

# **DisplayPort™ CTS Tools for UCD-500**

**Guide to  
Product Options**

## Copyright

This manual Copyright © Unigraf Oy. All rights reserved

Reproduction of this manual in whole or in part without written permission of Unigraf Oy is prohibited.

## Notice

The information given in this manual is verified in the correctness on the date of issue. The authors reserve the rights to make any changes to this product and to revise the information about the products contained in this manual without an obligation to notify any persons about such revisions or changes.

## Edition

DisplayPort CTS Tools for UCD-500, rev 02

Date: 22 December 2021

## Company information

Unigraf Oy  
Piispantilankuja 4, FI-02240 ESPOO, Finland

[info@unigraf.fi](mailto:info@unigraf.fi)

<https://www.unigraf.fi>

<http://www.unigraf-china.cn>

## Table of Content

	Table of Content.....	3
1.	General .....	4
	Reference Standards.....	4
	Released Versions.....	4
2.	DP 2.0 Link Layer CTS.....	5
	DP 2.0 Reference Hardware Products.....	5
	DP 2.0 CTS Test Software Product Options.....	5
	Description of DP 1.4 Link CTS.....	6
	DP 1.4 LL CTS for testing Source DUT (P/N: MT6637).....	6
	DP LL CTS upgrade from DP1.4 to DP2.0 for testing Source DUT (P/N: MT6652).....	8
	DSC Decoder CTS on DP.....	9
	DisplayID / EDID CTS for testing Source DUT (P/N MT6646).....	10
	Adaptive-Sync CTS for testing Source DUT P/N: MT6648.....	11
	DP 1.4 LL CTS for testing Sink DUT (P/N MT6635).....	12
	DSC Encoder CTS on DP (P/N MT6643).....	14
	DisplayID / EDID CTS for testing Sink DUT (P/N MT6647).....	16
	Adaptive-Sync CTS for testing Sink DUT P/N: MT6649.....	19
3.	HDCP 2.3 CTS for DisplayPort.....	20
	DP HDCP 2.3 CTS Capable Hardware Products.....	20
	DP HDCP 2.3 CTS Test Software Product Options.....	20
	Description of HDCP 2.3 CTS Tests.....	21
	HDCP 2.3 CTS for testing Source DUT on DP (P/N MT6634).....	21
	HDCP 2.3 CTS for testing Sink DUT on DP (P/N MT6636).....	22
	HDCP 2.3 CTS for testing Sink, Source and Repeater DUT on DP (P/N MT6638).....	23

# 1. GENERAL

## Reference Standards

High-bandwidth Digital Content Protection, Revision 2.3 on DisplayPort,  
Compliance Test Specification, Revision 1.1, 4 March 2019

VESA DisplayPort v1.4a Link Layer Compliance Test Specification (Link CTS),  
Revision 1.0, June 12, 2019

VESA® DisplayPort® DSC Link Layer Compliance Test Specification, Version 1.4a,  
Revision 1.1, Draft 6, Nov 18, 2019

VESA DisplayPort v1.4a DisplayID EDID Compliance Test Specification (DisplayID EDID CTS)  
Revision 1.3, 18 February, 2021

## Released Versions

This document explains features found in the following versions of the software:

Tool	Version
HDCP 2.3 CTS: UCD Console 2	
DP 2.0 CTS: UCD Console 2	

## 2. DP 2.0 LINK LAYER CTS

### DP 2.0 Reference Hardware Products

Product	P/N	Description
UCD-500 DP 2.0 Test Device	066700	DisplayPort™ 2.0 Video Generator and Analyzer unit for testing DisplayPort Sinks and Sources up to 8K@60Hz and 16K@60 Hz (with DSC) video modes with UHBR 20 Max Bit Rate Capability.

### DP 2.0 CTS Test Software Product Options

Product	P/N	Description
DP 1.4 LL CTS for testing Sink DUT	MT6635	DP 2.0 Link Layer compliance tests (HBR3) for testing Sink DUT. Audio and FEC CTS included
DP 1.4 LL CTS for testing Source DUT	MT6637	DP 2.0 Link Layer compliance tests (HBR3) for testing Source DUT. Audio and FEC CTS included
DP LL CTS Sink upgrade from DP1.4 to DP2.0 mode (Requires MT6635)	MT6650	DP 2.0 LL compliance tests (UHBR) for testing Sink DUT
DP LL CTS Source upgrade from DP1.4 to DP2.0 mode (Requires MT6637)	MT6652	DP 2.0 LL compliance tests (UHBR) for testing Source DUT
DisplayID / EDID CTS for testing Source DUT	MT6646	DisplayID CTS for testing Source DUT (*)
DisplayID / EDID CTS for testing Sink DUT	MT6647	DisplayID CTS for testing Sink DUT (*)
Adaptive-Sync CTS for testing Source DUT	MT6648	Adaptive-Sync CTS for testing Source DUT
Adaptive-Sync CTS for testing Sink DUT	MT6649	Adaptive-Sync CTS for testing Sink DUT
DP Link Analyzer for testing source DUT	MT6655	Main Link data analyses on the data captured by our Reference Sink

\*) DP 2.0 LL Branch CTS and DisplayID CTS for testing Source will be available in a future release

## Description of DP 2.0 Link CTS

### DP 1.4 LL CTS for testing Source DUT (P/N: MT6637)

#### AUX Reads after HPD Plug Event

Test Reference	Test Name
4.2.1.1	Source DUT Retry on No-Reply During AUX Read after HPD Plug Event
4.2.1.2	Source Retry on Invalid Reply During AUX Read after HPD Plug Event
4.2.1.3	Source Device HPD Event Pulse Length Test
4.2.1.4	Source Device IRQ_HPDPulse Length Test
4.2.1.5	Source Device Inactive HPD / Inactive AUX Test

#### EDID and DPCD Reads

4.2.2.1	DPCD Receiver Capability and EDID Read upon HPD Plug Event
4.2.2.2	DPCD Receiver Capability Read upon HPD Plug Event
4.2.2.3	EDID Read
4.2.2.4	EDID Read Failure #1: I2C-Over-AUX NACK
4.2.2.5	EDID Read Failure #2: I2C-Over-AUX DEFER
4.2.2.6	Source Device Inactive HPD / Inactive AUX test
4.2.2.7	Branch Device Detection upon HPD Plug Event
4.2.2.8	EDID Read on IRQ HPD Event after Branch Device Detection
4.2.2.9	E-DDC Four Block EDID Read
4.2.2.10	Link Status-Adjust Request AUX read interval during Link Training

#### Link Training

4.3.1.1	Successful Link Training at All Supported Lane Counts and Link Speeds
4.3.1.2	Successful Link Training Upon HPD Plug Event
4.3.1.3	Successful Link Training with Request of Higher Differential Voltage Swing During Clock Recovery Sequence
4.3.1.4	Successful Link Training to a Lower Link Rate #1: Iterate at Maximum Voltage Swing
4.3.1.5	Successful Link Training to a Lower Link Rate #2: Iterate at Minimum Voltage Swing
4.3.1.6	Successful Link Training with Request of a Higher Pre-emphasis Setting During Channel Equalization Sequence
4.3.1.7	Successful Link Training at Lower Link Rate Due to Loss of Symbol Lock During Channel Equalization Sequence
4.3.1.8	Unsuccessful Link Training at Lower Link Rate #1: Iterate at Maximum Voltage Swing
4.3.1.9	Unsuccessful Link Training at Lower Link Rate #2: Iterate at Minimum Voltage Swing
4.3.1.10	Unsuccessful Link Training due to Failure in Channel Equalization Sequence (loop count > 5)
4.3.1.11	Successful LT with Simultaneous Request for Differential Voltage Swing and Pre-emphasis during Clock Recovery Sequence
4.3.1.12	Source Device Link Training CR Fallback Test

4.3.1.13	Source Device Link Training EQ Fallback Test
----------	--

### Link Maintenance

Test Reference	Test Name
4.3.2.1	Successful Link Re-training After IRQ HPD Pulse Due to Loss of Symbol Lock
4.3.2.2	Successful Link Re-training After IRQ HPD Pulse Due to Loss of Clock Recovery Lock
4.3.2.3	Successful Link Re-training After IRQ HPD Pulse Due to Loss of Inter-lane Alignment Lock
4.3.2.4	Handling of IRQ HPD Pulse with No Error Status Bits Set
4.3.2.5	Lane Count Reduction

### Video Time Stamp Generation

4.3.3.1	Video Time Stamp Generation
---------	-----------------------------

### Main Stream Data Mapping

4.4.1.1	Pixel Data Packing and Steering
4.4.1.2	Main Stream Data Packing and Stuffing – Least Packed TU
4.4.1.3	Main Stream Data Packing and Stuffing – Most Packed TU

4.4.2	Main Video Stream Format Change Handling
-------	--

4.4.3	Power Management
-------	------------------

### Audio Stream Transmission over Secondary Packets

4.4.4.1	Configuring Video and Audio Parameters
4.4.4.2	Audio Stream Header Synchronization
4.4.4.3	Audio Time Stamp Generation
4.4.4.4	Audio InfoFrame Packet
4.4.4.6	Audio Start Sequence

### Source FEC Protocol

4.5.1.1	FEC enable verification for all supported Lane count and Link Speed
4.5.1.2	FEC ready verification for non FEC capable sink

## DP LL CTS upgrade from DP1.4 to DP2.0 for testing Source DUT (P/N: MT6652)

NOTE: This license adds the DP 2.0 CTS tests. For the complete Link Layer CTS for testing Source DUT, license P/N MT6637 is also needed

### EDID & DPCD Read

4.2.2.11	Various UHBR AUX read interval verification in first EQ loop*
4.2.2.12	UHBR Link Status/Adjust different FFE Request, different AUX read interval for 10 EQ loop*

\*VESA status: *In progress (TE correlation)*, Implementation status: *In progress (10Gb complete)*

### Link Training

4.3.1.14	Successful Link Training at All Supported Lane Counts and UHBR Link Speeds*
4.3.1.15	Successful Link Training Upon HPD Plug Event for UHBR speed*
4.3.1.16	Successful Link Training when EQ done at 20 <sup>th</sup> loop during channel EQ phase*
4.3.1.17	Successful Link Training to a Lower Bandwidth, when CHANNEL_EQ_DONE bits not set in 20 loops during channel EQ phase*
4.3.1.18	Successful Link Training to a Lower Bandwidth. When LT Failed received in middle of 20 loop (random value 1 to 19) during channel EQ Done*
4.3.1.19	Successful Link Training to a Lower Bandwidth. When LT Failed received at 20 <sup>th</sup> loop during channel EQ Done*
4.3.1.20	Successful Link Training to a Lower Bandwidth. When LT Failed received at after EQ done*
4.3.1.21	Successful Link Training to a Lower Bandwidth. When EQ_INTERLANE_ALIGN_DONE bit not set during EQ phase*
4.3.1.22	Successful Link Training to a Lower Bandwidth. When Symbols not locked during CDS phase*
4.3.1.23	Successful Link Training to a Lower Bandwidth. When CDS_INTERLANE_ALIGN_DONE bit not set during CDS phase*

\*VESA status: *In progress (TE correlation)*, Implementation status: *In progress (10Gb complete)*



## DSC Decoder CTS on DP

DSC Decoder CTS test set is included in the *DP 1.4 LL CTS for testing Source DUT (P/N: MT6637)* license.

### Source Device DSC Test Procedures

Test Reference	Test Name
4.6.1.1	DSC enable sequence verification
4.6.1.2	DSC PPS block prediction flag verification
4.6.1.3	DSC PPS convert RGB flag verification
4.6.1.4	DSC PPS YcbCr 4:4:4 convert RGB = 0) flag verification
4.6.1.5	DSC PPS Simple 4:2:2 flag verification
4.6.1.6	DSC PPS Native 4:2:2 flag verification
4.6.1.7	DSC PPS Native 4:2:0 flag verification
4.6.1.8	DSC PPS convert RGB flag verification for DSC Algorithm Revision 1.1
4.6.1.9	DSC PPS (YcbCr 4:4:4 convert RGB = 0) flag verification for DSC Algorithm Revision 1.1

## DisplayID / EDID CTS for testing Source DUT (P/N MT6646)

### Video Tests

Test Reference	Test Name
4.7.1.1	Basic Supported Formats
4.7.1.2	Preferred Timing
4.7.1.3	Out-of-Range Request
4.7.1.4	Invalid EDID

### Audio Tests

4.7.2.1	Basic Supported Formats
4.7.2.2	Out-of-Range Request

### Source Device Test Procedures (E-DDC Protocol)

4.7.3.1	EDID Read with More than 256 Bytes of Data Including DisplayID Block
4.7.3.2	EDID Read with Greater than 8 Blocks of Data Including DisplayID Block
4.7.3.3	EDID Read with Unknown Extensions and Unknown Data Blocks, Including DisplayID Block

### Source Device Test Procedures (DisplayID)

4.7.4.1	DisplayID Detailed Timing support
---------	-----------------------------------

### Source Device Test Procedures (Adaptive-Sync)

4.7.5.1	DisplayID Adaptive-Sync CVT RB Timing v3 Support*
---------	---

\*VESA status: In progress (TE correlation)

## Adaptive-Sync CTS for testing Source DUT P/N: MT6648

### Fixed-Average Vtotal Mode Support Validation

4.8.1.1	Fixed-Average Vtotal Mode Support over the Declared Frame Rate Range*
4.8.1.2	Fixed-Average Vtotal Mode Duration Increase and Decrease Constraint Value Support*

\*VESA status: In progress (TE correlation)

### Adaptive Vtotal Mode Support Validation

4.8.2.1	Adaptive Vtotal Mode Support with Duration Increase and Decrease Constraint Values*
4.8.2.2	Adaptive Vtotal Mode Support with Unconstrained Duration Increase and Decrease*

\*VESA status: In progress (TE correlation)

## DP 1.4 LL CTS for testing Sink DUT (P/N MT6635)

### AUX Channel Protocol

Test Reference	Test Name
5.2.1.1	Read One Byte from Valid DPCD Address
5.2.1.2	DPCD Receiver Capability Read (Read 12 Bytes from Valid DPCD Address)
5.2.1.3	Write One Byte to Valid DPCD Address
5.2.1.4	Write Nine Bytes to Valid DPCD Addresses
5.2.1.5	Write EDID Offset (One Byte I2C-Over-AUX Write)
5.2.1.6	Read One EDID Byte (One Byte I2C-Over-AUX Read)
5.2.1.7	EDID Read (1 Byte I2C -Over-AUX Segment Write, 1 Byte I2C-Over-AUX Offset Write, 128 Byte I2C-Over-AUX Read)
5.2.1.8	Illegal AUX Request Syntax
5.2.1.9	Glitch Rejection
5.2.1.10	Interleaved EDID and DPCD Receiver Capability Read
5.2.1.11	Downstream Stop on MOT Reset
5.2.1.12	Downstream Stop on Timeout

### Sink Device DPCD Field Implementation Addendum

5.2.2.1	Sink Organizationally Unique Identifier (OUI)
5.2.2.2	Sink Count
5.2.2.3	Sink Status
5.2.2.4	Sink Error Count
5.2.2.5	DPCD Address Range
5.2.2.6	Number of Receiver Ports
5.2.2.7	Main Link Channel Coding
5.2.2.8	ESI Field Mapping
5.2.2.9	Sink Device Symbol Error Count

### Link Training

5.3.1.1	Successful Link Training at All Supported Lane Counts and Link Speeds
5.3.1.2	Successful Link Training with Request of Higher Differential Voltage Swing During Clock Recovery Sequence
5.3.1.3	Successful Link Training to a Lower Link Rate Due to Clock Recovery Lock Failure During Clock Recovery Sequence
5.3.1.4	Successful Link Training with Request of a Change to Pre-Emphasis and/or Voltage Swing Setting During Channel Equalization Sequence
5.3.1.5	Successful Link Training at Lower Link Rate Due to Loss of Symbol Lock During Channel Equalization Sequence
5.3.1.6	Lane Count Reduction
5.3.1.7	Lane Count Increase
5.3.1.8	2-Lane Link Training CR/EQ Fallback Test
5.3.1.9	1-Lane Link Training CR/EQ Fallback Test

## Link Maintenance

Test Reference	Test Name
5.3.2.1	IRQ HPD Pulse Due to Loss of Symbol Lock and Clock Recovery Lock
5.3.2.2	IRQ HPD Pulse Due to Loss of Inter-lane Alignment Lock

## Main Video Stream Reconstruction

5.4.1.1	Pixel Data Reconstruction
5.4.1.2	Main Stream Data Unpacking and Unstuffing – Least Packed TU
5.4.1.3	Main Stream Data Unpacking and Unstuffing – Most Packed TU
5.4.1.4	Pixel ClockRecovery

5.4.2	Main Video Stream Format Change Handling
-------	--

5.4.3.1	Entering and Exiting Power Save Mode
5.4.3.2	Resumption of Main Link Activity After Extended Idle

## Main Audio Stream Reconstruction

5.4.4.1	Audio Test Patterns
5.4.4.2	Audio Startup and Format Change
5.4.4.3	RS Error Correction
5.4.4.4	Audio InfoFrame Packet
5.4.4.5	Audio Clock Recovery
5.4.4.6	Audio Stream Reception

## Sink FEC Protocol

5.5.1.1	Sink Device FEC capability verification
5.5.1.2	Successful Link Training at All Supported Lane Counts and Link Rates with FEC Enable
5.5.1.3	Uncorrectable Block error count
5.5.1.4	Correctable Block error count
5.5.1.5	Correctable Bit error count
5.5.1.6	Correctable Parity Block error count
5.5.1.7	Correctable Parity Bit error count

## DSC Encoder CTS on DP

DSC Encoder CTS test set is included in the *DP 1.4 LL CTS for testing Sink DUT (P/N: MT6635)* license.

### Sink Device DSC Test Procedures

Test Reference	Test Name
5.6.1.1	DSC capability verification
5.6.1.2	DSC RGB Color Depth Test
5.6.1.3	DSC RGB Block Prediction Test
5.6.1.4	DSC RGB bits-per-pixel test
5.6.1.5	DSC RGB slice test
5.6.1.6	DSC RGB lane test
5.6.1.7	DSC YcbCr 4:4:4 Color Depth Test
5.6.1.8	DSC YcbCr 4:4:4 Block Prediction Test
5.6.1.9	DSC YcbCr 4:4:4 bits-per-pixel test
5.6.1.10	DSC YcbCr 4:4:4 slice test
5.6.1.11	DSC YcbCr 4:4:4 lane test
5.6.1.12	DSC Simple 4:2:2 Color Depth Test
5.6.1.13	DSC Simple 4:2:2 Block Prediction Test
5.6.1.14	DSC Simple 4:2:2 bits-per-pixel test
5.6.1.15	DSC Simple 4:2:2 slice test
5.6.1.16	DSC Simple 4:2:2 lane test
5.6.1.17	DSC Native 4:2:2 Color Depth Test
5.6.1.18	DSC Native 4:2:2 Block Prediction Test
5.6.1.19	DSC Native 4:2:2 bits-per-pixel test
5.6.1.20	DSC Native 4:2:2 slice test
5.6.1.21	DSC Native 4:2:2 lane test
5.6.1.22	DSC Native 4:2:0 Color Depth Test
5.6.1.23	DSC Native 4:2:0 Block Prediction Test
5.6.1.24	DSC Native 4:2:0 bits-per-pixel test
5.6.1.25	DSC Native 4:2:0 slice test
5.6.1.26	DSC Native 4:2:0 lane test

## Sink DSC protocol extension

Test Reference	Test Name
5.6.2.1	DSC Height test
5.6.2.2	DSC Padding test
5.6.2.3	DSC RGB min and max bits-per-pixel test
5.6.2.4	DSC YcbCr 4:4:4 min and max bits-per-pixel test
5.6.2.5	DSC Simple 4:2:2 min and max bits-per-pixel test
5.6.2.6	DSC Native 4:2:2 min and max bits-per-pixel test
5.6.2.7	DSC Native 4:2:0 min and max bits-per-pixel test
5.6.2.8	DSC RGB most pack test
5.6.2.9	DSC Native 4:2:2 most pack test
5.6.2.10	DSC Native 4:2:0 most pack test
5.6.2.11	DSC one corrupt slice test
5.6.2.12	DSC interrupt test for Chunk Length error
5.6.2.13	DSC interrupt test for RC buffer under-run error
5.6.2.14	DSC interrupt test for RC buffer overflow error

## DisplayID / EDID CTS for testing Sink DUT (P/N MT6647)

### EDID Block 0

Test Reference	Test Name
5.7.1.1	VESA E-EDID Verification Guide (Syntax Verification Only)
5.7.1.2	Physical Display Characteristics

### EDID Block 0 (Basic Display Parameters and Features)

5.7.1.3.1	Test for a Valid Video Input Definition
5.7.1.3.2	Test for a Valid Feature Support Byte
5.7.1.3.3	Test For Valid Established Timings I & II
5.7.1.3.4	Test For Valid Standard Timings

### 18-Byte Descriptor Test Cases

5.7.1.4.1	Test for Detailed Timing Descriptors
5.7.1.4.2	Test for Valid Display Descriptor Structure
5.7.1.4.3	Test for Valid Display Range Limits (tag #FDh)
5.7.1.4.4	Test for Valid Standard Timing Identifier Descriptor (tag #Fah)
5.7.1.4.5	Test for Valid CVT 3 Byte Code Descriptor (tag #F8h)
5.7.1.4.6	Test for Valid Established Timings III Descriptor (tag #F7h)
5.7.1.4.7	Test for Valid String Descriptors (tags #FFh, #Feh, #FCh)
5.7.1.4.8	Unused – Reserved Data Tag Number (Tags #11h to #F6h)
5.7.1.4.9	Test for Valid Dummy Descriptors (tag #10h)

5.7.1.5	Test for Valid Extension Flag and Checksum
---------	--

### CTA Block Validation (CTA Extension Format)

5.7.2.1	CEA Extension Version Number
5.7.2.2	Byte #2 (18-byte Descriptor Offset 'd')
5.7.2.3.1	Byte #3 – Underscan support
5.7.2.3.2	Byte #3 – Basic audio support
5.7.2.3.3	Byte #3 – YcbCr Support
5.7.2.3.4	Byte #3 – Native DTD Count
5.7.2.3.5	Byte #3 – Byte 3 Consistency

### Data Block Collection (Type Validation)

5.7.2.4.1	Duplicate Data Block Validation
5.7.2.4.2	Validity of Data Block Types

### Short Video Descriptors (SVDs)

5.7.2.5.1	Validity of SVDs
5.7.2.5.2	SVD/DTD Ordering



## Audio Data Block

Test Reference	Test Name
5.7.2.6.1	Duplicate Audio Format Codes
5.7.2.6.2	Audio Output Validation

## Speaker Allocation Data Block

5.7.2.7.1	Verify Max Number of Channels
5.7.2.8	Test for Detailed Timing Descriptors

## DisplayID Extension Block Framework Validation

5.7.3.1	DisplayID EDID Extension Block Tag (Byte#0) and extension version (Byte#1)
5.7.3.2	DisplayID Section Size, Byte#2
5.7.3.3	DisplayID Product Identifier/ Primary Use Case, Byte#3
5.7.3.4	DisplayID Extension Count, Byte#4
5.7.3.5	DisplayID Section Checksums

## DisplayID Extension Block Tiled Display Topology Block

5.7.4.1	Block Revision (Byte#1)
5.7.4.2	Number of Payload Bytes in Block (Byte#2)
5.7.4.3	Tiled Display Capabilities (Byte#3, bit 6 and bit 7)
5.7.4.5	Tile Size (Byte#7 to Byte#10)

## DisplayID Extension with Stereo Display Interface Data Blocks

5.7.5.1	Block Revision and Other Data (Byte #1)
5.7.5.2	Number of Payload Bytes in Block (Byte#2)

## DisplayID Extension with Type VII Detailed Timing Block

5.7.6.1	Block Revision (Byte#1)
5.7.6.2	Block Number of Payload Bytes in Block (Byte#2)
5.7.6.3	Pixel Clock (Bytes #0 through #2 of each Descriptor)
5.7.6.4	Descriptor Payload Verification (Bytes #3 through #19 of each Descriptor)
5.7.6.5	Timing Support Validation

## DisplayID Extension with Type VIII Detailed Timing Block

5.7.7.1	Block Revision and Other Data (Byte#1)
5.7.7.2	Block Number of Payload Bytes in Block (Byte#2)
5.7.7.3	DMT Timing Codes
5.7.7.4	CTA Timing Codes
5.7.7.5	HDMI Timing Codes
5.7.7.6	Timing Support Validation

### DisplayID Extension with Type IX Detailed Timing Block

Test Reference	Test Name
5.7.8.1	Block Revision and Other Data (Byte#1)
5.7.8.2	Block Number of Payload Bytes in Block (Byte#2)
5.7.8.3	Timing Options (Byte #0 of each Descriptor)
5.7.8.4	Horizontal Active Image Pixels and Vertical Active Image Lines (Bytes #1-4 of each Descriptor)
5.7.8.5	Refresh Rate and Pixel Clock (Byte #5 of each Descriptor)
5.7.8.6	Timing Support Validation

### CTA Data Blocks in a DisplayID Extension

5.7.9.1	Block Revision (Byte#1)
5.7.9.2	Block Number of Payload Bytes in Block (Byte#2)
5.7.9.3	Validity of Data Block Types

### DisplayID Vendor-Specific Data Blocks

5.7.10.1	Block Revision (Byte#1)
5.7.10.2	Block Number of Payload Bytes in Block (Byte#2)
5.7.10.3	Manufacturer/Vendor ID Field

### Dynamic Video Timing Range Limits Data Block

5.7.11.1	Block Revision (Byte#1)
5.7.11.2	Block Number of Payload Bytes in Block (Byte#2)
5.7.11.3	Minimum and Maximum Pixel Clock (Bytes #3 through #8)
5.7.11.4	Minimum and Maximum Vertical Refresh Rate (Bytes #9 and #10)
5.7.11.5	Dynamic Video Timing Range Support Flags (Byte #11)

### DisplayID Data Block Version Validation

5.7.12.1	DisplayID Version 1.x Blocks
5.7.12.2	DisplayID Version 2.x Blocks
5.7.12.3	DisplayID Version 2.x Multiple Instances of Data Blocks

## Adaptive-Sync CTS for testing Sink DUT P/N: MT6649

### Adaptive-Sync Operation Validation

5.8.1.1	Fixed-Average Vtotal Mode Support over the Declared Frame Rate Range*
5.8.1.2	Duration Increase and Decrease Constraint Value Support in Adaptive Vtotal Mode*
5.8.1.3	Adaptive Vtotal Mode Support*

\*VESA status: In progress (TE correlation)

### 3. HDCP 2.3 CTS FOR DISPLAYPORT

#### DP HDCP 2.3 CTS Capable Hardware Products

Product	P/N	Description
UCD-500 DP 2.0 Test Device	066700	DisplayPort™ 2.0 Video Generator and Analyzer unit for testing DisplayPort Sinks and Sources up to 8K@60Hz and 16K@60 Hz (with DSC) video modes with UHBR 20 Max Bit Rate Capability.
UCD-400 DP 1.4 Test Device *	066600	DP1.4 / HBR3/MST capable test unit for DisplayPort Sink, Source and Repeater. USB 3.0 Interface to Host PC.
UCD-411 Tester	066606	DP1.4 / HBR3/MST capable Pattern Generator. USB 3.0 interface to Host PC.
UCD-424 Tester*	066630	DP1.4, HBR3 & PD3.0 capable test unit for DisplayPort Alt Mode Sink, Source and Repeater. USB 3.0 Interface to Host PC.
UCD-323 HDDP **	066512	4K capable test unit for digital video inputs and outputs. USB 3.0 Interface to Host PC.
UCD-340 USB-C DP Alt Mode Tester with Electrical Test **	066515	4K capable test unit for USB-C DP Alt Mode Sinks or Sources with Electrical Test. USB 3.0 Interface to Host PC. TSI SDK Basic Test Set included.
UCD-301 Digital ***	066510	4K capable test unit for digital video outputs. USB 3.0 Interface to Host PC.

\*) Approved as Authorized Test Tool for DP Sinks, Sources and Repeaters

\*\*\*) Approved as Authorized Test Tool for DP Sinks and Sources

\*\*\*) Approved as Authorized Test Tool for DP Sources

#### DP HDCP 2.3 CTS Test Software Product Options

Product	P/N	Description
HDCP 2.3 CTS for testing Source DUT on DP	MT6634	HDCP 2.3 on DisplayPort compliance tests for testing Source DUT. (Sets 1A + 1B)
HDCP 2.3 CTS for testing Sink DUT on DP	MT6636	HDCP 2.3 on DisplayPort compliance tests for testing Sink DUT. (Set 2C)
HDCP 2.3 CTS for testing Sink, Source and Repeater DUT on DP	MT6638	HDCP 2.3 on DisplayPort CTS for testing Sink, Source and Repeater DUT. (Sets 1A + 1B + 2C + 3A + 3B + 3C)

## Description of HDCP 2.3 CTS Tests

---

### HDCP 2.3 CTS for testing Source DUT on DP (P/N MT6634)

#### 1A. Downstream procedure with Receiver

Test Reference	Test Name
HDCP2.3 CTS 1A-01	Regular Procedure – With previously connected Receiver (With stored km)
HDCP2.3 CTS 1A-02	Regular Procedure – With newly connected Receiver (Without stored km)
HDCP2.3 CTS 1A-03	Regular Procedure – Receiver disconnect after AKE_Init
HDCP2.3 CTS 1A-04	Regular Procedure – Receiver disconnect after km
HDCP2.3 CTS 1A-05	Regular Procedure – Receiver disconnect after locality check
HDCP2.3 CTS 1A-06	Regular Procedure – Receiver disconnect after ks
HDCP2.3 CTS 1A-07	Regular Procedure – Receiver sends REAUTH_REQ after ks
HDCP2.3 CTS 1A-08	Irregular Procedure – Verify Receiver Certificate
HDCP2.3 CTS 1A-09	Irregular Procedure – SRM
HDCP2.3 CTS 1A-10	Irregular Procedure – Invalid H'
HDCP2.3 CTS 1A-11	Irregular Procedure – Pairing Failure
HDCP2.3 CTS 1A-12	Irregular Procedure – Locality Failure
HDCP2.3 CTS 1A-13	Regular Procedure – Encryption Disable Bootstrapping

#### 1B. Downstream procedure with Repeater

HDCP2.3 CTS 1B-01	Regular Procedure – With Repeater
HDCP2.3 CTS 1B-02	Irregular Procedure – Timeout of Receiver ID list
HDCP2.3 CTS 1B-03	Irregular Procedure – Verify V'
HDCP2.3 CTS 1B-04	Irregular Procedure – MAX_DEVS_EXCEEDED
HDCP2.3 CTS 1B-05	Irregular Procedure – MAX_CASCADE_EXCEEDED
HDCP2.3 CTS 1B-06	Irregular Procedure – Incorrect seq_num_V
HDCP2.3 CTS 1B-07	Regular Procedure – Re-authentication on HPD
HDCP2.3 CTS 1B-08	Regular Procedure – Re-authentication on REAUTH_REQ
HDCP2.3 CTS 1B-09	Irregular Procedure – Rollover of seq_num_V
HDCP2.3 CTS 1B-10	Irregular Procedure – Failure of Content Stream Management

## HDCP 2.3 CTS for testing Sink DUT on DP (P/N MT6636)

### 2C. Upstream procedure with Transmitter

Test Reference	Test Name
HDCP2.3 CTS 2C-01	Regular Procedure – With transmitter
HDCP2.3 CTS 2C-02	Irregular Procedure – New Authentication after AKE_Init
HDCP2.3 CTS 2C-03	Irregular Procedure – New Authentication during Locality Check
HDCP2.3 CTS 2C-04	Irregular Procedure – New Authentication after SKE_Send_Eks
HDCP2.3 CTS 2C-05	Irregular Procedure – New Authentication during Link Synchronization
HDCP2.3 CTS 2C-06	Regular Procedure – Encryption Disable Bootstrapping

## HDCP 2.3 CTS for testing Sink, Source and Repeater DUT on DP (P/N MT6638)

### 1A. Downstream procedure with Receiver

Please see above

### 1B. Downstream procedure with Repeater

Please see above

### 2C. Upstream procedure with Transmitter

Please see above

### 3A. Downstream procedure with Receiver

Test Reference	Test Name
HDCP2.3 CTS 3A-01	Regular Procedure – With previously connected Receiver (With stored $k_m$ )
HDCP2.3 CTS 3A-02	Regular Procedure – With newly connected Receiver (Without stored $k_m$ )
HDCP2.3 CTS 3A-03	Irregular Procedure – Verify Receiver Certificate
HDCP2.3 CTS 3A-04	Irregular Procedure – invalid H'
HDCP2.3 CTS 3A-05	Irregular Procedure – Pairing Failure
HDCP2.3 CTS 3A-06	Irregular Procedure – Locality Failure

### 3B. Downstream Procedure with Repeater

HDCP2.3 CTS 3B-01	Regular Procedure – With Repeater
HDCP2.3 CTS 3B-02	Irregular Procedure – Timeout of Receiver ID list
HDCP2.3 CTS 3B-03	Irregular Procedure – Verify V'
HDCP2.3 CTS 3B-04	Irregular Procedure – MAX_DEVS_EXCEEDED
HDCP2.3 CTS 3B-05	Irregular Procedure – MAX_CASCADE_EXCEEDED
HDCP2.3 CTS 3B-06	Irregular Procedure – Rollover of $seq\_num\_V$
HDCP2.3 CTS 3B-07	Irregular Procedure – Failure of Content Stream Management

### 3C. Downstream Procedure with Transmitter

Test Reference	Test Name
HDCP2.3 CTS 3C-01	Regular Procedure – Transmitter – DUT – Receiver
HDCP2.3 CTS 3C -02	Regular Procedure – Receiver Disconnect Propagation when an Active Receiver is Disconnected Downstream
HDCP2.3 CTS 3C -03	Regular Procedure – Receiver Connected when an Active Receiver is Connected Downstream
HDCP2.3 CTS 3C -04	Irregular Procedure – New Authentication after AKE_init
HDCP2.3 CTS 3C -05	Irregular Procedure – New Authentication during Locality Check
HDCP2.3 CTS 3C -06	Irregular Procedure – New Authentication after SKE_Send_Eks
HDCP2.3 CTS 3C -07	Irregular Procedure – New Authentication during Link Synchronization
HDCP2.3 CTS 3C -08	Irregular Procedure – Rx Certificate invalid
HDCP2.3 CTS 3C -09	Irregular Procedure – invalid H'
HDCP2.3 CTS 3C -10	Irregular Procedure – Locality Failure
HDCP2.3 CTS 3C-11	Regular Procedure – Transmitter – DUT – Repeater (With stored km)
HDCP2.3 CTS 3C-12	Regular Procedure – Receiver disconnect after AKE_Init
HDCP2.3 CTS 3C-13	Regular Procedure – Receiver disconnect after km
HDCP2.3 CTS 3C-14	Regular Procedure – Receiver disconnect after locality check
HDCP2.3 CTS 3C-15	Regular Procedure – Receiver disconnect after Ks
HDCP2.3 CTS 3C-16	Irregular Procedure – Timeout of Receiver ID list
HDCP2.3 CTS 3C-17	Irregular Procedure – Verify V'
HDCP2.3 CTS 3C-18	Irregular Procedure – DEVICE_COUNT
HDCP2.3 CTS 3C-19	Irregular Procedure – DEPTH
HDCP2.3 CTS 3C-20	Irregular Procedure – MAX_DEVS_EXCEEDED
HDCP2.3 CTS 3C-21	Irregular Procedure – MAX_CASCADE_EXCEEDED
HDCP2.3 CTS 3C-22	Regular Procedure – Repeater with zero downstream device
HDCP2.3 CTS 3C-23	Regular Procedure – Propagation of HDCP2_0_REPEATER_DOWNSTREAM flag
HDCP2.3 CTS 3C-24	Regular Procedure – Propagation of HDCP1_DEVICE_DOWNSTREAM flag
HDCP2.3 CTS 3C-25	Regular Procedure – Content Stream Management



# Version History

Rev.	Date	Author	Description
1	20.12.2021	Jes	Released
2	22.12.2021	Jes	Added Aadaptive-Sync licenses