VQTS4K
“SPARTAK”

VideoQ Test System

Video Test Pattern Generator & Analyzer

Training Presentation

April 2020

www.videoq.com

Section 1: VQTS4 System Top Level Description

This section provides general information sufficient for most users.

The following sections give more details about possible test sessions scenarios, VideoQ software tools usage and test patterns features.

General

SPARTAK-VQTS4K is a self-contained solution, combining:

- **SDI / HDMI** player & recorder based on BMD DeckLink 4K hardware
- **Uncompressed** AV signals in and out, up to 4096x2160p60
- Visual, instrumental and automated tests using VideoQ **VQL** Test Patterns Library
- Sophisticated image quality VideoQ **VQMA** software analyzer provides complete quality report in 2 seconds
- VideoQ **VQV** Viewer-Analyzer – unique video data analysis and fidelity verification tool
- Test Pattern Generator and Capture/Analysis sub-systems work simultaneously and independently, *thus providing for a variety of possible workflows and test sessions scenarios*
- *For more details about VQL, VQMA and VQV – see **separate presentations***

Applications

- Universal service platform for Video Streaming Quality Control
- Engineering & Development of video systems and devices
- Complex video systems integration and inter-operability testing
- QA/QC of broadcast, prosumer and consumer video systems with HDMI and/or SDI connectivity and/or network connectivity options
- Teleconference systems installation & calibration
- CDN and IPTV systems QA/QC

Features

Hardware:

- 4 RU Industrial Case PC, including powerful CPU, GPU and high-speed HDDs
- Black Magic Design 4K Video Capture and Playback Cards, HDMI and SDI I/O

Software:

- VQTSTPG – Test Patterns Selection and Preview Control Panel
- VQTS4K – Main Control Panel for Input Video Preview, Capture and Analysis
- VQMA – File-based Software Video Analyzer and Scope
- VQV – File-based Video Viewer-Analyzer
- VQMA and VQV programs are copy-protected by the same USB dongle

3rd parties software: FFMPEG libraries and binaries, RAR Archiver, PDF Factory printer utility

Rear Panel and Front Panel

Specifications

Industrial PC, 4RU rackmount, silent cooling

- Dimensions (W,H,D):
  432 mm (17"), 178 mm (7"), 521 mm (20.5")
- Power:
  100V-240V AC, 850W

Video Capture and Playout:

- Inputs:
  HDMI, SDI
- Outputs:
  HDMI, SDI
- Frame Sizes:
  1920x1080 (HD), 3840x2160 (4K UHD)
- Frame Rates:
  23.976, 24.0, 25.0, 29.97, 30, 50.0, 59.94, 60.0
- Color Spaces:
  YUV 422 (BT 709, BT2020), RGB 444

OS:
Windows 10 Pro

CPU:
AMD, 8 cores, Ryzen, 4.1 GHz

Memory:
32 GB

Storage:

- 1 TB - system
- 2 TB - video capture and playout
- 6 TB - video archive

Video File Formats:

- Lossless v210, r210 (AVI)
- Lossless VP9 (WEBM)
- Audio: 2.0 LR, 24/16 bit, 48 kHz,
  PCM (AVI) or OGG (WEBM)

GPU:
AMD 580XT

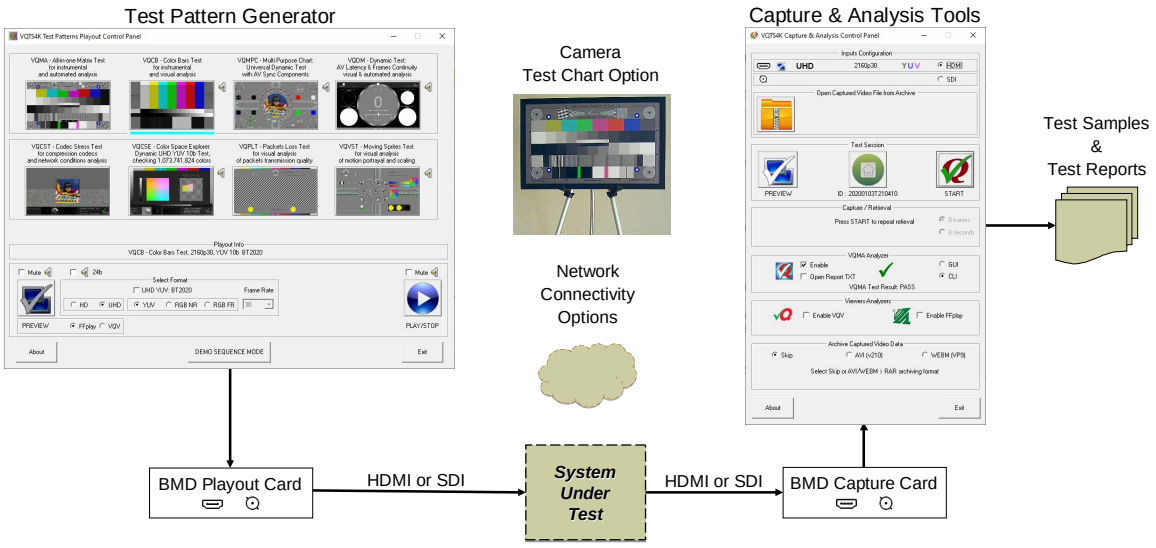
GPU Ports:

- DP x2
- HDMI x1
- DVI x1

USB Ports:

- SS10 x2
- SS x3
- Type C x1
- USB2 x2

VQTS4K Top Level Block Diagram



VQTS4K General Test Patterns Set

- VQMA – All-in-one Matrix Test for instrumental and automated analysis

- VQCB – Advanced Color Bars Test for instrumental and visual analysis

- VQMPC – Multi Purpose Chart: Universal Dynamic Test with AV Sync Components

- VQDM – Dynamic Test: AV Latency & Frames Continuity visual & automated analysis

- VQCST – Codec Stress Test for compression codecs and network conditions analysis

- VQCSE – Color Space Explorer: Dynamic UHD YUV Test checking 1,073,741,824 colors

- VQPLT – Packets Loss Test for visual analysis of packets transmission quality

- VQVST – Moving Sprites Test for visual analysis of motion portrayal and scaling

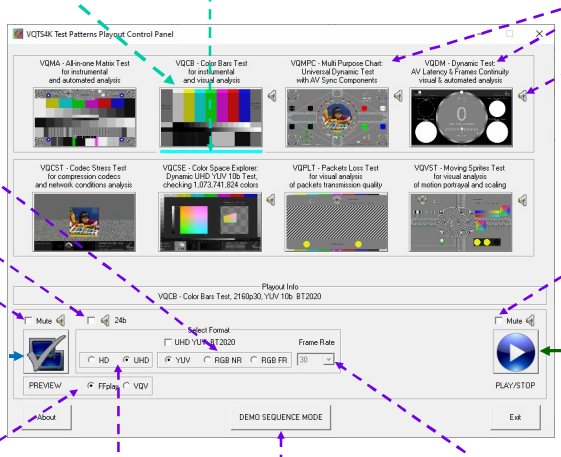
*See next sections and **separate presentations** for more details and usage of particular **test patterns***

Test Pattern Generator Control Panel

Click on the icon to select the desired **Test Pattern** **Cyan Marker** indicates the selected Test Pattern

Brief **Descriptions**

Select the desired **Color Space**:
- YUV Narrow Range
- RGB Narrow Range
- RGB Full Range



This Test Pattern contains **Active Audio Test Component**
*By default test patterns contain **mute** audio stream*

Mute HDMI/SDI Audio Stream

Select the desired **Bit Depth** of HDMI/SDI Audio Stream

Mute Preview Audio

PREVIEW ON/OFF toggle button

Test Pattern Playout **START / STOP** toggle button

Playout and Preview Modes are mutually exclusive

Playout and Preview Modes are mutually exclusive

Select the **Preview Tool**: **FFPlay** plays full speed, **VQV** provides sophisticated analyzers

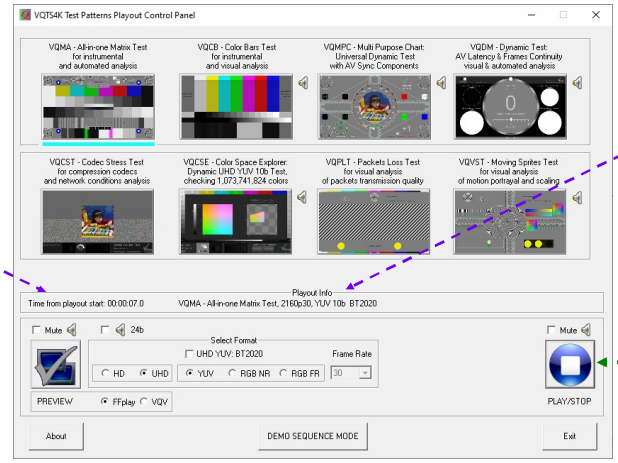
Select the desired **frame size**

Enable **Demo Sequence Mode:** *7 HD Tests or 8 UHD Tests*

Select the desired **frame rate.**

*In some versions frame rate is auto-set by frame size, e.g. only **UHD 30fps** and **HD 60fps** combinations are valid*

Test Pattern Generator – Playout in Progress



Elapsed Time Message in [DDD:]HH:MM:SS.ms format

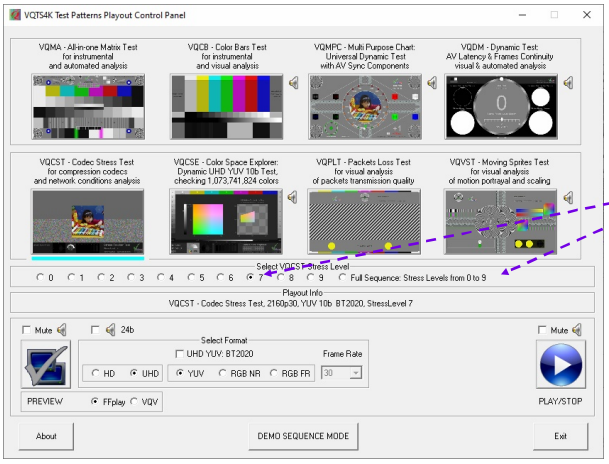
It is possible to change the Test Pattern or Video Format on-the-fly: Preview or Playout will stop, and then resume automatically

Selected Test Pattern Brief Info

Press **START / STOP** toggle button to stop playout .

On STOP the last output frame is frozen

Special Case: VQCST – Codec Stress Test



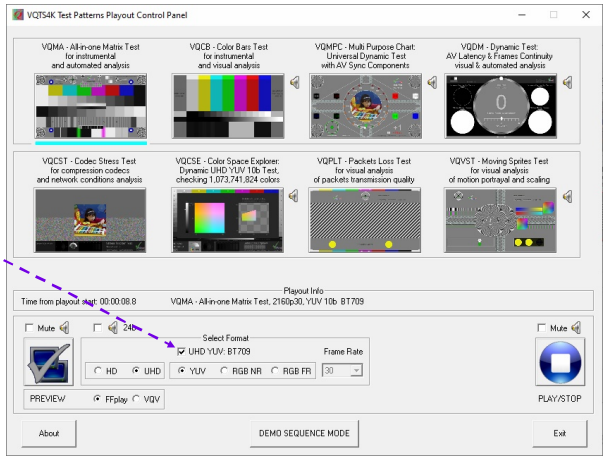
In case of **VQCST Codec Stress Test**

Stress Level Selection Sub-panel is enabled

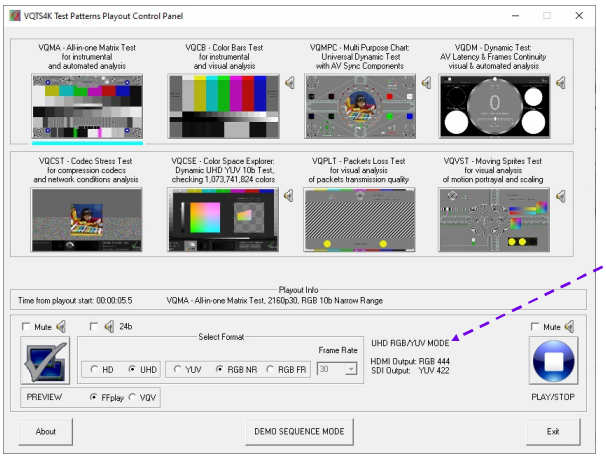
Select the desired **Stress Level** or **40s long Sequence** of 10 Stress Levels: **10 x 4s segments**.

UHD YUV Format of HDMI/SDI Outputs

In case of **UHD YUV** format
an additional color space selection
check box is enabled:
Toggle **BT709** or **BT2020**,
thus providing for both standard BT2020 output and non-standard, but widely used, BT709 UHD YUV video output



Mixed RGB/YUV UHD Format of HDMI/SDI Outputs



In case of **UHD RGB**
Test Pattern format selection
and BMD **6G** cards usage
actual signal formats on HDMI
and SDI connectors are
different:

HDMI 1.4b standard allows
RGB 444 output, but **6G SDI**
is limited to **YUV 422**.

In this mode SDI YUV data are
auto-converted from the
original UHD RGB data
by built-in hardware converter.

Capture and Analysis Control Panel

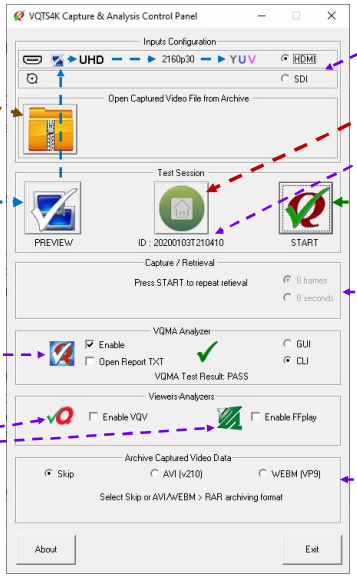
Archive Mode ON/OFF toggle button. Toggle it OFF to re-enable **Capture Mode**. Press **START** to retrieve from RAR archive the AVI/WEBM captured file and analyze it.

Preview ON/OFF toggle button. It invokes the **Live Preview Module**, which auto-configures the video input **frame size**, **frame rate** and YUV or RGB **color space**

Select **VQMA** options:
- Check **Enable** to do VQMA Test, i.e. open the video file in VQMA Analyzer**.**
- Check **Open Report TXT** if you want to read it immediately after (*in minimized Notepad*). *PASS/FAIL sign will be shown in any case*.
- **GUI** and **CLI** options are mutually exclusive, *but, if necessary, user can **reopen** the same video sample in GUI **after** the CLI test.*

Select the **Viewer-Analyzer**:
- **FFPlay** plays full speed, but it can be used only for visual-aural analysis
- **VQV** provides sophisticated analyzers, but it is not capable to play real time

User can launch any one tool, all, or none.



Select the desired Input: **HDMI** or **SDI**
***Live Preview Module** will be auto-launched*

RESET button restores default values and close/disable all analyzer windows

Auto-assigned **Test Session ID** (ISO Time Stamp for video and report files)

Press **START** button to run the main **Capture/Retrieval and Analysis Sequence**

Select **live capture duration**:
- **8 frames** duration is more suitable for VQMA
- **8 s duration** is more suitable for rather long dynamic tests, e.g. VQMPC or VQCSE

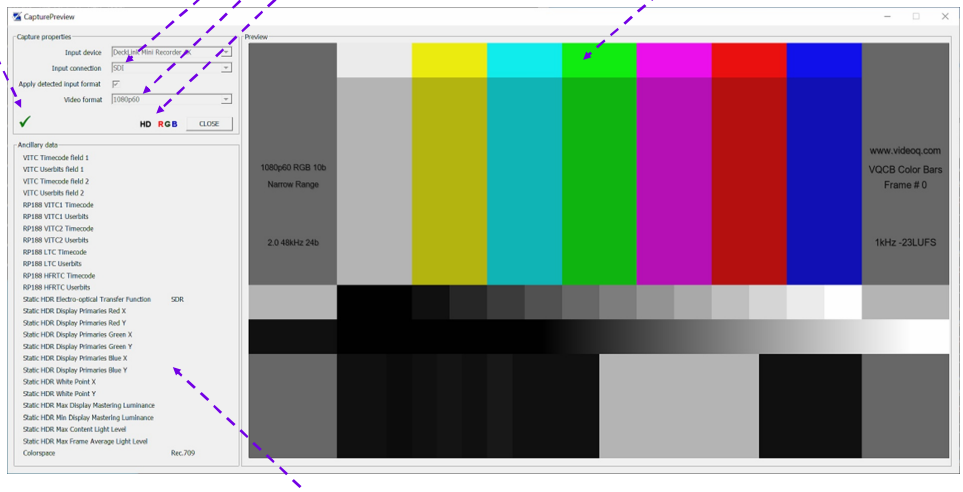
Select **video** data sample **archiving option**:
- **Skip** means that video file will be discarded (*VQMA Test Report TXT file is always stored*)
- **AVI** option is faster, but AVI files are larger and RAR file may come out relatively large
- **WEBM** VP9 lossless compression is slower, but file size may be significantly reduced. *Also, unlike uncompressed AVI, WEBM file can be played/streamed by media players*

Live Preview Module

Green check mark means that the detected format is suitable for VQTS4K capture/analysis

Detected video format of the selected SDI/HDMI input

Live video image



SDR / HDR Metadata present at the selected input

Capture/Retrieval and Analysis Progress Indicators

Stage 1: Capture/Retrieval

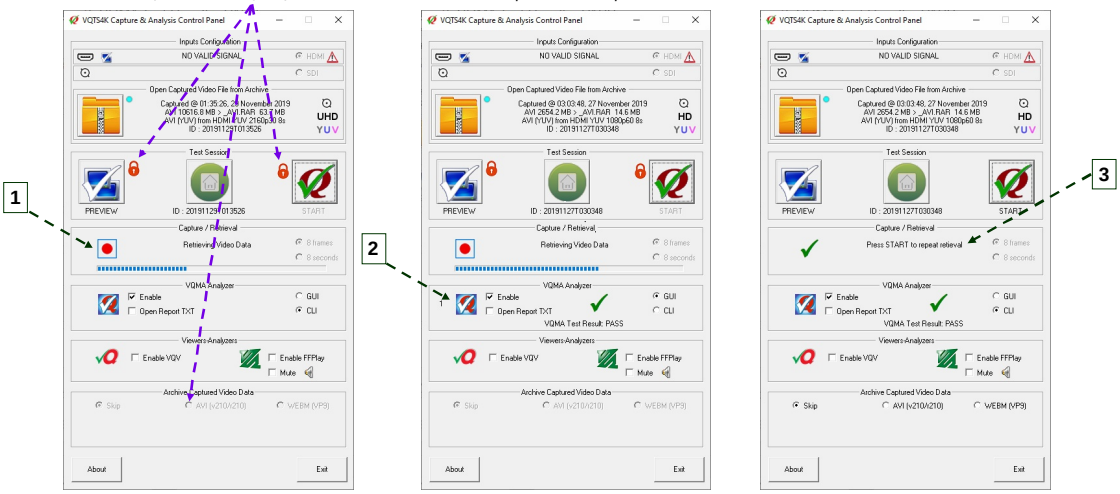
Some controls are frozen (disabled) until the end of capture and analysis process

Stage 2: VQMA Analysis

VQMA analysis may finish even before the end of capture/retrieval process

Stage 3: Test Session End

At this stage all frozen controls are released, so the user can start new Test Session



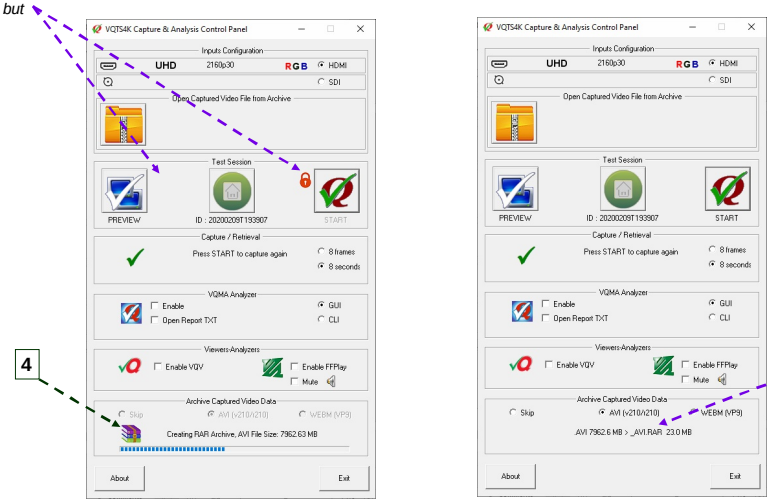
Captured Video Data Archiving Option

Stage 4: Optional Video Sample Encoding/Archiving after Live Video Capture

Capture control is frozen (disabled) until the end of the archiving process, but Preview is possible

Stage 4a: Archiving in progress

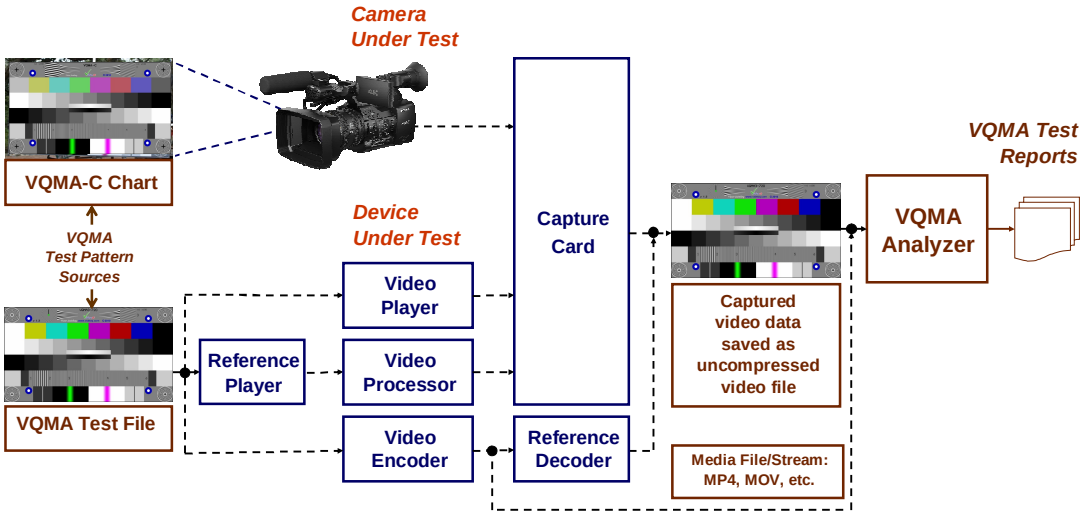
Stage 4b: Archiving finished



File Sizes Info Message

In this example RAR file is 350 times smaller than the original AVI file

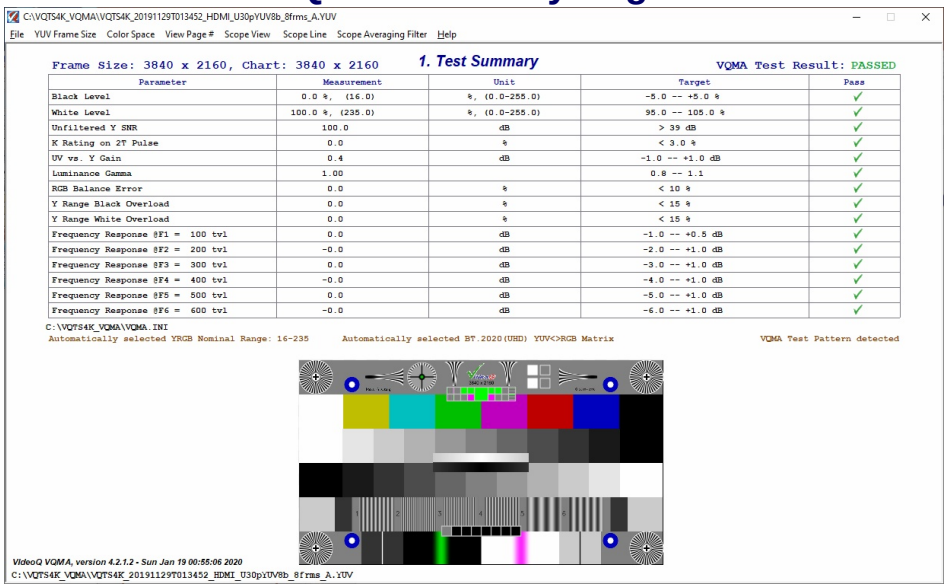
VQMA Analyzer Workflow



VQMA Analyzer Features

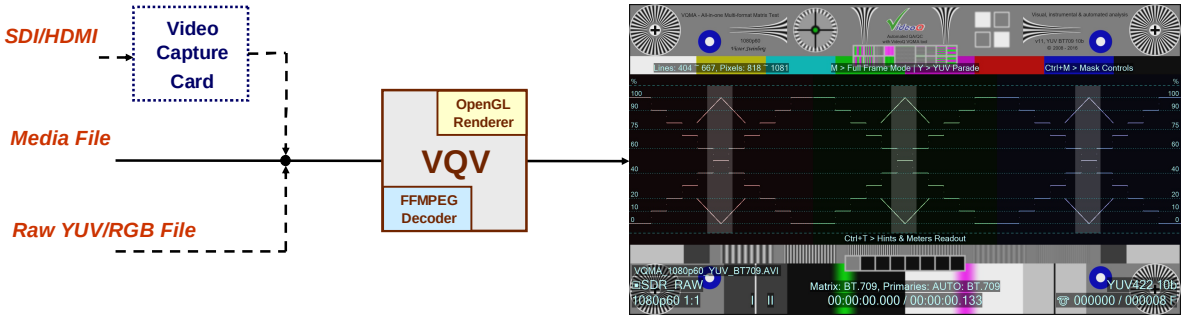
- 4th generation of VideoQ best-selling software product,
  suitable for any video format, any frame size (from 192x108 to 4096x3072), any frame rate
- Software executable under Windows™
- Automated analysis on the companion VQMA Matrix Test Pattern
- Variety of VQMA Test Pattern formats: Optical Chart, File, Signal, Stream
- Unique patented algorithms for accurate & fast measurements (typically 2-5 seconds)
- Built-in YUV/RGB Waveform Scope
- Noise Measurement and Waveform Scope work on any static image
- Windows GUI Mode for R&D and product verification, multi-page on-screen Report printable to PDF
- Command Line Interface (Batch) Mode for automated QA/QC operation, machine-readable Report file with Pass/Fail marks

VQMA Summary Page



VQV Viewer-Analyzer Top Level Workflow Diagram

A rendered image with the unique VQV readout and VQV filters/meters overlays

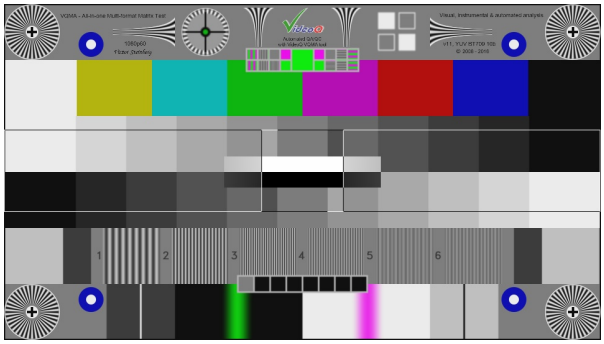


VQV Analyzer Usage Example

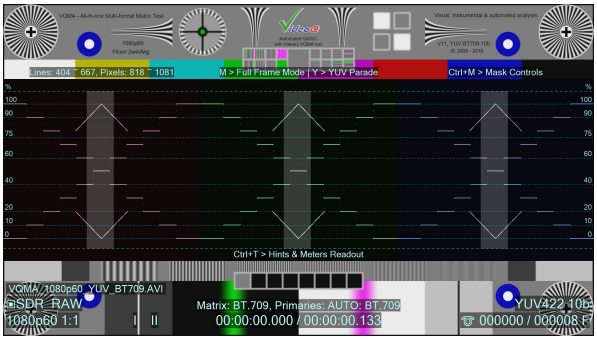
Press **Ctrl + W** to launch **Waveform Monitor Tool**

Checking RGB levels of VQMA test pattern central bands

Step 1:
Adjust the Lines and Pixels Selection **Mask** of VQV Waveform Monitor using Mouse & Mouse Wheel, then ***click*** within the selected area



Step 2:
VQV Waveform Monitor will display RGB Waveforms and measured RGB Levels within the selected **Mask**



Test result: PASS – VQV shows full signal range from 0% to 100%, ramp signals are not clipped

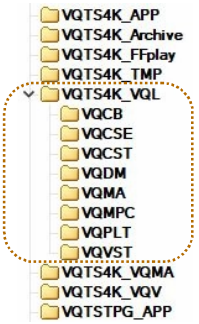
Section 2: VQTS4K Files and Folders

This section explains VQTS4K files and folders structure.

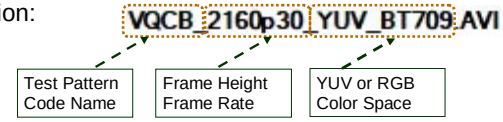
It also contains information about the files used by Test Pattern Generator Control Panel and the files created by Capture-Analysis Control Panel.

Test Pattern Generator Files & Folders

Test Pattern Generator is the engine sending to BMD card video data stored in the AVI files located in the corresponding sub-folders of the main **VQTS4K_VQL** folder. Names of the 8 sub-folders are matching the codenames of 8 test patterns.



AVI files naming convention:



There are 2 available combinations of Frame Height and Frame Rate:

- **2160p30**
- **1080p60**

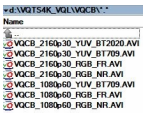
There are 4 available Color Spaces:

- **YUV_BT709** (1080p60 & 2160p30)
- **YUV_BT2020** (only for 2160p30)
- **RGB_Full_Range** (1080p60 & 2160p30)
- **RGB_Narrow_Range** (1080p60 & 2160p30)

Thus, each test pattern is typically represented by 7 AVI files.
There are two special cases – VQCSE and VQCST (see next slide)

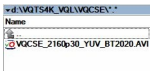
Test Patterns by Folders

VQCB folder contains **7 AVI files**



Each of VQMA, VQDM, VQMPC, VQPLT, VQVST folders also contain 7 AVI files

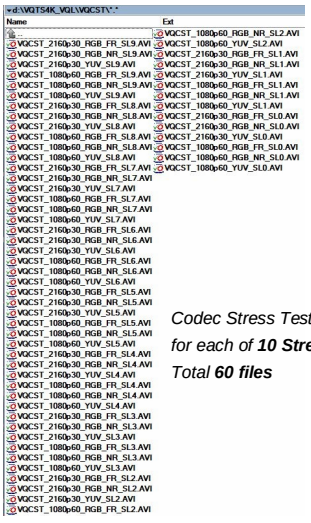
VQCSE folder contains **1 AVI file**



*UHD YUV Color Space Explorer exists in **one** format:*

2160p30_YUV_BT2020

VQCST folder contains **60 AVI files**



*Codec Stress Test files are available in **6 formats** for each of **10 Stress Levels**:*
*Total **60 files***

Test Pattern Generator Application Files

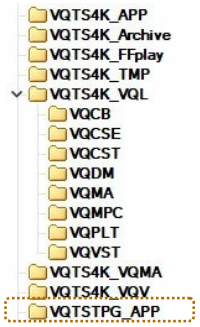
Main **VQTS4KTPG.EXE** file (TPG Control Panel executable) is located in V**QTSTPG_APP** folder.

It is co-located with two important .INI files:

- **VQTSTPG_Config.INI**
- **VQTSTPG.INI**

```
;VideoQ VQTS4K, VQTS4K_Config.INI file
;THIS IS AUTOMATICALLY GENERATED FILE
;
[APP_DIR]
C:\VQTSTPG_APP
[VQL_DIR]
D:\\VQTS4K_VQL
[ARCHIVE_DIR]
C:\VQTS4K_Archive
[DEBUG_MODE]
FALSE
```

```
;VideoQ VQTS4K, VQTSTPG.INI file creat
;THIS IS AUTOMATICALLY GENERATED FILE
;
[TestPatternIndex]
TestPatternIndex=6
[VideoFormatCode]
VideoFormatCode=U30
[ColorSpace]
ColorSpace=YUV
[BT709_for_UHD_YUV]
BT709_for_UHD_YUV=FALSE
[PreviewApp]
PreviewApp=FFplay
[VQCST_StressLevel]
VQCST_StressLevel=6
```



VQTSTPG_Config.INI file editing is needed only for hardware configuration and debugging, e.g. to change the ARCHIVE_DIR location.

VQTSTPG.INI file is auto-saved each time the TPG Control Panel is closed, thus allowing to resume test session with the same set of controls. Manual editing and saving of various versions of this file may help to manage the semi-automatic test procedures and test workflow scripting.

In any case, such editing should be done with caution and only by advanced users.

Capture and Analysis Application Files

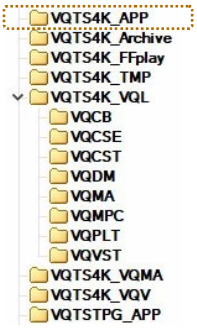
Main **VQTS4K.EXE** file (Capture and Analysis Control Panel executable) is located in **VQTS4K_APP** folder.

It is co-located with two important .INI files:

- **VQTS4K_Config.INI**
- **VQTS4K.INI**

```
;VideoQ VQTS4K, VQTS4K_Config.INI file
;THIS IS AUTOMATICALLY GENERATED FILE
;
[APP_DIR]
C:\VQTS4K_APP
[TMP_DIR]
C:\TMP
[VQMA_DIR]
C:\VQTS4K_VQMA
[VQV_DIR]
C:\VQTS4K_VQV
[FFPLAY_DIR]
C:\VQTS4K_FFplay
[ARCHIVE_DIR]
C:\VQTS4K_Archive
[DEBUG_MODE]
FALSE
```

```
;VideoQ VQTS4K, VTS4K.INI file created
;THIS IS AUTOMATICALLY GENERATED FILE
;
[Input_Select]
InputSelectSW=1
[HDMI_Input_FormatCode]
HDMI_Input_FormatCode=H60pYUV10b
[SDI_Input_FormatCode]
SDI_Input_FormatCode=H60pYUV10b
[Capture_Duration]
CaptureDurationSW=0
[VQMA_Mode]
VQMA_Mode=1
[Enable_VQMA]
Enable_VQMA=1
[Open_VQMA_Report]
OpenVQMAReport=0
[Enable_VQV]
Enable_VQV=0
[Enable_FFplay]
Enable_FFplay=0
[StoreVideoData]
StorageFormatSW=0
```



VQTS4K_Config.INI file editing is needed only for hardware configuration and debugging, e.g. to change the ARCHIVE_DIR location.

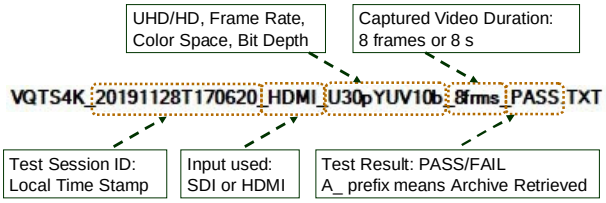
VQTS4K.INI file is auto-saved each time the Control Panel is closed, thus allowing to resume test session with the same set of controls. Manual editing and saving of various versions of this file may help to manage the semi-automatic test procedures and test workflow scripting.

In any case, such editing should be done with caution and only by advanced users.

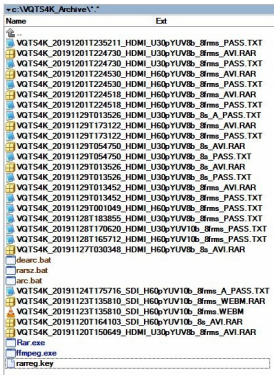
VQTS4K Archive Folder

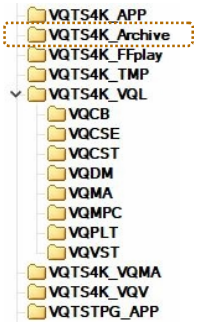
The **VQTS4K_Archive** folder contains Test Report TXT files auto-saved after each run of VQMA analyzer.

Test Report files naming convention:



See next section for more info about Test Report Files.





The VQTS4K_Archive folder may also contain RAR files created by optional encoding/archiving of captured video.
RAR files naming convention is the same, but instead of PASS/FAIL sub-string of TXT file RAR file name includes AVI or WEBM sub-string indicating the video encoding format used.

This folder also contains other files required for VQTS4K system normal operation.

Other VQTS4K System Folders

These folders contain .BAT and .EXE files required for VQTS4K system normal operation.

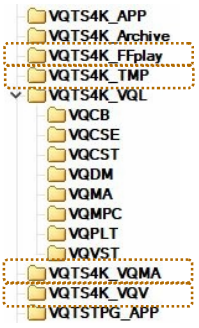
The content of these folders should not be modified in any case.

There is one exception.

Manual editing and saving of various versions of **VQMA.INI** file in **VQTS4K_VQMA** folder may help to manage the **semi-automatic test procedures** and **test workflow scripting**.

See next section for more info about VQMA.INI Files

In any case, such editing should be done with caution and only by advanced users.



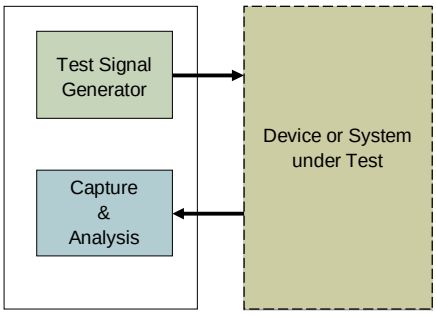
Section 3: Test Sessions Organization

This section explains usage of VQTS4K system tools in various test scenarios.

It also contains more details about VQMA .INI files and VQMA Test Reports

Open Loop and Closed Loop Workflows

Typical VQTS4K Test Workflow is of “closed loop” type, where test signal is returned to the same unit where it was originated.



Alternatively, there are various “open loop” Test Workflows. In such cases Test Signal Generator and Capture-Analysis Modules could be not involved or located at different places.

The examples are:

- Visual quality assessments of video system performance, e.g. playout of VQCST test pattern aimed to check a compression codec performance.
  In such case Capture and Analysis module is not used at all, or used for capture only.
- Usage of VQMA-C reflectance chart to test video camera performance. In such case the VQTS4K Test Signal Generator module is either not used at all, or used for some other tasks.
- Playout of VQDM test pattern. In this case AV Sync errors are either assessed via visual-aural estimation, or AV Sync error measurement is performed by VQDM100 analyzer unit.

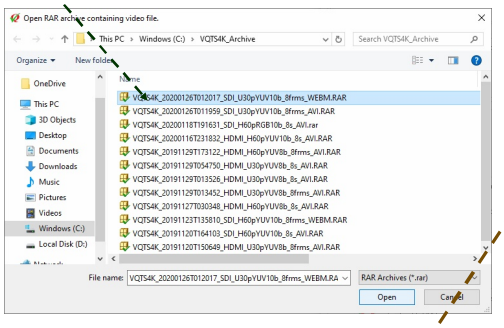
Captured Video Data De-Archiving & Offline Analysis

Press **Archive Mode** Button

1

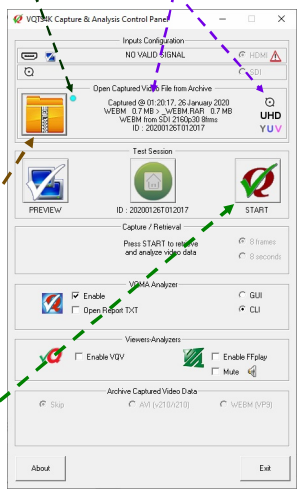
This brings up the standard **File Open** dialog

2 Select the desired file ID (Time Stamp)



Archive Mode ON Indicator

3 Archived Video File Info



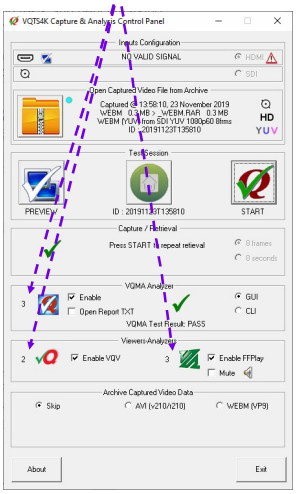
Toggle **Archive Mode** button OFF
to re-enable the SDI/HDMI **Capture Mode**.

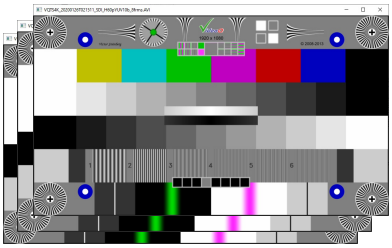
or

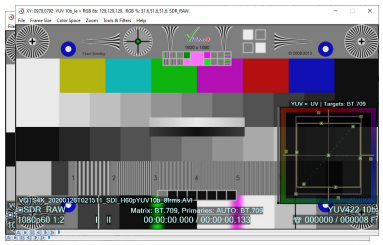
Press **START** to retrieve from RAR archive
the AVI/WEBM captured file and analyze it.

Multiple Concurrent Analyzers

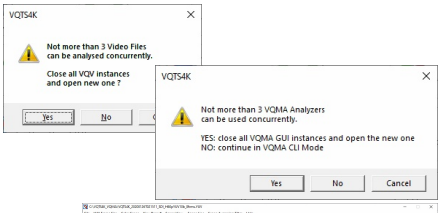
It is possible to open ***several*** VQMA, VQV and/or FFPlay ***windows***. This is useful for debugging tests and benchmarking.
Up to ***three*** windows of each analyzer type can be opened (3x3 – up to 9 windows) , thus providing for comparative analysis of any combination of live captured or archived samples.

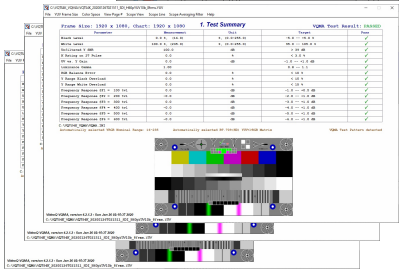






For each analyzer type opening of 4th window brings up the corresponding warning message box:





VQMA Test Report Sample

; VideoQ Inc. Copyright [c] 2005-2019
; VQMA v4.2.1.2 Test Report
LOCAL_DATE_TIME_YEAR, Sun Dec 01 23:52:13 2019
UTC_YEAR_DATE_TIME, 2019-12-01T23:52:13Z
;
REPORT_FILE, "C:\VQTS4K_Archive\VQTS4K_20191201T235211_HDMI_U30pYUV8b_8frms_PASS.TXT"
TEST_FILE, "C:\VQTS4K_VQMA\VQTS4K_20191201T235211_HDMI_U30pYUV8b_8frms.YUV"
INI_FILE, "C:\VQTS4K_VQMA\VQMA.INI"
;
TEST_RESULT, **PASSED**
;
DATA_TYPE, YUV
FRAMES_ANALYZED, 8
FRAME_WIDTH, 3840
FRAME_HEIGHT, 2160
VQMA_CHART_VALIDATION, Success
CHART_TYPE, **Test_Pattern**
ORIGINAL_FRAME_WIDTH, 3840
ORIGINAL_FRAME_HEIGHT, 2160
CHART_WIDTH, 3840
CHART_HEIGHT, 2160
YRGB_RANGE_SELECTION, Auto
SELECTED_YRGB_RANGE, 16-235
COLOR_MATRIX_DETECTED, BT.2020-UHD
COLOR_BARS_MAX_RGB_ERROR, 0, 8 bit value
Y_BLACK, 0.0, %, Success
Y_WHITE, 100.0, %, Success
SNR, 100.0, dB, Success
K_RATING, 0.0, %, Success
UV_Y_GAIN, 0.4, dB, Success
Y_GAMMA, 2.2, , Success
RGB_BALANCE_ERROR, 0.0, %, Success
Y_BLACK_RANGE_ERROR, 0.0, %, Success
Y_WHITE_RANGE_ERROR, 0.0, %, Success
FREQUENCY_RESPONSE_1, 0.0, dB, Success
FREQUENCY_RESPONSE_2, -0.0, dB, Success
FREQUENCY_RESPONSE_3, 0.0, dB, Success
FREQUENCY_RESPONSE_4, -0.0, dB, Success
FREQUENCY_RESPONSE_5, 0.0, dB, Success
FREQUENCY_RESPONSE_6, -0.0, dB, Success;

Success-Failure flags shown above are derived
; using the following target values:
; C:\VQTS4K_VQMA\VQMA.INI
;VideoQ VQMA v4.1.2.2, .INI file created Mon Dec 30 17:38:54 2013

Last section of each Report contains copy of the INI file (tolerance values) used to make PASS/FAIL decision.
Test Report format is equally suitable for human operator and for automated processing within the database.
For example, user can copy Test Report file and change its extension from TXT to CSV to open it in Excel.

Default VQMA.INI File – Structure and Values

;THIS IS DEFAULT VQMA.INI FILE - to be edited or replaced as needed
;
; [Y_BLACK_LEVEL_]
; Y_BLACK_LEVEL_UNIT=%
; Y_BLACK_LEVEL_MIN=-5.00
; Y_BLACK_LEVEL_MAX=5.00
; [Y_WHITE_LEVEL_]
; Y_WHITE_LEVEL_UNIT=%
; Y_WHITE_LEVEL_MIN=95.00
; Y_WHITE_LEVEL_MAX=105.00
; [Y_SNR_]
; Y_SNR_UNIT=dB
; Y_SNR_MIN=39.00
; [K_RATING_]
; K_RATING_UNIT=%
; K_RATING_MAX=3.00
; [UV_Y_GAIN_]
; UV_Y_GAIN_UNIT=dB
; UV_Y_GAIN_MIN=-1.00
; UV_Y_GAIN_MAX=1.00
; [Y_GAMMA_]
; Y_GAMMA_UNIT=
; Y_GAMMA_MIN=1.80
; Y_GAMMA_MAX=2.50
; [Y_RANGE_BLACK_ERROR_]
; Y_RANGE_BLACK_ERROR_UNIT=%
; Y_RANGE_BLACK_ERROR_MAX=15.00
; [Y_RANGE_WHITE_ERROR_]
; Y_RANGE_WHITE_ERROR_UNIT=%
; Y_RANGE_WHITE_ERROR_MAX=15.00
; [FREQUENCY_RESPONSE_1_]
; FREQUENCY_RESPONSE_1_UNIT=dB
; FREQUENCY_RESPONSE_1_MIN=-1.00
; FREQUENCY_RESPONSE_1_MAX=0.50
; [FREQUENCY_RESPONSE_2_]
; FREQUENCY_RESPONSE_2_UNIT=dB
; FREQUENCY_RESPONSE_2_MIN=-2.00
; FREQUENCY_RESPONSE_2_MAX=1.00
; [FREQUENCY_RESPONSE_3_]
; FREQUENCY_RESPONSE_3_UNIT=dB
; FREQUENCY_RESPONSE_3_MIN=-3.00
; FREQUENCY_RESPONSE_3_MAX=1.00
; [FREQUENCY_RESPONSE_4_]
; FREQUENCY_RESPONSE_4_UNIT=dB
; FREQUENCY_RESPONSE_4_MIN=-4.00
; FREQUENCY_RESPONSE_4_MAX=1.00
; [FREQUENCY_RESPONSE_5_]
; FREQUENCY_RESPONSE_5_UNIT=dB
; FREQUENCY_RESPONSE_5_MIN=-5.00

Customization and Editing of VQMA INI Files

VQMA checks the captured video data against the tolerance values contained within the VQM.INI file residing in the VQMA.EXE folder.

The content of the .INI file can be edited using any text editor (e.g. Notepad).
User can input the customized tolerance values for any parameter.

This allows application of different sets of tolerance values appropriate for the device under test or test conditions.

Only numerical values can be edited, the list of parameters and units of measurement codes should not be modified.
For each parameter the target values are defined by three or four consecutive lines:

1. Parameter Code [in square brackets]
2. Unit Of Measurement Name
3. Lower Limit (Minimum Value)
4. Upper Limit (Maximum Value)

For example:
; [Y_BLACK_LEVEL_]
; Y_BLACK_LEVEL_UNIT=%
; Y_BLACK_LEVEL_MIN=-5.00
; Y_BLACK_LEVEL_MAX=5.00:

For some parameter MIN value is not applicable, so it is omitted, for example:
; [RGB_BALANCE_ERROR_]
; RGB_BALANCE_ERROR_UNIT=%
; RGB_BALANCE_ERROR_MAX=10.00

Usage of Edited VQMA INI Files

It is recommended to store customized .INI files under the names which are different from the reserved ones, e.g. CAMERA1_1080p60.INI.

One simple way to find out the optimal numerical values for the .INI file is to get the measured values from the actual device Test Report, then modify the tolerances by some “reasonable headroom” value.

For example, if the measured camera signal-to noise ratio is 46 dB, then deducting the “reasonable headroom” of 3 dB it make sense to set the Y_SNR_MIN value = 43 dB.

To use the customized .INI file simply copy the selected CAMERA1_1080p60.INI file overwriting the existing VQMA.INI file.

It is also advisable to keep a backup copies of the original and edited .INI files, thus allowing to revert to the desired values if necessary.

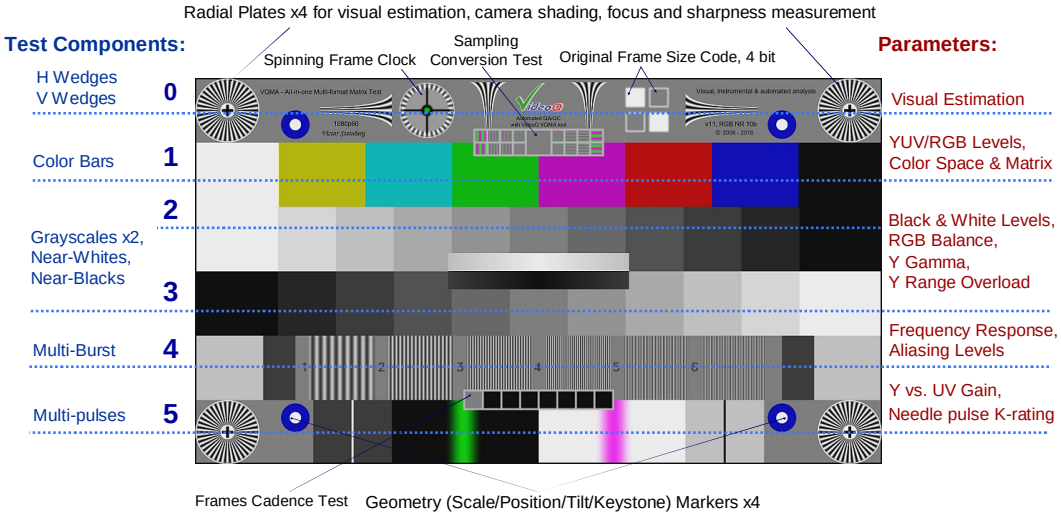
The process of replacement of the .INI files can be automated by usage of conventional batch files or scripts.

Section 4: Test Patterns

This section provides more details about VQTS4K Standard Set of 8 Test Patterns

VQMA Test Pattern Composition

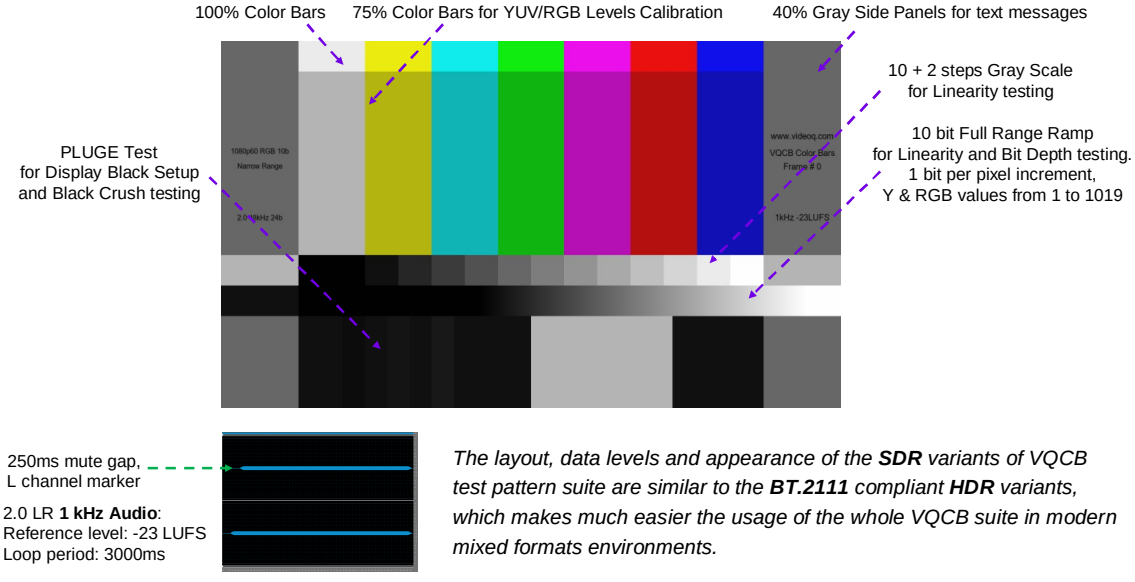
All-in-One: Single pattern allows automatic measurement of multiple video image parameters



VQMA Test Pattern Features

- VQMA test pattern exists in a variety of formats: File, Signal, Stream, VQMA-C Optical Chart.
  Some test components are different or not present on VQMA-C Optical Chart
- VideoQ methodology allows triple usage: visual, instrumental and fully automated
- VQMA test pattern contains specially designed components making video calibration an easy and straight forward procedure
- The test pattern components are designed to be compatible with a majority of video cameras, software or hardware codecs and media players
- VQMA test pattern contains 6 relatively large bands, so it remains suitable for accurate measurements even after low bitrate coding and severe position and/or scaling errors; zoom-out down to 25% of original size, overscan up to 105%, optical chart tilt, flickering or non-uniform illumination are acceptable

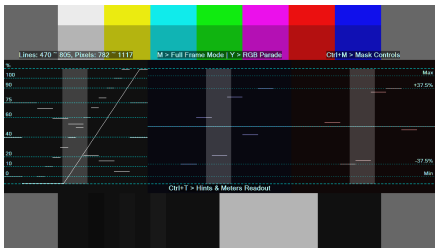
VQCB "Wonder Bars" Test Pattern Composition



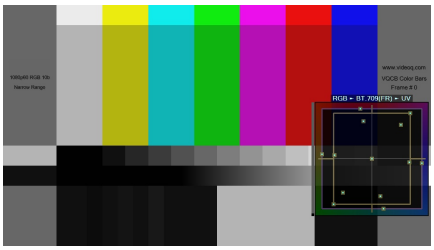
*The layout, data levels and appearance of the **SDR** variants of VQCB test pattern suite are similar to the **BT.2111** compliant **HDR** variants, which makes much easier the usage of the whole VQCB suite in modern mixed formats environments.*

VQCB Test Pattern Features

VQV **Waveform Monitor** shows accurate YUV levels of Gray Scale, Full Range Ramp and 75% Color Bars



VQV **Vector Scope** shows accurate UV levels of 100% and 75% Color Bars



VQV **Light Levels Map** highlights levels below Ref. Black and above Ref. White

VQMPC Test Pattern Composition

Four **Corner Radial Plates** aimed at testing **Geometry & Sharpness**

Vertical Ruler, Vertical Frequency Bursts

AV Sync Error Circular Graticule
Coarse +/-3000 ms scale: *"red" range*

Fine +/- 500 ms scale: *"green-and-brown" range,*

Reserved for customer logo and/or text message

Horizontal Ruler, Horizontal Frequency Bursts

Four H & V **Edge Markers** *line width = 1 pixel*

Four Tri-level **Black PLUGE** boxes aimed at testing **YRGB min levels**

Four Tri-level **White PLUGE** boxes aimed at testing **YRGB max levels**

Frames Counter Video Continuity Test

AV Sync Test: Orbiting White Ball (2 speeds). If "Bop" sound starts with the Ball in the "green" zone (green marker flashing) then AVS error is within +/- 100 ms

Central Photo 0.5*H Insert aimed at checking **Color Rendition**

0.7*H **Circle and Diamond** Lines aimed at testing picture **Geometry**

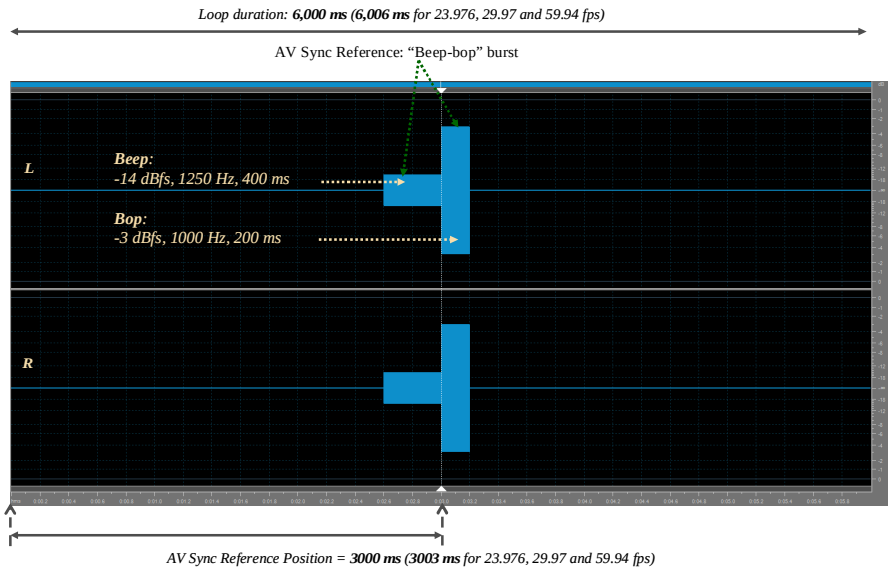
VQMPC Test Pattern Features

Multi-purpose, multi-resolution, multi-format test pattern to check at glance:

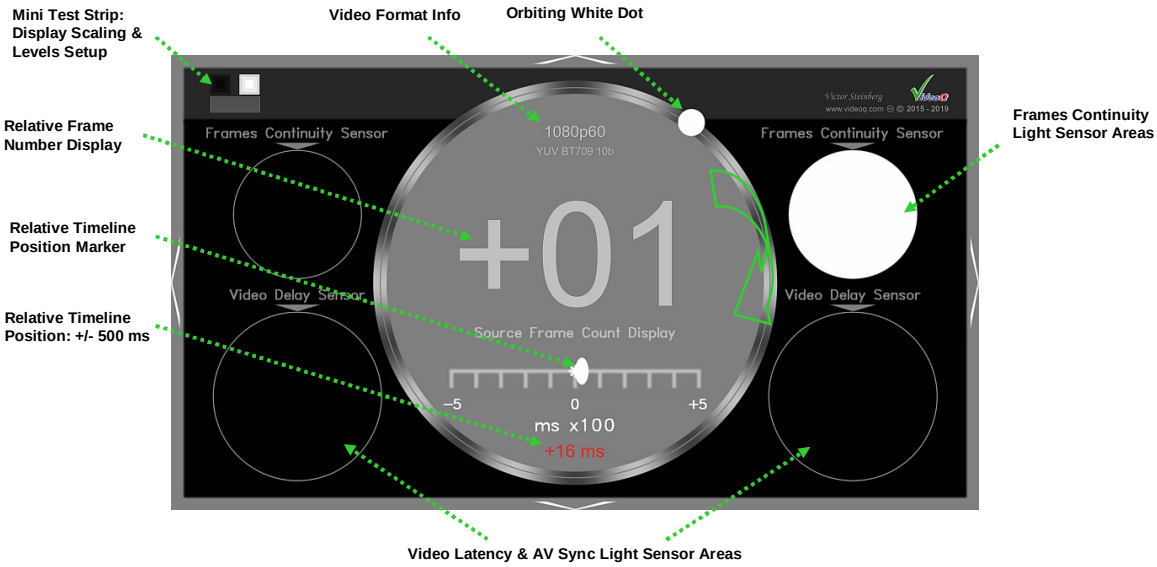
- **Geometry**: Aspect Ratio, Overscan and "Ultra-wide Mode" effects of the display
- **Scaling Quality** or proof of no-scaling, especially in case of DHCP/DRM conflict in STB/OTT
- **Colors**: PLUGEs x8 for display setup and Photo Insert for general quality evaluation
- **2D Frequency Response** and **Sharpness Correction** settings
- **Frames Continuity**, e.g. codec freeze-skip, 3:2 pull-down, frame rate conversion
- **De-interlacing Performance**: artifacts are especially noticeable on moving white circle component
- **AV Sync Errors** (6000/6006 ms loop): coarse range +/-3000 ms and fine range +/-500 ms
- **Option of automatic Audio Gain & AV Sync Errors measurement**
  via VideoQ software tools

For more info see separate VQMPC presentation

VQMPC Audio Component Time-line

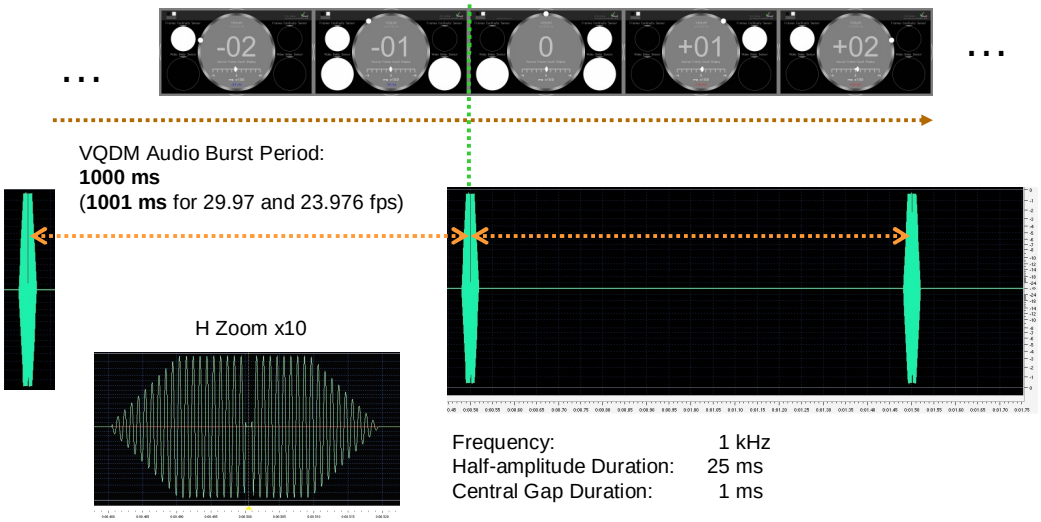


VQDM Test Pattern Composition



VQDM Video & Audio Components Time-line

Video Frames # **-01** and # **0** flashing **White**



VQDM Test Pattern Features

Dynamic AV test pattern aimed at testing AV Latencies, AV Sync Errors and Frames Continuity.

VQDM Test Pattern components:

- Highly visible Time Stamps (frame numbers) in the central area, suitable for taking off-screen photos
- Synchronously rotating white dot (clock dial) serving to check frame sequence continuity
- Two large circular Light Sensor Areas flashing White in sync with the Audio Burst
- Two smaller circular Light Sensor Areas flashing White for first 2 frames of 4 frames period
- Sliding white ellipse marker indicating current frame position within the +/- 500 ms timeline scale; position “0” marks the center of Audio Burst

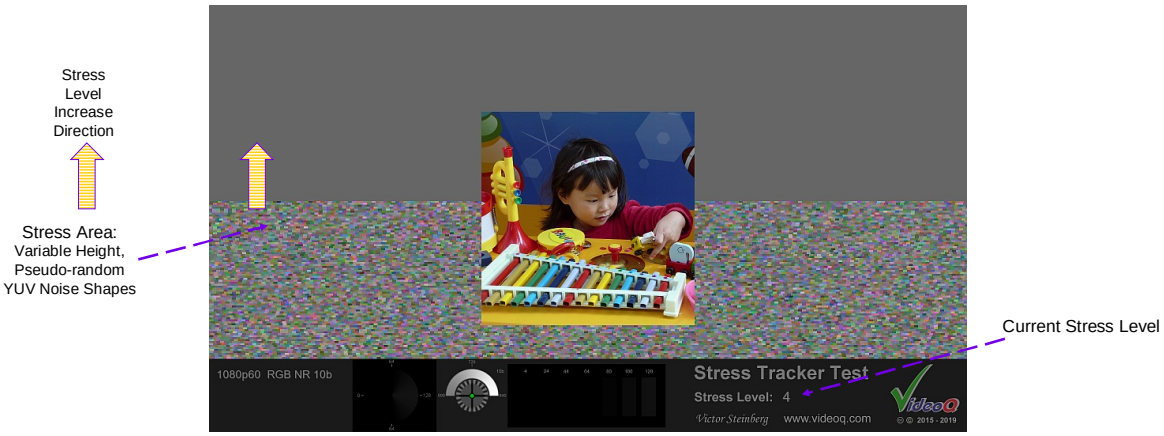
The VQDM Test Pattern is compatible with VideoQ **VQDM100** Analyzer – versatile compact and robust multi-purpose tool for R&D and glass-to-glass QA/QC.

Instant visual-aural timeline quality estimation plus automatic latency and AV sync measurement.

For more info see separate VQDM presentation

VQDM100
Carry Case Content

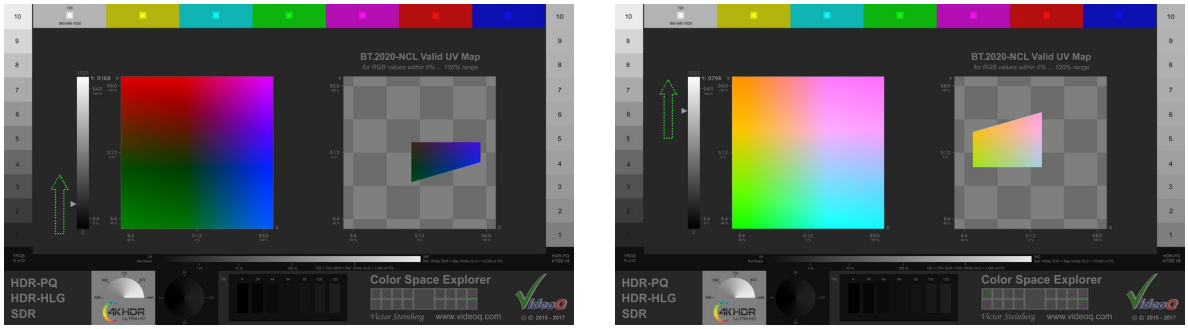
VQCST Test Pattern



VQCST is a 40s sequence of ten 4s segments featuring 10 Stress Levels from 0 to 9, high quality central photo insert, Black SPLUGE, White SPLUGE and rotating wheel clock.
Also it is possible to play out infinite loop of any particular Stress Level segment.
This QA/QC, setup and debug tool provides for both subjective estimation and objective measurement of Stress Response.

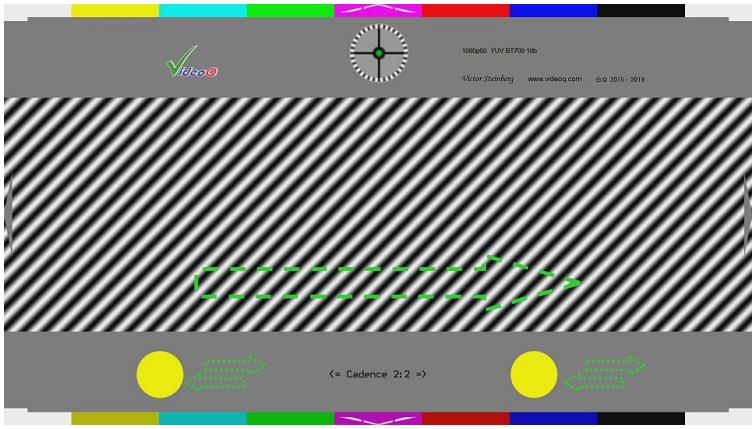
VQCST test is available in UHD and HD frame sizes, YUV and RGB Color Spaces.

VQCSE – Color Space Explorer ™ Dynamic Test



In 34 seconds this sophisticated dynamic UHD test checks more than one billion (1024^3) colors of the **10 bit YUV** color space. Thus it covers all combinations of Y, U and V values – from 0 to 1023, including all "illegal" colors.
For any given Y 10b value "Valid UV Map" on the right side shows the boundaries of "legal" colors area.
VQCSE is equally suitable for **SDR**, **HDR-PQ** and **HDR-HLG** systems, checking processors, codecs and display performance.
It is suitable for both visual and instrumental tests, the results are visible on regular video monitors, waveform monitors and/or vectorscopes.
VQCSE is especially efficient in combination with *the VideoQ **VQV** Viewer-Analyzer tool*.

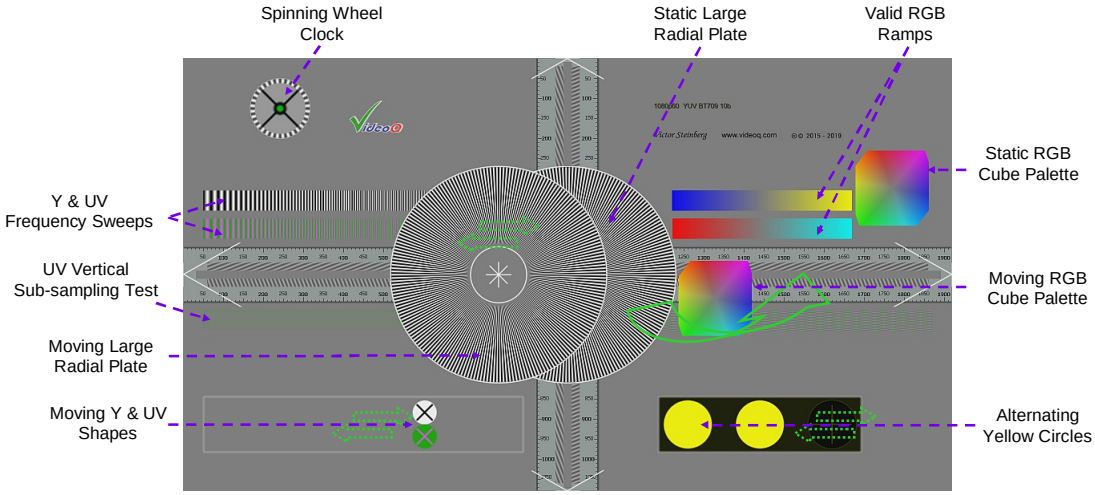
VQPLT – Frames Continuity and Packet Loss Test



VQPLT test features rotating wheel clock, scrolling medium frequency diagonal sinusoidal pattern and frame counter display.

This simple test provides for checking the video communication systems performance in the congested network conditions. Even intermittent or partial disruptions of the smooth timeline progress, e.g. frozen image slices due to the network packets loss, are easily noticeable. It is equally suitable for visual estimation and automated monitoring (watchdog functionality).

VQVST – Moving Sprites Test Pattern



VQVST is a sophisticated Moving Sprites Test aimed at visual analysis of motion portrayal, dynamic scaling, frame rate conversion and de-interlacing artifacts.

About VideoQ

Company History

- Founded in 2005
- Formed by an Engineering Awards winning team sharing between them decades of global video technology.
- VideoQ is a renown player in calibration and benchmarking of Video Processors, Transcoders and Displays, providing tools and technologies instantly revealing artifacts, problems and deficiencies, thus raising the bar in productivity and video quality experience.
- VideoQ products and services cover all aspects of video processing and quality assurance - from visual picture quality estimation and quality control to fully automated processing, utilizing advanced VideoQ algorithms and robotic video quality analyzers, including latest UHD and HDR developments.

Operations

- Headquarters in CA, USA
- Software developers in Silicon Valley and worldwide
- Distributors and partners in several countries
- Sales & support offices in USA, UK