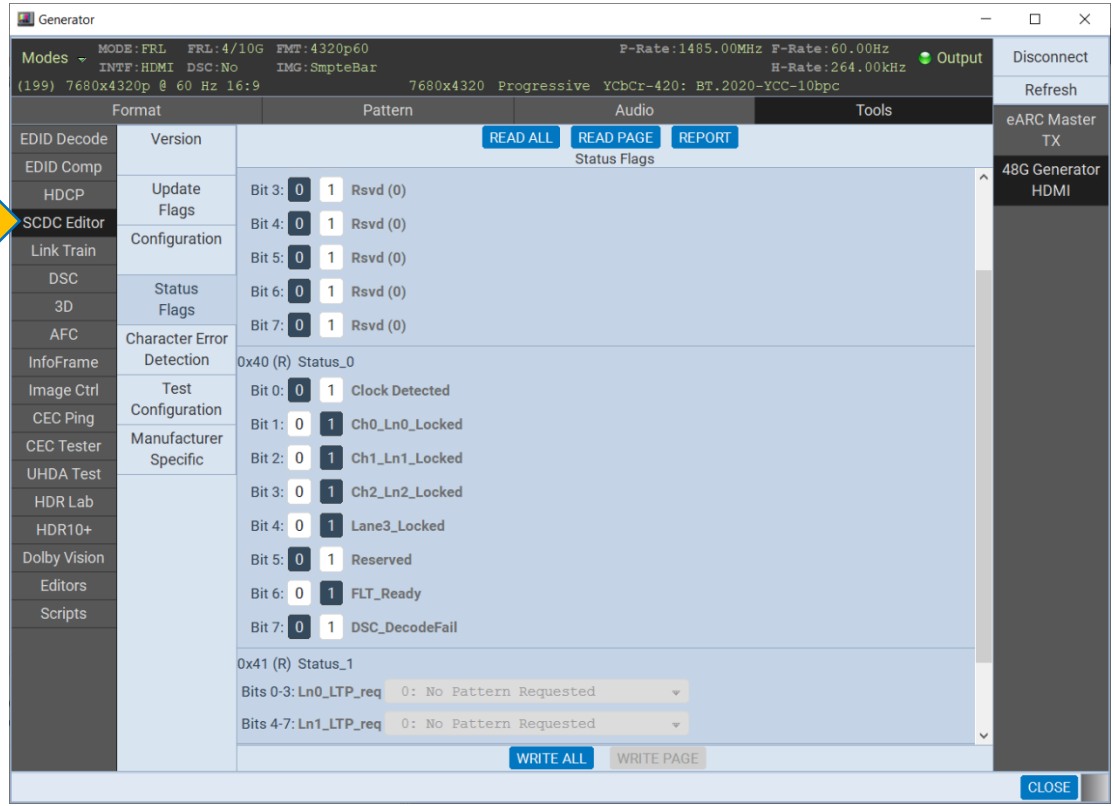
HDMI Video Generator – Compare EDIDs

- HDMI Video Generator:
  - View and verify EDID contents of a connected display. Check for checksum and header errors
  - Check EDID against known-reference or read the same EDID successively.
  - Report provides details difference.



Video Generator – Verify SCDC Registers

- HDMI Video Generator:
  - Read and verify HDMI SCDC register values for capabilities, configuration and status.



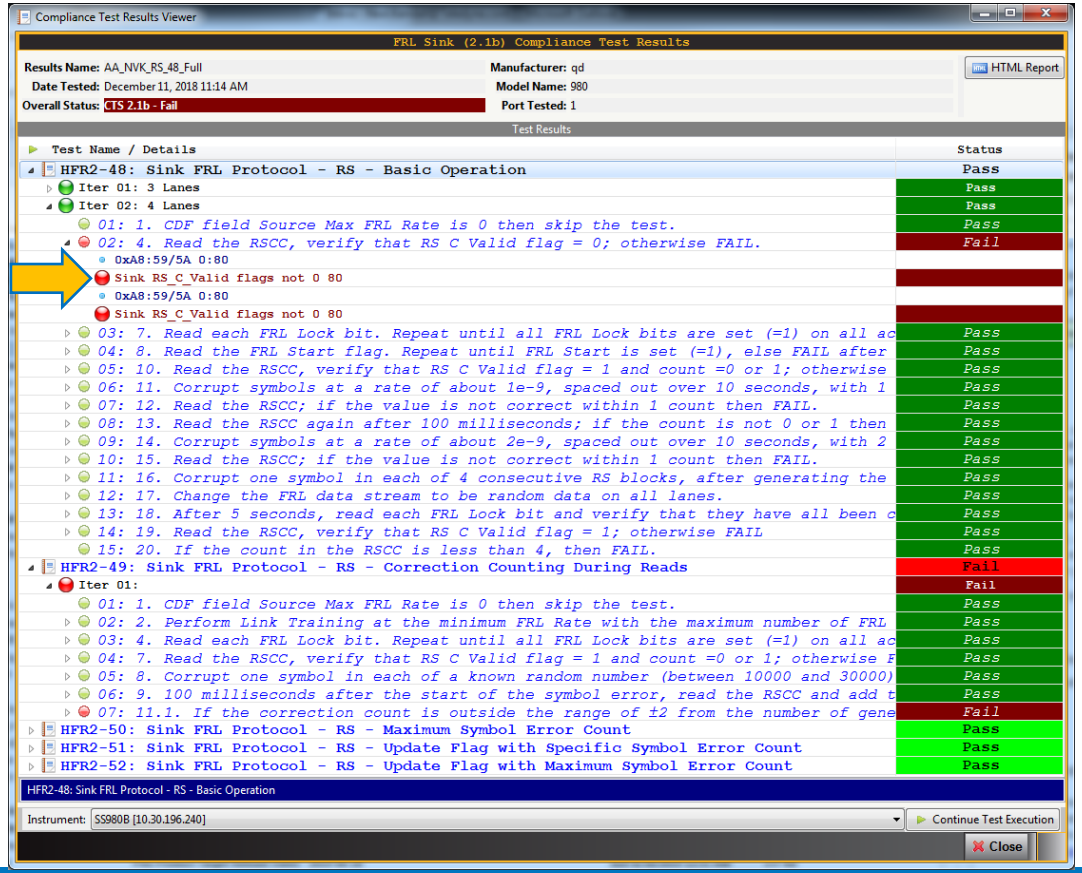
HDMI 2.1 Sink Testing
Compliance Testing

HDMI Fixed Rate Link (FRL) Sink Compliance Test

- HDMI 2.1 FRL sink compliance Testing:
  - Run FRL sink compliance tests. Full list of tests supported (partial list shown right).

HDMI Fixed Rate Link (FRL) Sink Compliance Test

- HDMI 2.1 FRL sink compliance Testing:
  - Run FRL sink compliance tests. Full list of tests supported.
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of FRL devices.
  - Enables export of compliance test results to share w/ colleagues.

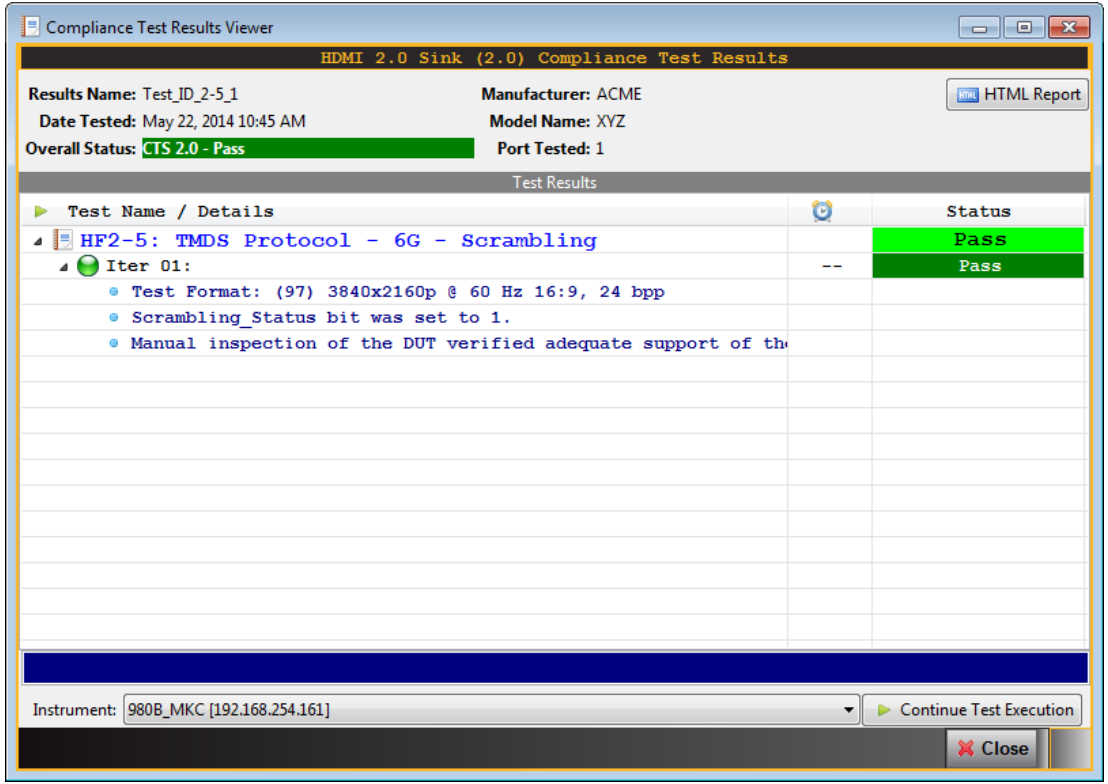


HDMI TMDS Sink Compliance Test

- HDMI TMDS compliance Testing:
  - Run TMDS sink compliance tests. Full list of tests supported (partial list shown right).

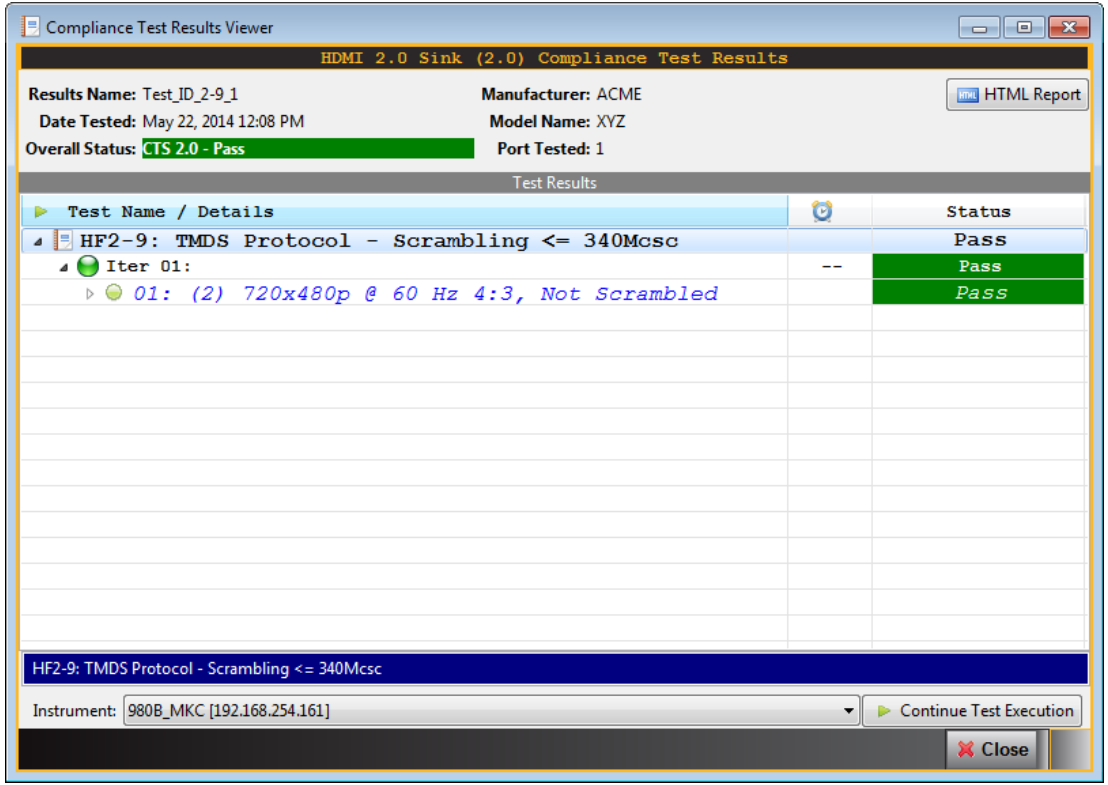
HDMI TMDS Sink Compliance Test

- HDMI TMDS compliance Testing:
  - Run TMDS sink compliance tests. Full list of tests supported.
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of HDMI TMDS devices.
  - Enables export of compliance test results to share with colleagues.



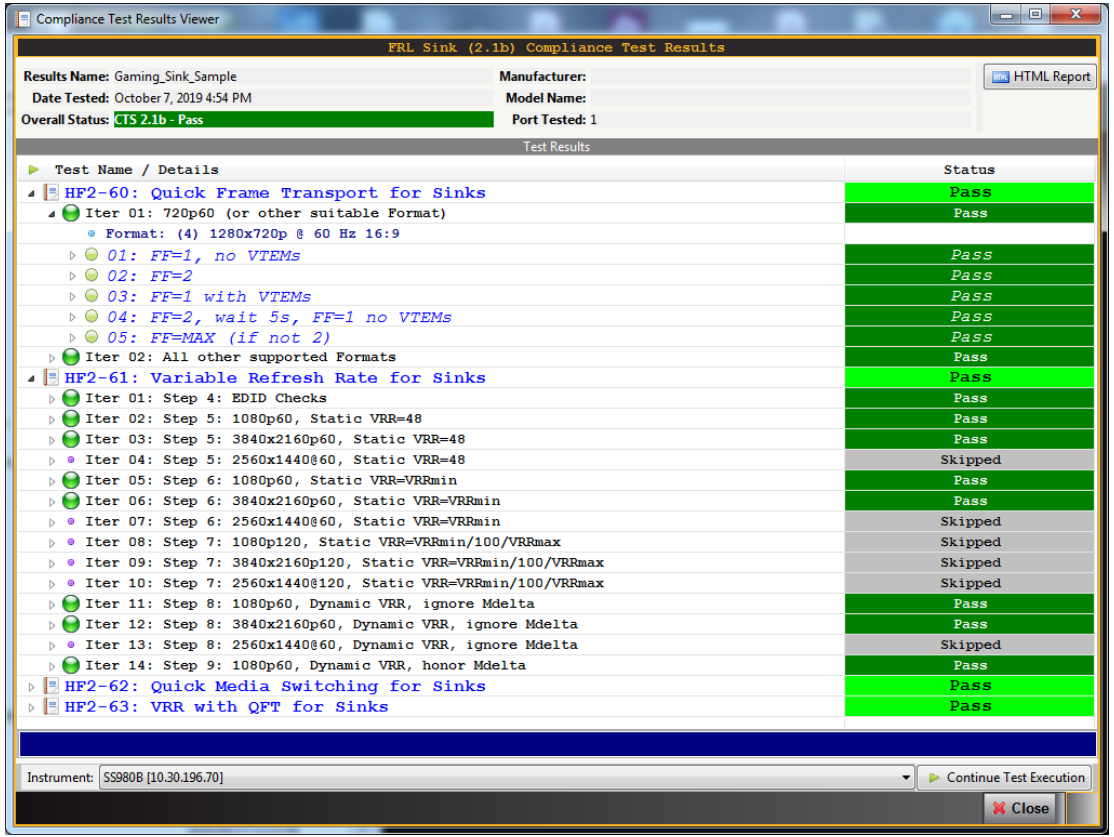
HDMI TMDS Sink Compliance Test

- HDMI TMDS compliance Testing:
  - Run TMDS sink compliance tests. Full list of tests supported.
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of HDMI TMDS devices.
  - Enables export of compliance test results to share with colleagues.



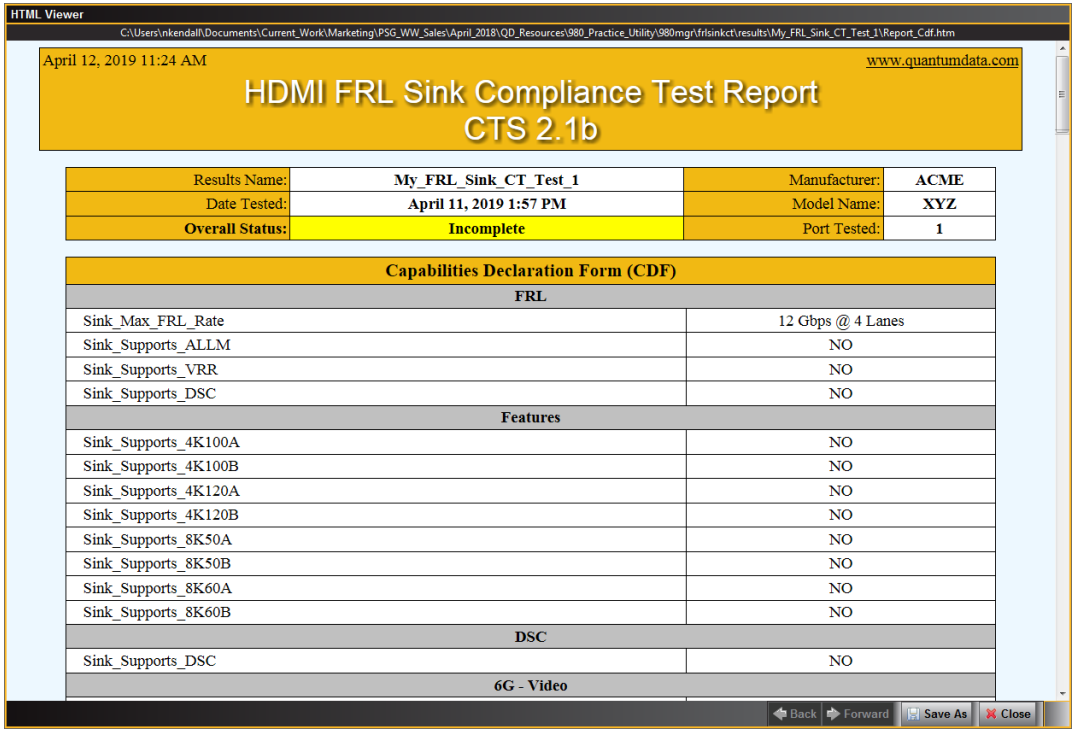
HDMI FRL/TMDS Gaming Sink Compliance Test

- HDMI 2.1 FRL/TMDS Gaming sink compliance Testing:
  - Run FRL/TMDS Gaming sink compliance tests:
    - Quick Frame Transport (QFT).
    - Variable Refresh Rate (VRR).
    - Quick Media Switching (QMS).
    - VRR with QFT.
    - ALLM (not currently supported).
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of FRL or TMDS Gaming-capable devices.
  - Enables export of compliance test results to share w/ colleagues.



HDMI Compliance Testing – Export Compliance Test Results

- HDMI Aux Compliance Test Results Export:
  - Save compliance test results and HTML file for easy and universal viewing through browser.



HTML Viewer

C:\Users\nkendall\Documents\Current_Work\Marketing\PSG_WW_Sales\April_2018\QD_Resources\980_Practice_Utility\980mgr\frlsinkct\results\My_FRL_Sink_CT_Test_1\Report_Cdf.htm

April 12, 2019 11:24 AM www.quantumdata.com

HDMI FRL Sink Compliance Test Report CTS 2.1b

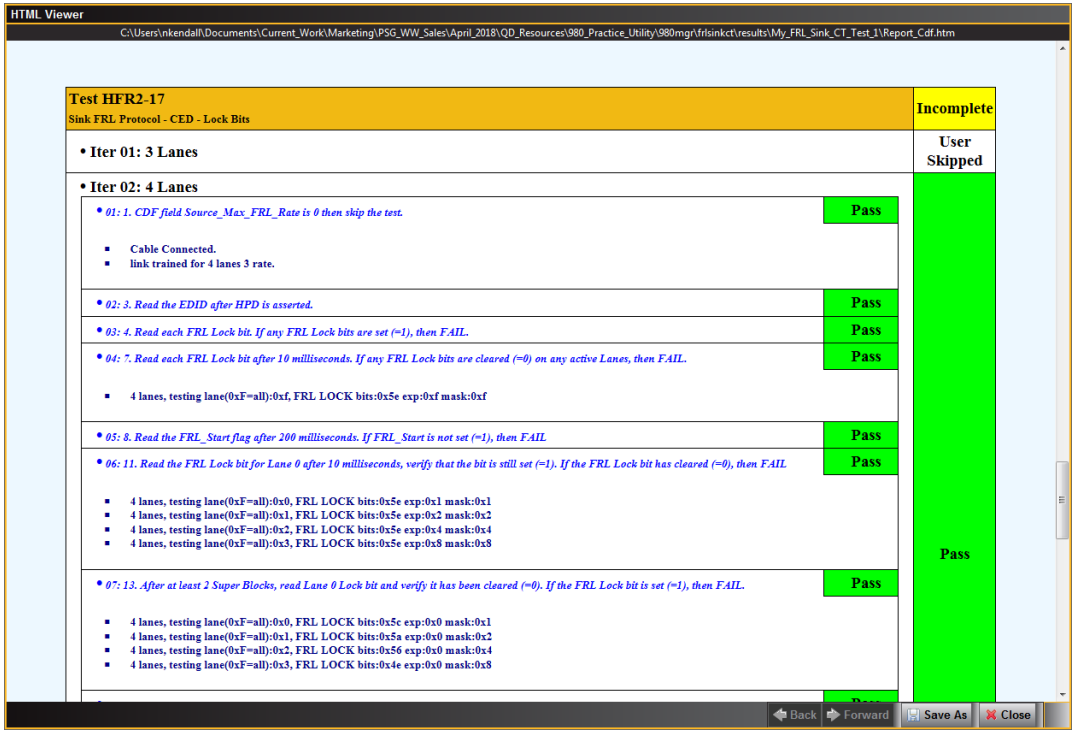
Results Name:	My_FRL_Sink_CT_Test_1	Manufacturer:	ACME
Date Tested:	April 11, 2019 1:57 PM	Model Name:	XYZ
Overall Status:	Incomplete	Port Tested:	1

Capabilities Declaration Form (CDF)	
FRL	
Sink_Max_FRL_Rate	12 Gbps @ 4 Lanes
Sink_Supports_ALLM	NO
Sink_Supports_VRR	NO
Sink_Supports_DSC	NO
Features	
Sink_Supports_4K100A	NO
Sink_Supports_4K100B	NO
Sink_Supports_4K120A	NO
Sink_Supports_4K120B	NO
Sink_Supports_8K50A	NO
Sink_Supports_8K50B	NO
Sink_Supports_8K60A	NO
Sink_Supports_8K60B	NO
DSC	
Sink_Supports_DSC	NO
6G - Video	

Back Forward Save As Close

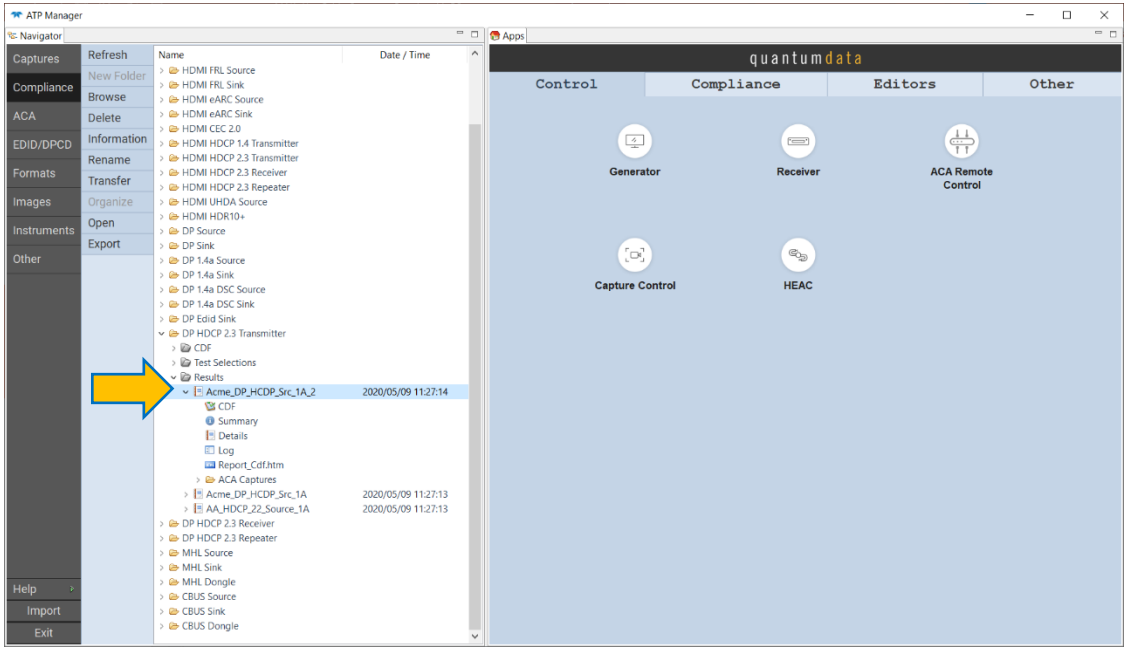
HDMI Compliance Testing – Export Compliance Test Results

- HDMI Aux Compliance Test Results Export:
  - Save compliance test results and HTML file for easy and universal viewing through browser.



HDMI Compliance Testing – Export Compliance Test Results

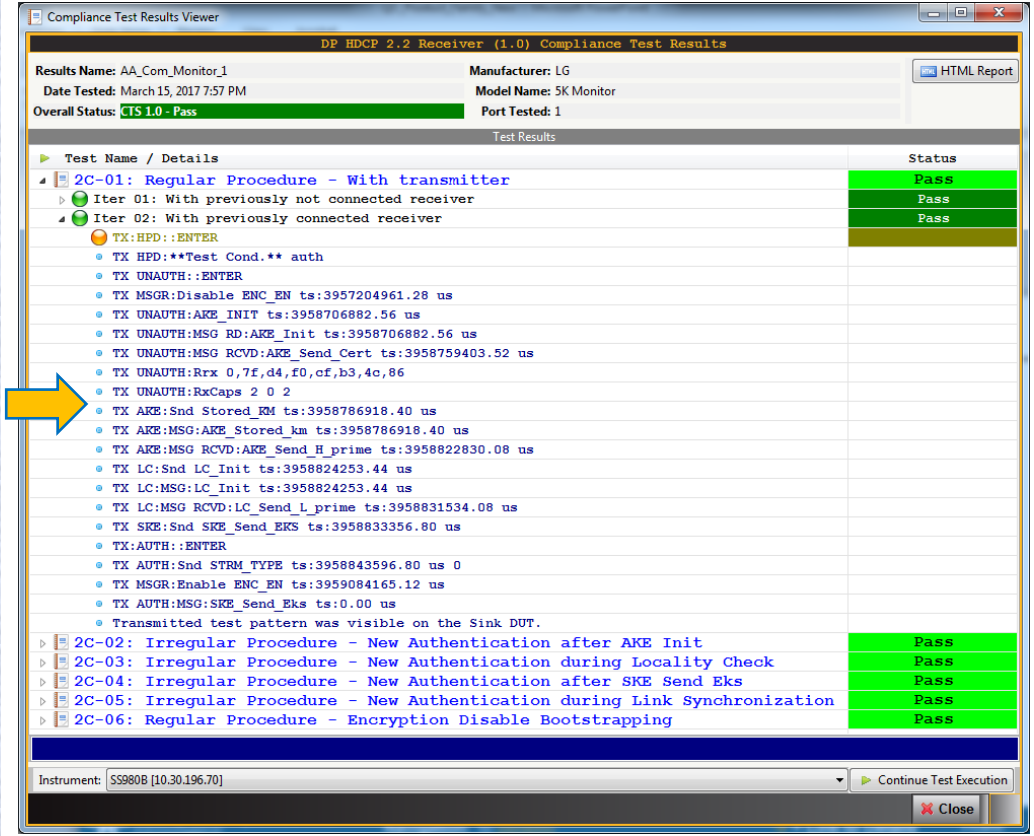
- HDMI Aux Compliance Test Results Export:
  - Save compliance test results and HTML file for easy and universal viewing through browser.
  - Export compliance test results for dissemination to colleagues, other subject matter experts or Teledyne Customer Support.



HDMI 2.1 Sink Testing
HDCP Compliance Testing

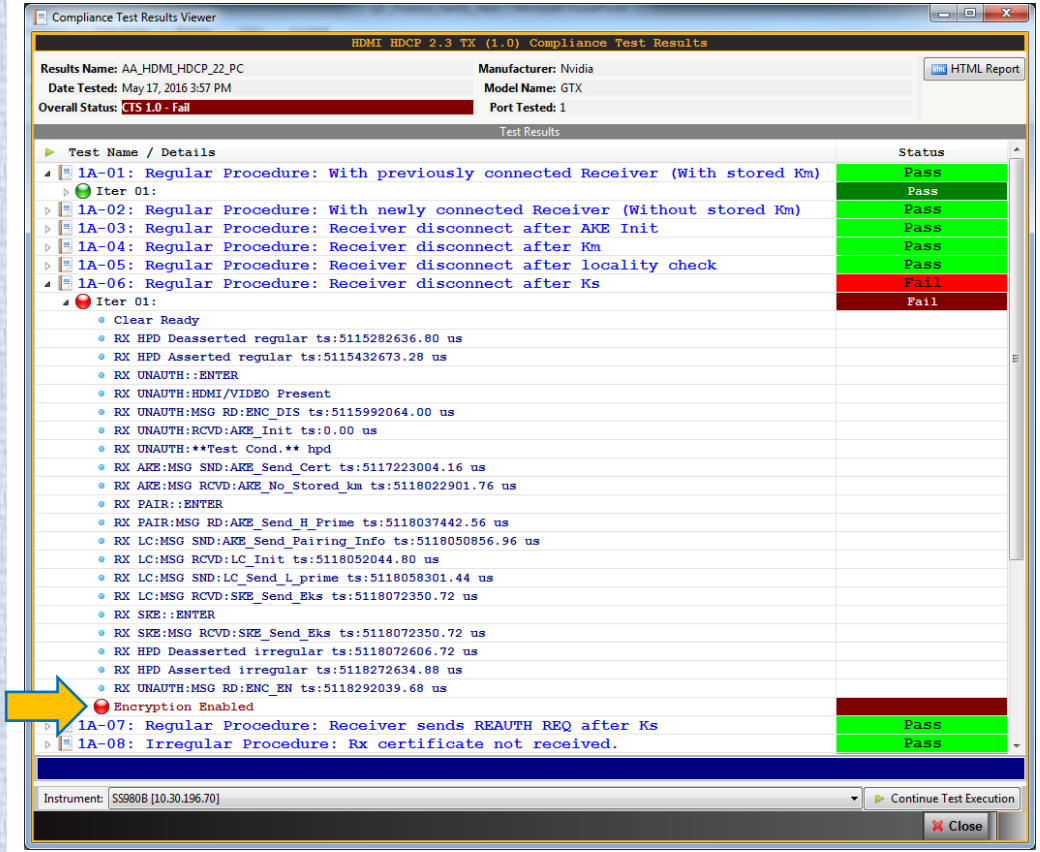
HDMI HDCP 2.3 Sink Compliance Testing

- HDMI HDCP 2.3 compliance Testing:
  - Run HDCP 2.3 sink compliance tests. All tests supported.
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of HDMI devices.
  - Enables export compliance test results to share with colleagues.



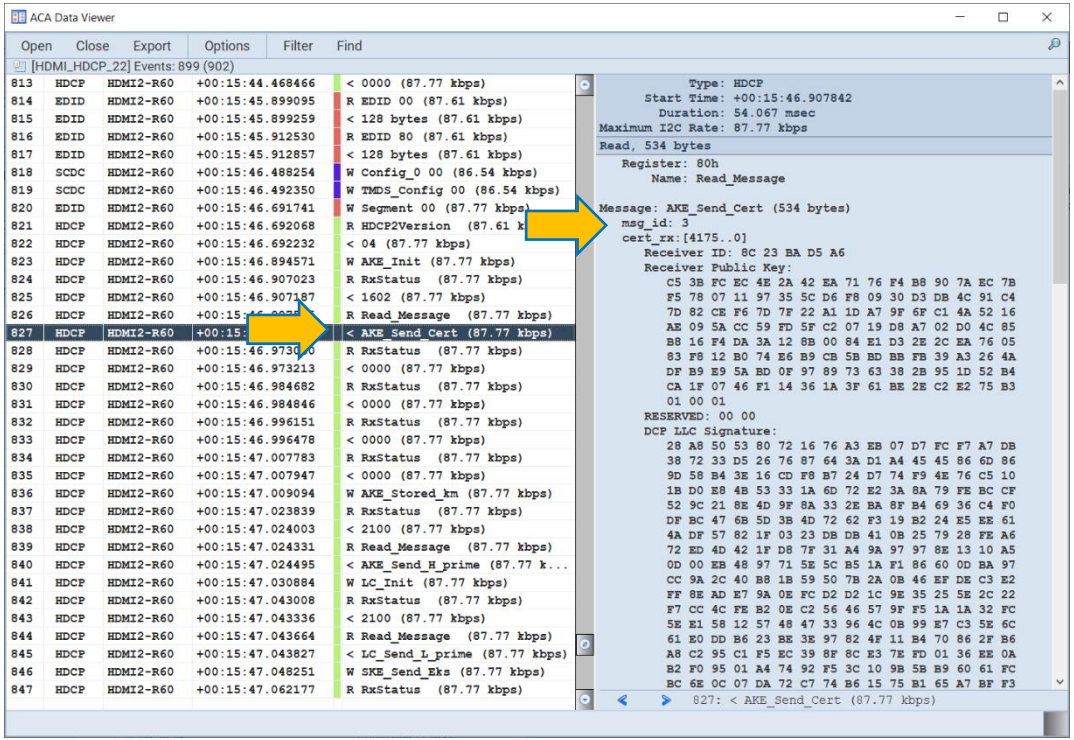
HDMI HDCP 2.3 Sink Compliance Testing

- HDMI HDCP 2.3 compliance Testing:
  - Run HDCP 2.3 sink compliance tests. All tests supported.
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of HDMI devices.
  - Enables export compliance test results to share with colleagues.



HDMI HDCP 2.3 Sink Compliance Test - ACA Test Capture Logs

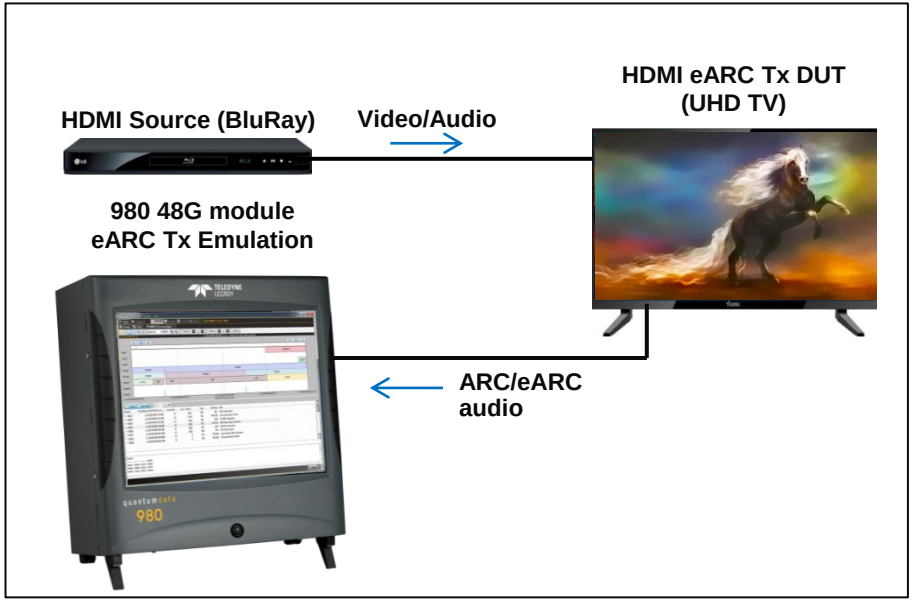
- HDMI Aux Channel Analyzer Timestamp control:
  - View the ACA transaction files for each HDCP test to confirm failures.
  - View details of any transaction.
  - View time stamps.



HDMI 2.1 eARC Testing
Enhanced Audio Return Channel

HDMI eARC Tx Testing

- HDMI 2.1 eARC Testing:
  - Verify eARC Tx (TV) for common mode and differential mode operation.
  - Run eARC common and differential mode compliance tests for Tx devices. Full list of tests supported.

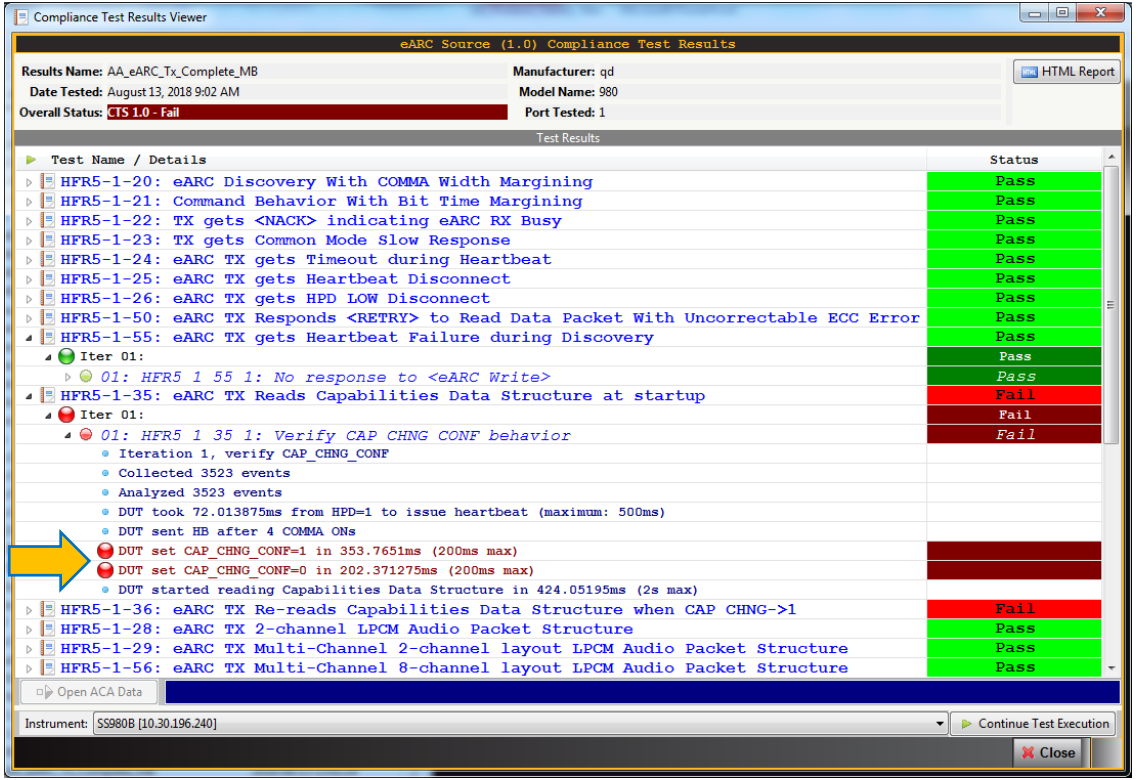


HDMI eARC Tx Testing

- HDMI 2.1 eARC Testing:
  - Verify eARC Tx (TV) for common mode and differential mode operation.
  - Run eARC common and differential mode compliance tests for Tx devices. Full list of tests supported (only partial list shown right).

HDMI eARC Tx Testing

- HDMI 2.1 eARC Testing:
  - Verify eARC Tx (TV) for common mode and differential mode operation.
  - Run eARC common and differential mode compliance tests for Tx devices. Full list of tests supported.
  - Provides detailed Test Results with Pass/Fail and details for each subtest.
  - Enables compliance self-testing and/or pre-testing of eARC devices.
  - Enables export of compliance test results to share w/ colleagues.



HDMI eARC Common Mode Configuration Sequence

- HDMI 2.1 eARC Testing:
  - Verify eARC common mode connection sequence using Aux Channel Analyzer (ACA) utility.
  - Enables export of ACA eARC Common Mode transactions to share w/ colleagues.