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VQV

VideoQ Viewer

Media Files Viewer-Analyzer

Training Presentation

May 2024

www.videoq.com/vqv.html

www.videoq.com

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*Click on **VQV Logo***
in the upper-right corner
of any slide for this
Table Of Content

Learn more about VQV*:* http://www.videoq.com/vqv.html

General

- VQV is an Augmented Intelligence software tool, instantly revealing your video camera, codec, scaler, converter or other video HW and/or SW device/workflow performance
- Unique video data analysis and fidelity verification tool for the file-based environment
- The 4th generation smart tool for production and post-production facilities, CDN and IPTV systems, development labs, software developers and high volume manufacturers
- An essential QA/QC tool for broadcast, prosumer and consumer video systems with LAN/WAN connectivity
- VQV displays images and parameters of all compressed video files in a variety of formats, including MOV, MXF, MP4, AVI, TS, M2TS, etc.
- In addition, VQV reads, plays, converts and outputs uncompressed video material data in YUV/RGB/BMP formats, *bit by bit, pixel by pixel, frame by frame*

VQV and VQMP – General Concept

VQV compatible **VQMP** player can be used as a stand-alone QA/QC tool or it can work in close co-operation with VQV.

In the latter case **VQV** is a **master control point**, launching VQMP player (*and sync server running in the background*) as needed.

In any case **video files** can be opened in **VQV** and/or in **VQMP**.

VQMP can open and analyze **audio files**, but VQV can not.

VQMP player has many **useful features**:

- Real time playout via ffmpeg hardware accelerated decoder
- Fast intuitive timeline navigation and speed/scale/zoom/pan controls
- Playlist manager, recent files manager, video and audio tracks selection
- Advanced AV Monitor and Audio Analyzer

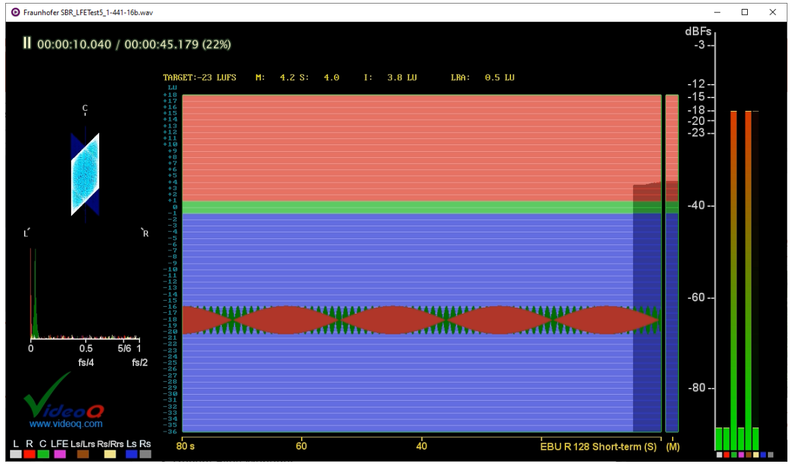
Learn more about VQMP: http://www.videoq.com/vqmp.html

SDR media file opened in **VQMP** window

Audio Levels Meter and **Recent Files** overlays

7.1 surround sound audio file opened in **VQMP** window

Advanced Audio Analyzer overlay



SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

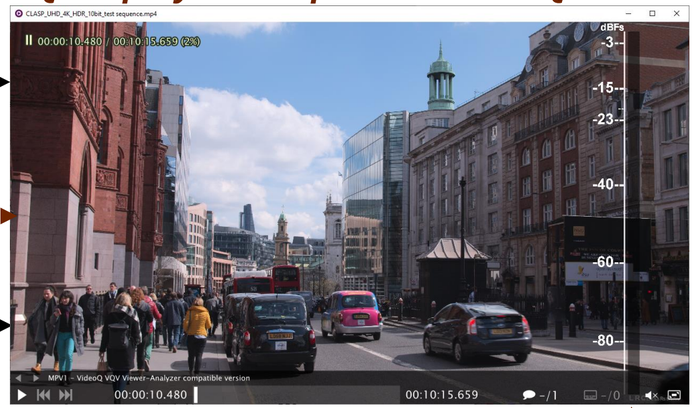
The Top Level Workflow Diagram

Stream

Playlist

Media File

VQMP player compatible with VQV



Real time video playout,
up to 8K UHD HDR/SDR,
multi-channel sound,
AV analyzer overlays

Sync Server Controls

Media File

Raw YUV/RGB File

OpenGL Renderer

VQV

FFMPEG Decoder

HDMI/SDI

Capture HW

Stream

Capture SW

Converted Raw YUV/RGB Files

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

UHD HDR10 sample video – courtesy of newsbyte.co.uk

VQV Features 1

- An offline video player with sophisticated viewer-analyzer functionality
- Covers a wide range of frame sizes and formats, up to **8K**, including variety of **HDR** formats (**PQ**, **HLG**, and **LOG**, several user-selectable rendering modes)
- VQV displays frame by frame:
  - XY positions, YUV & RGB Levels and expected (as by selected model) Light Levels of every pixel, line, frame or segment
  - GOP structure, frame type, bitrate statistics for the selected frame or selected timeline segment
  - Light Levels (LL) values in **perceived nits** (= *cd/m^2 only on shades of Gray*) or **%** of the selected LL range limit
- Uses fast intuitive controls for timeline position, zoom, signal gain, filter mask size and position
- Contains built-in high-gain spatial and temporal high-pass filters r*evealing even hardly visible artefacts*
- The user can choose:
  RGB, Y, UV, R, G, B or LL view channel, color space, level scheme and SDR/HDR Rendering Mode
- A right-click submenu allows fast creation of snapshots or thumbnail .BMP images
- VQV also contains a powerful “Export as" file and data format converter
- Provides for quick frames/profiles comparison and benchmarking by running multiple VQV instances

VQV Features 2 (continued)

- For R&D and product verification work, VQV can be launched in a **Windows GUI Mode**
- For semi-automatic QA/QC operation VQV provides multiple GUI instances via **Command Line Mode**
- VQV opens and decodes any wrapped/compressed video file (*all formats supported by ffmpeg*)
- VQV opens static image files in a variety of formats – JPG, PNG, TIF, etc.
- VQV opens single frame file, folder with numbered frame files, or large multi-frame RAW video files
- Video data export processing provide for:
  - Frame cadence change: N:1 decimation, 3:2 repeat, 1:N frame repeat, and/or A-B fragment repeat
  - Color space and pixel format conversion: **SDR ⇔ HDR**, **YUV ⇔ BMP/RGB**, **UYVY ⇔ Planar YUV**
- Resolutions supported:
  from **192x108** to **7680x4320 (8K)**, **8**, **10, 12** or **16** bits per component
- Repeat full duration (loop) or selected fragment (**A-B loop**) playout
- Shuttle/Jog playout modes, variable forward and backward playout speed (VideoQ ‘Videola’):
  Actual frames-per-second speed depends on CPU/GPU power and video frame size

VQV Features 3 (continued)

- **SDR / HDR** (Standard Dynamic Range / High Dynamic Range) Modes supported:
  - **SDR** – Conventional YUV/RGB data format, selectable rendering modes
  - **HDR-PQ** (Perceptual Quantizer), selectable rendering modes, including RAW video data image
  - **HDR-HLG** (Hybrid Log Gamma), selectable rendering modes, including RAW video data image
  - **HDR LOG** (Camera LOG and DPX LOG), selectable rendering modes, including RAW video data image
- Auto and manual selection of YUV ⇔ RGB and XYZ ⇒ RGB **matrices** and color space **primaries**:
  - **UHD** and **8K** (BT.2020/BT.2100, DCI-P3)
  - **HD** (BT.709, BT.2020, DCI-P3)
  - **SD** (BT.601)
- Switchable YUV ⇔ RGB levels mapping:
  - **Full Range (FR)**, e.g. 8 bit **RGB 0-255** format, which **requires down-scaling** to make **YUV 16-235**
  - **Narrow Range (NR)**, e.g. 8 bit **RGB 16-235** format, which **does not requires down-scaling** to make **YUV 16-235**
- Variety of Input and output RAW YUV / RGB formats:
  - Interleaved, 422 UYVY 8bpc and RGB48YUV48 – interleaved 16pcb YUV/RGB
  - Planar 444 RGB and YUV, 422, 411 and 420 YUV, bit depth: 8, 10, 12, 14 or 16bpc

VQMP Media Player Features

- VQV compatible real time media player combining minimalistic GUI (OSC = On-Screen Controller pop-up bar) with intuitive keyboard/mouse/overlay controls
- Powerful ffmpeg-based hardware-accelerated decoder that supports nearly all media formats, up to 8K UHD HDR/SDR
- HDR (PQ and HLG) to SDR conversion for easy HDR preview on SDR screen
- Multi-channel audio rendering engine, up to 7.1 surround sound
- Fast intuitive timeline navigation, including switchable messages and GoTo Manager
- Smart speed/scale/zoom/pan controls with info overlays
- Smart file opening, including configurable use of last-used timeline position and track controls
- Playlist Manager with editing controls
- Recent Files Manager with editing controls
- Smart video, audio and subtitle tracks selection
- Advanced AV Monitor and sophisticated Audio Analyzers

For more about VQMP see separate presentation

VQV GUI: Menus & Controls

Top level menus: **File**, **Frame Size, Color Space**, **Zoom**, **Tools & Filters**, **Help**

Title Bar Band

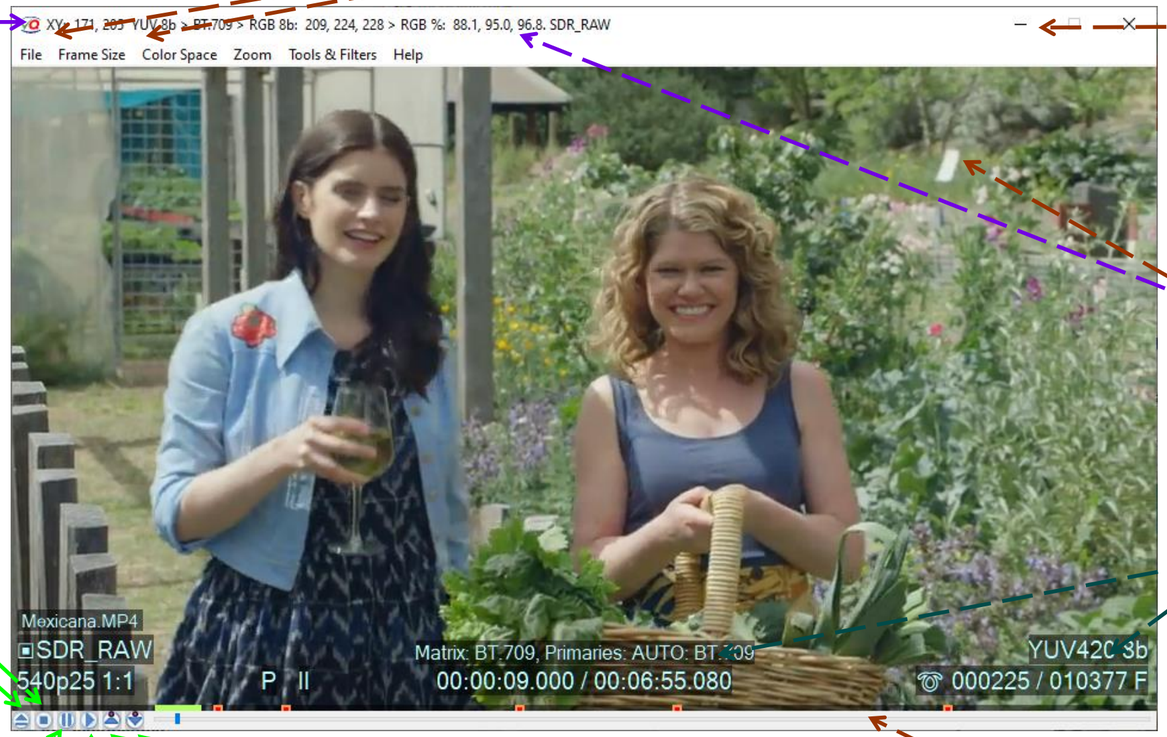
shows messages about:

- media file format,
- selected modes of operation,
- current timeline position,
- measured parameters values

Stop Button forces **Jog Mode**, current frame number resets to **0**. All filters and overlays reset to **Off**.

Eject Button

Close (release) media file,
2nd click will **re-open** closed file



VQMP Server Control Buttons:

Send/receive **file path** and **timeline position** between **VQV** and **VQMP** windows

Pause Button **Play Button** toggles Play/Pause.

When **Mouse Cursor** is within the **Title Bar**, **Title Bar Message** shows the file name/format:

VQMA_1280x720_8frms_UYVY_8b.YUV

MP4[AVC] 540p25 8b 0.535 Mbps Frame: 9924 / 15142

When **Mouse Cursor** is within the **Active Image Area**
S key toggles the **Title Bar Message**
e.g. between **current pixel** parameters and **current frame** levels statistics

Text Info Overlay Messages

Press **T** key to toggle it On/Off
Ctrl+T toggles auto-hide mode On/OFF

Navigation Slider Band:

When **Mouse Cursor** is in this band the **Title Bar Message** shows media format info, current timeline position and playout speed.
Press **S** key to cycle thru the message modes, e.g.:

540p59.94 8b "B" 0.010 bpp 0.317 Mbps 235 / 3634 00:00:03.921 / 00:01:00.627

540p59.94 8b "B" 662 bytes 235 / 3634 00;00;03;55 / 00;01;00;36

SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

VQV and VQMP Synchronization

VQV is a **master control point**, launching **VQMP** player (*and sync server running in the background*) as needed.

Video files can be opened in VQV and/or in VQMP, so there are **several cases**:

- VQV and VQMP render **the same file**, *possibly at different timeline positions.*
- VQV and VQMP render **two different files**, *even of two different types, e.g., video file by VQV, audio file by VQMP*

In any case, VQV can exchange with VQMP short command messages containing:

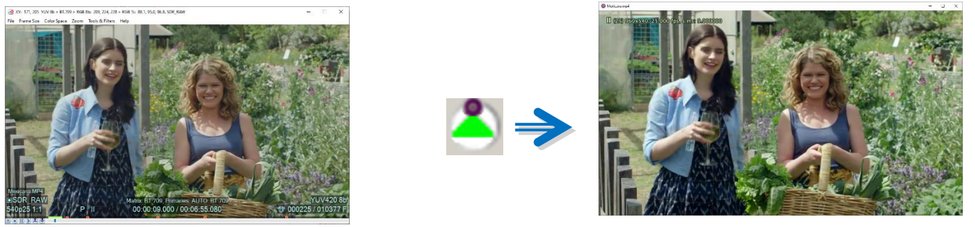
- Full path to media file
- Timeline position in s.ms format

Click on VQV  button or use **Ctrl+ Up Arrow**
to send message **from VQV to VQMP**

Click on VQV  button or use **Ctrl+ Down Arrow**
to request and receive message **from VQMP to VQV**

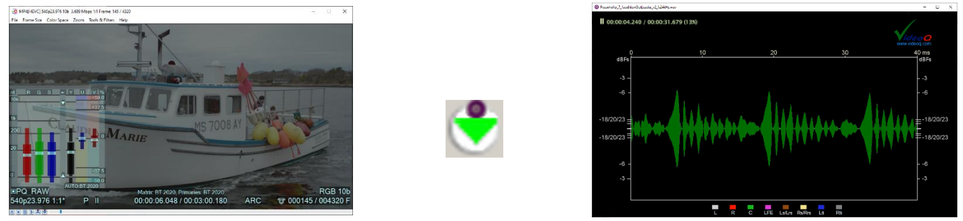
Idle VQV **launches** idle VQMP (*server initialization only*)

VQV **sends** to VQMP current SDR file path and timeline position

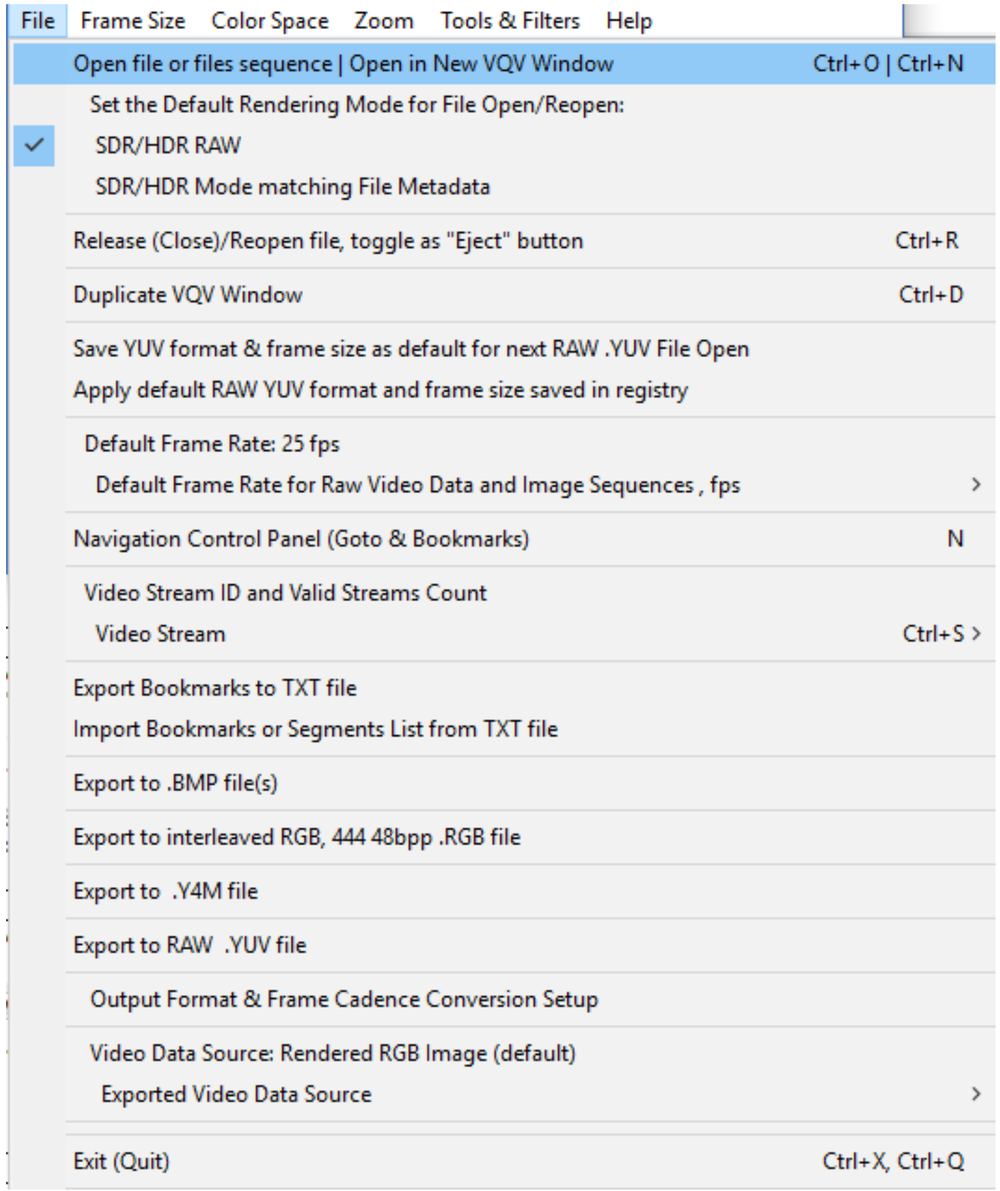


VQV **requests and receives** from VQMP HDR file path and timeline position

Special case: VQV **can not open audio** file, but VQMP **can**



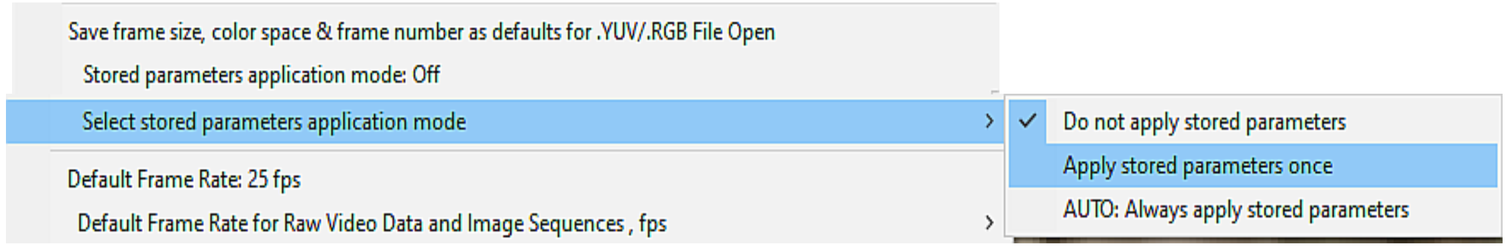
File Menu



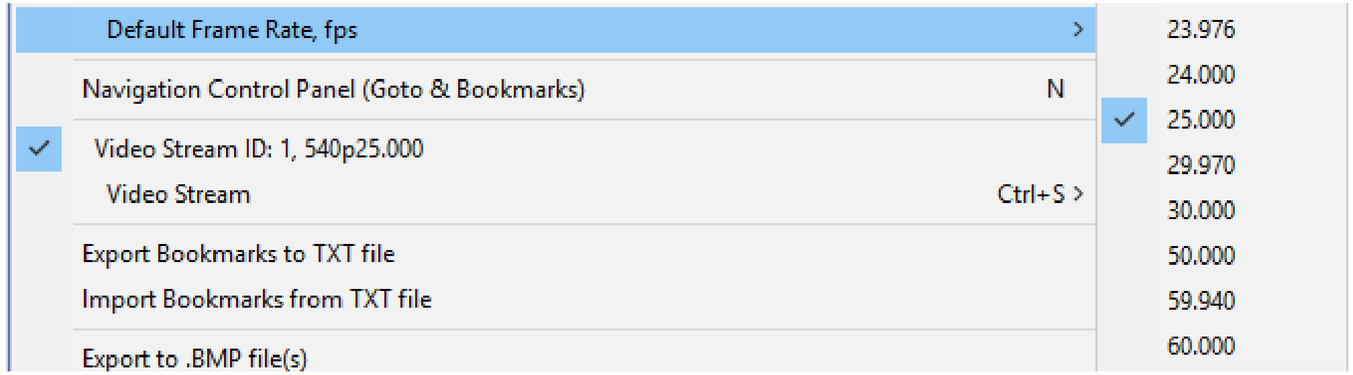
This menu controls the following operations:

- Media File Open /Close / Quit Operations:
  - **Ctrl + O** brings up standard File Open Dialog,
    Ctrl + N does the same, but the selected file opens in new window.
    Ctrl + D duplicates current VQV window.
    Ctrl + S cycles thru video streams (if media file streams count > 1)
    Ctrl + X, Ctrl + Q serve to exit (quit) VQV program
  - Released (closed) file can be reopened, e.g. for iterative video codec settings optimization. **Ctrl + R** shortcut is a toggle control for this process. **Eject Button** also toggles between File Close / File Reopen.
    Reopen operation restores previous timeline position preserving main controls, but some tools, overlays and controls could be reset to defaults.
    Ctrl + Eject brings up standard File Open Dialog (same as **Ctrl + O**).
  - File open menu options set defaults for: Rendering Mode, RAW YUV pixel format and Frame Rate,
- Files Export / Import:
  - Export / Import **Bookmarks** to / from ***.vqvbm.txt** file, or import **Segments List** from ***.vqtsf.txt**. *If present, **InFilesPath.vqtsf.txt** file and/or **InFilePath.vqvbm.txt** file are auto-loaded immediately after opening InFilePath media file.*
  - Export of source or rendered RGB data to BMP / RGB file.
    Multi-frame content can be saved as a folder with numbered BMP frames or as a single multi-frame RGB file (16b per component, 48b per pixel).
  - Export to Y4M / RAW YUV file with optional conversion of pixel format.

File Menu Options

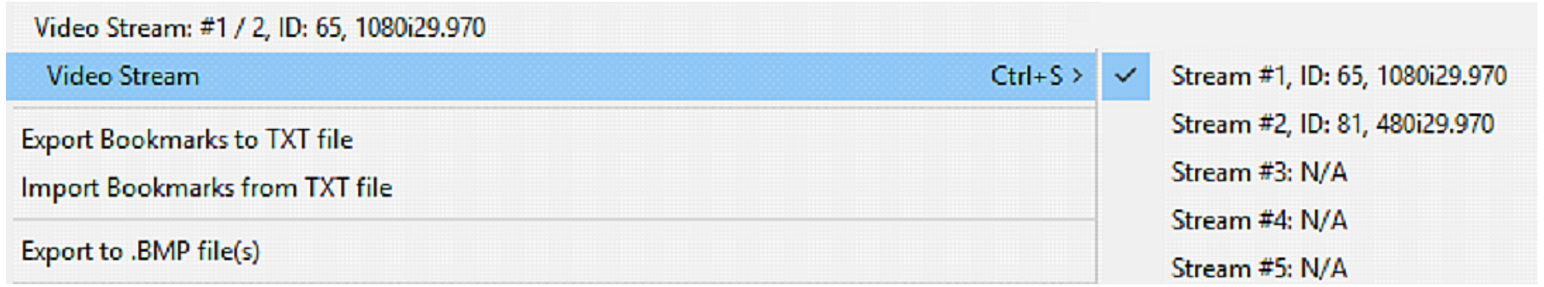


It is possible to save in Windows Registry current (user-selected) pixel format and frame size of RAW file, e.g. UYVY 1920x1080, thus providing for easier opening of similar files. This function has a pop-up configuration sub-menu: OFF, Apply Once, AUTO: Always Apply



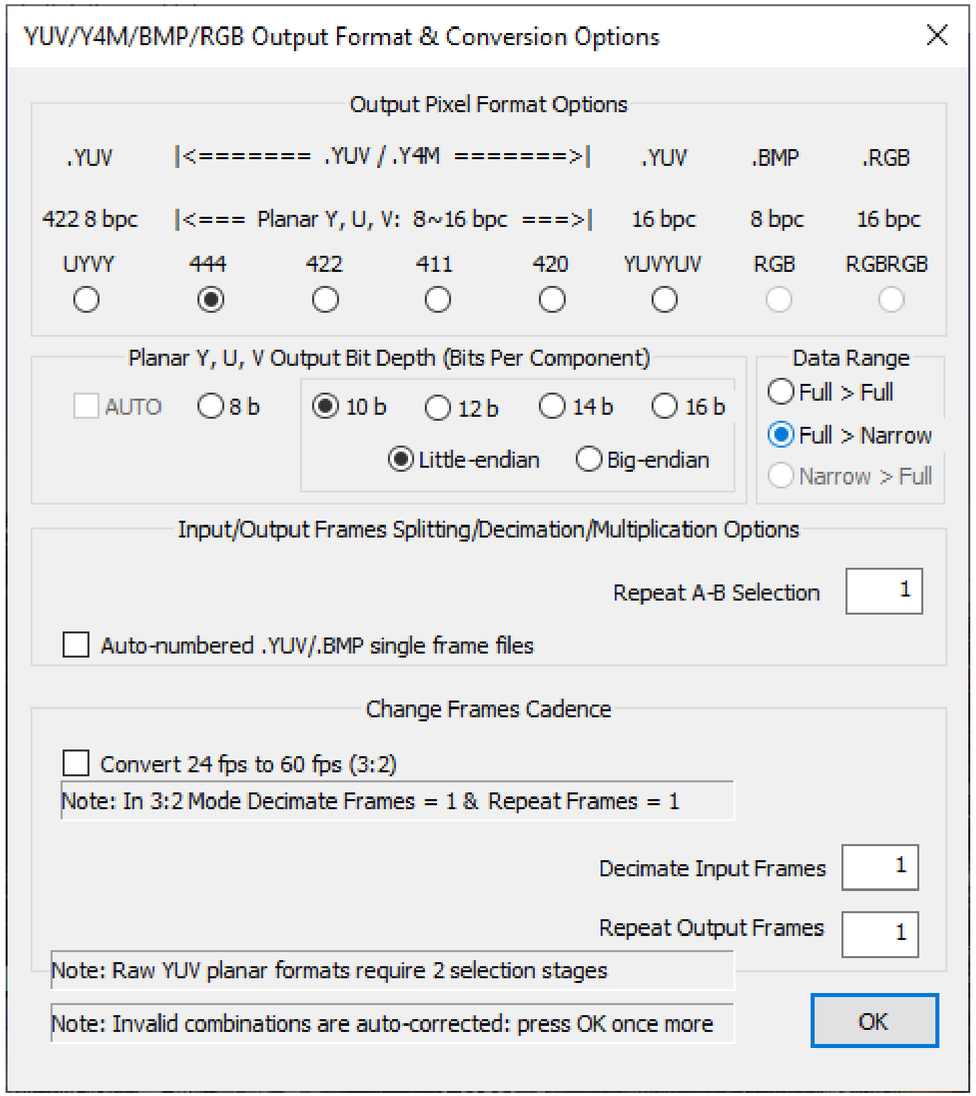
Default Frame Rate can be selected at any time, thus providing for advanced opening of RAW data files or media files with missing, wrong or corrupted Frame Rate metadata.

Shortcut **N** brings up Navigation Control Panel pop-up window, *see next slides for more details*



If the analyzed file contains several video streams, it is possible to select any one for analysis.
Select with mouse click or shortcut; **Ctrl +S**

YUV/RGB Output Format & Conversion Options



This pop-up dialog windows can be launched from File menu. It provides for YUV/RGB formatting and data range conversion options:

- YUV output pixel format selection:
  - UYVY (aka “interleaved 422”), compatible with widespread SDI stream format
  - Widespread planar 444, 422, 411, and 420 YUV formats, 8bpc … 16bpc, LE or BE
  - VideoQ proprietary 444 interleaved 48b (16b per component) format
- Frame sequence splitting/multiplication options (BMP & YUV):
  - Repeat pre-selected A-B segment of media file several times. It is useful, e.g. for creation of dynamic video by repetition of a single static frame
  - Split selected A-B segment into a set of numbered frames (UYVY format only)
- Frame cadence conversion controls (BMP & YUV):
  - It is possible to simulate 24 fps to 60 fps frame rate conversion (3:2 cadence) by checking the corresponding box. In such case all even-numbered source frames will be repeated 3 times and all odd-numbered frames will be repeated 2 times, thus two input frames will be converted to 5 output frames.
  - Combining “Decimate” and “Repeat” numbers provides for the creation of custom frame cadences, e.g. Decimate = 2 and Repeat = 1 will simulate 50 fps to 25 fps (or 60 fps to 30 fps) frame rate reduction.

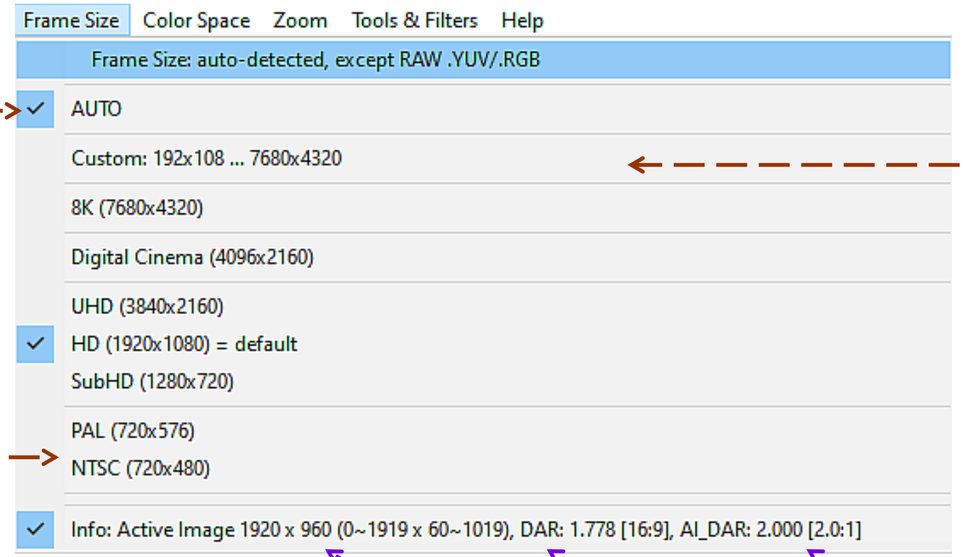
Frame Size Menu

Manual selection of **Frame Size** is required only for **RAW YUV/RGB** input format.

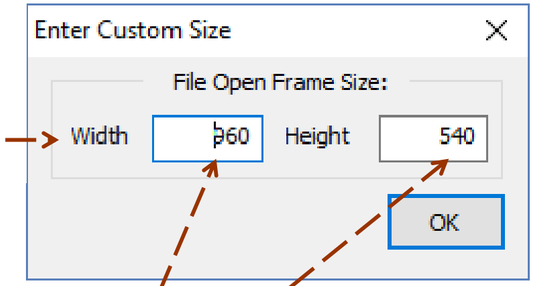
*For all other input formats Frame Size is set **automatically** and the Frame Size menu used only as **info message***

*Only for **UYVY** format:*
*if the actual Raw YUV frame size is **unknown**, then it makes sense to enable the AUTO detection (smart guess) mode*

It is recommended to select correct frame size before opening **RAW YUV/RGB** files.



Click on **Custom Size** will bring up the pop-up dialog window



Manual selection of **Custom Frame Size**, the values set are used only for **RAW YUV/RGB** input format.

Info Message showing currently selected **Frame Mode, Active Frame Size** & **Display Aspect Ratio** resulting from Black Bands (**Letterbox** / **Pillarbox**) detection and media file metadata (**PAR/DAR**) processing.

*The control switching Full Frame Mode / Active Frame Analysis Modes is in Tool & Filters menu: shortcut: **Ctrl + Shift +A**.*
*Black Bands Meter: Shortcut: **Ctrl +A***

Color Space Menu

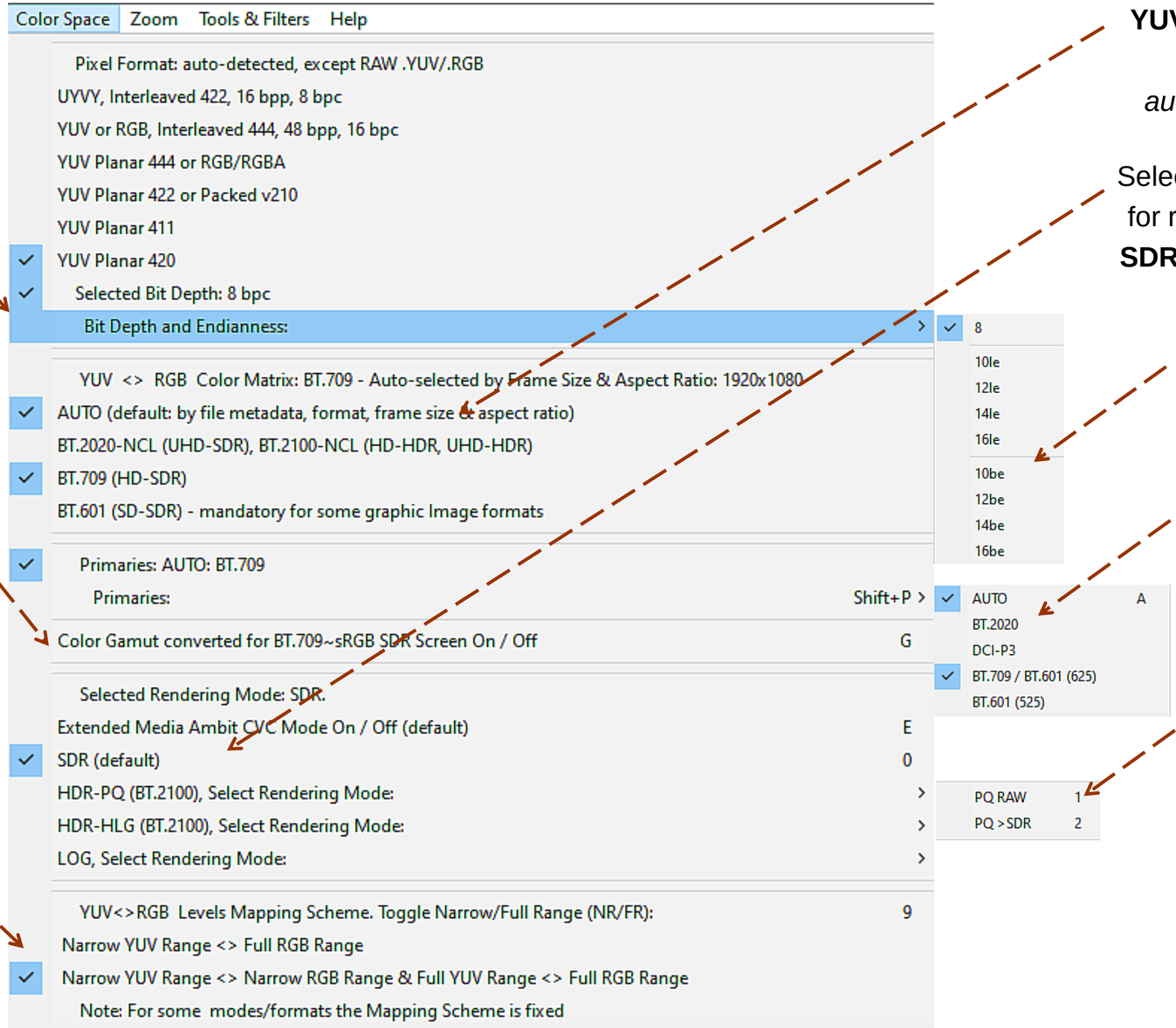
YUV/RGB **Pixel Format**:
Except Raw YUV/RGB files the format is set automatically, so these menu lines are used mainly for information

Color Gamut Conversion Mode
On/Off

Select
YUV ⇔ RGB Conversion Type

For **SDR** & **HDR** Modes user can choose between "**Narrow**" and "**Full**" Data Range

*For some **HDR** Modes the selection is fixed (AUTO), so it can not be changed by user*



YUV ⇔ RGB Color Matrix:
Matrix can be set automatically or manually

Select **Dynamic Range Type** used for rendering and measurements:
SDR, HDR-PQ, HDR-HLG or **LOG**

Select **Bit Depth** and **endianness**
Only for RAW YUV inputs

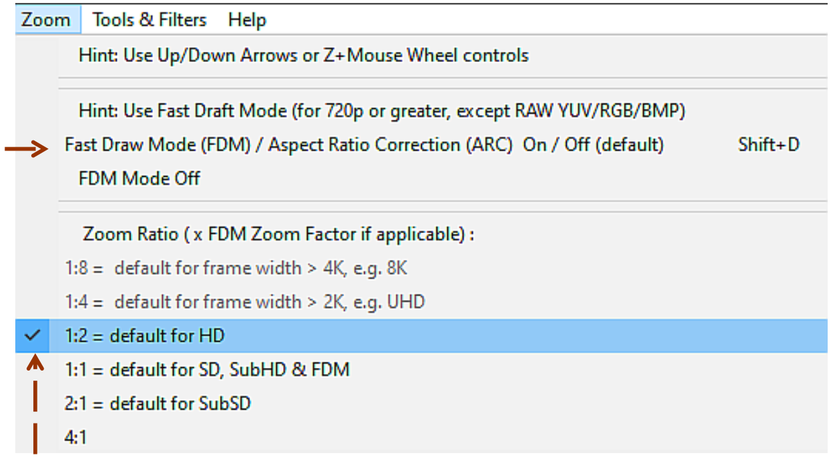
Select **Primaries**

Select a sub-variant of the selected rendering mode:

e.g. for **HDR-PQ** select
HDR-PQ RAW
or
HDR-PQ > SDR
converted RGB

Zoom and Pan Controls

Fast Draw Mode provides for faster analysis and playout due to built-in frame size converter so any input size greater than 1280x720 is converted to *960x540 frame size*



Select Rendered Image **Zoom Ratio**

D*epending on Frame Size some ratios (too small or too big) could be excluded, and the corresponding menu line grayed out, e.g. for 960x540 size 1:4 zoom is not available and for UHD frame size 4:1 zoom ratio is not available.*

Zoom Ratio can be changed in three ways:

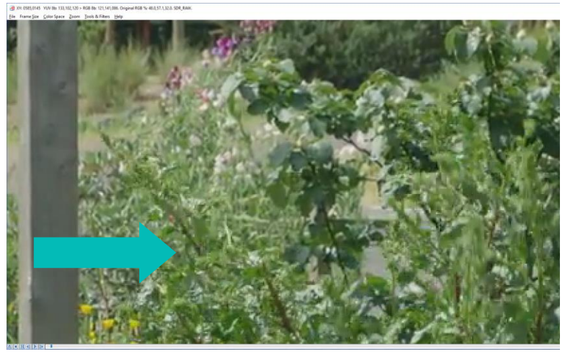
- Click on the desired line in **Zoom menu**
- Press **Up/Down Arrows** (*image centered zoom*)
- Point the cursor to an area of interest, press and hold **Z** key, then rotate **Mouse Wheel** (*cursor centered zoom*)

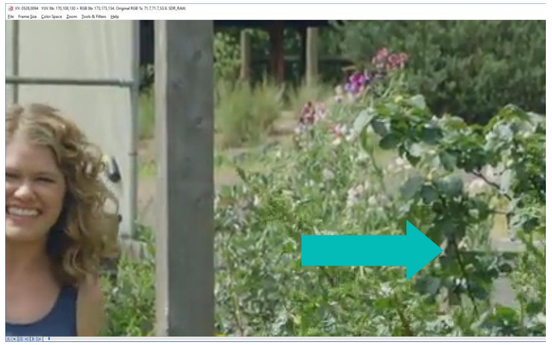
For ratios greater than 1:1, image is magnified ***by simple pixel repetition without any smoothening filter***, thus making analyzed ***artifacts more visible***

Zoom Ratio 4:1

If zoomed image is larger than VQV active window dimensions (which depends on PC monitor resolution), then press and hold **Left Mouse Button** and move the mouse cursor in the desired direction to move the whole image (Pan Control).

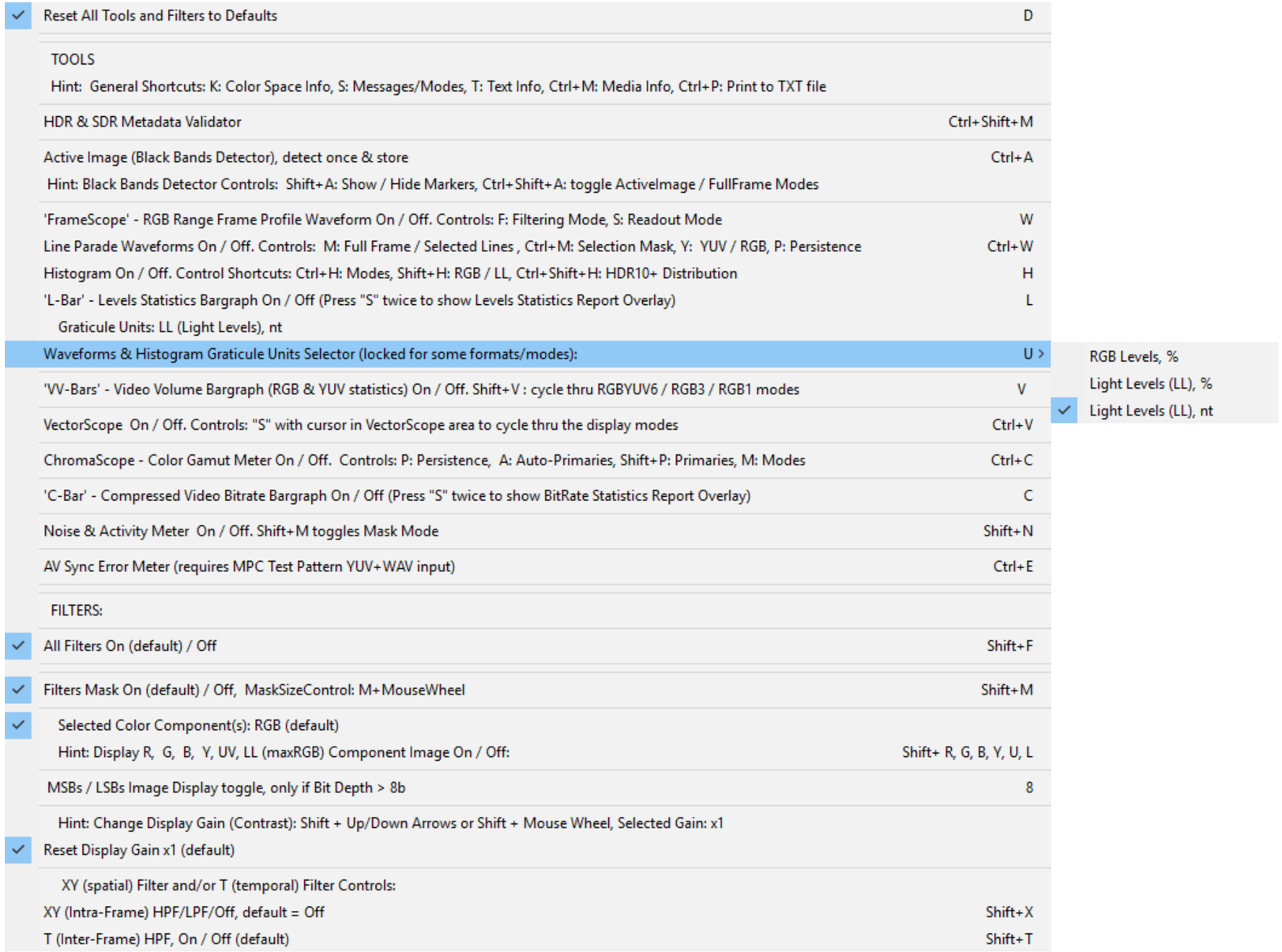
Mouse Pan Control, Zoom Ratio 2:1





SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Tools & Filters Menu



Tools Section:

Controls built-in **meters & analyzers** and the corresponding **overlays** showing the analysis results.

See next slides for more details

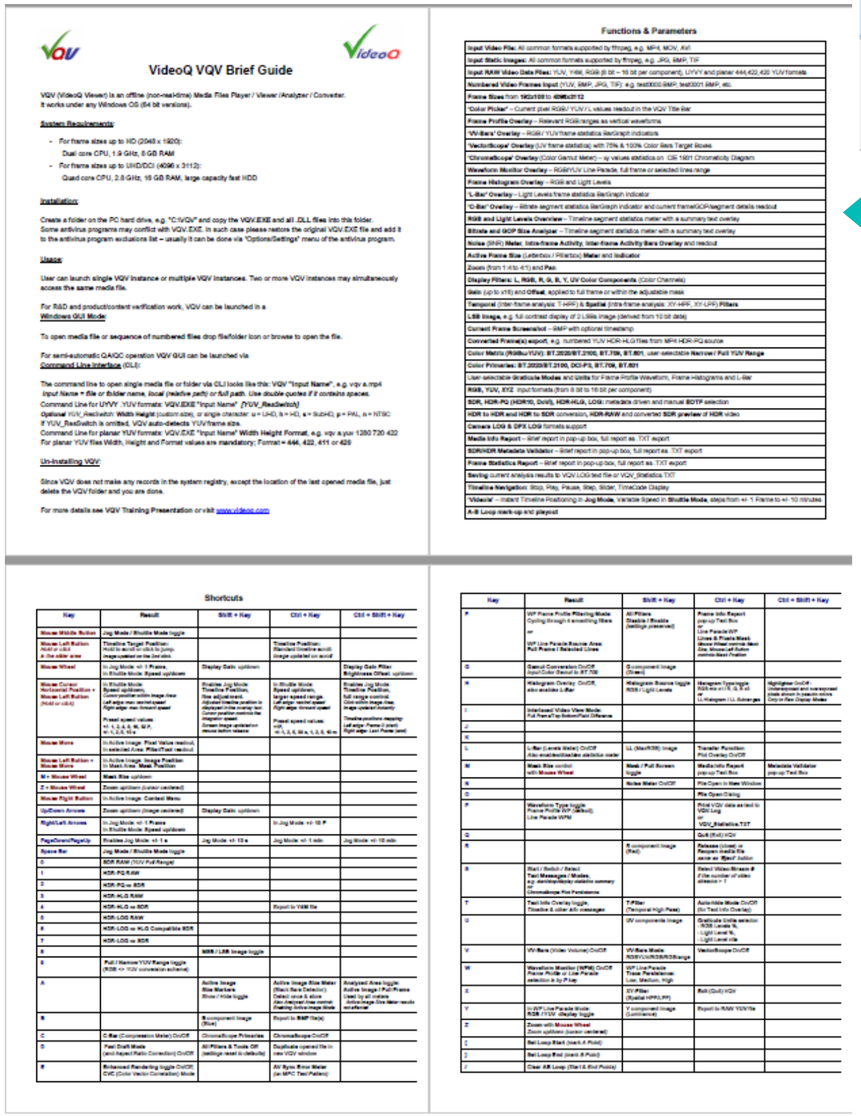
Filters Section:

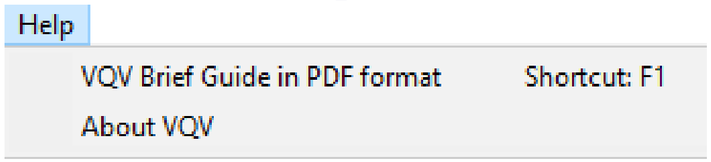
- **Filter Mask** (adjustable square or full screen)
- **R, G, B, Y, UV, LL** color channels selection
- **MSB/LSB** image selection (if input > 8b)
- **Display Gain** (contrast): x1, x2, x4, x8, x16
- **XY (spatial) Filter**: HPF (details) or LPF (blur)
- **T (temporal) Filter** shows frames differences

XY Filter can be combined with T Filter, e.g. T HPF cascaded with XY LPF.

See next slides for more details.

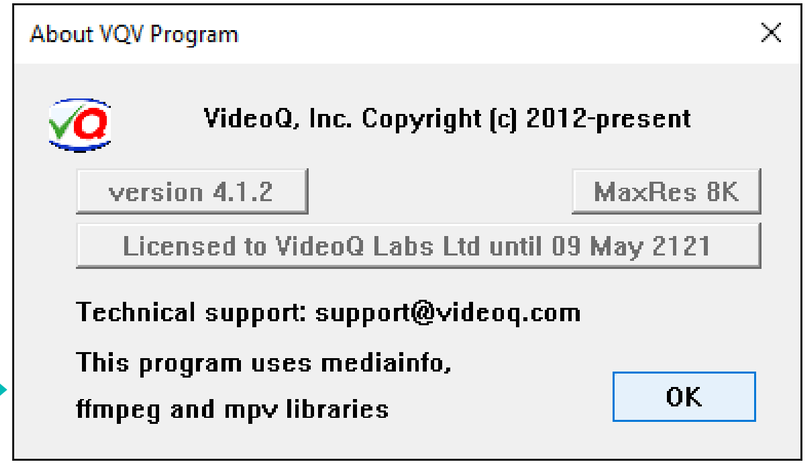
Help Menu





Press keyboard **F1** button to open "**VideoQ VQV Brief Guide**" PDF document, containing list of available functions and Table of Shortcuts
See also Table of Shortcuts slides at the end of this presentation

Help menu 2nd line brings up compact '**About VQV**' pop-up window.
It contains version and copyright details.



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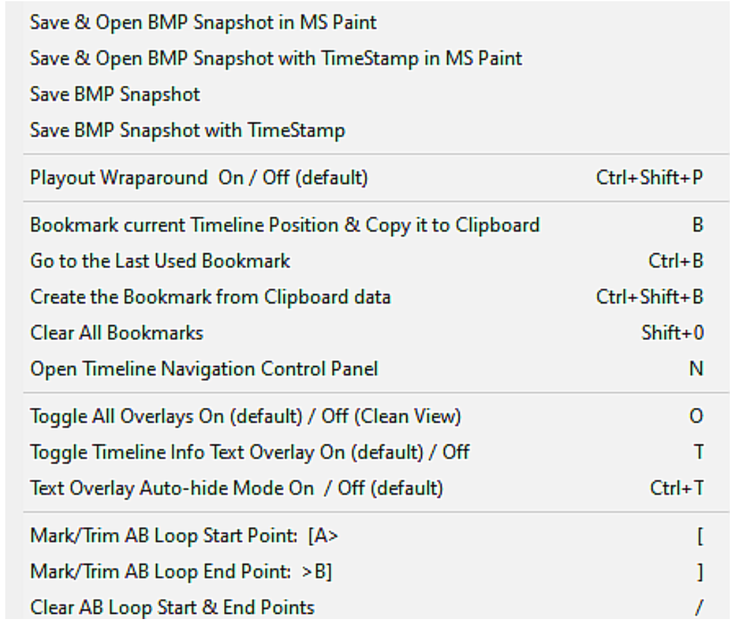
Note that the VQV companion **VQMP** player is controlled by a separate group of shortcuts aka "keybindings". Within the active VQMP window press keyboard **F1** button to open "**vqmpv_bindings.rtf**" in WordPad.
VideoQ version of **VQMP shortcuts** is significantly different from the original **MPV shortcuts**, but some original MPV shortcuts are still active. To see the full list of **original MPV controls** press keyboard **F2** button to open "**mpv.io.html**" in your default browser.

Right-click Context Menu



This pop-up window can be invoked by pressing **Mouse Right Button** whilst cursor is in the **Active Image Area**.

The menu contains 4 sections allowing to:

- Save current frame **Snapshot** as **BMP** file and optionally open it with **Microsoft Paint**
- Control **Playout Wraparound Mode** and **Bookmarks** creation and usage
- Control **Timeline & Info Text Overlays**
- Mark **A-B loop** timeline segment boundaries (Start and End points)

Snapshot file name is automatically appended by current frame number and frames count, e.g. "TestSDR_frame_225_of_10377.BMP".

Snapshot file name can be optionally appended by PC local date and time, e.g. "TestSDR_frame_225_of_10377_20170308_205801.BMP"

Loop start set: displayed symbol = **[A>**

Loop end set: displayed symbol = **>B]**

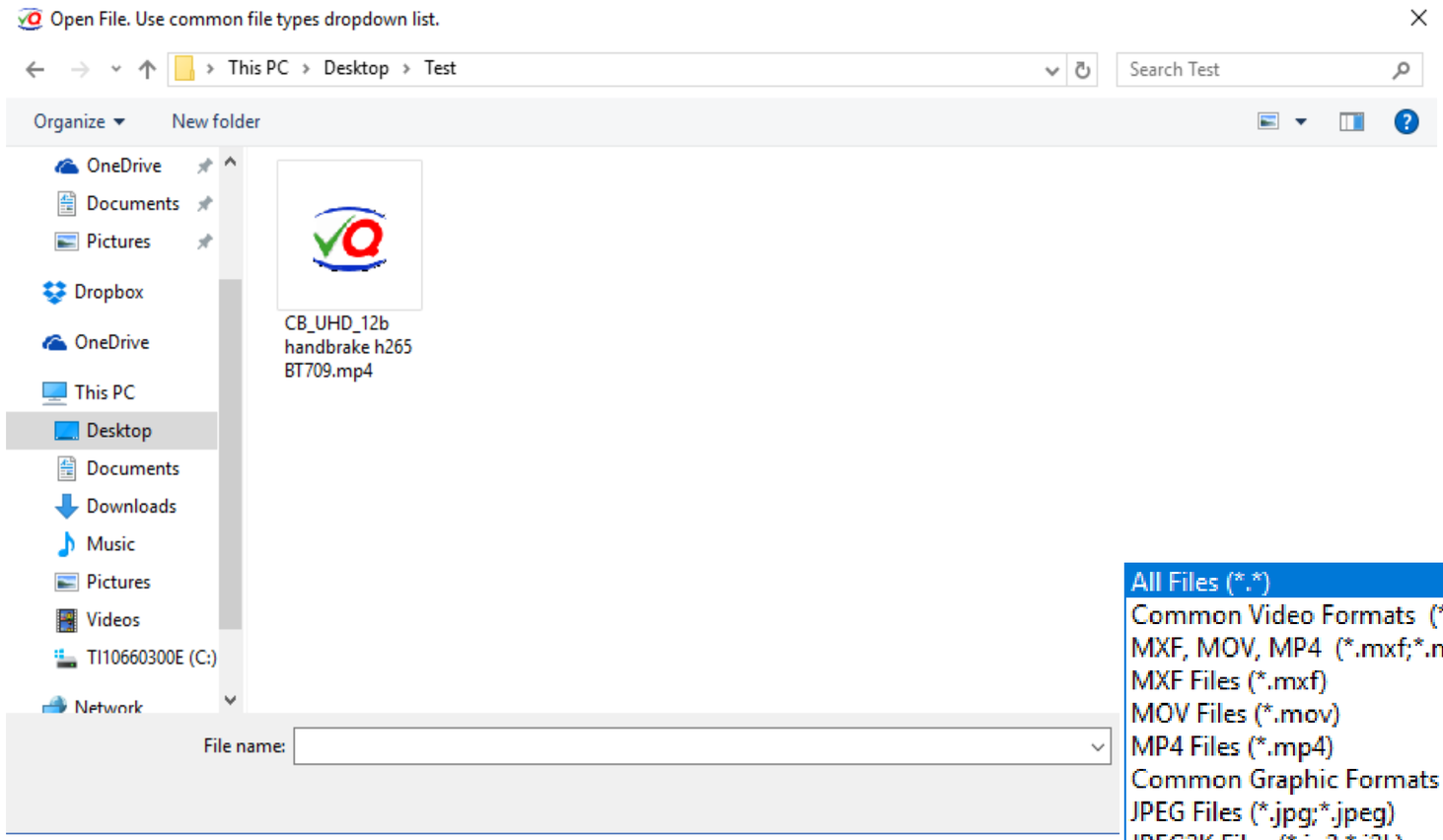
Time position within the loop limits: displayed symbol = **[AB]**

Time position outside the loop limits: displayed symbol = **B]>**

There are 3 modes of Text Overlay presentation: **On**, **Off**, and **Auto-hide**.
In Auto-hide Mode two lines of Text Overlay are displayed only when mouse cursor is below the active image, i.e. in the timeline slider area.

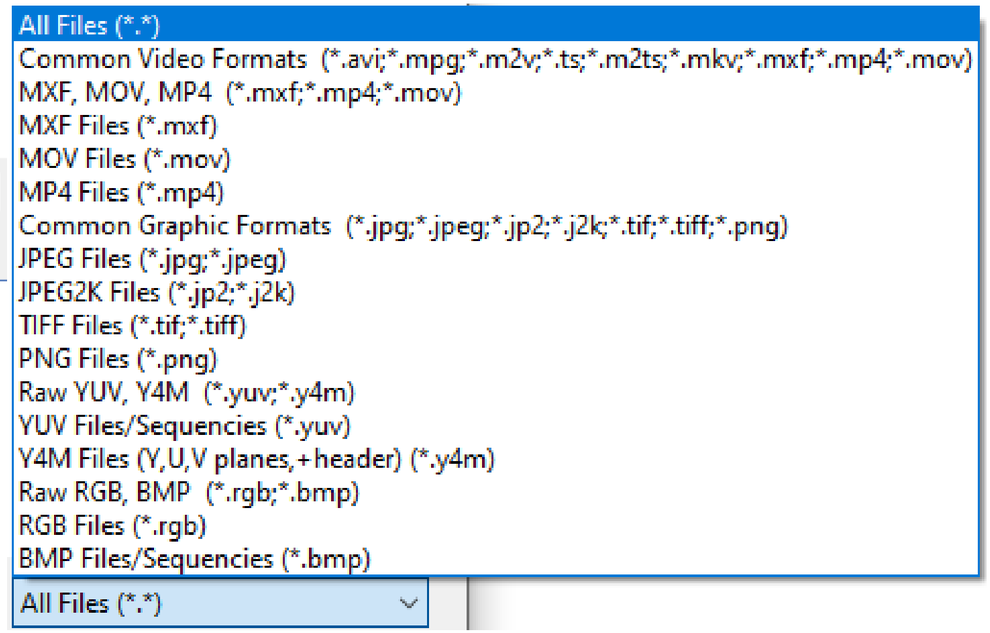
Default AB Loop limits (frame numbers) are: A (Start) = 0, B (End) = frames_count -1
If Start > 0 or End < frames_count -1, AB limits are shown in the **top row** of Text Overlay
For example if frames_count = 100, and user marked only A point = 20, then loop playout will start at frame 20, continue until frame 100 and restart at frame 20 if Wraparound Mode is ON.

Opening Media File via Windows GUI Dialog

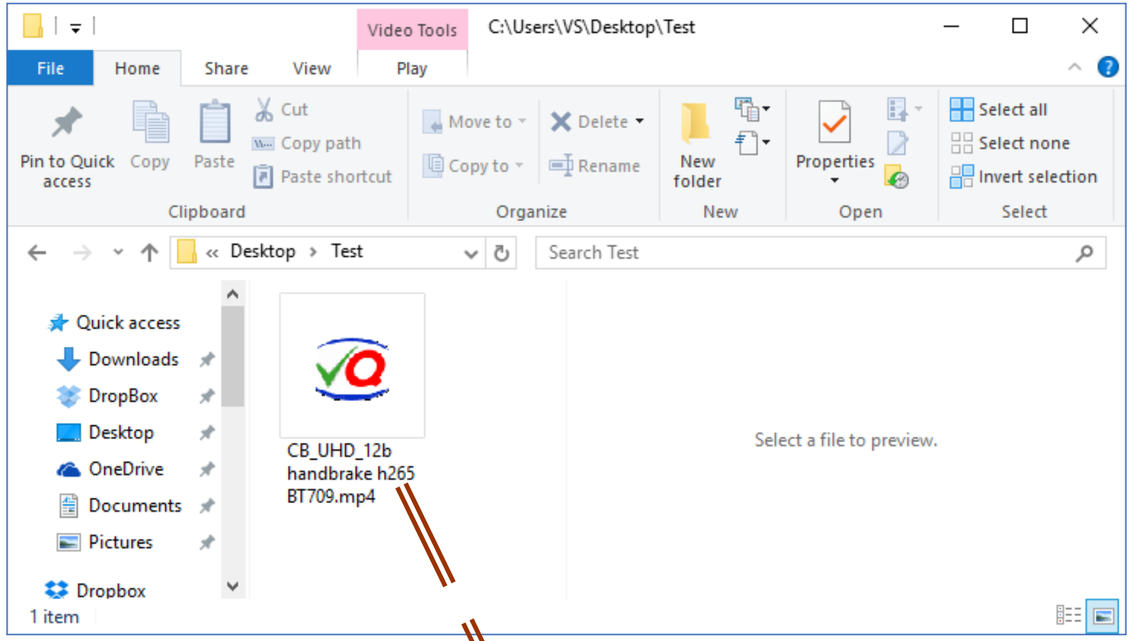


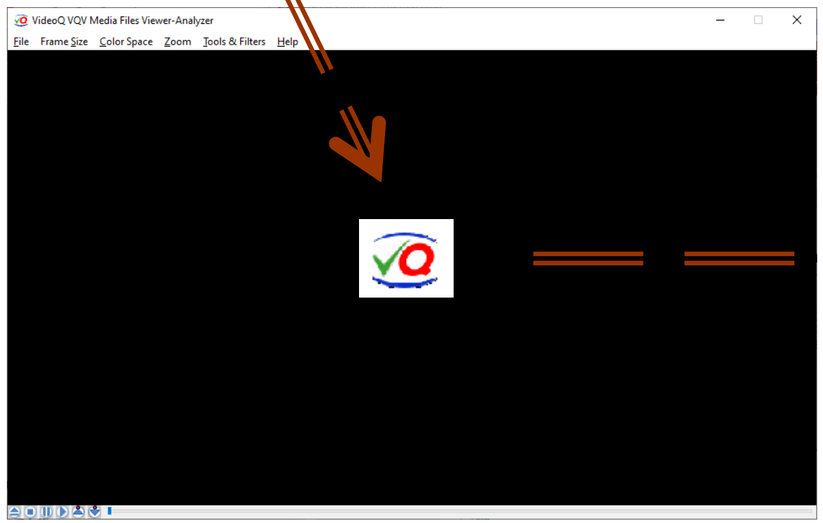
VQV GUI Menu File/Open (Shortcut Ctrl+O) brings up standard Windows dialog.

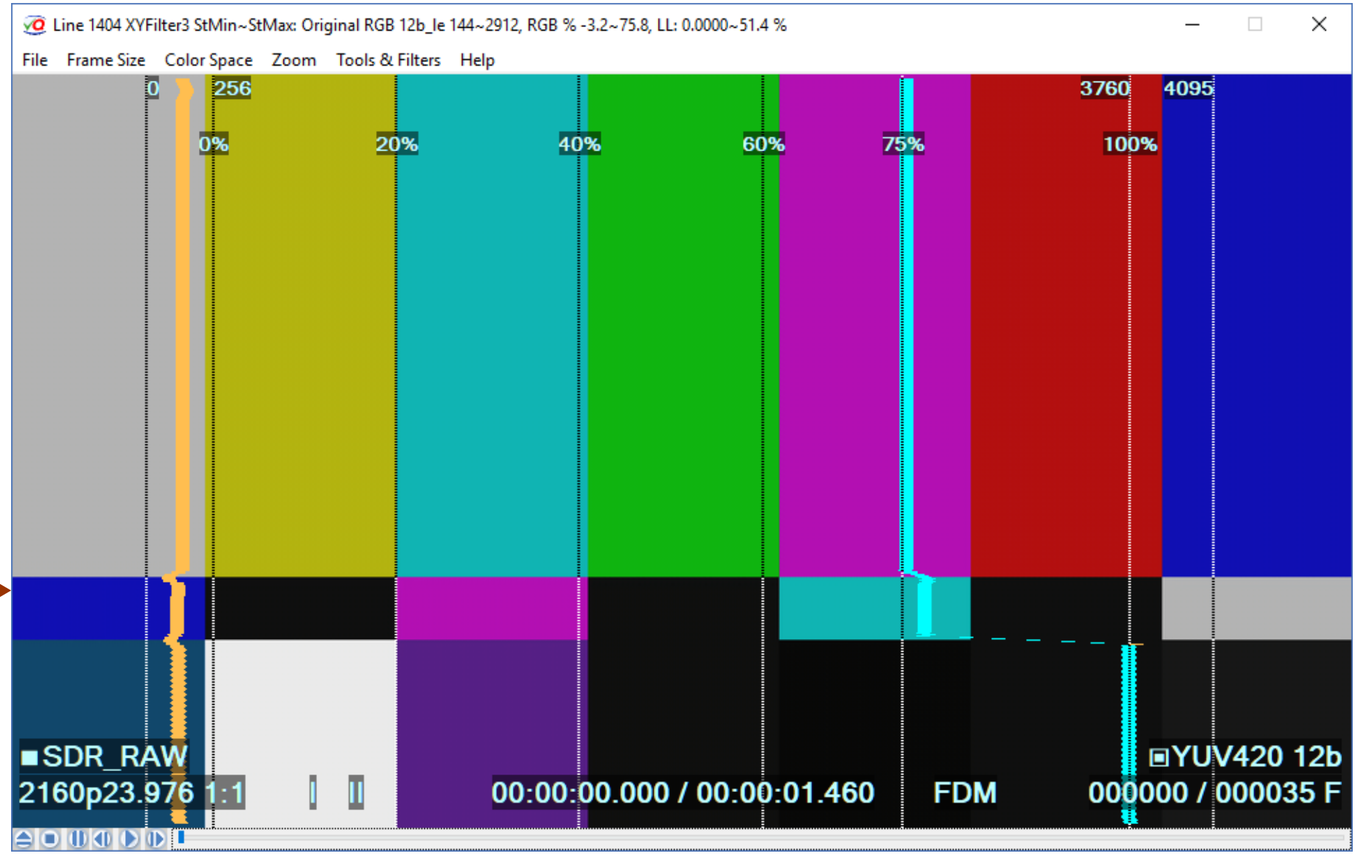
User can use wildcards, type specific file type, e.g. *.mp4, or select the appropriate line from **drop-down list**.



Opening Media File via Drag-And-Drop







VQV supports Windows standard file extension association procedure, as well as **drag-and-drop** (quick & easy) opening procedure.

Timeline Navigation and Playout

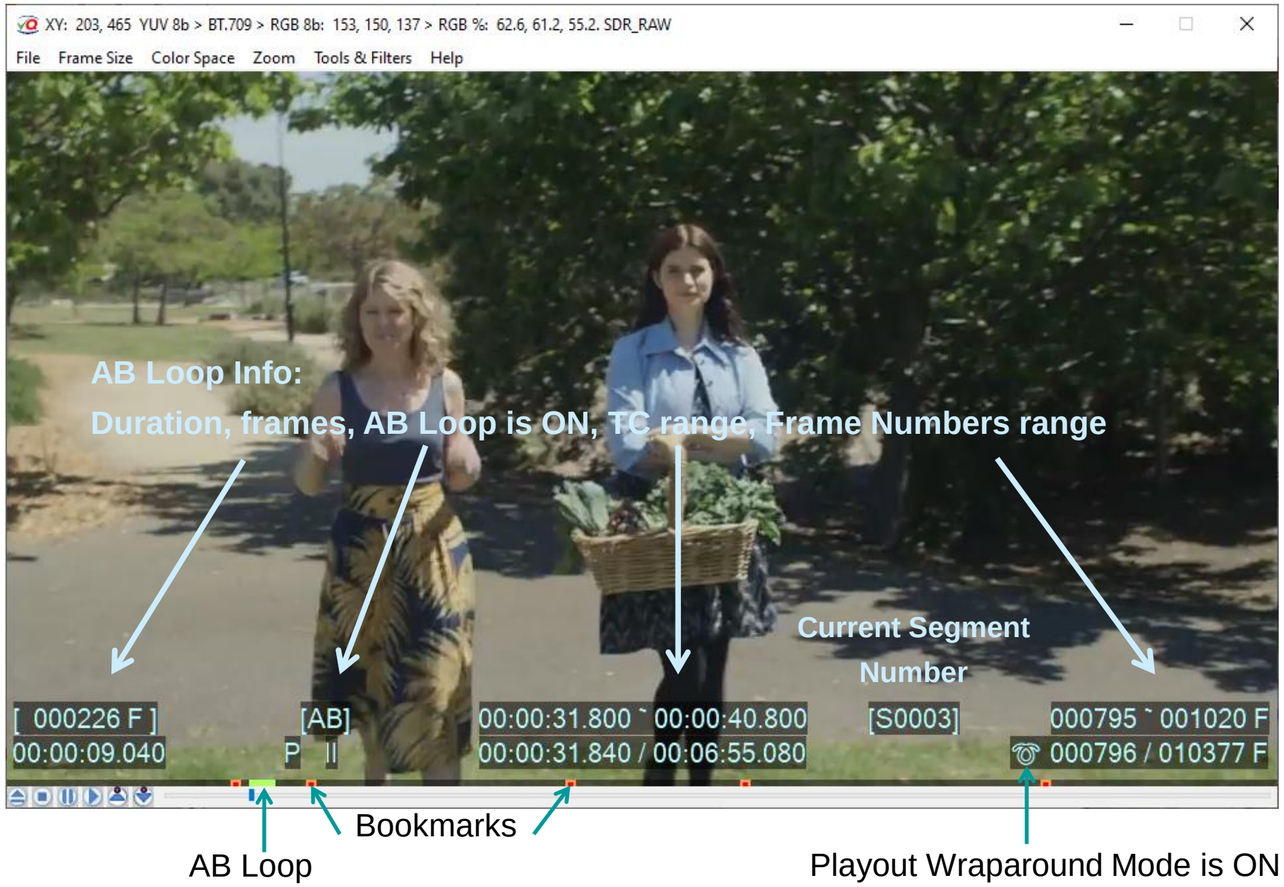
Shuttle Mode – Speed Controls
VideoQ Videola™

Mouse Wheel
or **Right/Left Arrows:**
Preset speed values:
+/- 0, 1, 2, 5, 10 frames,
1, 2, 5, 10, 20 s, 1 m (60 s)

Also available are fractional playout speeds (slow motion):
+/- 0.1, 0.2 and **0.5**
of the media file frame rate.

Ctrl + Mouse Left Button
and cursor position
within Image Area

On release of Mouse Left Button or Ctrl key playout continues at the last selected speed.



Play Button, Space Bar
and **Mouse Middle Button** toggle between:
- **Play** (aka **Shuttle Mode**)
- **Pause** (aka **Jog Mode**)

Pause button always enables **Jog Mode**

Shift + Mouse Left Button click within Image Area also toggle between:
- **Play**
- **Pause**

and reset playout speed to +1.0

Jog Mode – Timeline Position Controls

• **Mouse Wheel**	**+/- 1 frame**
• **Right/Left Arrows**	**+/- 1 frame**
• **Ctrl + Right/Left Arrows**	**+/- 10 frames**
• **PgDn/PgUp**	**+/- 1 s**
• **Shift + PgDn/PgUp**	**+/- 10 s**
• **Ctrl + PgDn/PgUp**	**+/- 1 m**
• **Ctrl + Shift + PgDn/PgUp**	**+/- 10 m**

- **Ctrl + Mouse Left Button**
and cursor position within Image Area
Seek with variable speed.

On release of Mouse Left Button or Ctrl key playout will **pause** at **last shown frame**

Ctrl + Shift + P toggles 
Playout Wraparound Mode On/Off.

*In Shuttle Mode every video frame is decoded and displayed only at speed values **-1**, **0** and **+1**. Any other speed means decimation, e.g. speed +5.0 means that every 5th frame is shown.*

SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Segments Info Overlay Options

Press **Shift + S**
to cycle thru 3 Text Info Display Modes:
Segments, **AB Loop**, **Regular Video**
(only if Segment List Data available)

Press **< *or* >** to browse Bookmarks / Segments by Number
or
Ctrl + < *or* > to browse Bookmarks by Position *or* Segments +/- 10 (50)

Press **Ctrl + 0**
to toggle Segments Info Text Overlay:
On/Off
(Segments List data are preserved)

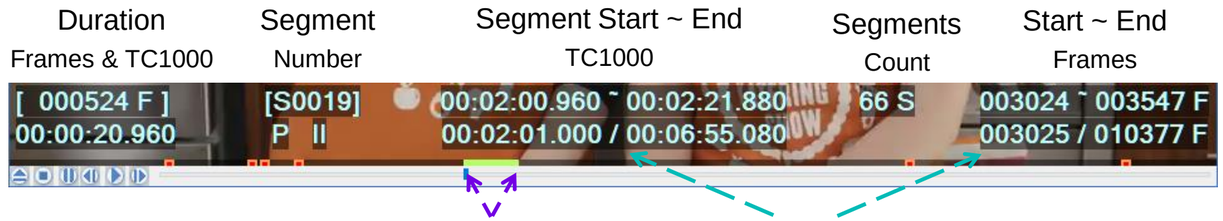
Regular Video Mode with optional Segments Info

Current Segment Number & Duration

Current Bookmark Number & Position

Other Bookmarks

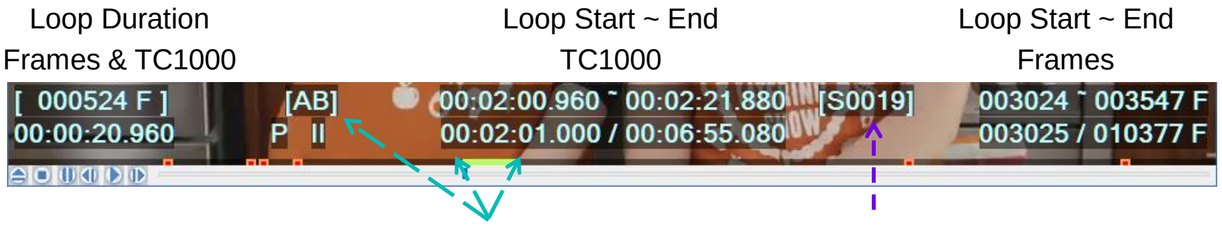
Segments Info Mode



Current Segment

Current Time Position TC1000 & Frames

AB Loop Mode with optional Segments Info



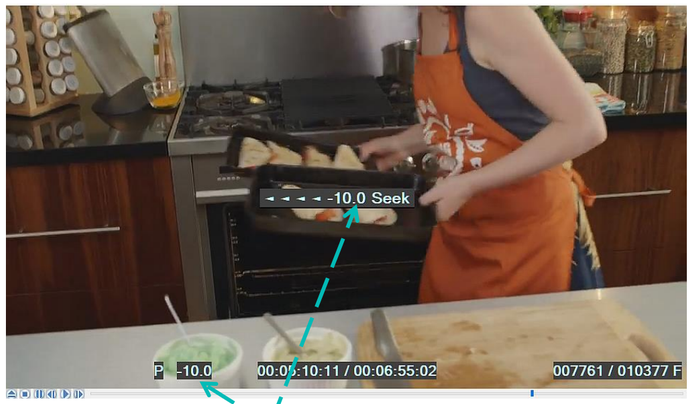
AB Loop Mode Markers

Segment Number
(if matching AB Loop Start & End Positions)

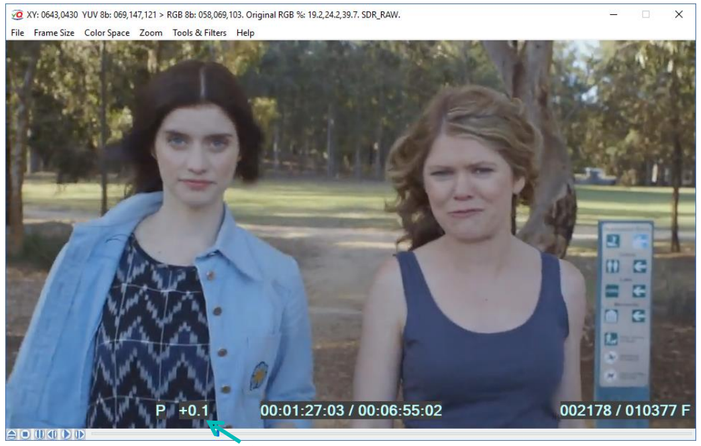
SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Seek & Play Controls and Indicators

Jog Seek Mode – Position Control:
Mouse Left Button *within Slider Area*



Jog Seek Mode – Position Control: **Ctrl + Mouse Left Button** *within Image Area,*
also **Ctrl** and/or **Shift** + **Left/Right Arrows** or **PhDn/PgUp**



Shuttle Mode Speed Control by Mouse Wheel,
also **Left/Right Arrows**

Shuttle Mode – Speed Control: **Ctrl + Mouse Left Button** *within Image Area*

SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Timeline Navigation Panel

Press **N**
to invoke
Navigation Panel
pop-up window

Text Edit Boxes:
Enter / copy / paste *either* **Segment Number**, **Frame Number** *or* **Time Position: s[.ms]**, **TC1000** *or* **SMPTE Time Code** of the **Target Timeline Position**. All related boxes content will be auto-updated after confirmation.
If confirmed by **Enter** key or **OK** button (1st OK to review, 2nd OK to confirm), VQV will create new **Bookmark** and go this position.

Timeline Info Boxes
(not editable)

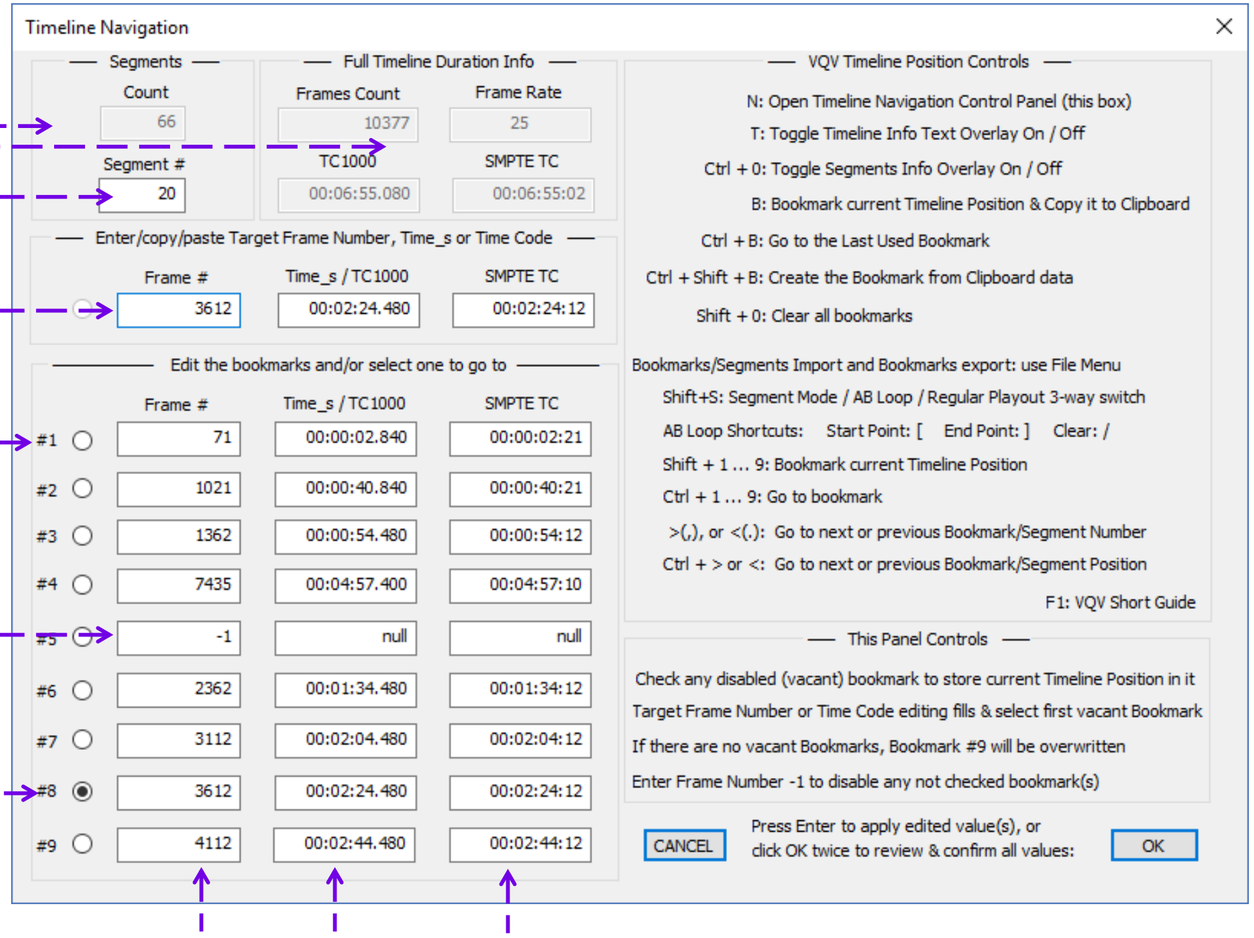
Target Segment
(if segments data available)

Target Time Position Direct Control Boxes

9 Radio Buttons
serve for direct selection of the **Target Time Position**

*Frame Number **-1** means disabled (vacant) Bookmark*

*At the dialog start the selected Radio Button designates the **Last Used Bookmark***



Review all Frame Numbers and Time Code strings, then ***confirm*** them by 2nd **OK** click

It is possible to edit more than one **Bookmark Box**
Note that Frame Numbers and Time Code strings should be ***confirmed*** by 2nd **OK** click.

Entering Frame Number **-1** disables (vacates) the edited bookmark.

Bookmarks / Segments Shortcuts:
(active only when Navigation Panel closed)
To **record** bookmark on pause or during playout press **B** or **Shift + Digit Key** from **1** to **9**.

To **go to** the recorded bookmark press **Ctrl + Digit Key** from **1** to **9** at any time.

It is possible **to clear** all bookmarks on pause or during playout by pressing **Shift + 0**

To go to the **Next** or **Previous Bookmark Number** or **Segment Number** press **<** *or* **>** key

To go to the **Next** or **Previous Bookmark Position** press **Ctrl + <** *or* **>.**
Ctrl + B: go to the **Last Used Bookmark**.

Ctrl + 0 toggles Segments Info On/Off

Bookmarks Info Report and Bookmarks Controls

Use File>Export Bookmarks Menu

to save **InFilePath.vqvbm.txt** and open in minimized Notepad window.

Report file name is fixed and it is co-sited with the analyzed media file.

```
VQV v 2.2.1. Copyright (c) 2012-2018 VideoQ, Inc.
Bookmarks Info Report created: 2018-11-25T22:06:53
Media File: "C:\VQV_Test\_HDR_Test_Sample_1knt_10b.mp4"
Frames Count: 0015000, Duration: 00:10:00.000, Frame Rate: 25
#, FrameNo,    TC1000,     SMPTE_TC
1, 0000000, 00:00:00.000, 00:00:00:00
2, 0009000, 00:06:00.000, 00:06:00:00
3, 0003000, 00:02:00.000, 00:02:00:00
4, 0006000, 00:04:00.000, 00:04:00:00
5,    null,     null,      null
6,    null,     null,      null
7,    null,     null,      null
8,    null,     null,      null
9,    null,     null,      null
== DO NOT EDIT ABOVE THIS LINE ==
== ADD YOUR NOTES BELOW =========
```

It is possible to rename the saved bookmarks file as needed.
It is also possible to add explanatory notes ***after*** the bookmarks data.

For QA/QC purposes it is helpful to add comments about the bookmarked timeline positions, e.g. “Frame 9000 Frame Average Light Level is beyond the specified limit”.

Added comments are ignored in case of opening of the modified bookmarks file via **File>Import Bookmarks** menu.

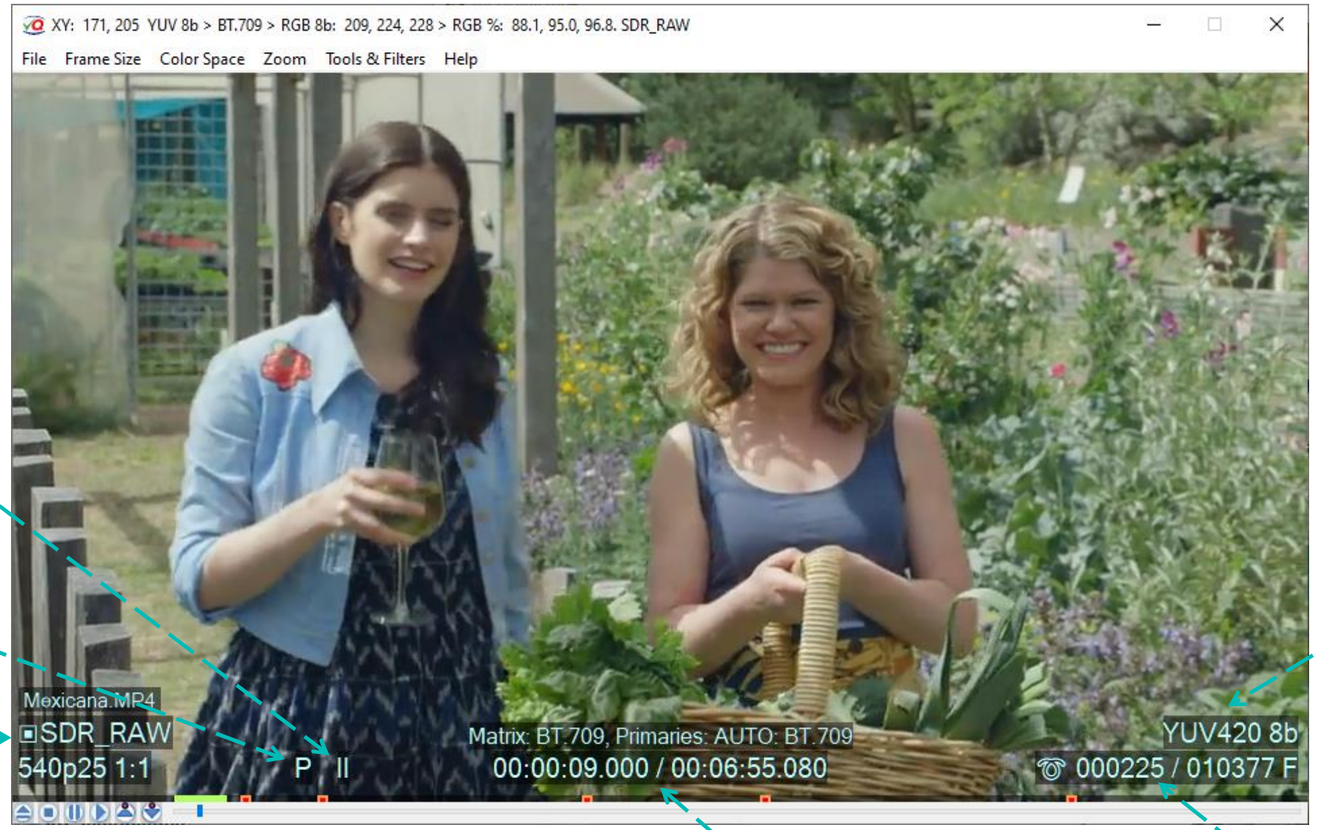
Use **B** shortcut to bookmark ***current*** **Timeline Position** and copy the TC1000 time code string of this position to Windows Clipboard.
Use **Ctrl + B** to go to the **Last Used Bookmark** timeline position.

Ctrl + Shift + B shortcut can be used to create bookmark from Clipboard data, e.g. for fast bookmark transfer from any document or from one VQV instance to another VQV instance.
The supported data string format options are:

- Frame Number, e.g. “018002”
- TC1000 Time Code, e.g. “00:06:00.040”
- SMPTE Time Code, e.g. “00:06:00:02”

Text Info Overlay

*If mouse **cursor** is in the **slider area**, then speed, frame number and time code are shown in the* **Title Bar** *thus duplicating the* **Text Info Overlay** *shown at the bottom of Active Image*



Press **T** key to toggle Text Info overlays On/Off,

Ctrl + T toggles Text Overlay Auto-hide Mode

Current playout speed
i.e. Shuttle Mode timeline steps
in **frames**. **seconds**, or **minutes.**

Pause symbol = Jog Mode

Current Frame Type
(only for compressed video),
e.g. ‘I’, ‘P’, ‘B’

DR Mode & Scanning Standard
- Selected Dynamic Range Mode
- Frame Height, Interlace, Rate, and Zoom *(hidden on playout)*

Video Format Info
(hidden on playout)

YUV ⇔ RGB Narrow Range (NR) Symbol

YUV ⇔ RGB Full Range (FR) Symbol

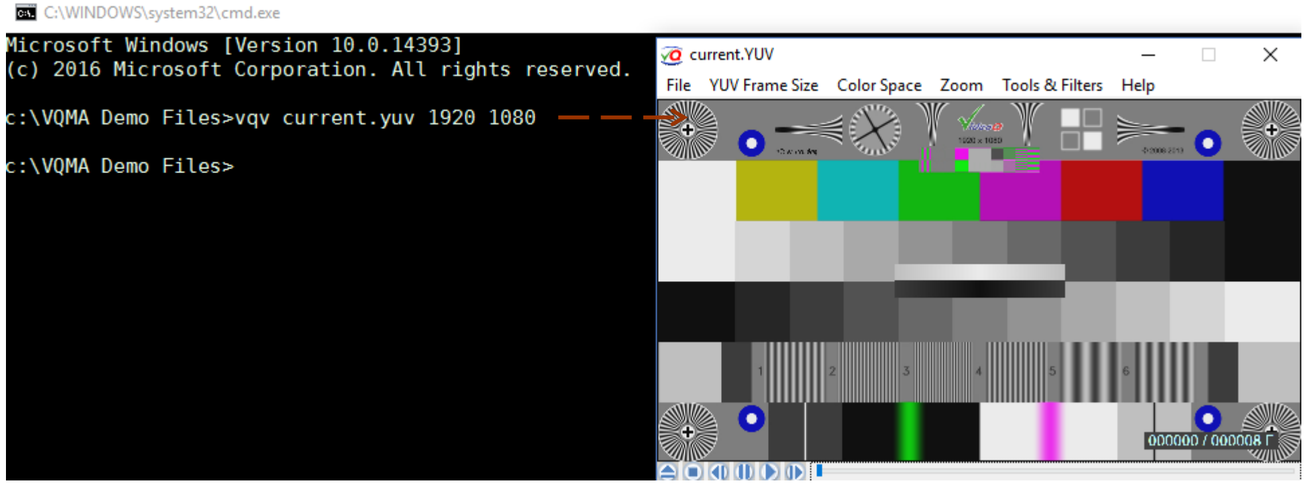
Timeline Position Info:
CurrentTimeCode / DurationTimeCode

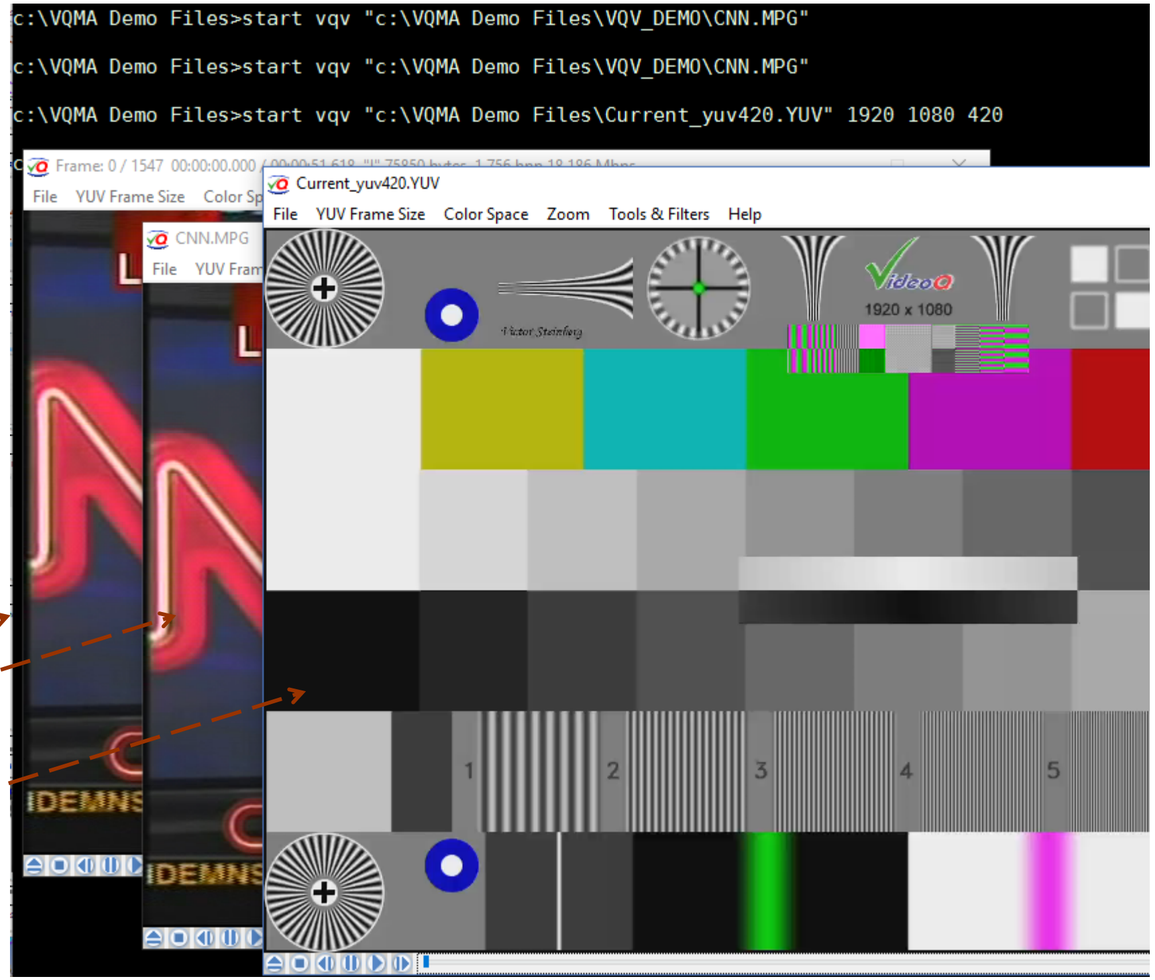
Timeline Position Info:-
CurrentFrameNo / TotalFramesCount

SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Opening Media File via CLI 1

Simple Example: Single raw UYVY data .YUV file opened via command line interface





Advanced Example: Launch multiple VQV instances, using ‘start’ prefix:

Open several files or open the same file in several separate windows

start vqv "c:\VQMA Demo Files\VQV_DEMO\CNN.MPG"

start vqv "c:\VQMA Demo Files\VQV_DEMO\CNN.MPG"

start vqv “c:\VQMA Demo Files\Current_yuv420.YUV” 1920 1080 420

Such batch opening is very useful for benchmarking and iterative tests – because it allows side-by-side comparison of “before and after” variants.

Opening Media File via CLI 2 (continued)

If Input Name is a FOLDER, containing **numbered YUV or BMP files**, then the file with the **lowest number** belonging to the **numbered frame sequence** found **within the folder** will be opened first, and the whole sequence can be played, e.g.

vqv “c:\VQMA Demo Files\Vadaro Raptor”

If Input Name designates **any numbered file** within a folder, then the file with the **lowest number** belonging to the **numbered frame sequence** will be found, and the whole sequence can be played, e.g. the command line

vqv “c:\VQMA Demo Files\Vadaro Raptor\RV_25Apr13_3.bmp”

produces the same result as the command line above

```
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

c:\VQMA Demo Files>vqv "c:\VQMA Demo Files\Vadaro Raptor\RV_25Apr13_3.bmp"
```

Tools & Meters Categories

- VQV analyzers and meters can be sorted out into 3 categories:

  1. YUV & RGB **Levels Analyzers**, providing for several secondary analyzers,
     such as **Frame Lines RGB Range Profile**, **Video Volume Meter**, **VectorScope**, **ChromaScope**, etc.

  2. Intra-frame Activity and Inter-frame **Activity Analyzers**, also providing for **Noise Level Meter**

  3. **Bitrate, Packet Size** and **GOP Structure Statistics Analyzers**

- For all 3 categories the analysis results are presented in two formats:

  1. **Graphical overlays** – Bargraphs, Waveforms and Vector Display formats

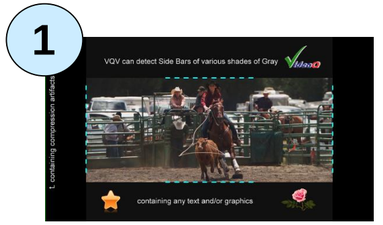
  2. **Numerical readouts**, shown as Title Bar Message and/or Text Overlay

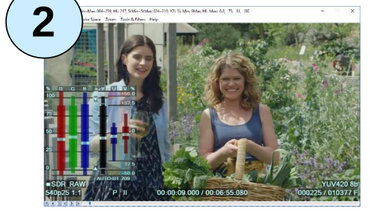
- Some analyzers, filters and overlays can be combined, some others are mutually exclusive

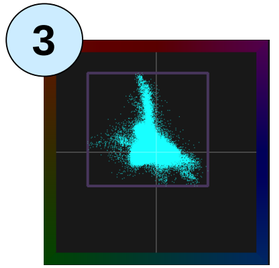
Tools & Meters Overview

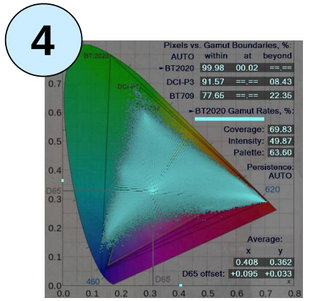
See next slides for detailed description of:

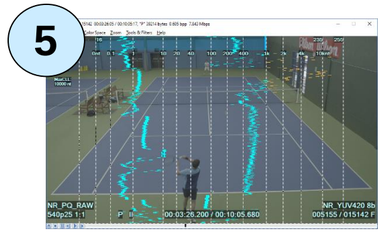
1. **Active Image Size Meter**
2. Video Volume Meter – **VV-Bars ™**
3. **VectorScope**
4. **ChromaScope**
5. RGB Frame Profile Monitor – **FrameScope ™**
6. RGB/YUV Line Parade **Waveform Monitor**
7. RGB/Light Levels **Histograms**
8. RGB/Light Levels Analyzer – **L-Bar ™**
9. Bitrate Analyzer – **C-Bar ™**
10. **Noise Meter**

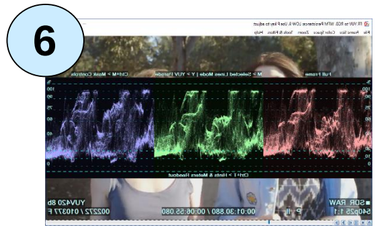


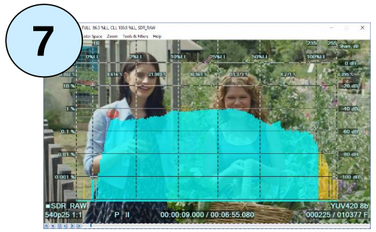


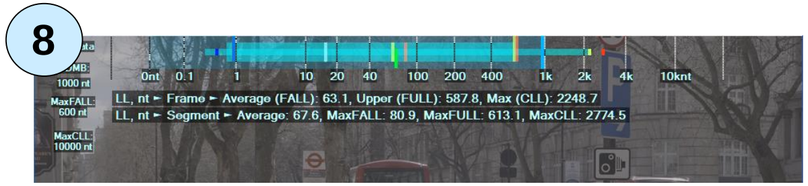












Active Image Frame Size Meter

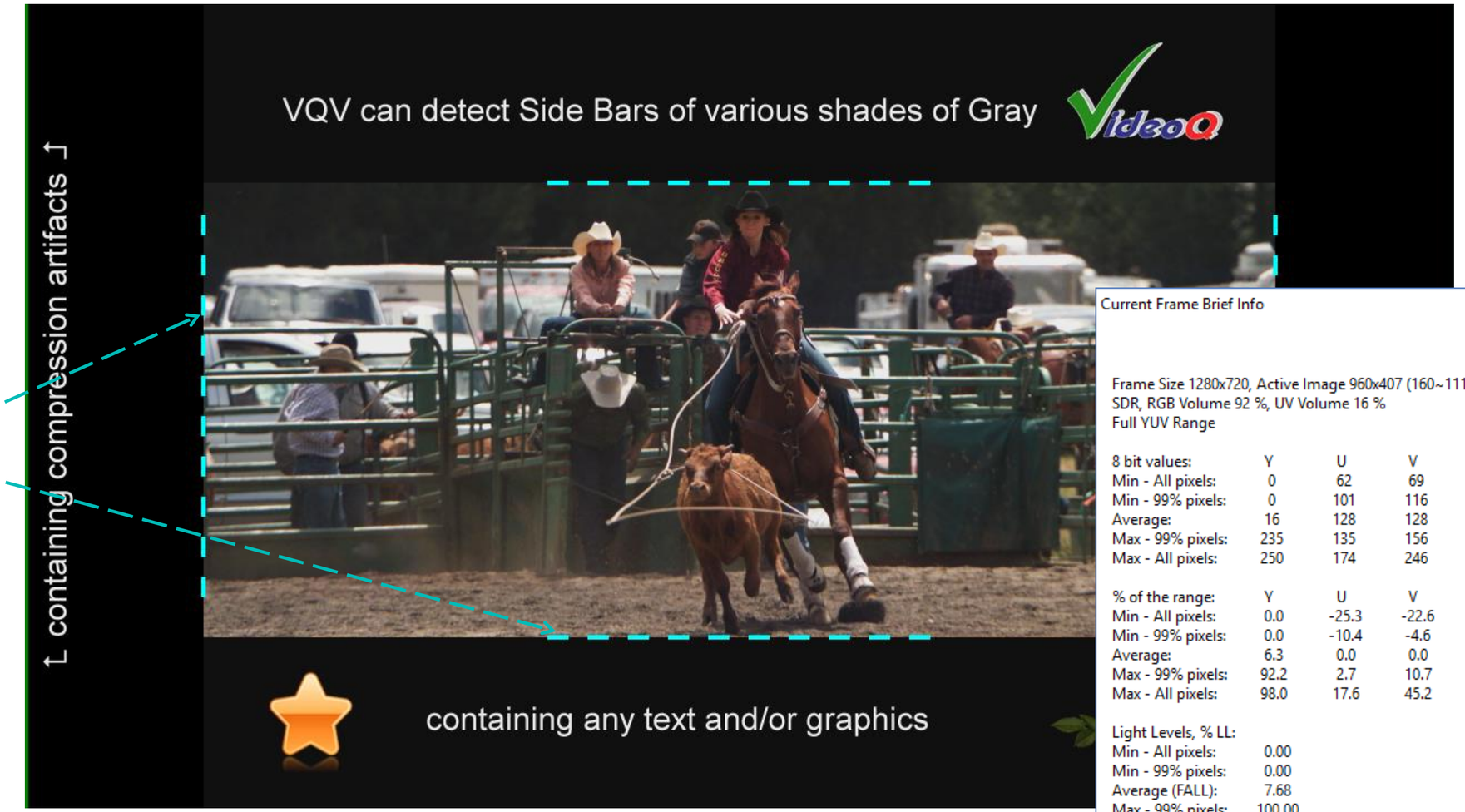
Press **Ctrl + A**
to detect
Active Image Size

Also used as Statistics Analysis Area
Full Frame / Active Image *switch*

Press **Shift + A**
to show/hide
Active Image Size
Markers

Ctrl + Shift + A
Analyzed Area toggle:
Active Image / Full Frame

Active Image Size Meter results are not affected



Current Frame Brief Info

Frame Size 1280x720, Active Image 960x407 (160~1119x160~566)
SDR, RGB Volume 92 %, UV Volume 16 %
Full YUV Range

8 bit values:	Y	U	V	R	G	B
Min - All pixels:	0	62	69	0	0	0
Min - 99% pixels:	0	101	116	0	0	0
Average:	16	128	128	45	43	39
Max - 99% pixels:	235	135	156	235	235	233
Max - All pixels:	250	174	246	255	254	254

% of the range:	Y	U	V	R	G	B
Min - All pixels:	0.0	-25.3	-22.6	0.0	0.0	0.0
Min - 99% pixels:	0.0	-10.4	-4.6	0.0	0.0	0.0
Average:	6.3	0.0	0.0	17.6	16.9	15.3
Max - 99% pixels:	92.2	2.7	10.7	92.2	92.2	91.4
Max - All pixels:	98.0	17.6	45.2	100.0	99.6	99.6

Light Levels, % LL:

Min - All pixels:	0.00
Min - 99% pixels:	0.00
Average (FALL):	7.68
Max - 99% pixels:	100.00
All pixels Max (CLL):	100.00

Save full info to machine-readable "VQV_FrameInfoReport.TXT" ?

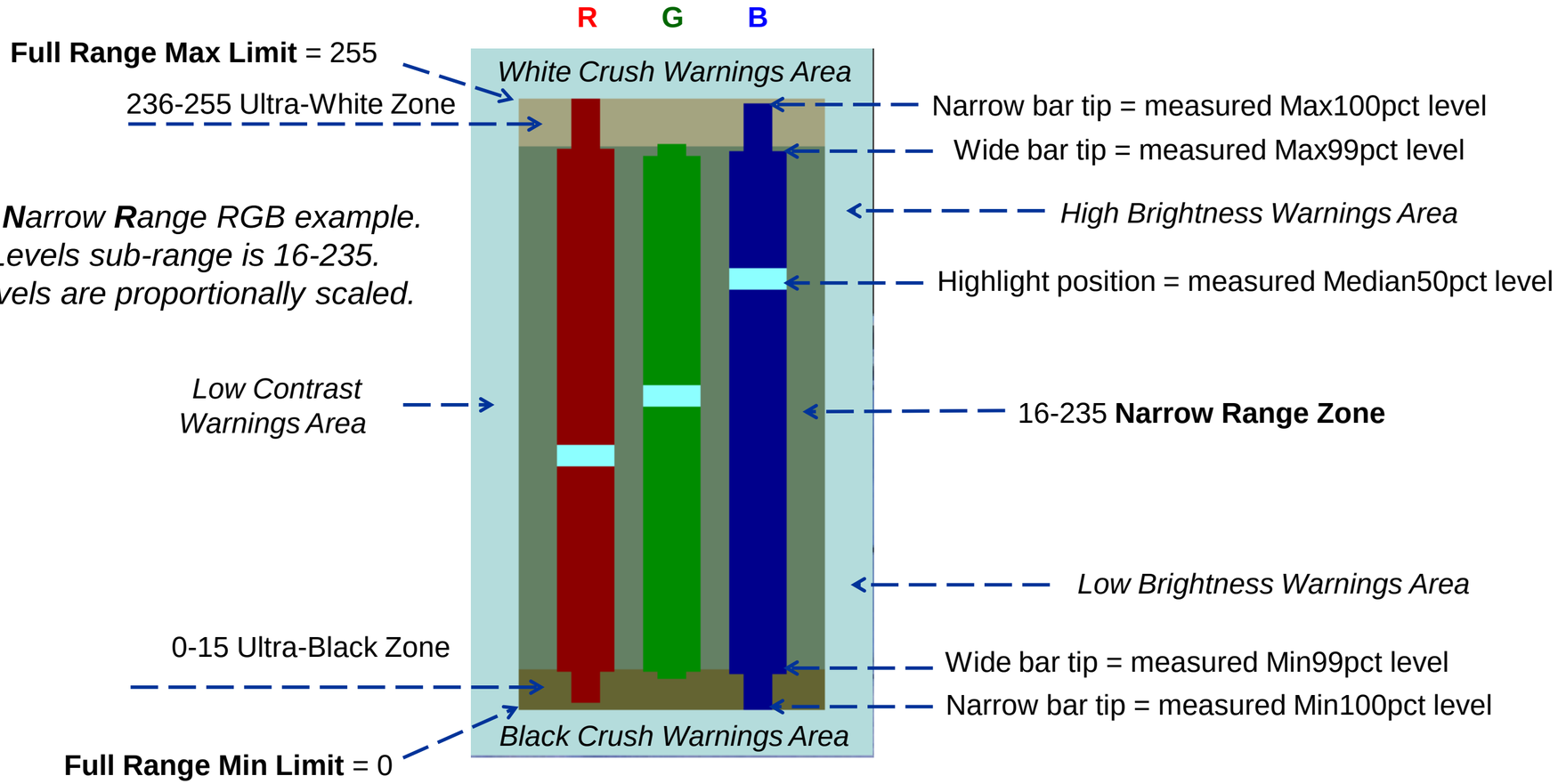
Yes No

Active Image Size Detection *affects the results of* ***all other Meters*** *because the black bands (Letterbox, Pillarbox, PostStamp) may significantly affect image levels and activities statistics.*

Video Volume Bars – VV-Bars Overlay

Press **V**
to toggle On/Off
VV Bars Overlay

*This slide shows typical 8 bit **N**arrow **R**ange RGB example.*
For 8 bit NR encoding Valid Levels sub-range is 16-235.
For Bit Depth > 8 bit these levels are proportionally scaled.



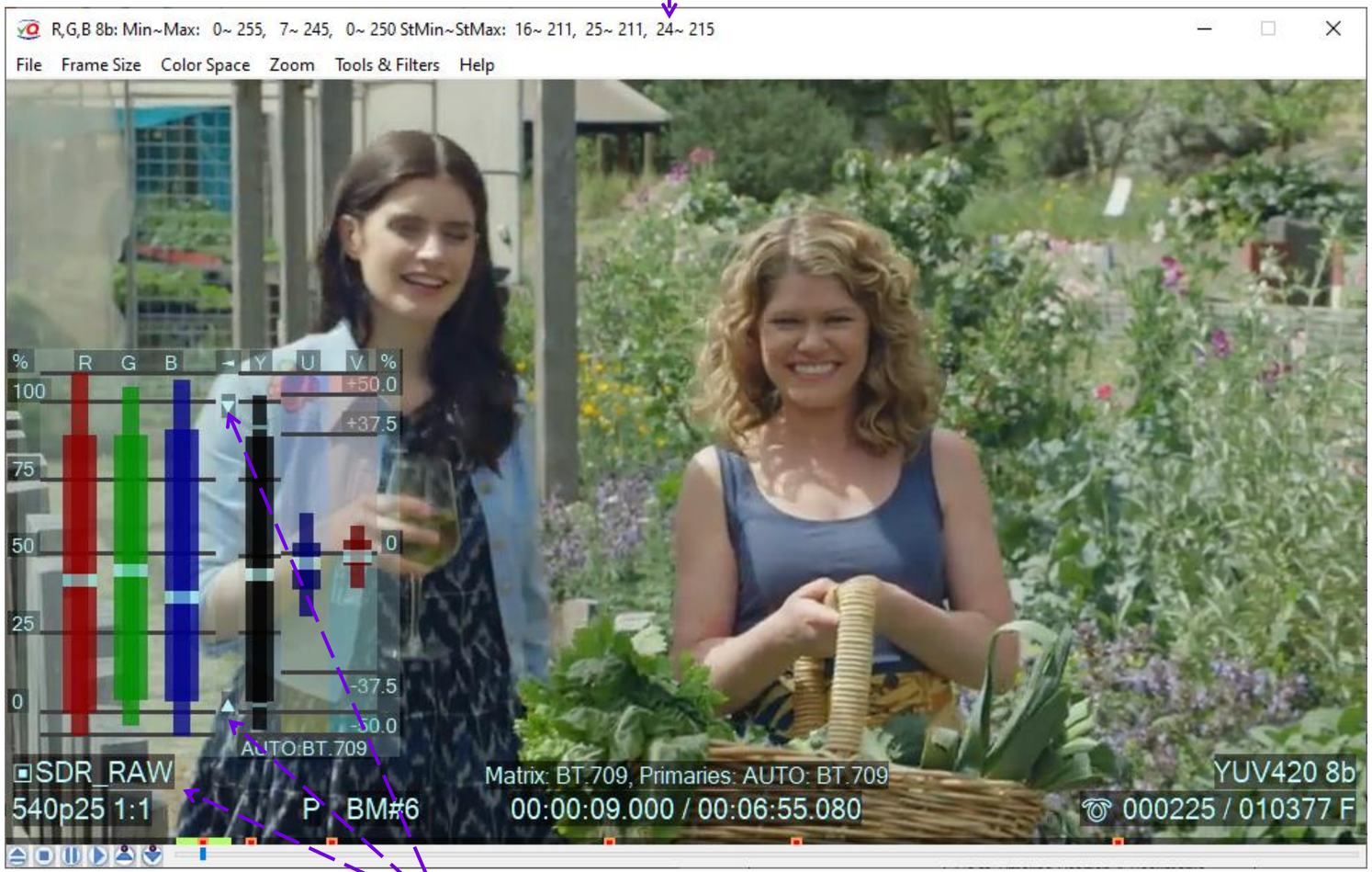
Each **Wide Bar** represents the color component range for **reliable 98%** of current frame pixels, ignoring specular highlights, whilst corresponding **Narrow Bar** shows ***extreme*** values for **all (100%)** pixels - they are nearly random and may vary a lot.

This explains the drastic difference in the dynamic behavior of two bars on live video playout:
Wide Bar size and position typically do not change significantly from frame to frame, but Narrow Bar tips are moving very fast.

VV-Bars Variants

Press **V**
to enable **VV-Bars**

Press **S**
and put **Mouse Cursor** in the **VV-Bars area**.
VQV Title Bar shows VV-Bars statistics numerical values



Selected YUV ⇔ RGB Conversion Parameters:
YUV RAW (Narrow Range within Full Range), Matrix BT.709

Press **Shift + V**
to cycle thru 3 Display Modes:
YUVRGB (6 Bars), **RGB** (3 Bars), **RGB Range** (1 Bar)

Selected YUV ⇔ RGB Conversion Parameters:
YUV Narrow Range ⇒ RGB Full Range, Matrix BT.709

SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Smart VectorScope

Press **Ctrl + V**
to toggle On/Off
VectorScope Overlay

UV Vectors Histogram
with automatic
brightness adjustment

V

U = 255, V = 255

U = 240, V = 240

Rectangular **Palette** is a visual hint for UV vectors hues.

Inner Palette edge serves as a boundary marker for Nominal Range Area (U & V from 16 to 240)

U = 240, V = 128

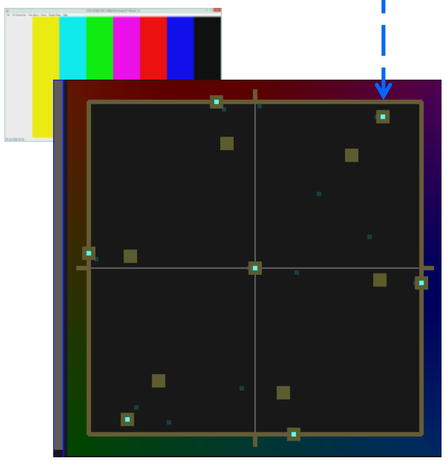
U = 240, V =16

U

U = 0, V = 0

Peak Levels Marker
Rectangle limited by:
U & V
Min & Max values

*If Test Pattern input detected, the rectangle limits are auto-adjusted to **measured** UV levels.*
***Target boxes** (dark yellow) designate 75% & 100% Color Bars*



4 Display Modes

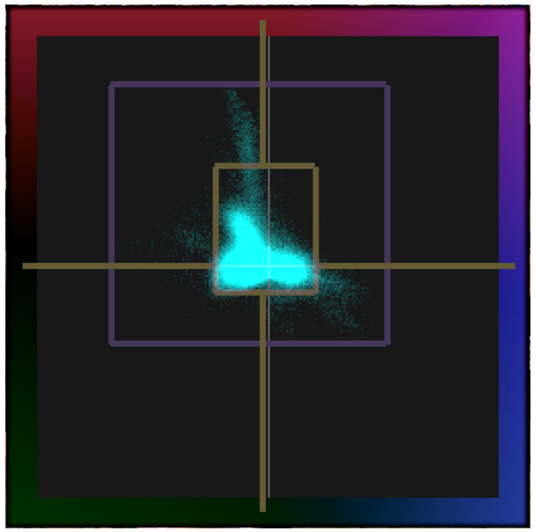
Press **S** whilst
Mouse Cursor
is in **VectorScope area**
to change
display modes

VectorScope Modes

4 Display Modes: Press **S** whilst **Mouse Cursor** is in the VectorScope area to change the display mode

Target Boxes
are enabled automatically
by VQV Color Bars Detector

Mode 1: (default) - **AUTO**

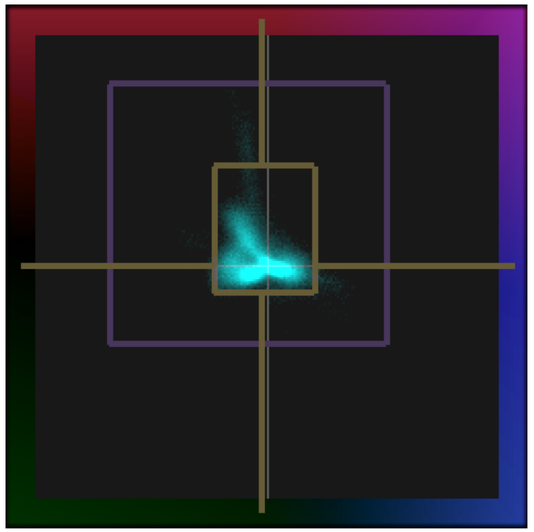


Suitable for **majority of use cases**.

Waveform brightness (Gain) is auto-adjusted to fit measured Chroma Volume limits.

Due to the built-in **Color Bars Detector** Mode 1 automatically switches to Mode 4 if Color Bars or similar test patterns are presented, so there is no need to switch modes manually.

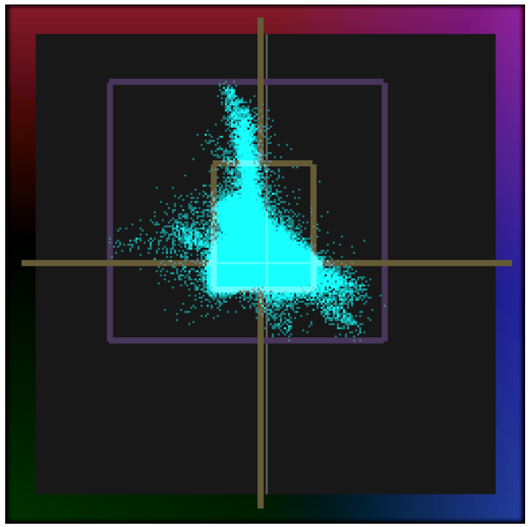
Mode 2: **Fixed Gain x1**



x1 Gain provides for better visibility of **dominant colors distribution** (2D contour shape).

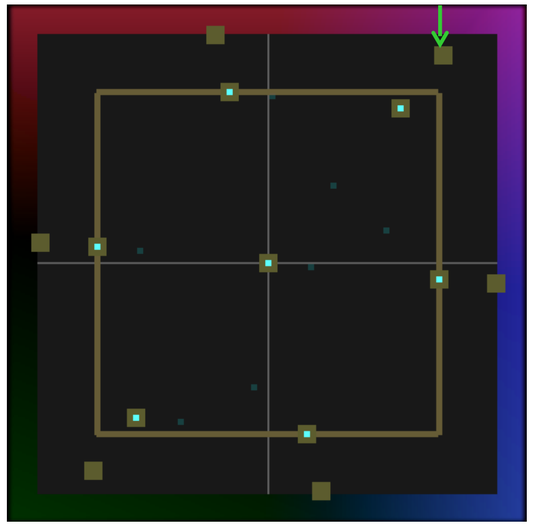
However, in this Mode low probability colors (e.g. colors of small size objects) are hardly noticeable.

Mode 3: **Fixed Gain x8**



x8 Gain provides for better visibility of **low probability colors** (e.g. colors of small size objects).

Mode 4: **Color Bars**



Mode 4 enables **Color Bars Target Boxes** (dark yellow squares) for:
SD (BT.601), HD (BT.709), UHD (BT.2100), 75% **and** 100% Color Bars

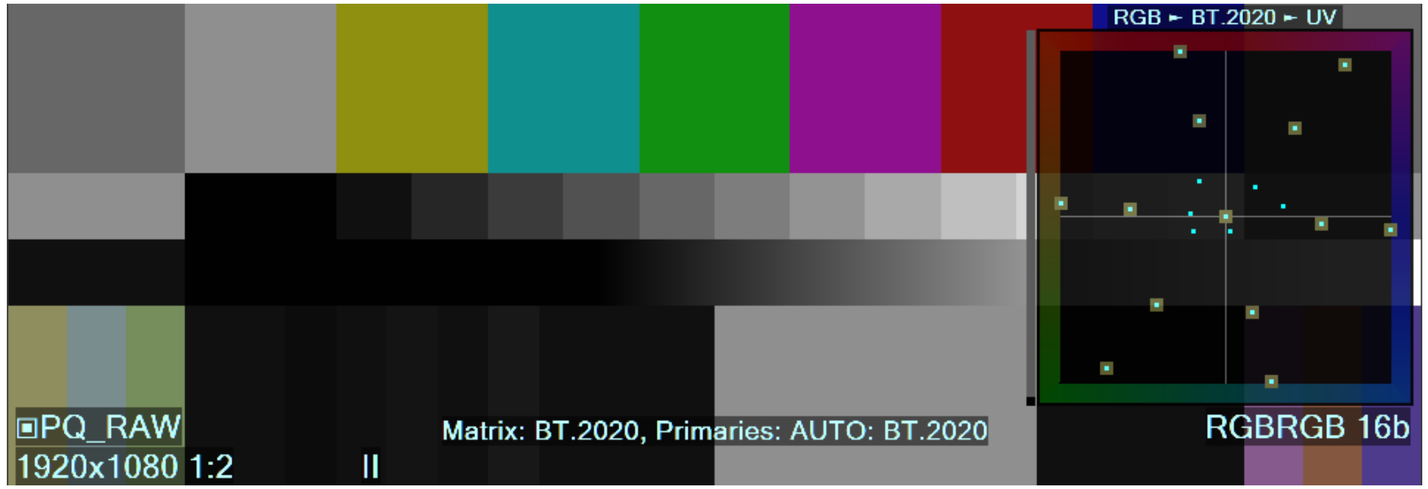
Also Gain value is adjusted and spot size increased providing for better visibility of actual Color Bars UV values and reduced visibility of spurious low probability colors, such as transitions and overshoots.

Medians and 100% peaks display disabled.

Checking HDR-PQ RGB Data vs. File Metadata

Press **Ctrl + V**
to toggle On/Off
VectorScope Overlay

Media file metadata correctly designate HDR-PQ RGB Narrow Range format.
Both 100% Bars and 58% Bars hit the centers of target boxes.



Media file metadata correctly designate HDR-PQ RGB Full Range format.
Both 100% Bars and 58% Bars hit the centers of target boxes.

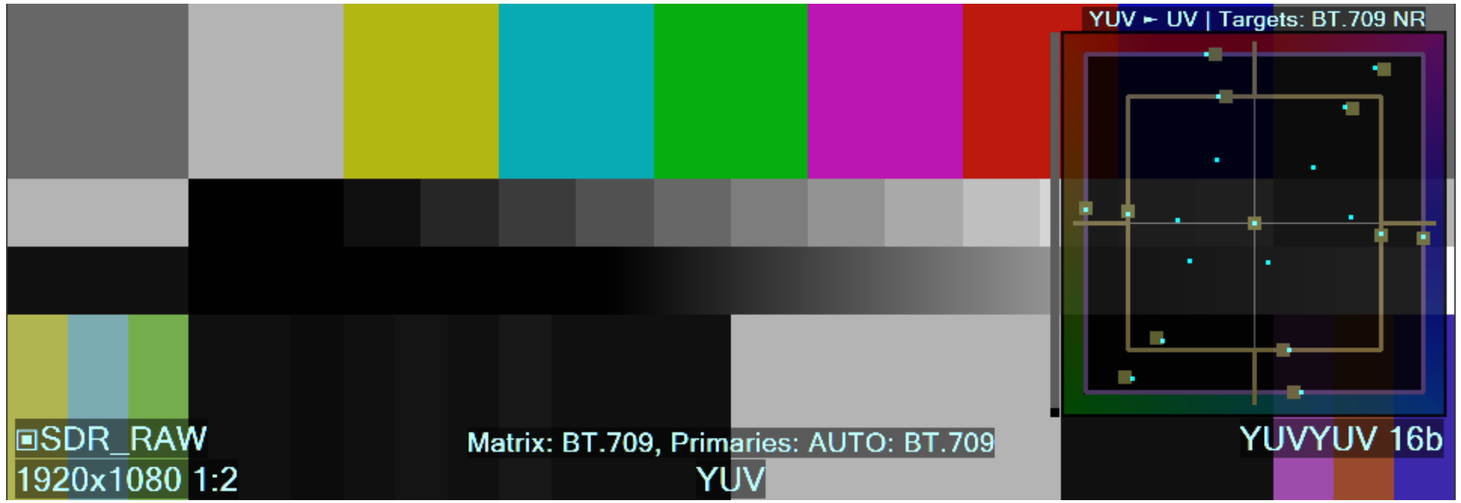
VQCB HDR-PQ Test
NR & FR RGB versions

Checking Color Matrix – VectorScope

HD file metadata correctly designate Color Matrix as BT.2020 (*probably, down-converted from UHD source*)

Press **Ctrl + V**
to toggle On/Off
VectorScope Overlay

HD file metadata are wrong; Color Matrix incorrectly reported as BT.709 (*default for HD frame size*)



Smart ChromaScope

Press **Ctrl + C**
to toggle On/Off
ChromaScope Overlay

The background is the low contrast semi-transparent image of the **Chromaticity Diagram** showing all colors within the **spectral locus**

Cyan colored overlay represents
Video Image Chromaticity Histogram
(*depending on the Color Space selection)*

File **Metadata Info** relevant for ChromaScope: **Color Matrix**, **Primaries** and **Transfer** function

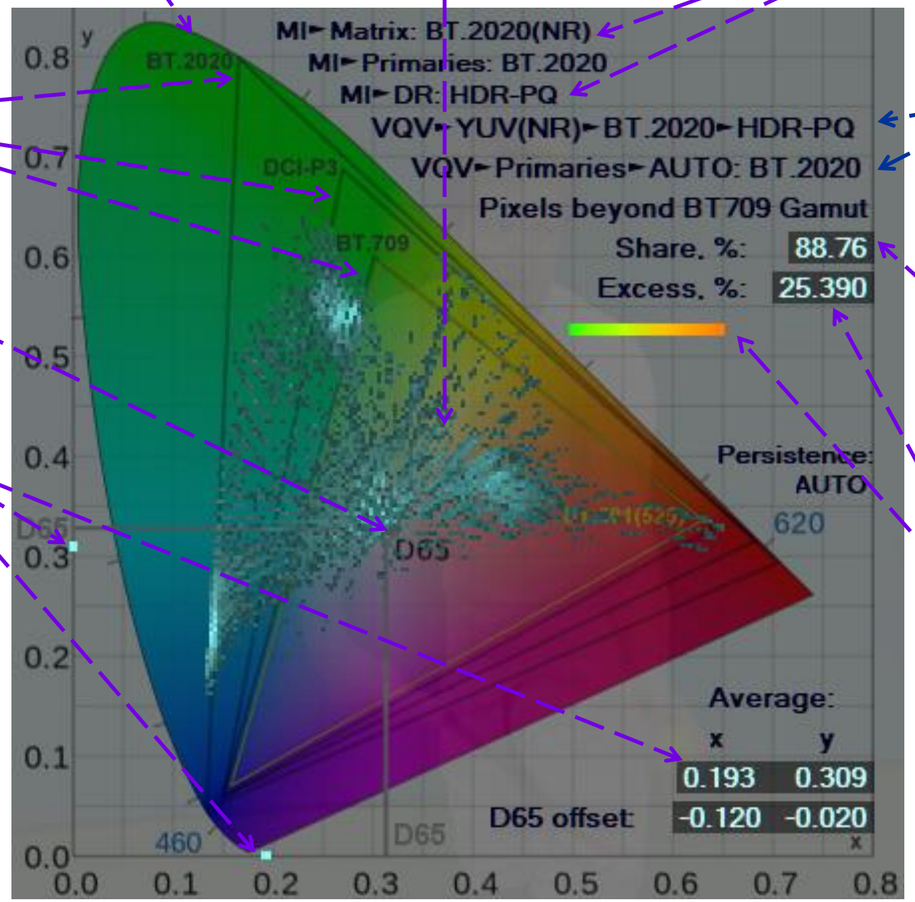
BT.2020, **DCI-P3**, **BT.709** and **BT.601 Primaries Gamut Boundaries** (color triangles)

Select **Color Space** via main ‘Color Space’ menu and ‘ChromaScope Primaries’ submenu. White point is not switchable, always **D65**

ChromaScope calculates and displays the **x** and **y** values of **Average Chromaticity** point and the offset of this point vs. the **D65 Reference White** point.

D65 Offset Markers on x and y axes are helpful for at-glance detection of the significant color shifts.

Typical color balanced video images have Average Chromaticity close to the D65 point, though for the example shown the dominance of green and blue colors is clearly visible.



User-selectable **VQV Color Processor** parameters, such as **Color Matrix**, **Primaries** and **Transfer** function, may or may not match the analyzed media file metadata.

If the selected Color Space is **BT.2020** or **DCI-P3** ChromaScope calculates and displays the **Share** of pixels having chromaticity beyond the limits of **BT.709** triangle, i.e. the percentage of colors **illegal** for the ubiquitous HD color space.

The integrated **Excess** value helps to estimate the relevance of such “difficult” pixels.
For fast estimation the Excess value is also displayed as color-coded **Bargraph** growing from Green to Red (logarithmic scale).

ChromaScope Presentation Modes

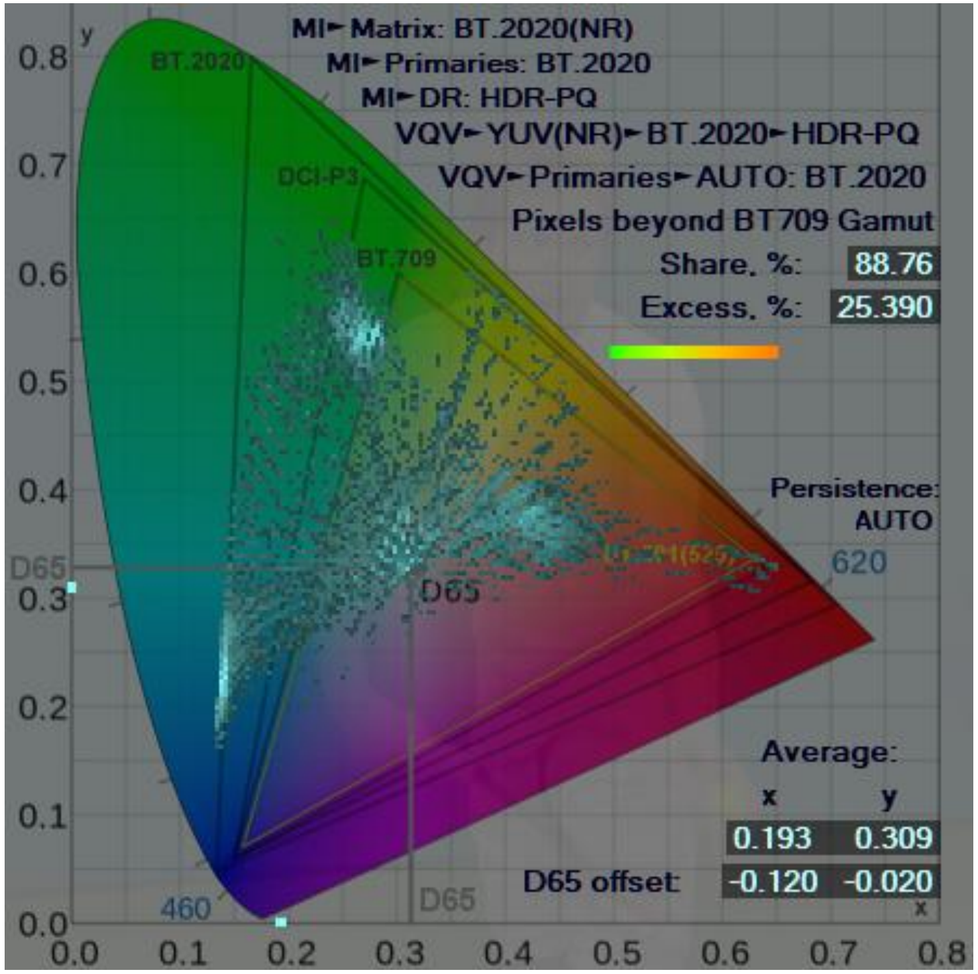
ChromaScope Presentation Mode 1 (*default)* shows media file metadata, the status of VQV color processing/analysis controls and the most important **Content Statistics** analysis results.

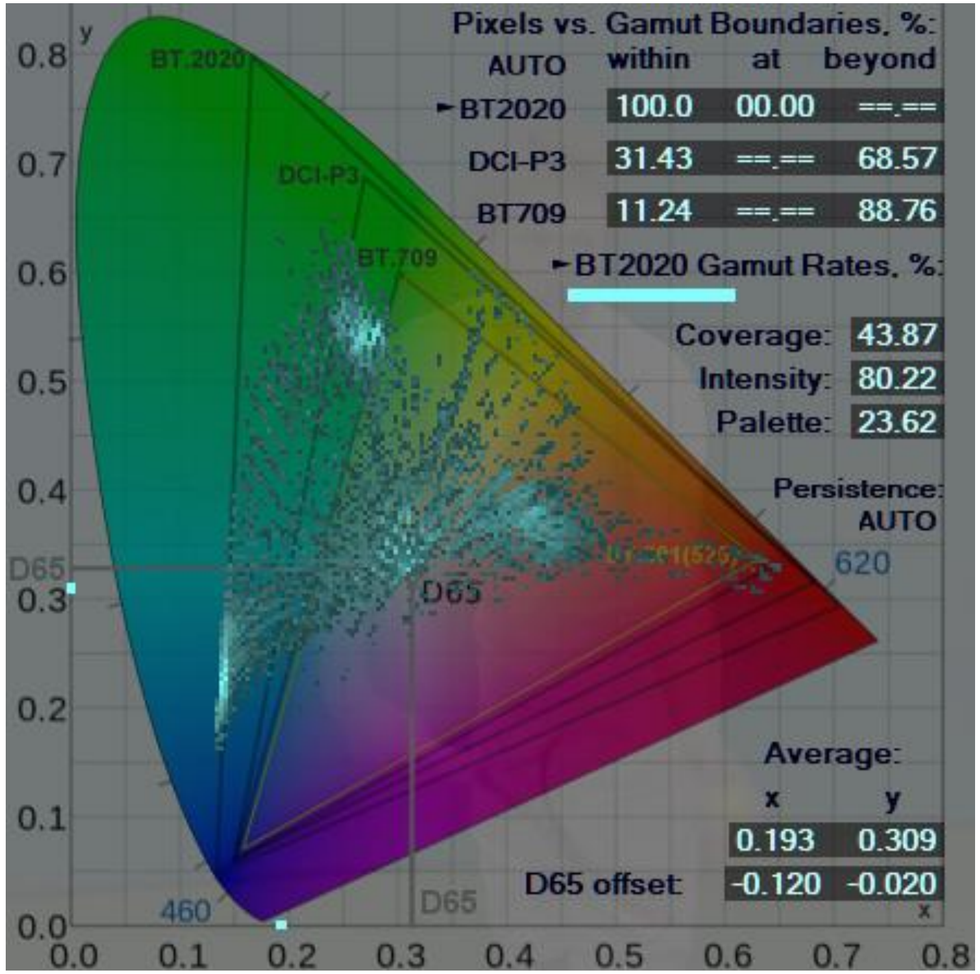
Press **M**

to toggle between

the **ChromaScope Presentation Modes**

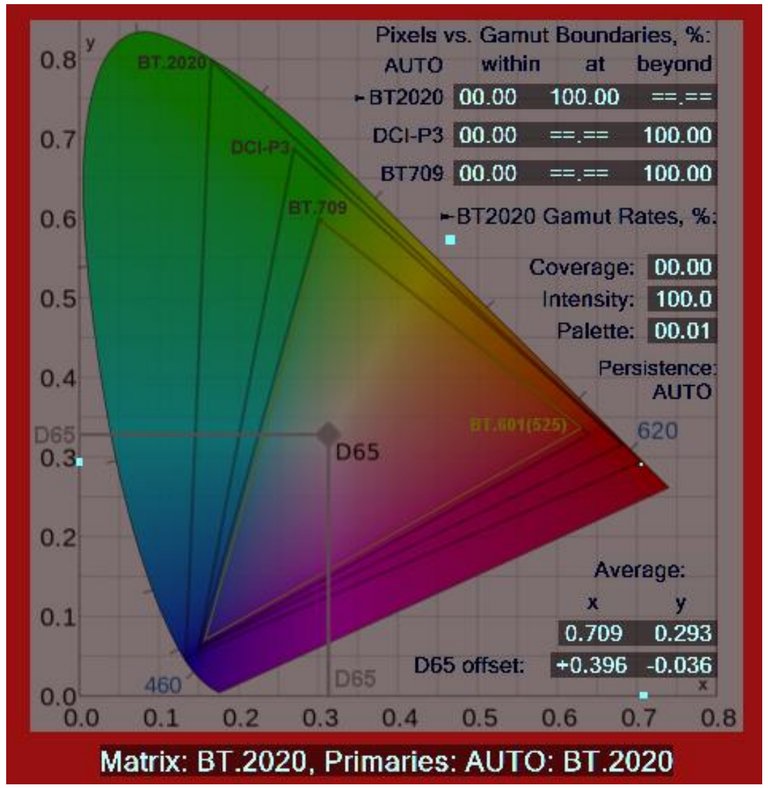
ChromaScope Presentation Mode 2 shows **Content Statistics Table** and **Gamut Rates** of the analyzed content as well as cyan-colored **Gamut Coverage Bar**.



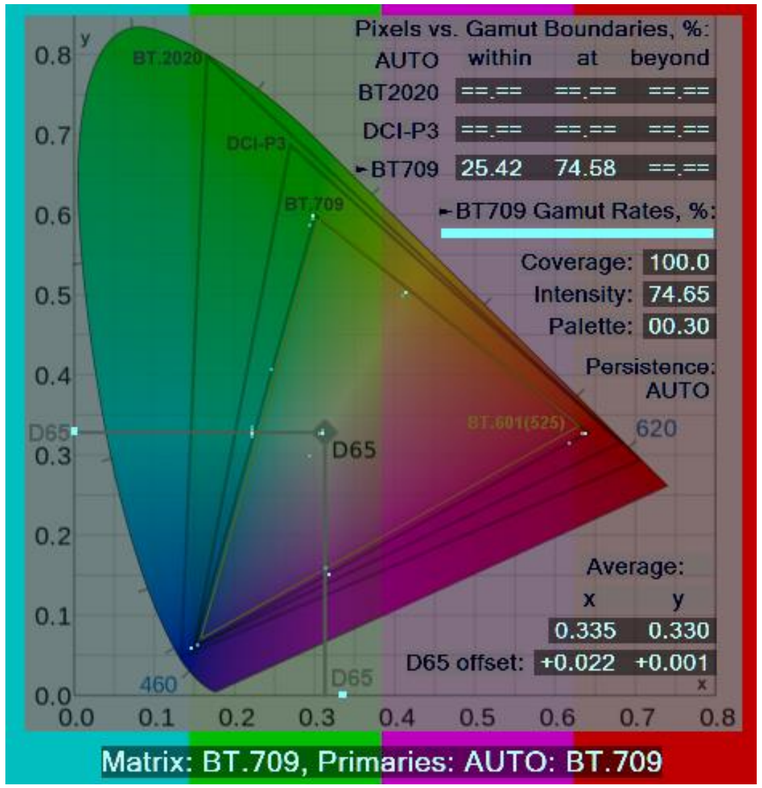


Content Gamut Analyzer Usage Examples

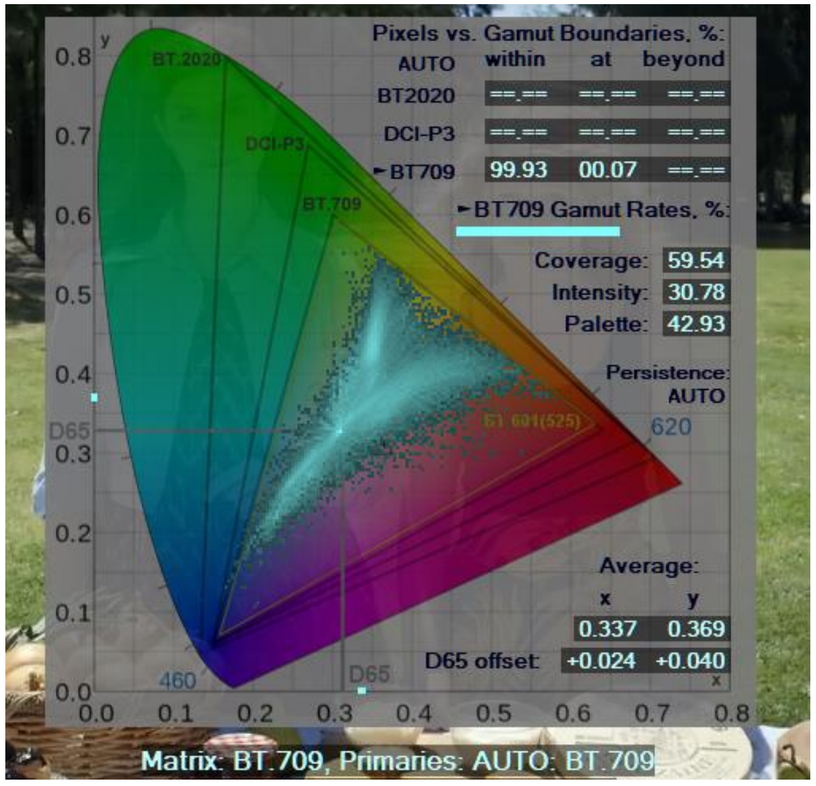
Example #1 – Solid Red UHD HDR-PQ Image.
Coverage Rate = 0% and Palette Rate is 0.01% because there is only one color present (Red).
Intensity Rate = 100% because this color is just Red, i.e. its Green and Blue components = 0.
Note 0% of pixels ***within*** the Gamut Boundaries, there are no other colors except Red,
i.e. 100% of pixels are ***at*** the Boundary.



Example #2 – Color Bars HD SDR Image.
Coverage Rate = 100%, i.e. the **Content Gamut** extent is equal to the **Primaries Gamut** extent.
Intensity Rate = 75% because only 6 of 8 Bars are colored (White & Black Bars Chromaticity = D65).
Thus, only 75% of pixels (6 of 8 Bars) are ***at*** the selected **Primaries Gamut Boundaries**; note the bright dot at the D65 Reference White point.

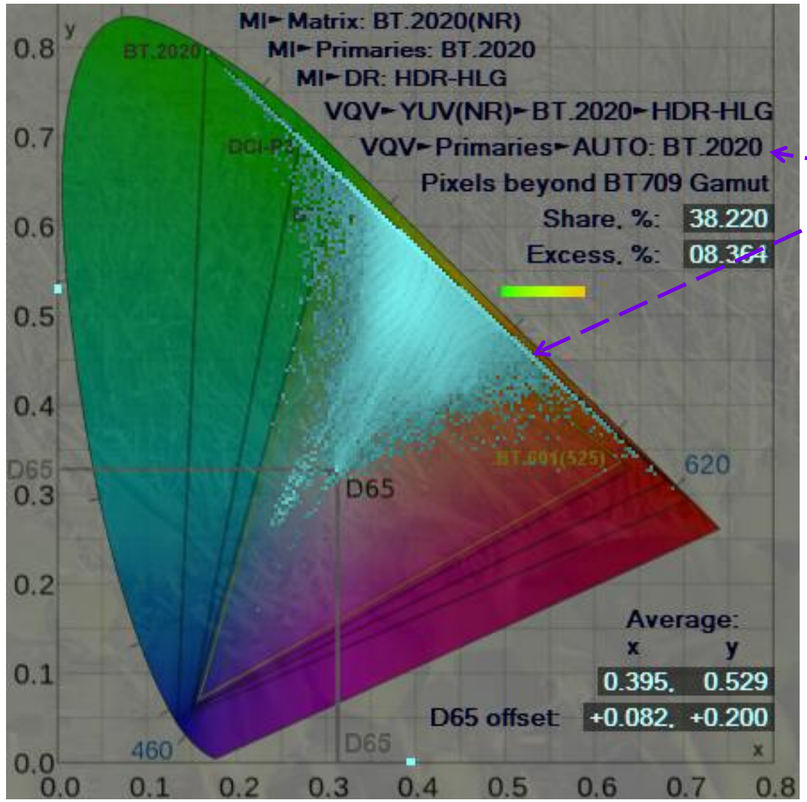


Example #3 – Typical HD SDR Video Image.
Coverage Rate is about 60% because the extent of the **Content Gamut** is noticeably smaller than the selected **Primaries Gamut**.
Intensity Rate is about 30% because the dominant colors (brighter cyan areas) are of low and medium saturation.
Palette Rate 43% indicates the relative value of measured **Content Gamut Area**.



Selecting ChromaScope Primaries

By default ChromaScope uses **AUTO** color space selection, typically defined by media file metadata. In this example **BT.2020** Primaries are used.



Press **Shift + P**

to cycle thru

the **ChromaScope Primaries**

from auto-configurable list

Use **Color Space>Select Primaries** menu for manual selection:

- **BT.2020**
- **DCI-P3**
- **BT.709 / BT.601 (625)**
- **BT.601 (525**)

Switching **Primaries** provides for quick visual estimation of chromaticities distributions within **Gamut Triangles**.

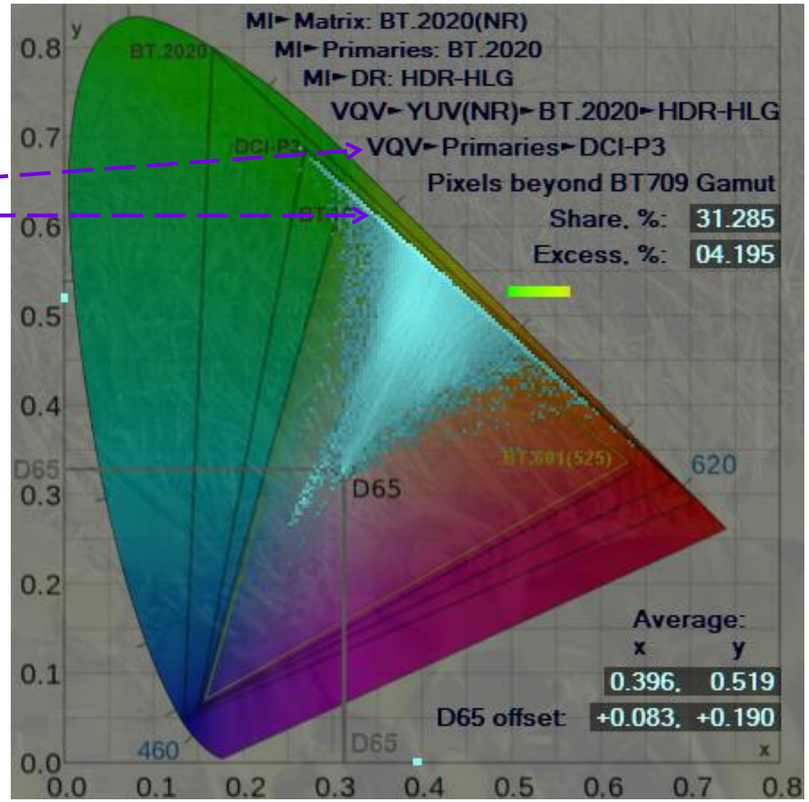
Double Click on ChromaScope pop-up window to cycle thru the most used **Primaries** (BT.2020/DCI-P3/BT.709) and two ChromaScope **Presentation Modes**.

Press **A**

to **AUTO** select

the **ChromaScope Primaries**

In this example ChromaScope use **DCI-P3** color primaries (medium size triangle) selected **by the user** instead of AUTO selected (default) BT.2020 color primaries

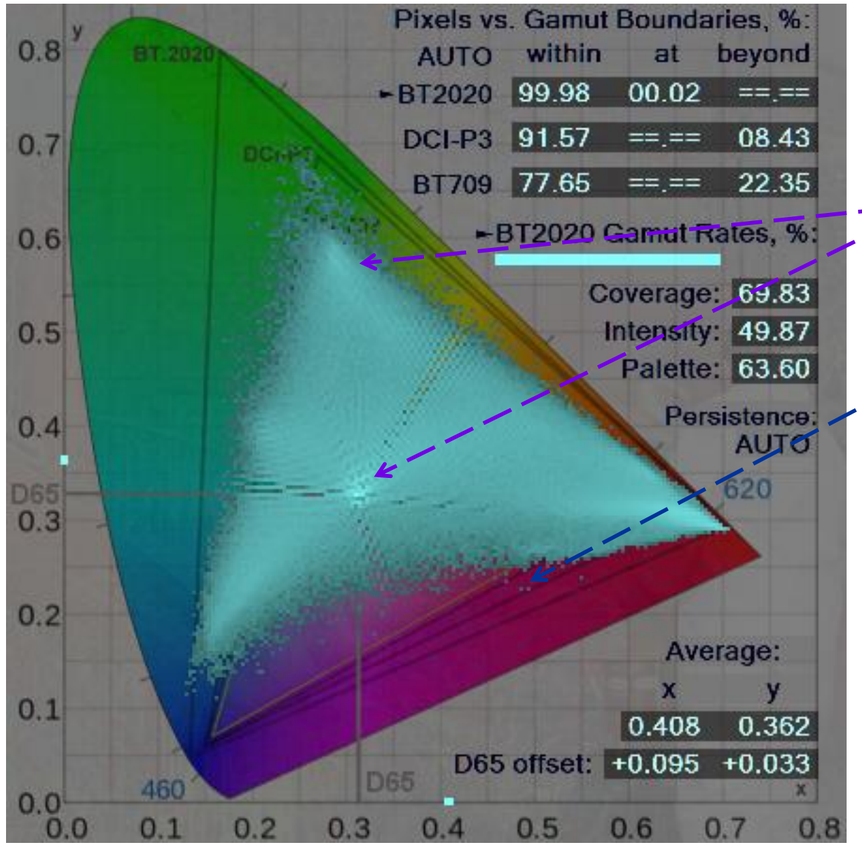


ChromaScope Display Persistence Modes

In the default **AUTO Persistence Mode**
the Cyan overlay color intensity is proportional to the logarithm of the probability (events frequency).
Total range is 100 dB (5 decimal orders).

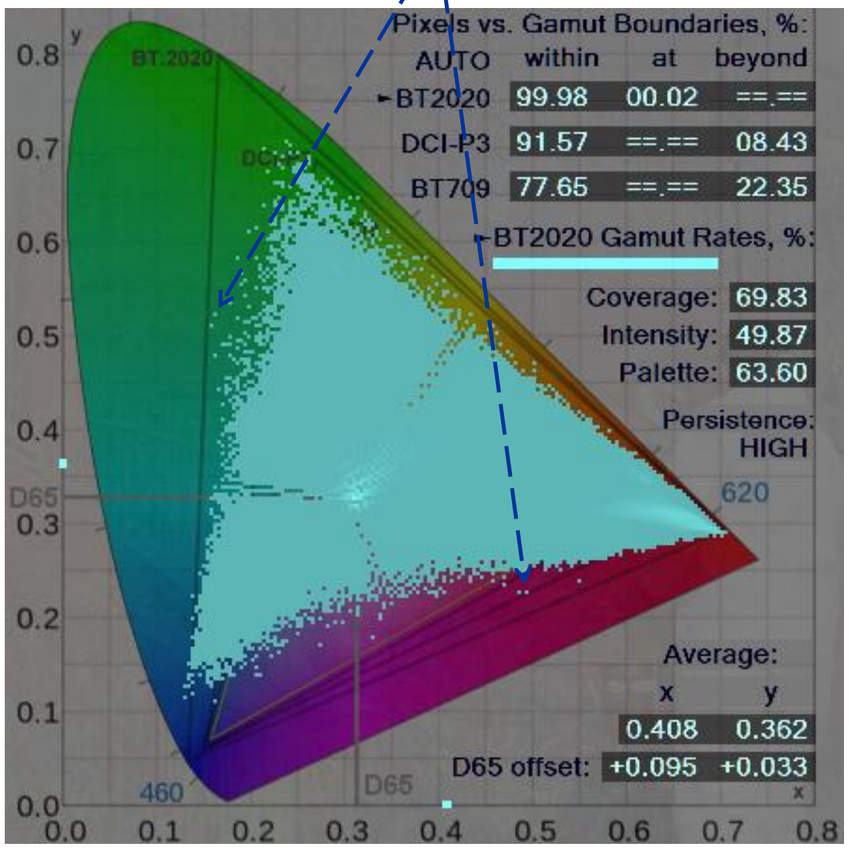
Press **P**
to change
the **ChromaScope Persistence**

In **High Persistence Mode**
the overlay minimum brightness is lifted up; even very low probability events are clearly visible.



High probability events look brighter, thus allowing to see 2D distribution profile,

but extremely low probability events could be difficult to see.



ChromaScope Plotting Modes

The traditional **CIE1931 xy** color space is still widely used.
For example, the display Primaries and D65 White Point are typically specified as x & y values.
By default VQV ChromaScope starts in this mode.

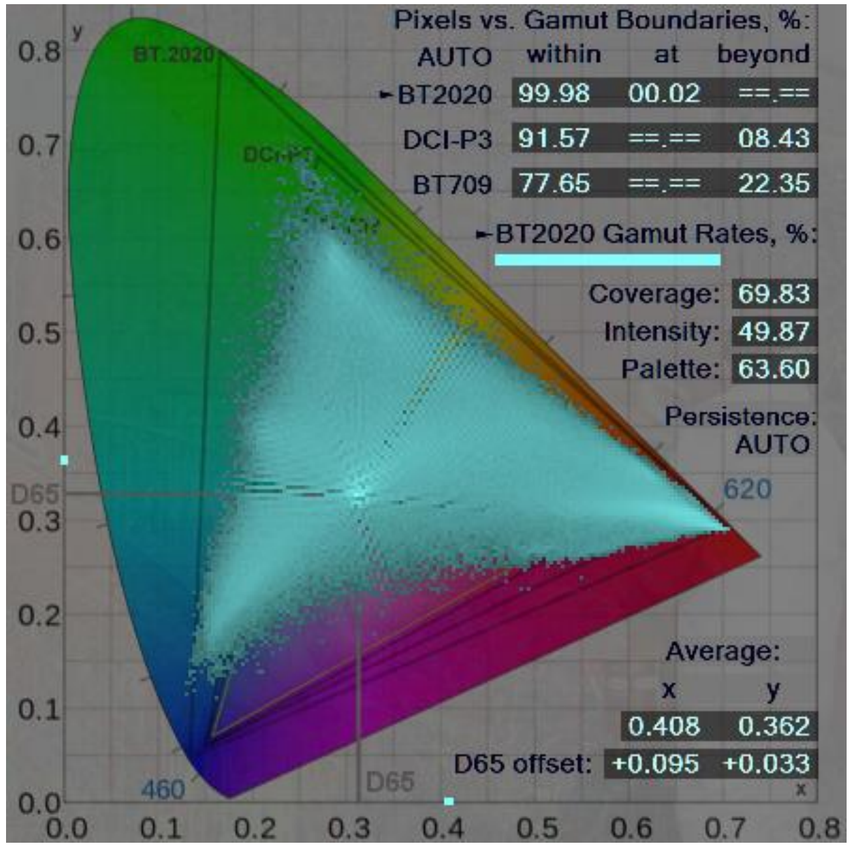
Press **U**

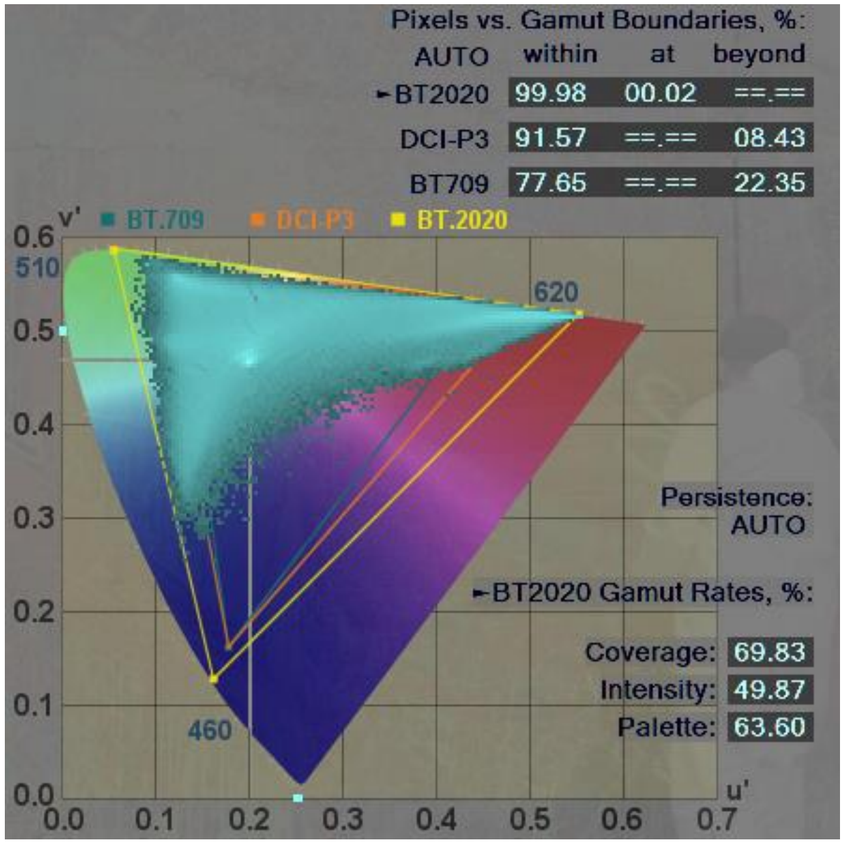
to change

the **ChromaScope Plotting Mode:**

CIE1931 xy / CIE1976 u'v'

The main advantage of **CIE1976 u'v'** color space, commonly known by its abbreviation CIELUV, is the uniform chromaticity scale (UCS).
The disadvantage is the reduced resolution in subjectively important tints of green area, due to the increased resolution within the less critical Blue-Magenta-Red area.

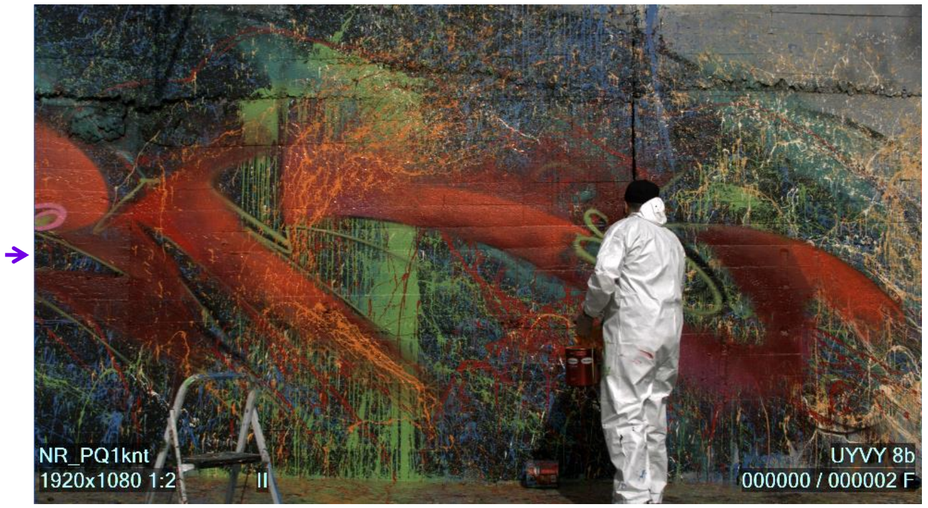




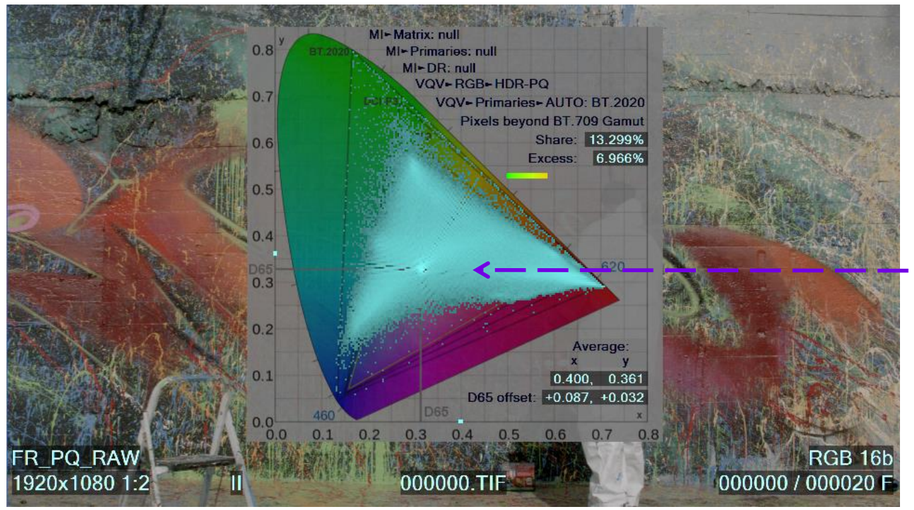
ChromaScope HDR Content Analysis Example

RGB 16 bit, TIF, HDR-PQ Original

RGB 16 bit ⇒ YUV 8 bit ⇒ RGB 8 bit



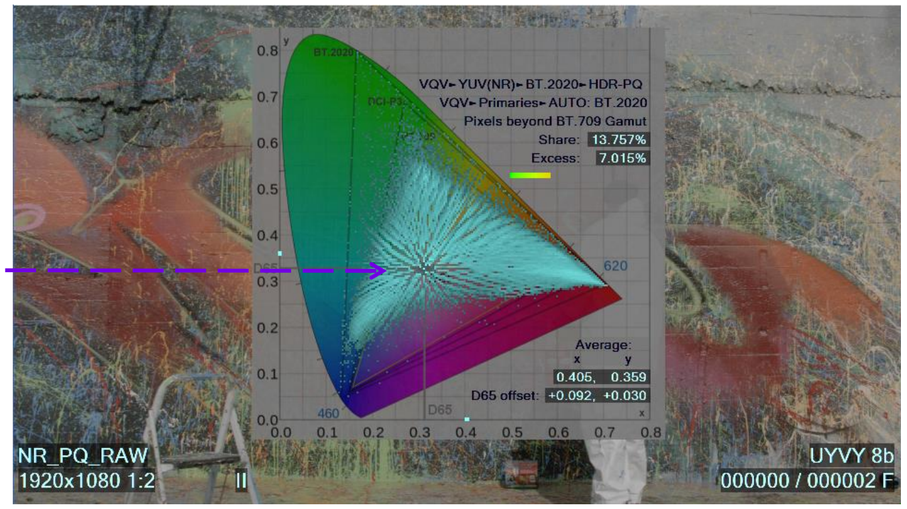
Original Image
and
Reconstructed Image
look very similar.



Magic bit!

VQV ChromaScope
reveals **coarse**
quantization artifacts:

Smooth Distribution
on the left
vs.
“Herringbone Pattern”
on the right



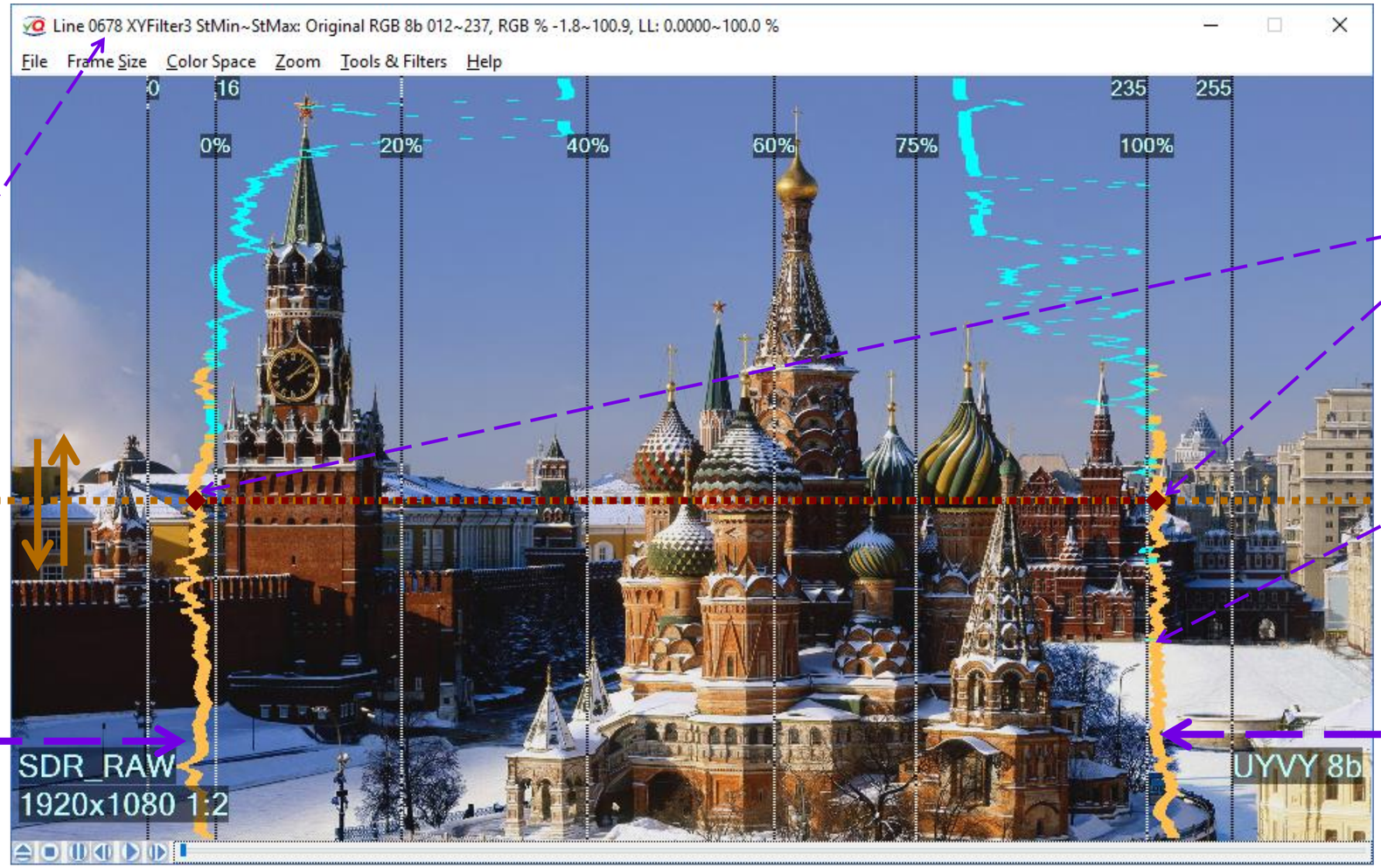
HDR sample video – courtesy of Sony

FrameScope Waveform Tool

Press **W** key
to toggle On the
FrameScope™
Overlay.
(Frame Profile Waveform)

Line Number and
the corresponding
Title Bar
Numerical Readout
values are defined
by the **Mouse Cursor**
vertical position

RGB / LL **Line Statistics**
Min value
updated line-by-line



Frame Profile Waveform
shows the
Current Line
RGB / LL Range
from Min(R,G,B) to Max(R,G,B)

RGB / LL
Min & Max value
beyond the valid range
(from 0 % to 100 %)
are shown in **Yellow**

RGB / LL **Line Statistics**
Max value
updated line-by-line

The **Graticule** vertical lines positions can be switched from **RGB Levels** in **percents** of the Reference White to **Light Levels** in **nits** or **percents** – Shortcut: **U**.

In **SDR** mode the graticule units are percents of RGB or LL range. In **HDR RAW** modes the graticule vertical dotted lines represents BT.2100 light levels.

In down- and cross- conversion modes 100% line may represent the selected **TDMB** (**T**arget **D**evice **M**ax **B**rightness) value.

FrameScope Waveform Filtering Options

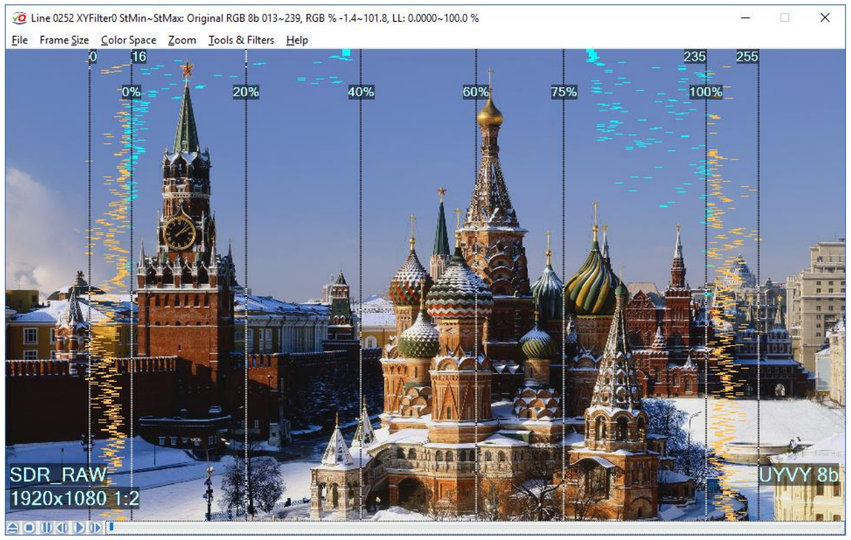
Press **F** key

to cycle through the

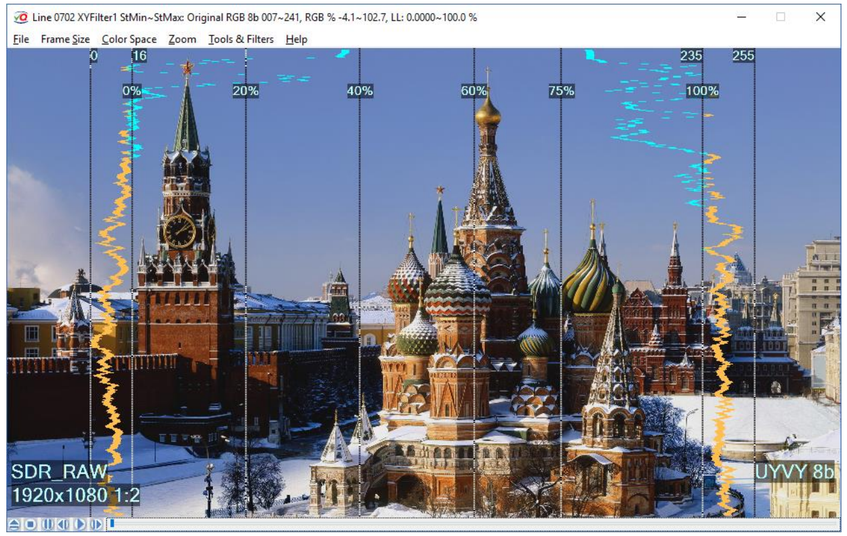
Frame Profile

Filtering Options

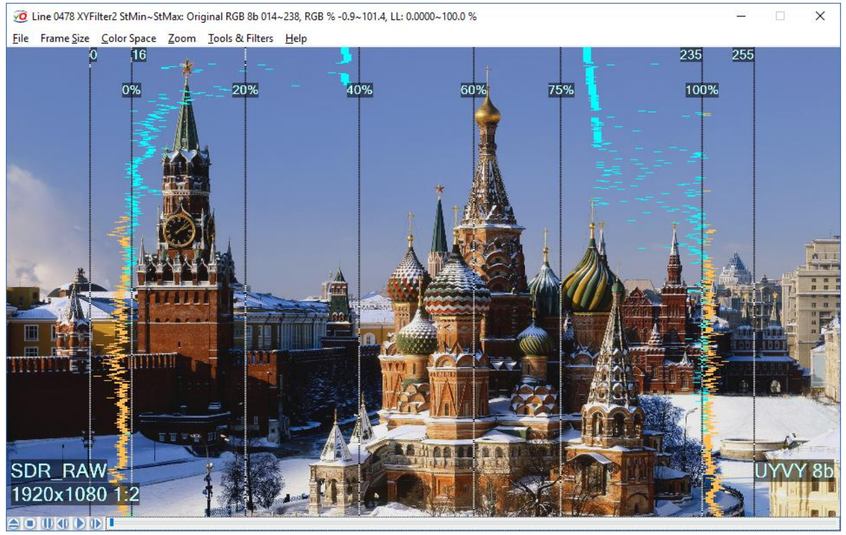
XYFilter0 – Filtering **Off**



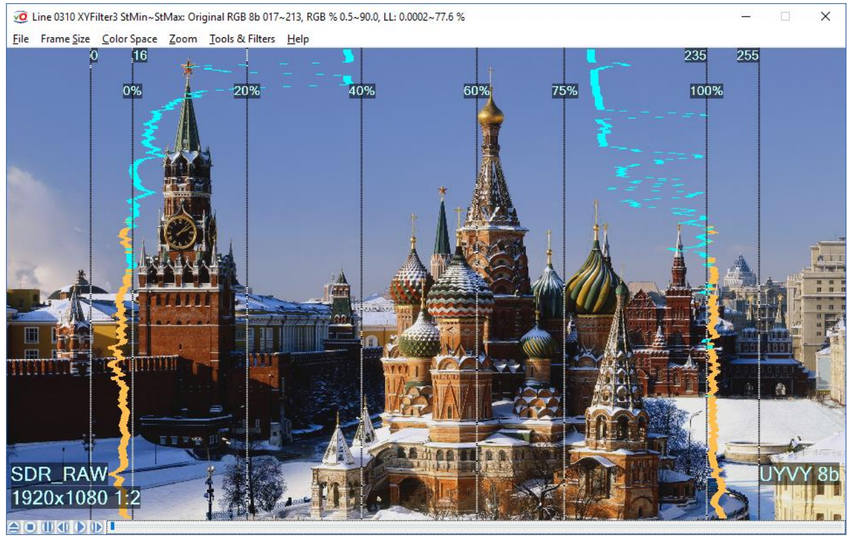
XYFilter1 – Vertical (Y) Filter, Running Sum of adjacent lines



XYFilter2 – Horizontal (X) Filter, Relevant Statistics Pixels



XYFilter3 – Both X & Y Filters On ***(default)***

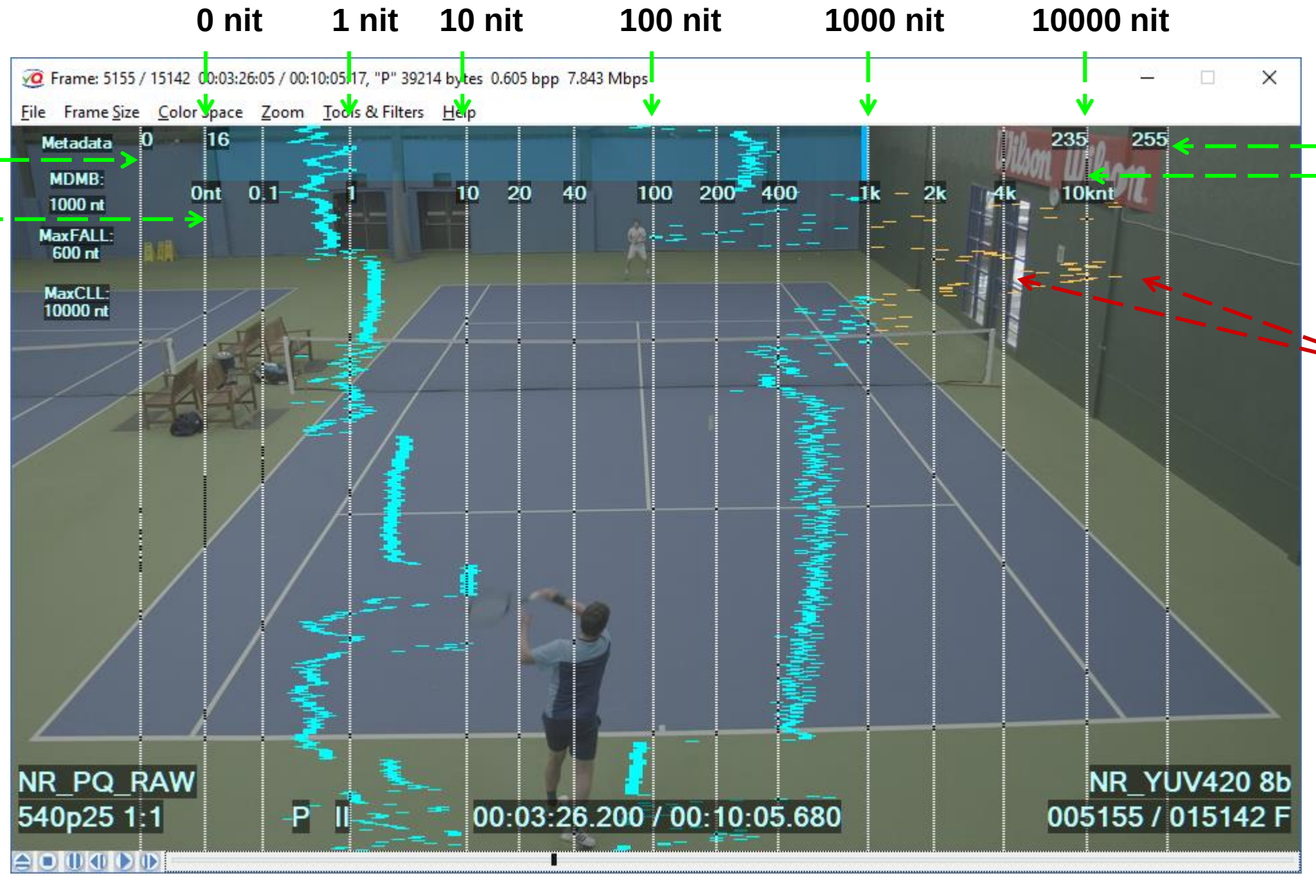


HDR-PQ Light Levels Frame Profile Example

Press **1**
to enable the
PQ-RAW Mode

Press **W**
to toggle On the
FrameScope™
(Frame Lines Profile)
Waveform Overlay

Light Levels Reference Markers (dotted lines) overlay



Data range min 8 bit limit = 0

Nominal Black = 16

Data range max 8 bit limit = 255

Narrow Range Limit = 235

More than 10,000 nit limit!
Very strong overexposure,
due to the bright object
(swimming pool glass door)

Checking HDR10 content. HDR10 metadata specify Narrow YUV Range and MDMB/TDMB = 1000 nit

Analysis conclusion: Though, this is a valid **HDR-PQ** clip, formatted into **Narrow Range YUV**, and on average **matching** the declared **1,000 nit TDMB** limit, but in this particular frame the lightest pixels are not only above **1,000 nit**, but above the **10,000 nit** limit of the **Narrow Range YUV format**.

HDR sample video – courtesy of newsbyte.co.uk

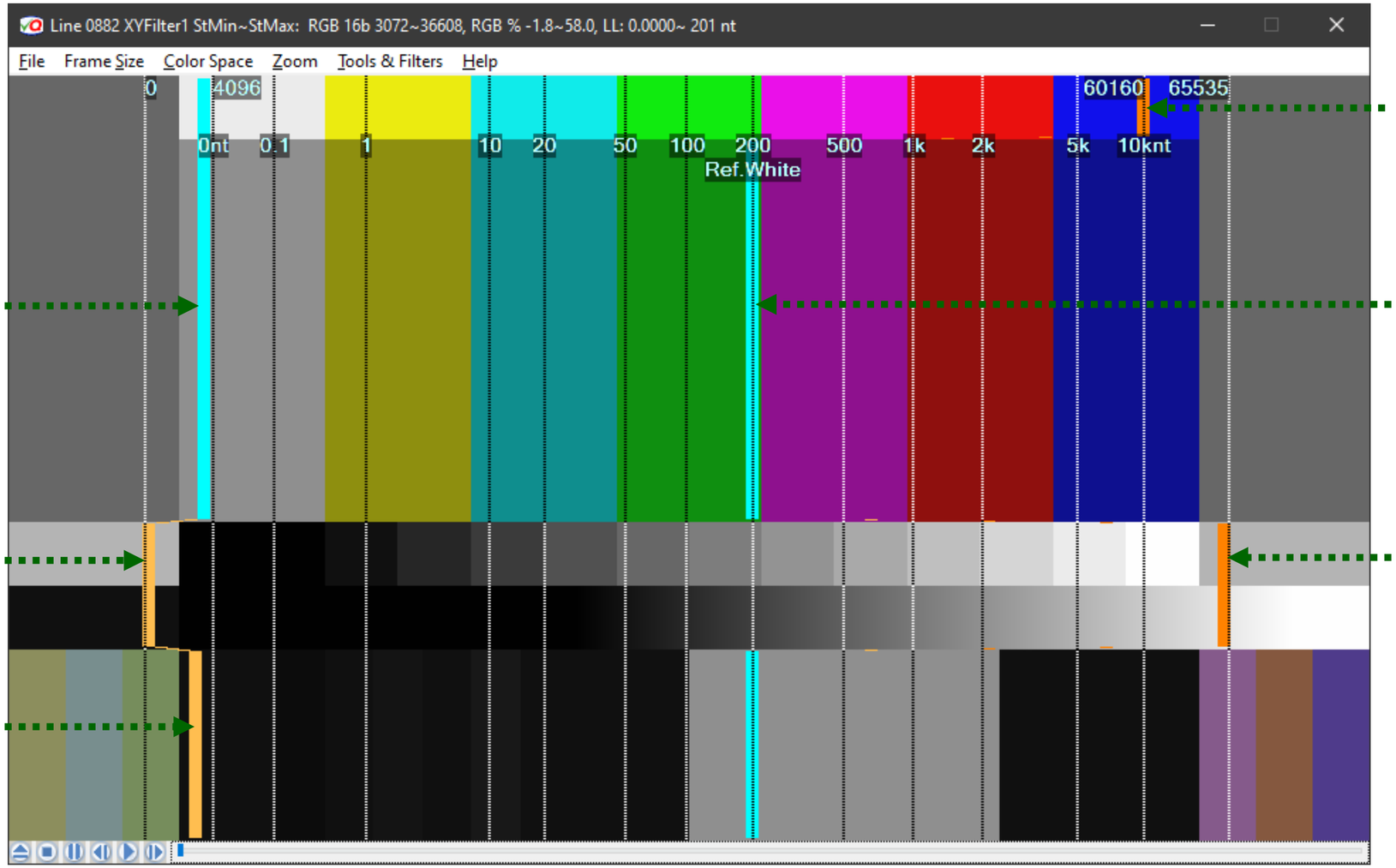
Checking HDR-PQ YUV Data Levels – FrameScope

YUV 16b data are correct: FrameScope shows correct NR HDR-PQ levels

Press **W**

to toggle On the **FrameScope™** (Frame Lines Profile) Waveform Overlay

HDR-PQ Mode: Graticule Units auto-switched to nits, top row shows actual 16b values



100% Bars
Max Level: 16b 60160
100% ⇔ LL 10,000nt
Peak White

100% Bars & 58% Bars
Min Level: 16b 4096
0% ⇔ LL 0nt

58% Bars
Max Level: 16b 36608
58% ⇔ LL 200nt
Reference White

Grayscale & Ramp
Min Level: 16b 252
-6.8% ⇔ LL 0nt

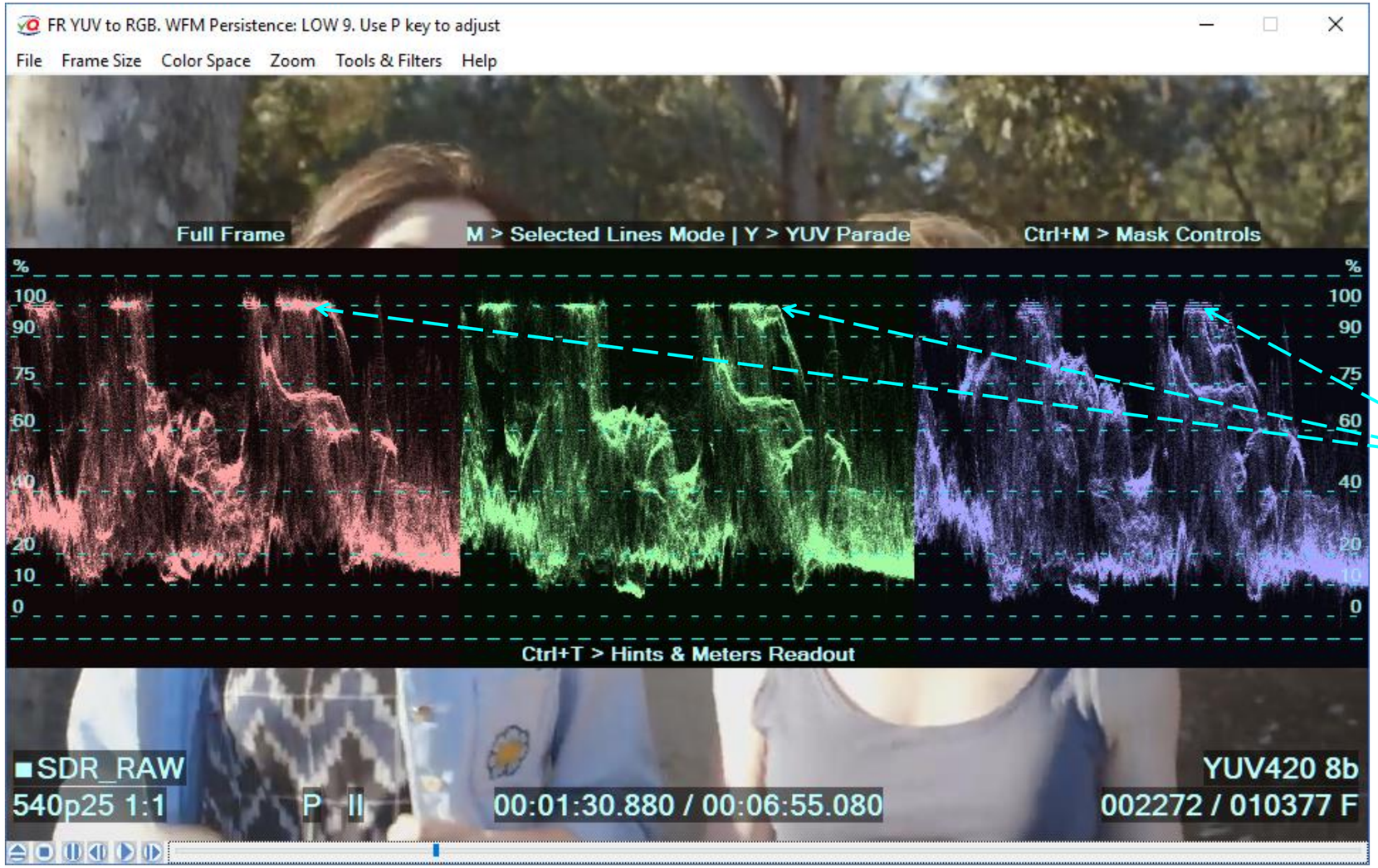
Grayscale & Ramp
Max Level: 16b 65024
109% ⇔ LL 10,000nt

PLUGE
Min Level: 16b 3072
-1.8% ⇔ LL 0nt

HDR sample video – courtesy of newsbyte.co.uk

Line Parade Waveform Monitor – Visual Analysis Tool

Press **Ctrl + W**
to toggle On the
Line Parade Waveform



RGB Line Parade Waveform Mode provides for easy **correlation** of the object **horizontal position** and the corresponding video **signal levels**

.

Note the **high density** of **Red** & **Green Waveforms** near the **100% (Ref.White)** marker of the Graticule (*not so strong for **Blue***).

It means massive clipping of white and yellow tones

.

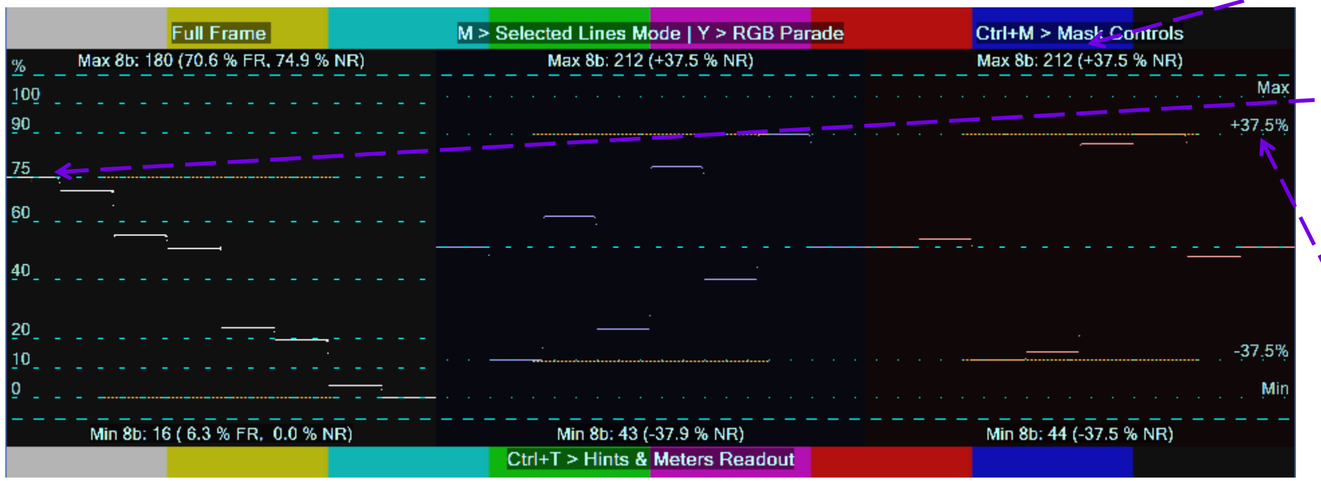
SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Line Parade Waveform Options

Press **Y**
In Line Parade Mode
to toggle
RGB / **YUV**

9 key
toggles
Full / **Narrow**
YUV Range Mode

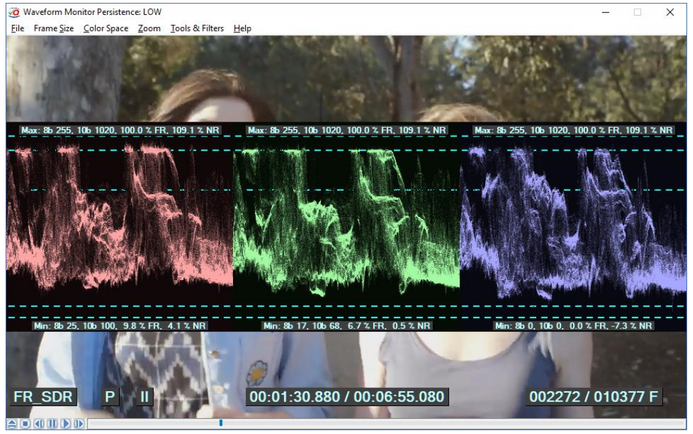
YUV Narrow Range Line Parade, 75% UHD Color Bars



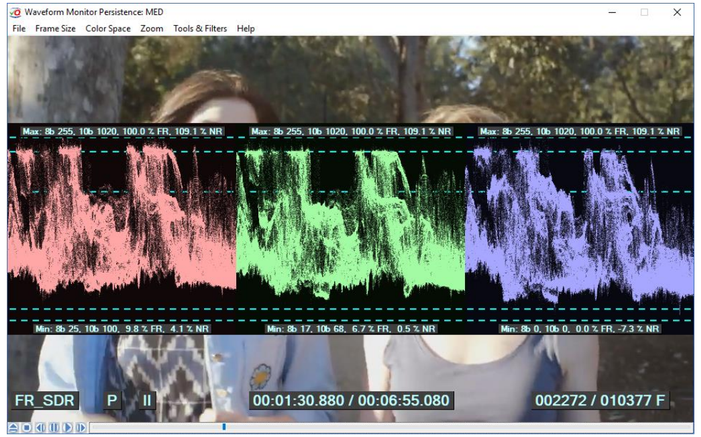
Waveform Monitor displays the **numerical readouts** of:
Min & Max values for **R**, **G**, **B**, **Y**, **U** and **V** channels in
8 bit digital values and **percents**.

Critical Reference Levels Markers (cyan dotted lines):
- **Full Range Limits: 8b 0** and **8b 255**,
- **Narrow Range Limits:**
  Y: 8b 16 (*10b 64, 0%)* and **8b 235** (*10b 940, 100%),*
  UV: 8b 16 (*10b 64, -50%)* and **8b 240** (*10b 960, +50%),*
- **75% Sub-range Limits** *(for HLG Reference White and Color Bars)*:
  Y: 8b 180 (*10b 720, 75%),*
  UV: 8b 44 (*10b 176, -37.5%) and* **8b 212** (*10b 848, +37.5%)*

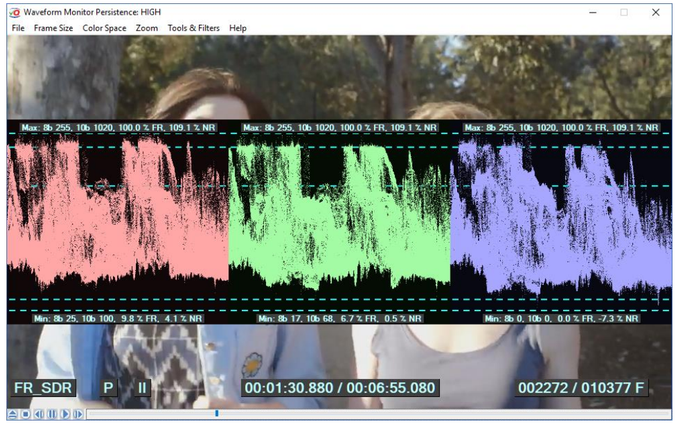
P
controls the
Persistence
strength:
from **Low** to **High**



Low Persistence (default mode) is useful
for the **general assessment**,
e.g. for the "white crush" check



Medium Persistence reveals pixel values of a
lower occurrence rate (smaller objects)



High Persistence reveals pixel values of the
lowest occurrence rate (the smallest objects)

Line Select Mode

Press **Ctrl + W**
to toggle On the
Line Parade Waveform

Press **M**
to toggle
Full Frame / **Line Select** Modes

Ctrl + M
enables
Mask Controls:

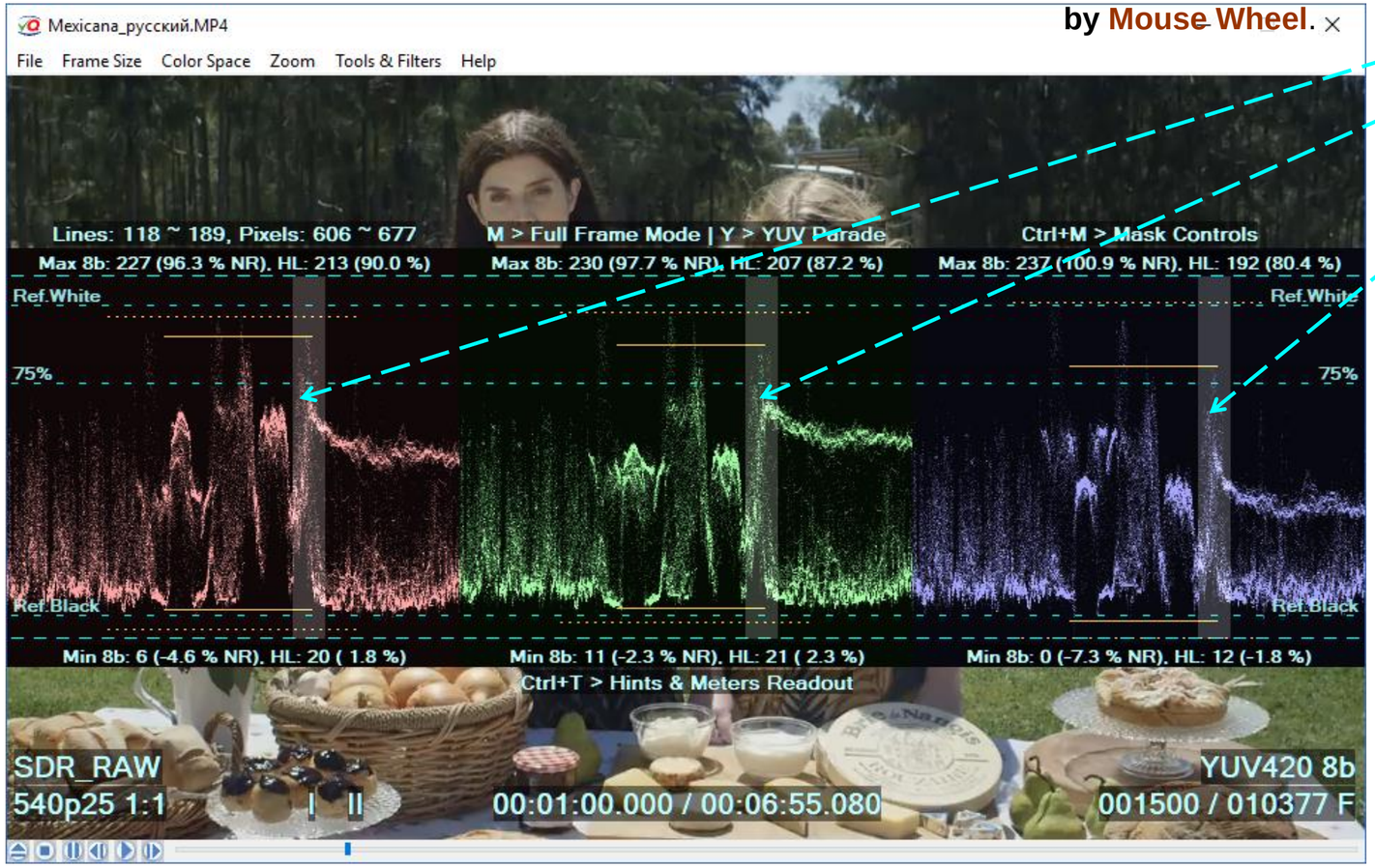
Step 1

Adjust **Line Range Mask**
Vertical Position**:**
by Mouse Cursor
and **Mask Size:**
by Mouse Wheel.

Square **Highlighted Mask**
defines **Pixel Number Range.**
Adjust the Horizontal Position
by moving the **Mouse Cursor**

Press **M**
again to show
RGB/YUV Waveforms
in **Line Select** Mode

Step 2



Mouse Double Click
is a handy shortcut to
cycle thru 4 modes**:**

1. Full Frame WF
2. Mask adjustment
3. Line Select WF
4. Full Frame WF

In Line Select Mode
the **R**, **G**, and **B** (or Y, U, V)
Min and **Max** values
are calculated separately:

- for the **Full Frame Area**

- for the **Square Mask Area:**
  i.e. for the highlighted Pixels
  within the highlighted Line Range

.

SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Line Parade Waveform – HDR-PQ Example

Press **Ctrl + W**
to toggle On the
Line Parade Waveform

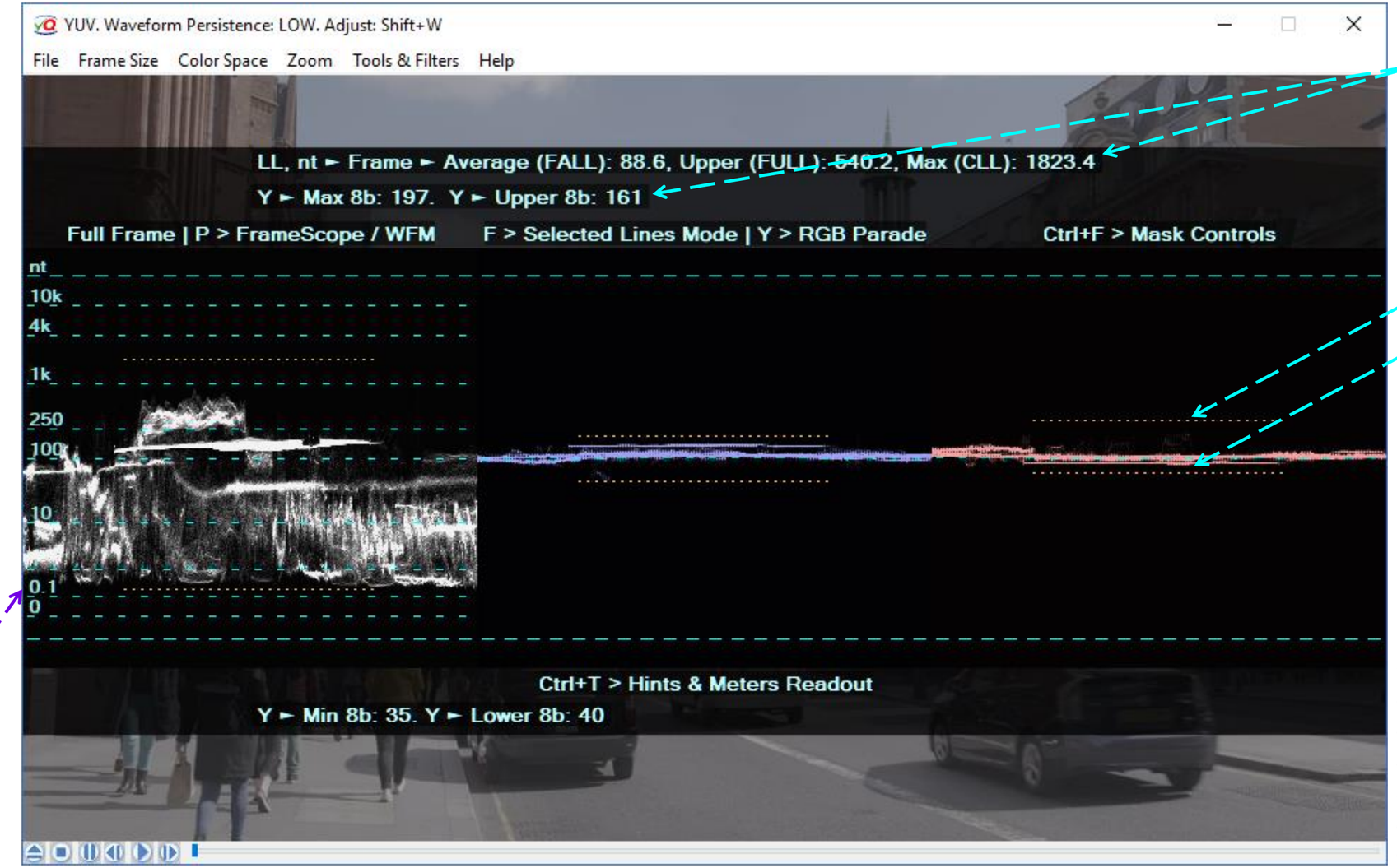
Press **1**
to enable
HDR-PQ RAW Mode

Press **Y**
to select **YUV**

Press **9**
to select
Narrow YUV Range

Press **Ctrl + T**
Cycle to
Full Info Text Mode

Y signal levels **Graticule** automatically switched to **PQ nits**



Measured LL and Y levels readout

Dotted line markers show measured signal range updated frame-by-frame

.

Seldom happening narrow signal peaks could be difficult to see even in high persistence mode.
Brown dotted line markers and numerical readouts reveal actual YUV/RGB/LL ranges

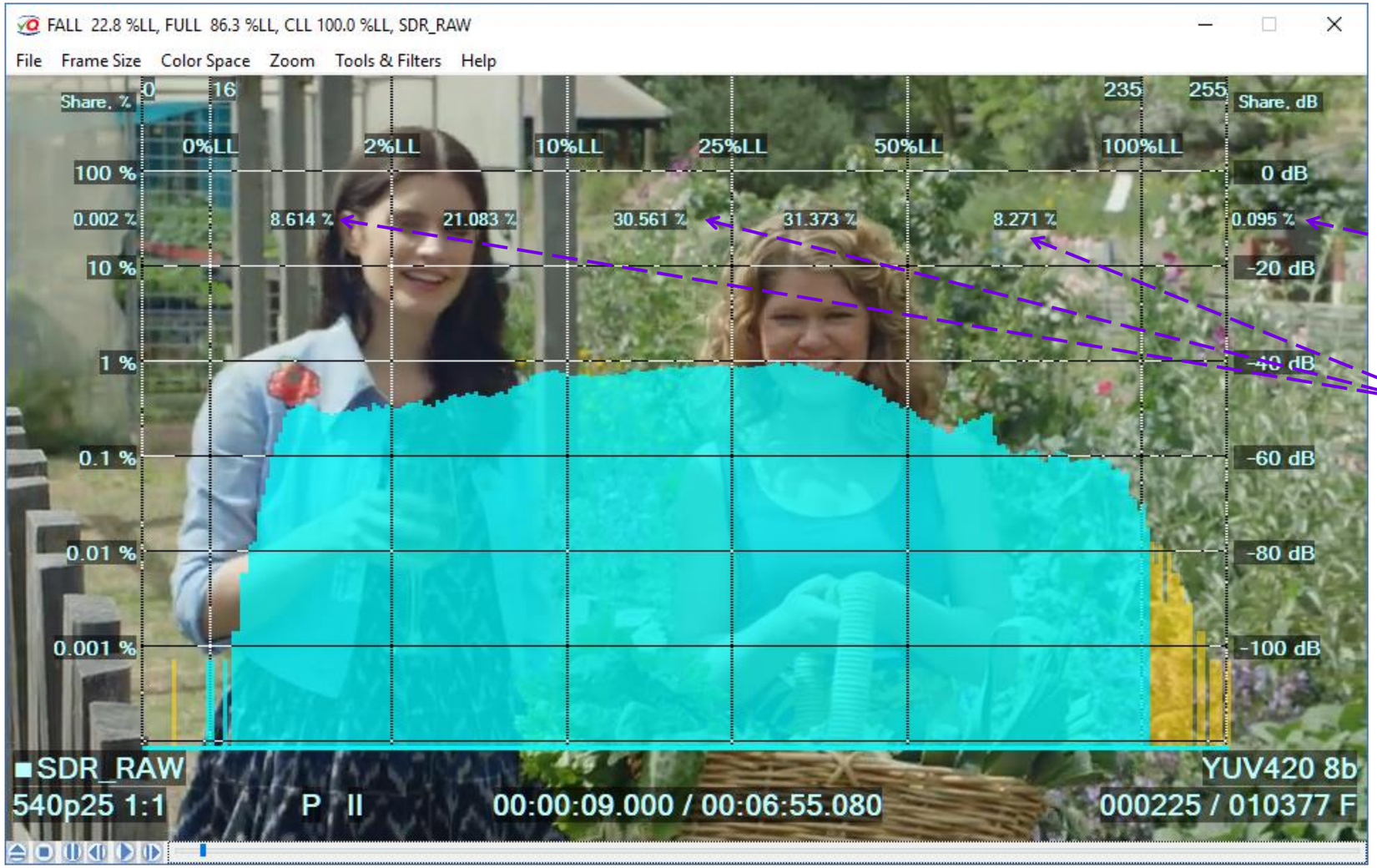
Frame Histogram Tool

Press **H**
to toggle On the
Frame Histogram Overlay

Digits keys *are shortcuts to some common* ***Dynamic Range Modes****:*

- ***0*** *– SDR = default mode*
- ***1*** *– HDR-PQ RAW*
- ***2*** *– HDR-PQ>SDR*
- ***3*** *– HDR-HLG RAW*
- ***4*** *– HDR-HLG>SDR*
- ***5*** *– LOG-RAW*
- ***6*** *– LOG>HLG*
- ***7*** *– LOG>SDR*
- ***8*** *– MSB/LSB Images*
- ***9*** *– YUV range toggle*

E.g. press **0**
to enable the default
SDR RAW Mode



Some **white clipping** takes place, but **0.095 %** of the total screen area is an **acceptable** value

All sub-ranges are more or less **evenly populated**.

It means **good** SDR image

The default **Histogram Overlay Mode** is the **Light Levels Histogram** shown above

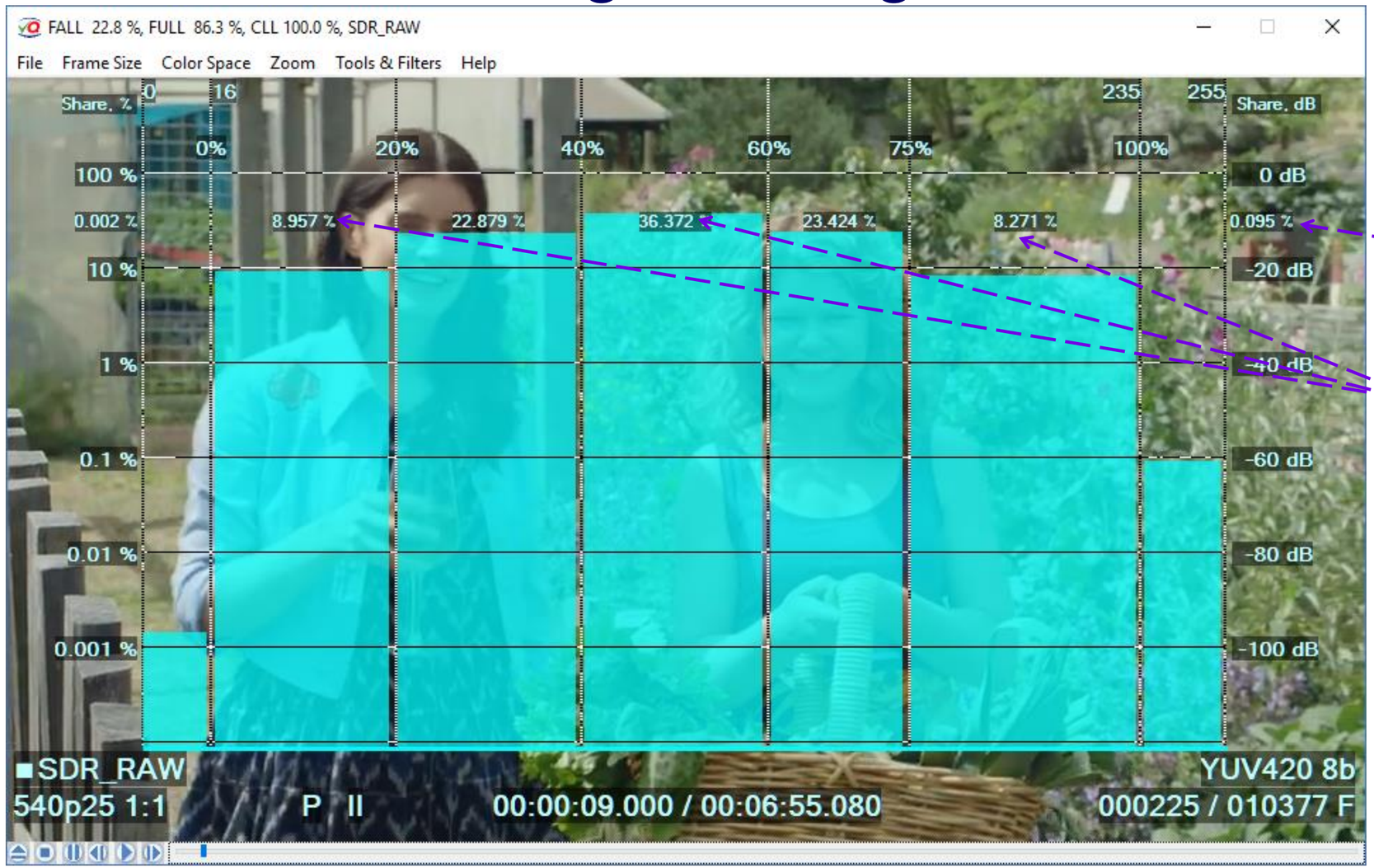
SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Sub-ranges Histogram

Press **H**
to toggle On the
Frame Histogram Overlay

Press **Ctrl + H**
to toggle On the
Alternative Sub-ranges Histogram

Press **U**
to toggle the
RGB / Light Levels
Units & Graticules



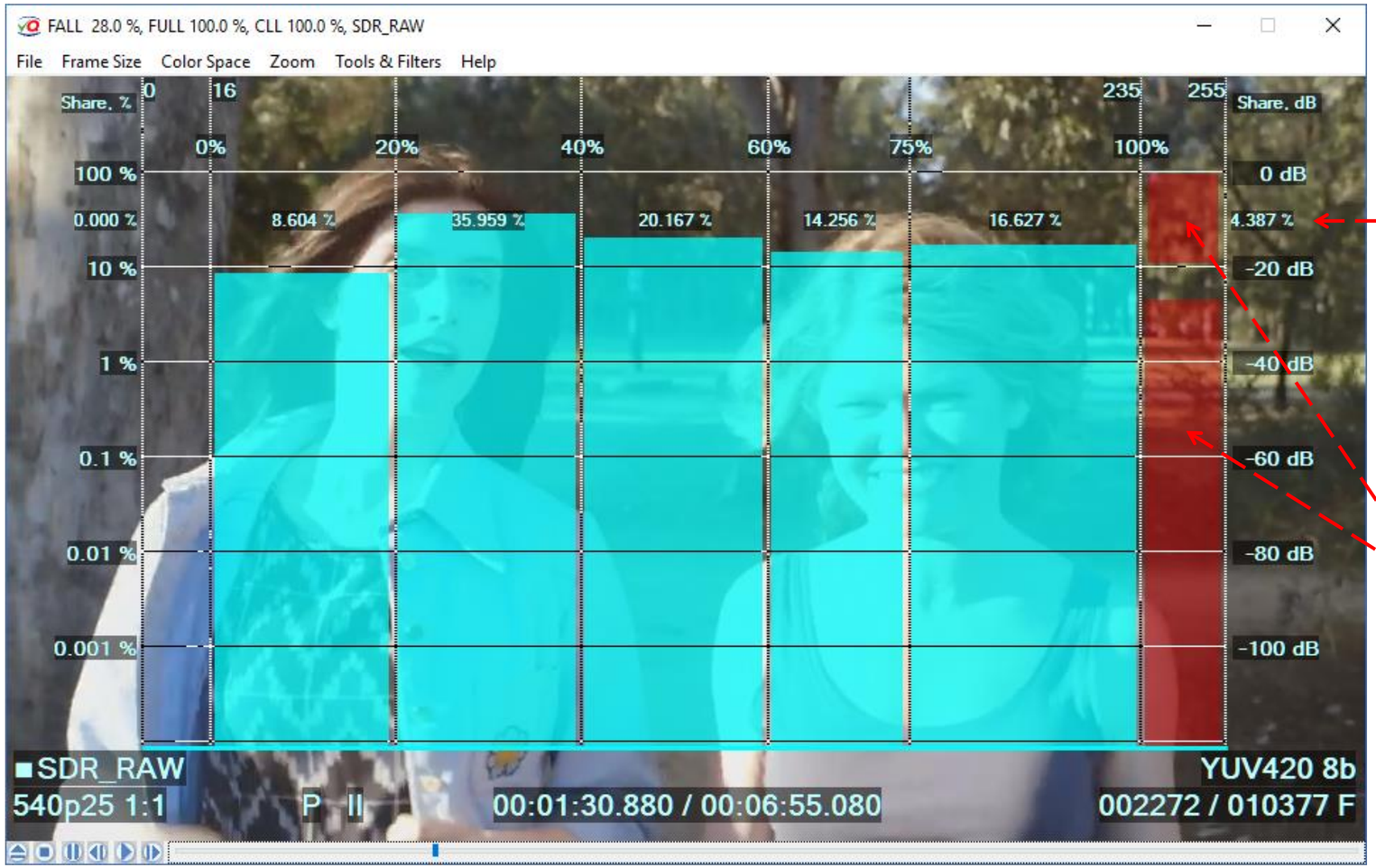
Some **white clipping** takes place, but **0.095 %** of the total screen area is an **acceptable** value

All sub-ranges are more or less **evenly populated**.

It means **good** SDR image

SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Sub-ranges Histogram Alarms



Strong white clipping
(“White Crush”)
takes place.

4.4 % of the screen area
is above the **4 %**
Red Alarm Threshold

Red Alarm Highlighter
indicates
the affected sub-range
above 100% White

SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

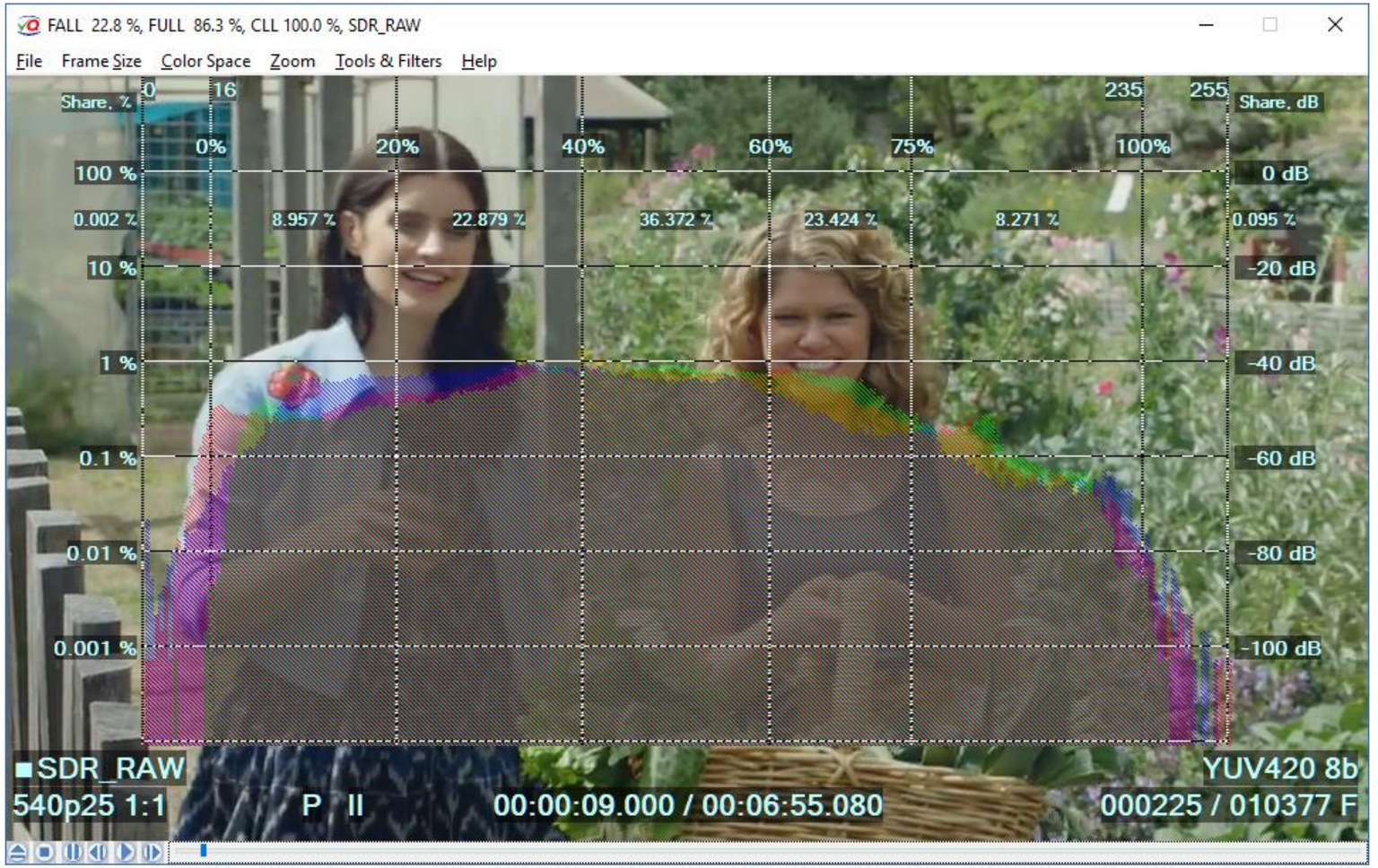
RGB Logarithmic Histogram

Press **H**
to toggle On the
Histogram Overlay

Press **Shift + H**
to toggle On the
RGB Logarithmic Histogram

*Press **Shift + H***
again to restore
LL Histogram

Shift + H toggles LL / RGB



Patterned Gray central area designate the case where all 3 **R**, **G** and **B** histogram **channels overlap**.

Colored areas shows the **dominant color channel(s)**, e.g. transparent **green** color means that for **this level** the **G** channel has **more hits** than two other channels, i.e. **R** and **B**.

Yellow area color means that **both R** and **G** have **more hits** than **B**. Magenta color means that for these levels G channel has less hits than R and B, etc.

Big advantage of this mode is the **logarithmic vertical scale**, so the events of **very low occurrence rate** (few pixels per frame) are still visible.

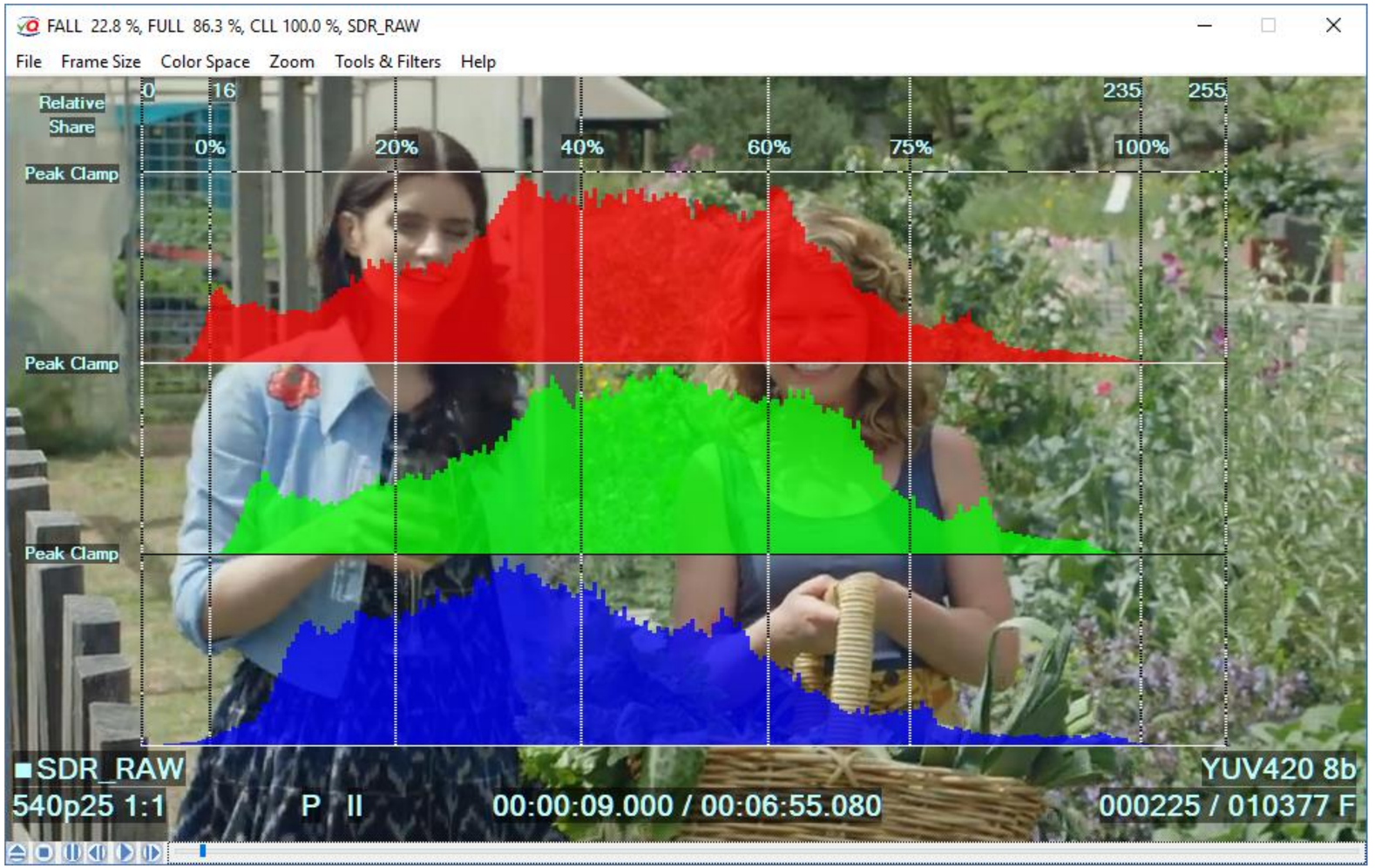
SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

RGB Linear Histograms

Press **H**
to toggle On the
Histogram Overlay

Press **Ctrl + H**
to enable the
Alternative
Histogram Mode

Press **Shift + H**
to enable
3 separate R, G, B
Linear Histograms



This mode serves mainly for **general assessment** of R, G and B levels distribution **shape**, **horizontal position** and **horizontal extent**.

All 3 (R, G and B) histograms are separately **normalized** to the corresponding **peak values**.

R, G and B levels are presented in a **relative linear scale**.

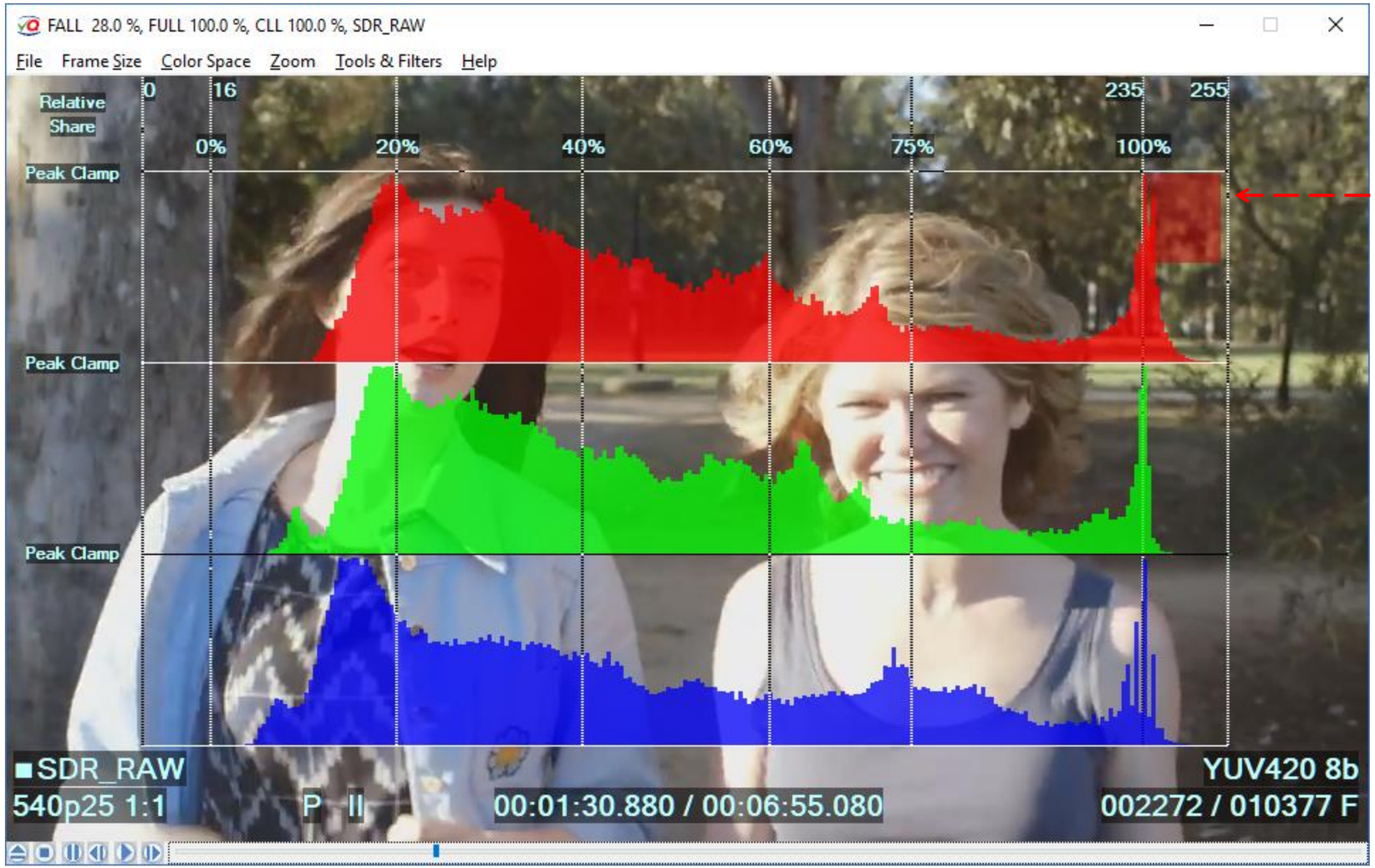
SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

RGB Linear Histograms Alarms

Note the **high probabilities** of **Red** & **Green** histograms near the 100% limit on the right side
(*not so strong for **Blue***).

It means massive clipping of white and yellow tones

.



Strong white clipping *(“White Crush”)* takes place, **Red Alarm Flag** is raised

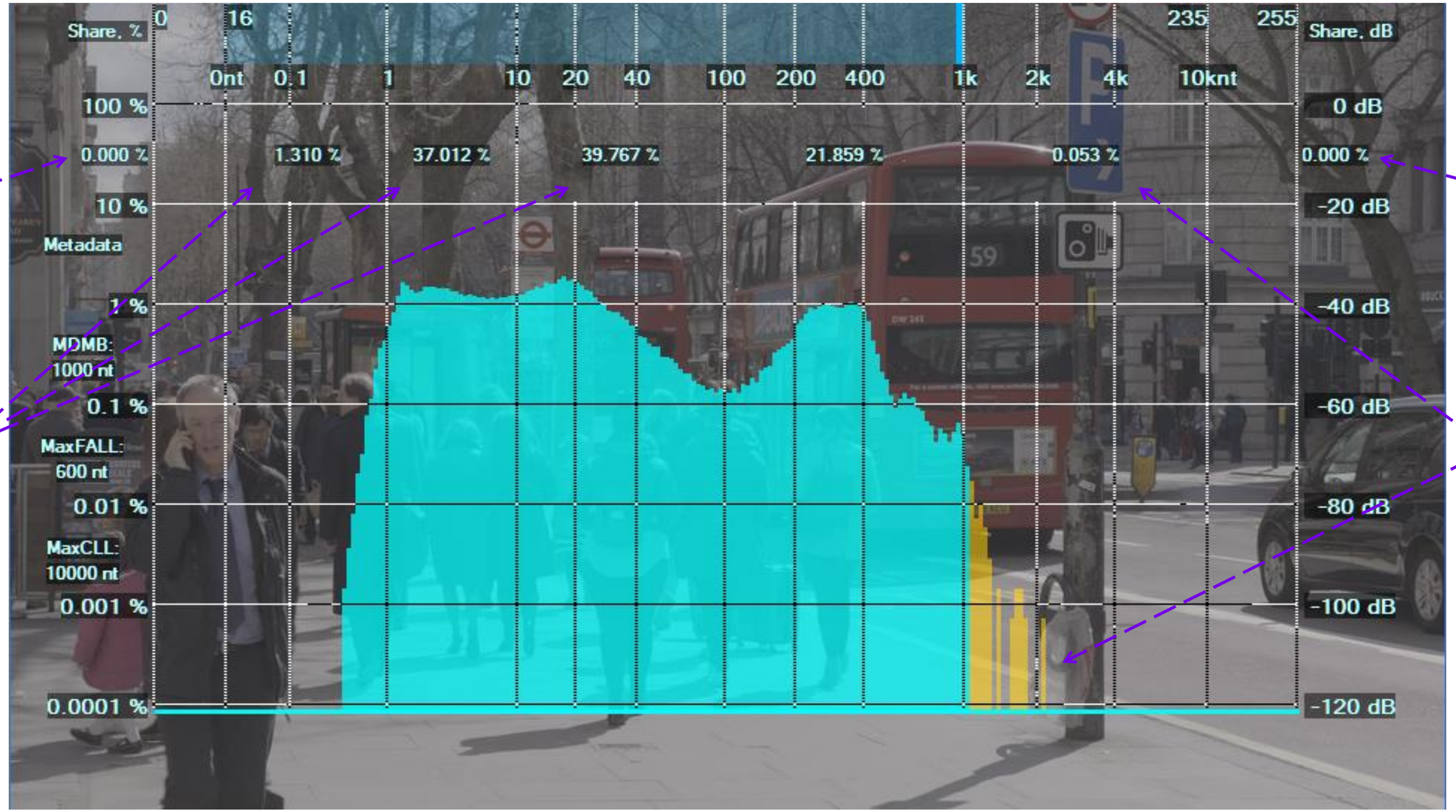
SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

HDR10 Light Levels Histogram Example

Press **1**
to enable:
PQ-RAW
Mode

The **sub-range *below Narrow range black limit*** is measured *to check for "Black Crush"*

VQV calculates shares of **screen area** for several **sub-ranges** of a Histogram



The **sub-range *above Narrow Range* limit** is measured to check for "White Crush", **0 %** means no crush

0.053 % value means that there are not so many pixels **above 1000 nt** limit

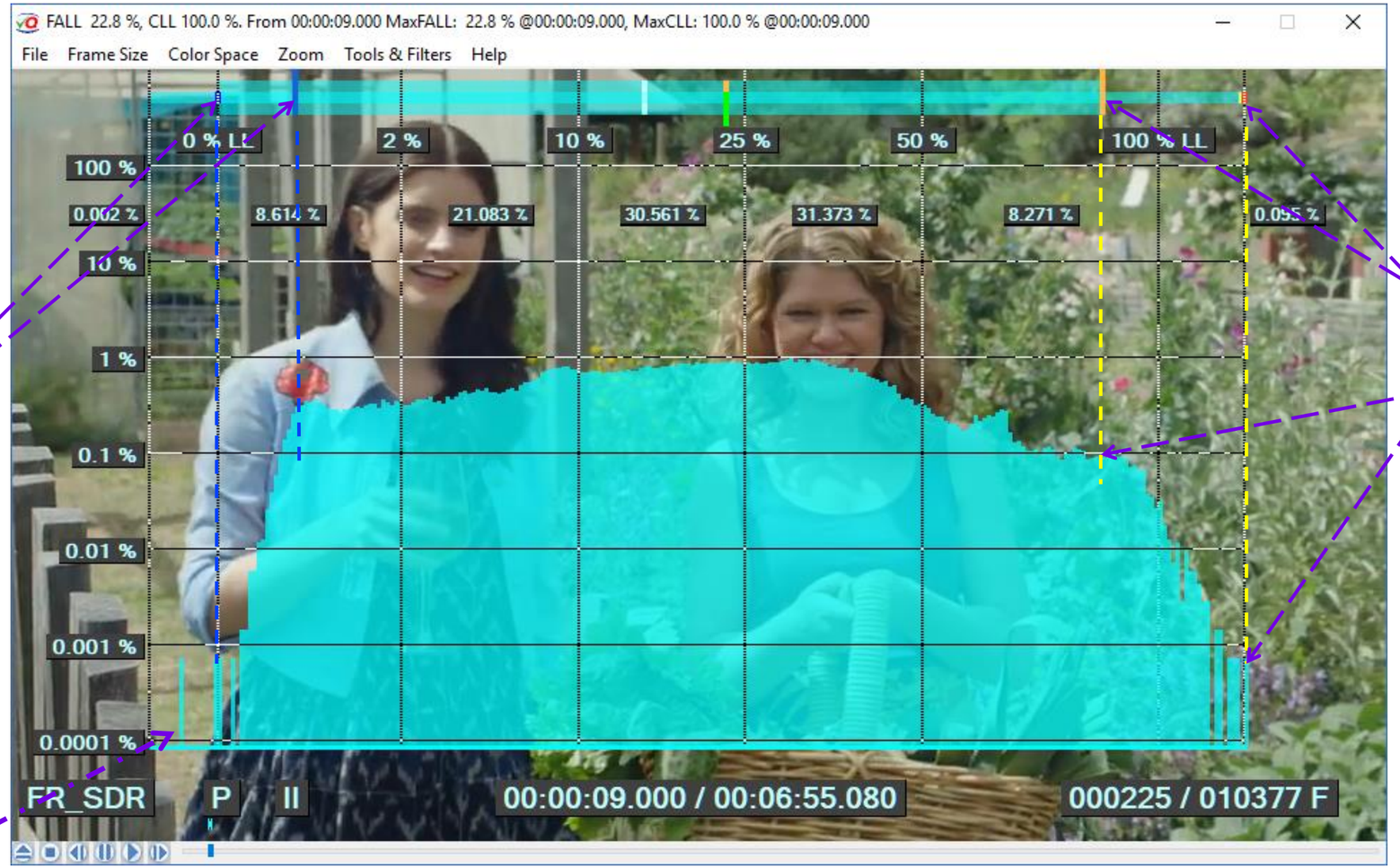
Logarithmic scale of histogram bins counts (vertical co-ordinate) covers very large range of values
from 100 % of screen area (in case of solid flat color the bin count may be in millions) down to 0.0001 % (even single pixel events are visible)

HDR sample video – courtesy of newsbyte.co.uk

L-Bar & Light Levels Histogram

Press **H** then **U**
(and optionally **Ctrl + H, Shift + H**)
to select the desired
Histogram Mode, e.g.
Light Levels Histogram
in percents of LL range

Then press **L**
to enable.
L-Bar



Absolute LL Min and
Relevant LL Min
Blue Markers
always correlate
with the left edge of
LL Histogram profile.

But min (R, G, B) value,
i.e. **Narrow Bar left edge**,
may go lower than
the **LL Histogram left edge**,
e.g. on **colored shadows**

Frame Light Level
Relevant Max
and
Absolute Max (aka CLL)
Yellow Markers
always correlate
with the right edge of
LL Histogram profile

L-Bar provides for **fast and reliable** RGB and LL parameters **assessment** even when the actual histogram is **hidden**

SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

HDR10+ Light Levels Distribution Analyzer

Press

Ctrl + Shift + H

to enable

HDR10+

Levels Statistics Analyzer

This also enables
L-Bar & **PQ_RAW** Mode

Cyan Bars show **maxRGB** (aka **Linear Light Levels**) **Distribution Values, nit** *(Frame Percentiles)* for each one of 7 specified percentage threshold values.

Green Bars show similar **Distribution Values, nit** *(Scene Percentiles),* of the selected **Segment**.

Numerical readout of the **Distribution Values** for the current **Frame (F)** and the analyzed **Segment (S)**

Analysis Progress Bar:
From the selected start frame to the current frame

L-Bar provides for **fast and reliable** RGB and LL parameters **assessment.**

Text info under the L-Bar provides brief summary of LL statistics analysis of the current frame and the selected segment.

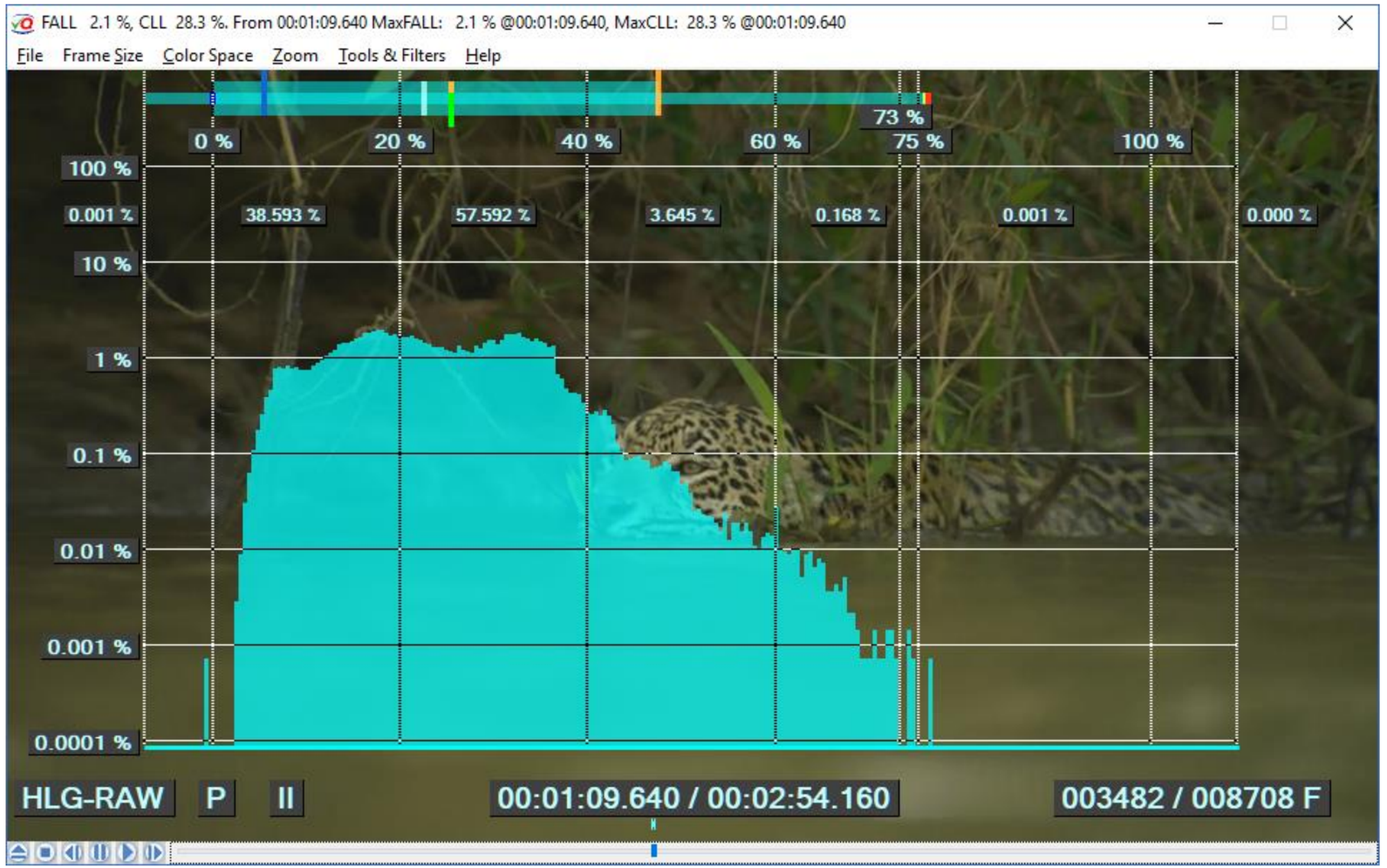
HDR sample video – courtesy of newsbyte.co.uk

L-Bar & Histogram of HLG Video

Press **3**
to enable the
HLG-RAW mode

Press **L** and **H**
to enable the
L-Bar + Histogram
combination

Press **U**
to select the
desired Graticule Units
e.g. **RGB Range %**



VQV calculates screen area in percents for several **sub-ranges**. The **most populated** RGB signal **sub-range** is **20% to 40%,** it occupies 57.6 % of screen area.

Such histogram distribution means that on “compatible” SDR display a viewer will see rather **dark image**.

Note that there are practically **no pixels** related to two bands **above Reference White** Level (75% signal, 26 % LL) – histogram counts are 0.001% and 0 %.

UHD HLG sample video – courtesy of BBC

L-Bar – Levels Statistics Visual Summary

Press **L** to toggle On the **L-Bar**.

Press **Play Button** or **Space Bar** to start collecting **Segment Statistics Data.**

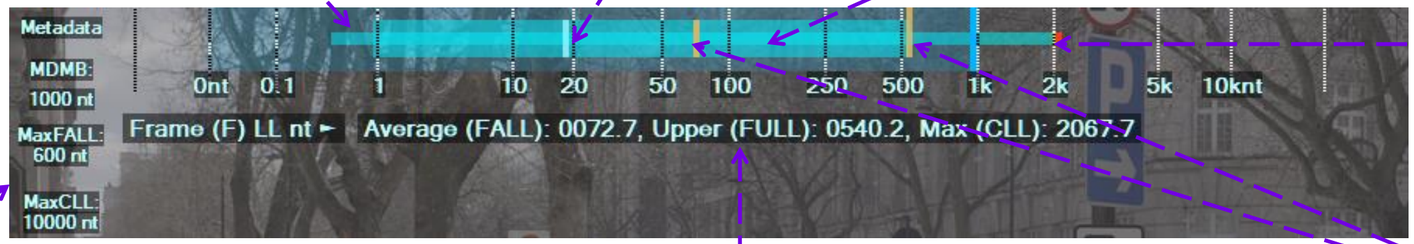
At the end of wanted fragment press **S**.

Statistic Report will be printed as text overlay. To save it to text file press **Ctrl + P**

Narrow Bar
shows 100% of pixels
(full frame RGB range)
Min & Max limits,

Cyan Highlight
shows Median Level
(50% of frame pixels)

Wide Bar
shows 99% of pixels
(most relevant RGB range)
Min & Max limits,



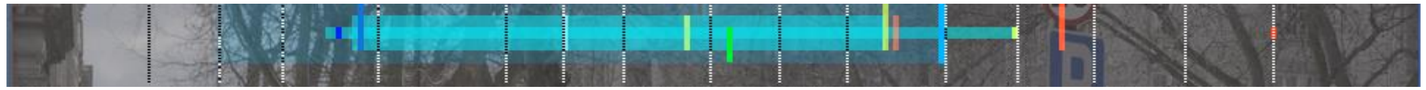
Yellow Marker:
Frame Max Light Level (CLL)
of the current frame
updated frame-by-frame

Light Levels Metadata
Numerical Readout
(if available)

Current Frame
Statistically Relevant Light Levels
Numerical Readout

Yellow Markers:
Frame Average Light Level (FALL)
&
Frame Upper Light Level (FULL)
of the current frame
updated frame-by-frame

Press **T** to toggle ON/OFF text labels and numerical readout messages:



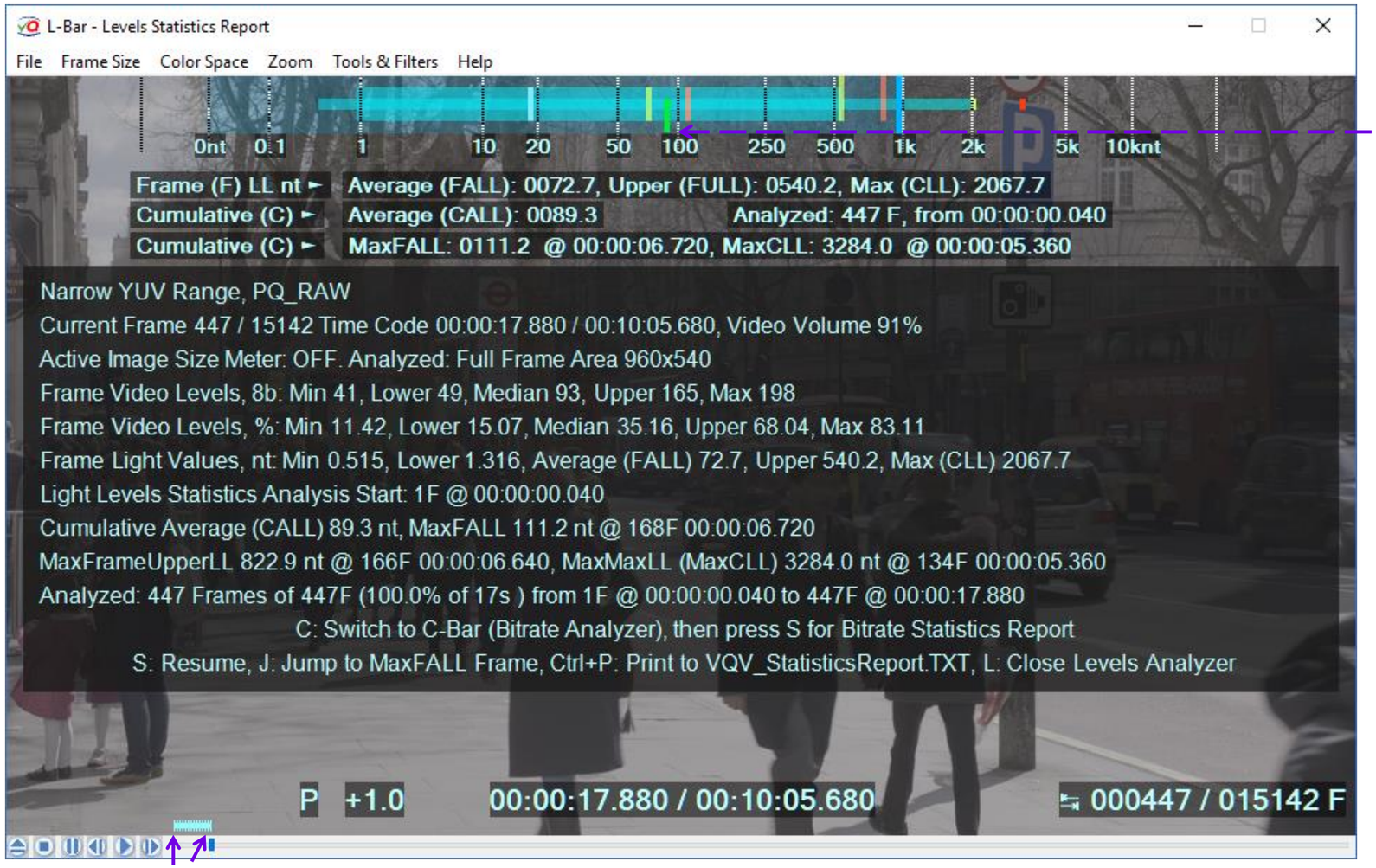
HDR sample video – courtesy of newsbyte.co.uk

L-Bar & Video Fragment Statistics Example

At the end of wanted fragment press **S**.

Statistic Report will be printed as text overlay.

To save it to text file press **Ctrl + P**



Green Marker:
Segment Average LL

Red Markers
max values of the corresponding **Yellow** markers within the segment

On-screen Report:

RGB & Light Levels Current Frame Statistics & Fragment Statistics
up to the current frame

C-Bar Bitrate Analyzer is running in the background when **L-Bar** is enabled.
Press **C**
to switch between L-Bar and C-Bar Modes.

Analysis Progress Bar:
From the selected start frame to the current frame

HDR sample video – courtesy of newsbyte.co.uk

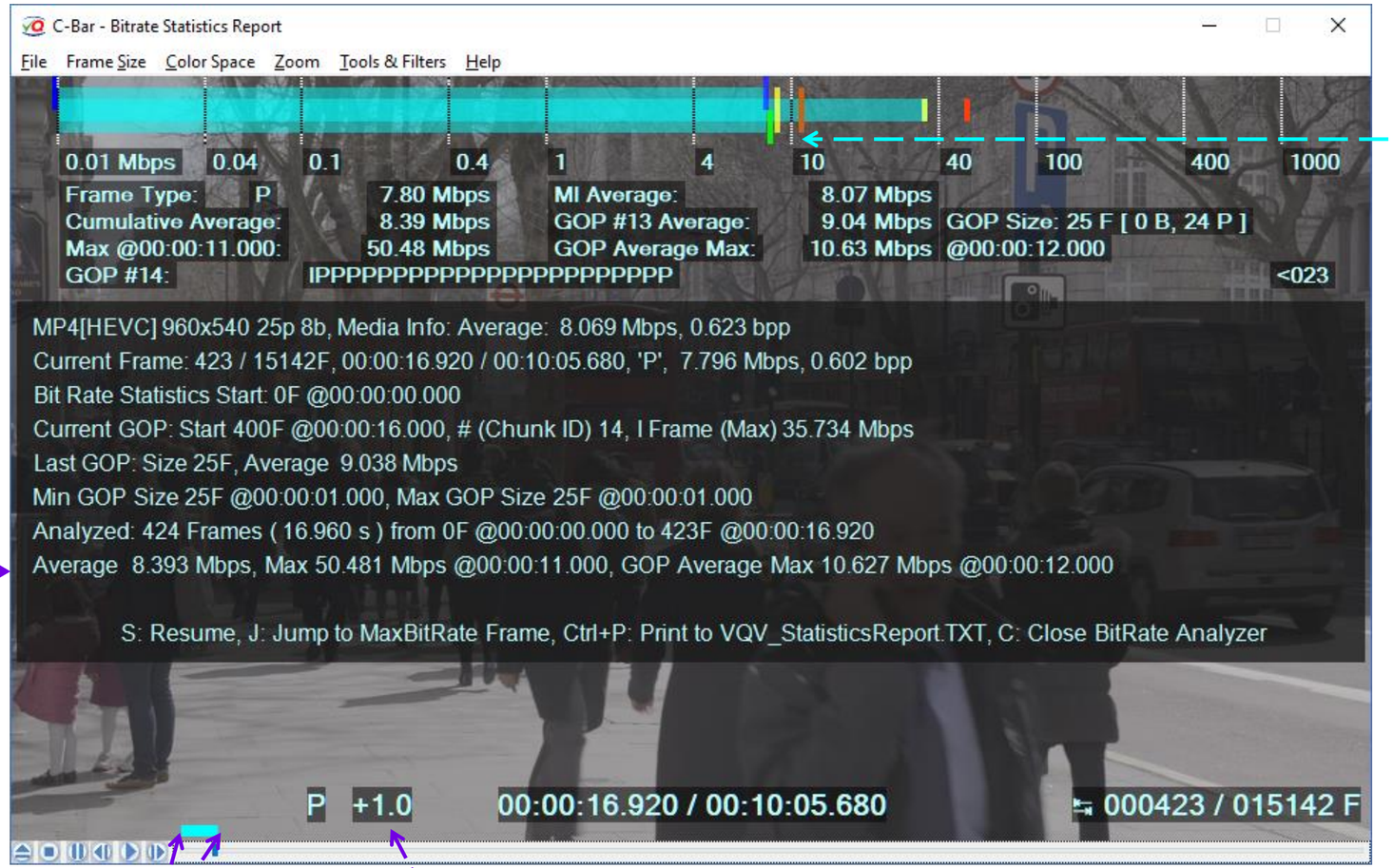
C-Bar – Compressed Video Bitrate Analyzer

Press **C** to enable
the Bitrate Analyzer tool

Press Play Button
to collect and display **Bitrate Statistics Data**

At the wanted fragment end
press **S**
Statistic Report will be printed as text overlay;
to save it press **Ctrl + P**

Logarithmic Bitrate Graticule covers very wide range: from **0.01 Mbps** to **1,000 Mbps**



C-Bar Overlay
Narrow Bar: 'I' Frame Bitrate,
Wide Bar: 'P'/'B' Frame Bitrate

On-screen Report:
Codec Info & Compressed Data Statistics
up to the current frame

C-Bar Bitrate Analyzer is running in the background when **L-Bar** is enabled.
In such case press **C**
to switch between
L-Bar and C-Bar Modes,
otherwise pressing **C** will switch **C-Bar** Off.

Statistics Progress Bar:
From the start frame to the current frame

*Note that **full** Bitrate Statistics Report is available only if VQV plays at the nominal **+1** speed, otherwise only current frame brief report is available.*

SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

C-Bar Bitrate Markers

Blue Markers:
Video Stream
Average & Max Bitrates
specified in **stream metadata**

Red Marker:
Segment Max Bitrate
updated frame-by-frame

Critical Bitrates

Green Marker:
Integrated
Average Bitrate
up to the current frame

Yellow Marker:
Last GOP
Average Bitrate

Brown Marker:
Segment Max of
GOP Average Bitrate
up to the current GOP

Yellow Marker:
Current GOP Max Bitrate
typically = I-frame Bitrate

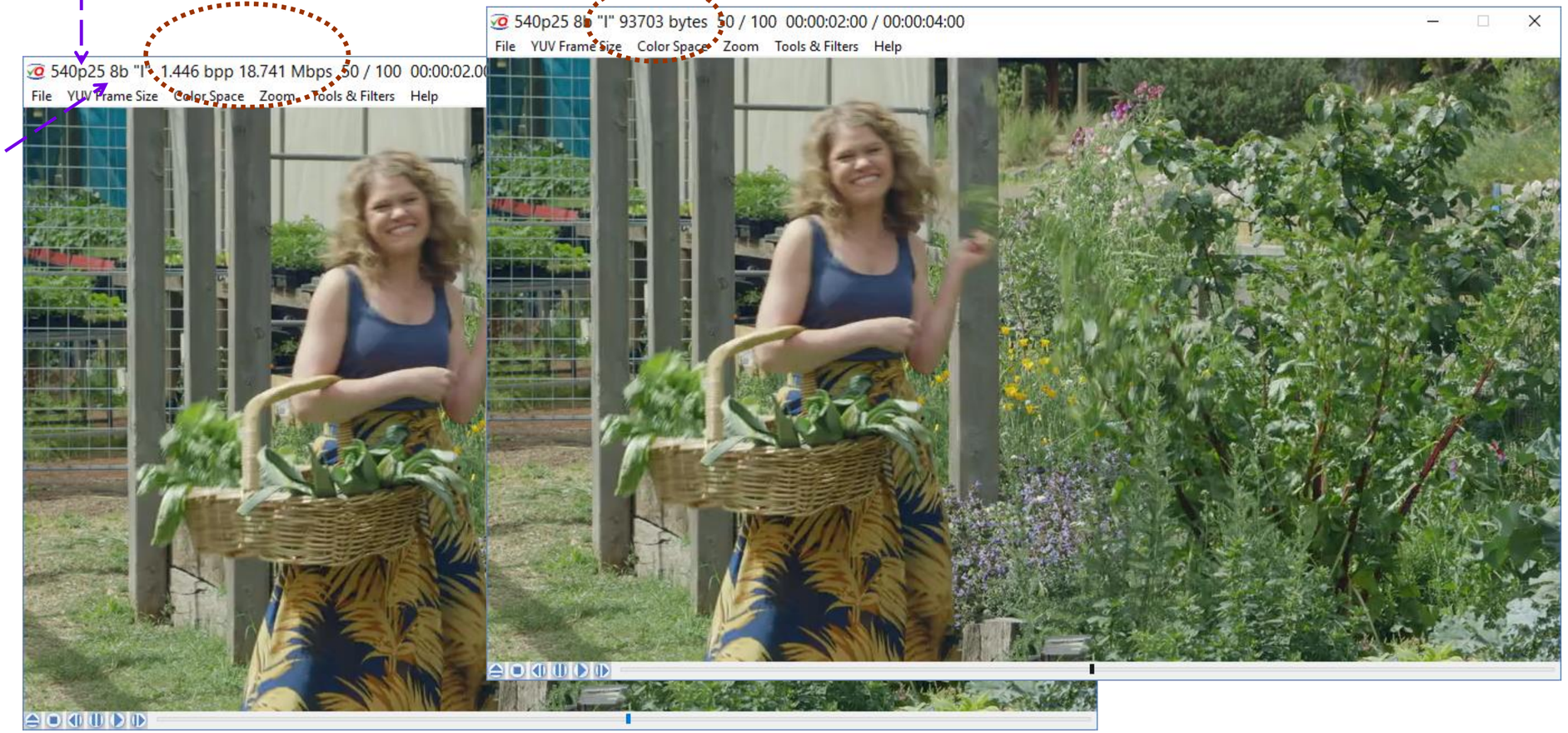
Compressed Video Parameters & Title Bar Messages

Frame Size,
Frame Rate,
Interlace symbol

Frame Type,
Bits Per Pixel,
current Bitrate, Mbps

Message Display option (press **S**):
Compressed frame size, bytes

Bits Per
Component
(Bit Depth)



SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Tools Combinations

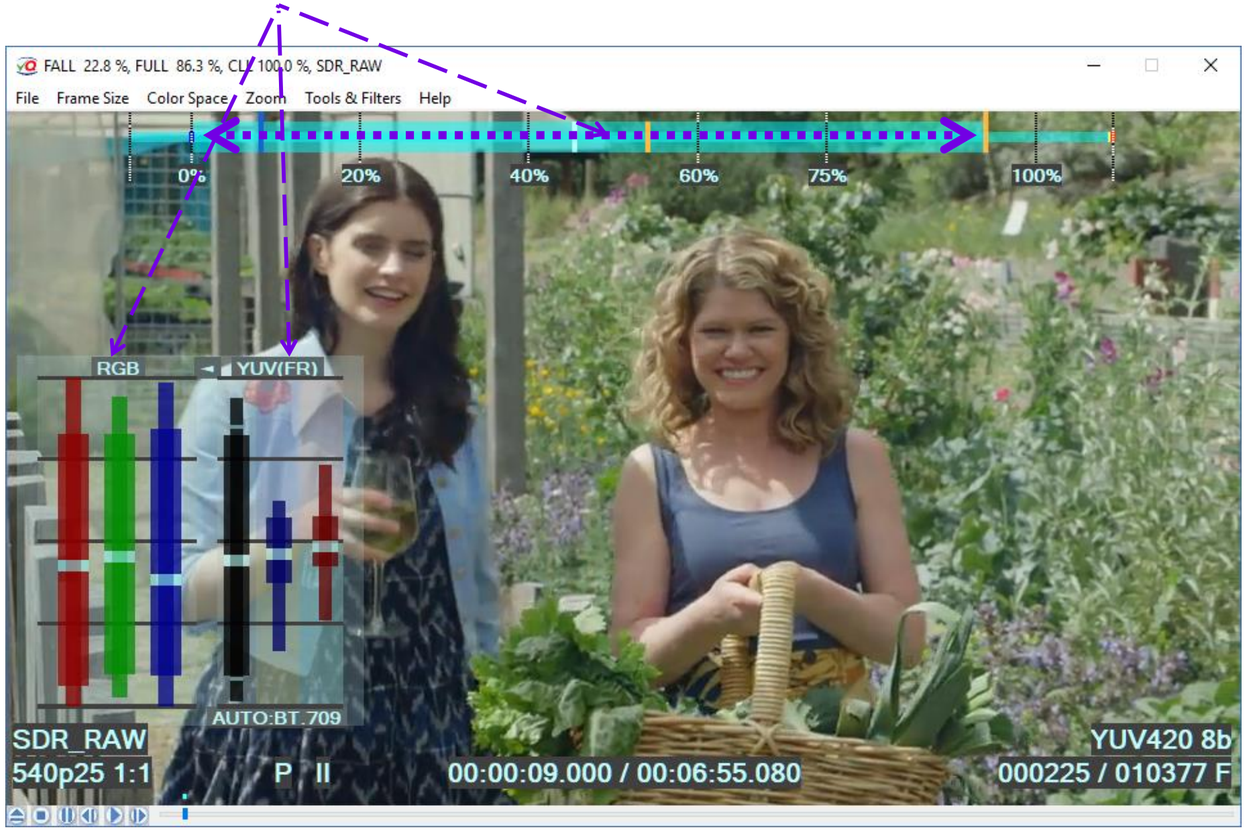
Press **V** then **L**
to enable two overlays:
VV-Bars & **L-Bar**

Press **9**
to switch between two
YUV to RGB Range Mapping Modes:
Full Range (FR) vs. **Narrow Range (NR)**

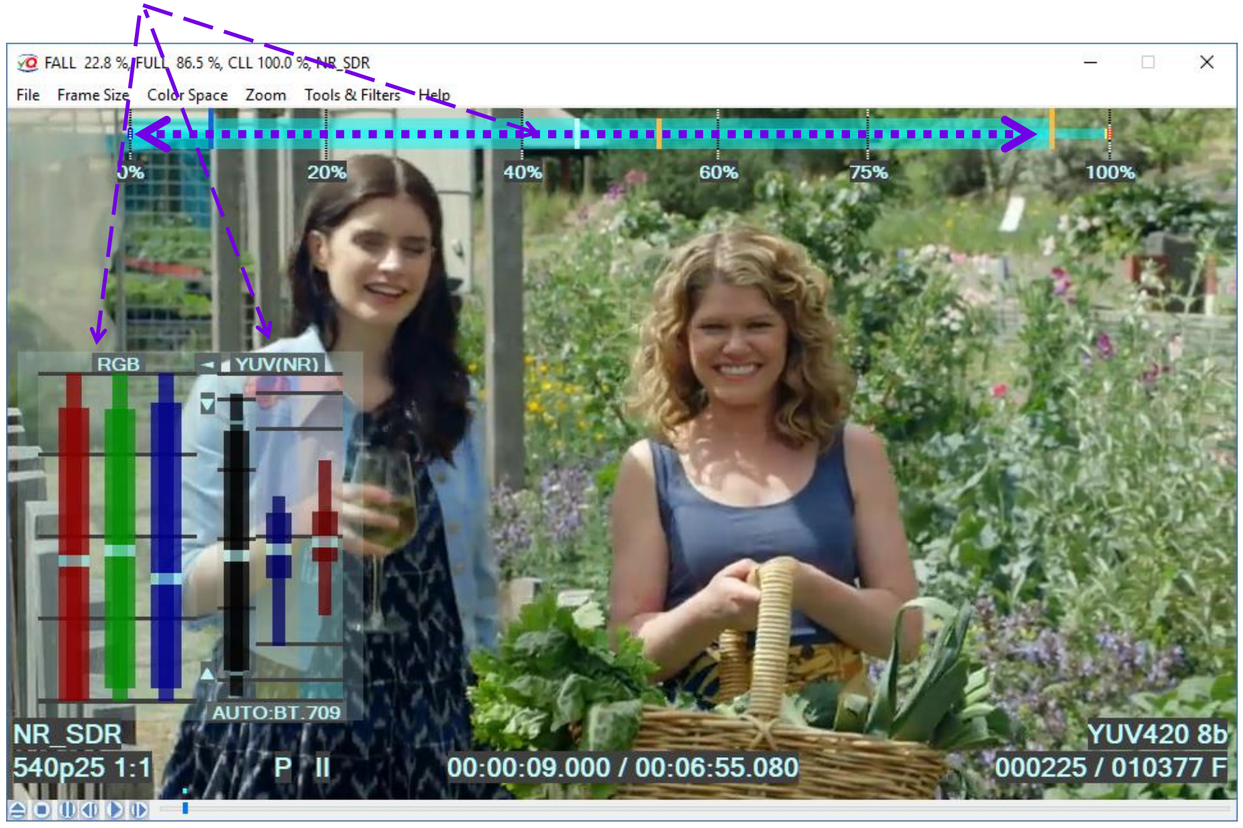
***C-Bar, L-Bar**, **VV-Bars** and **VectorScope** can be used together in any combination, but not in combination with the **Waveform Monitor**.*

*The **Histogram** overlay can be used together with **L-Bar**, but not with the **C-Bar, VV-Bars**, **VectorScope** or **Waveform.***

Full YUV Range Mode means
reduced contrast of **rendered RGB** image



Narrow YUV Range Mode means
higher (normal) **contrast** of **rendered RGB** image



SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

L-Bar combined with VV-Bars

SDR RAW – Full Range (QC) Mode

Press **9**
to switch between two
RGB ⇔ YUV Level Mapping Modes:
Full vs. **Narrow**

SDR – Narrow Range (Regular Viewing) Mode

R channel **Upper Level** is
at the Full Range Max Limit Level,
i.e. above the White Crush threshold

B channel **Lower Level** is
slightly below the Narrow Range Min Limit Level
Black Crush is possible

White Crush Markers are On in all 3 channels,
R is the most affected one (brightest indicator)

B channel:
Medium strength **Black Crush Marker**

SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Noise & Inter-frame Activity Meter

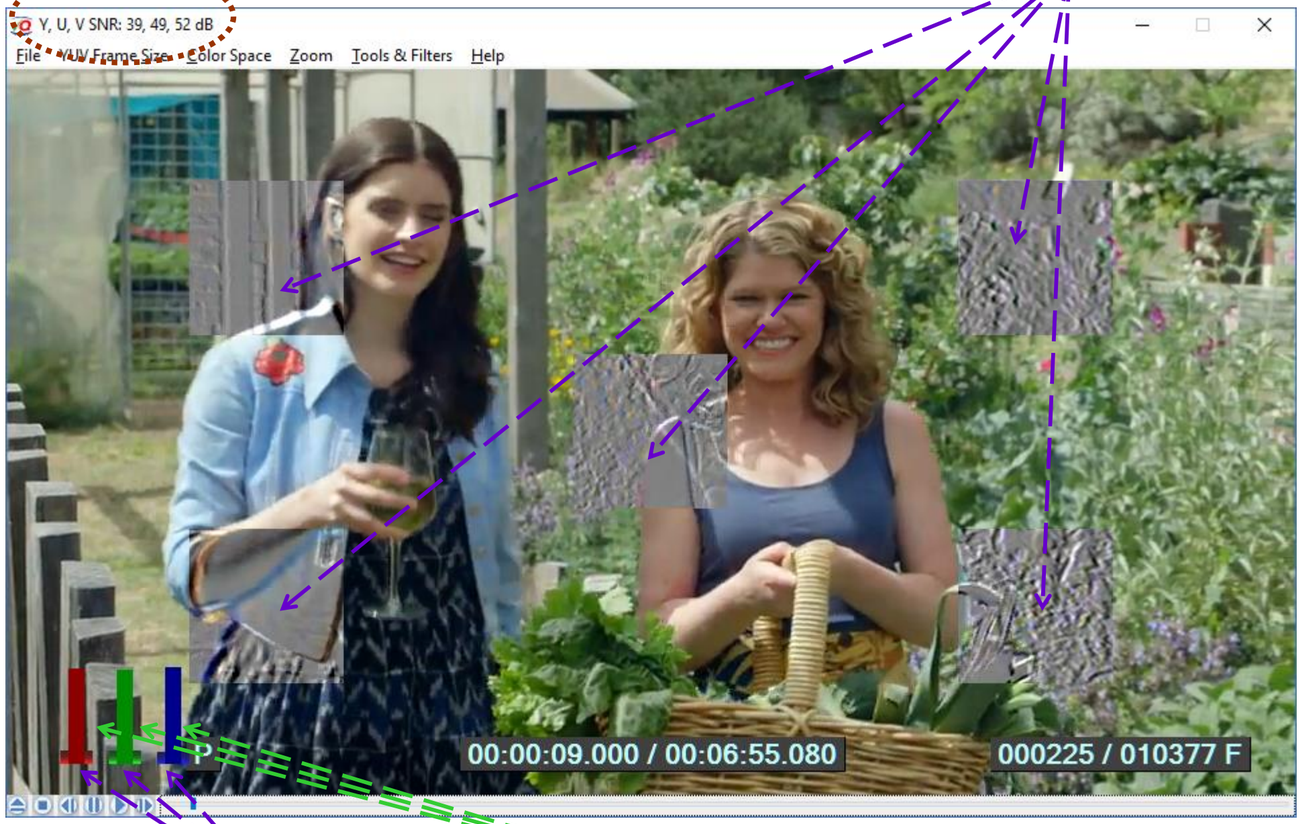
Press **Shift + N**

to toggle On the

Noise Meter

Y SNR = 39 dB,
U SNR = 49 dB,
V SNR = 52 dB

5 SNR Meter Zones



Noise Distribution
BarGraph Display

Inter-Frame Activity
BarGraph Display

Relatively poor Y SNR value is probably caused by strong Intra-frame and Inter-frame Activities creating problems for the camera noise reducer

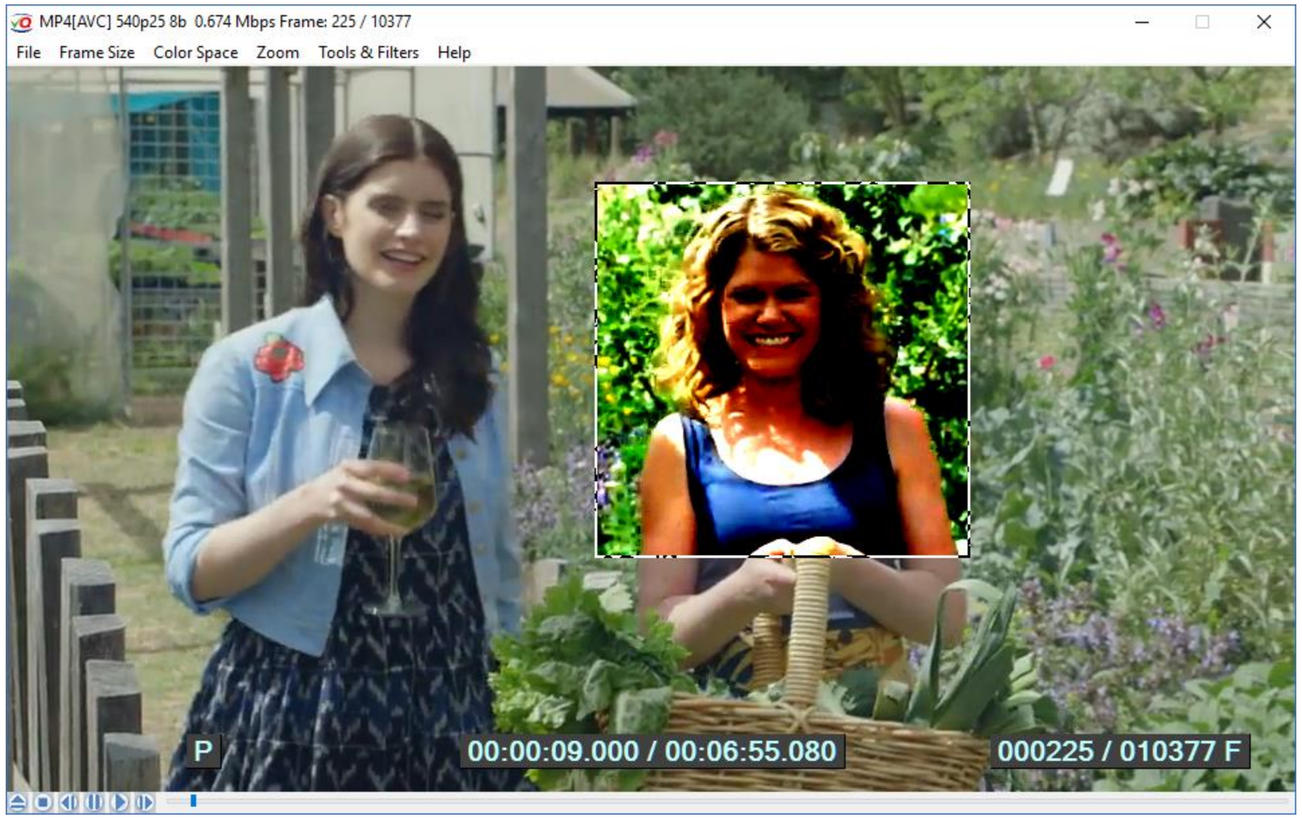
SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Displayed Image Filters

- VQV displayed image filters can be sorted out into 4 categories:
  - **Color Components Filters**: RGB, R, G, B, Y, UV or LL images with out of range highlighter and heat map options.
  - **Digital Levels Filters**: Gain, Brightness offset, MSB/LSB selector
  - **Spatial Filter**: HPF (High Pass Filter) or LPF (Low Pass Filter) providing for intra-frame activity assessment
  - **Temporal Filter**: HPF (High Pass Filter) providing for inter-frame activity and frames repetition cadence assessment
  - Filters can be applied to:
  - Screen area limited by square mask with adjustable size and position
  - Full screen area
- **Shift + M** toggles between Mask / Full Screen modes, the default mode depends on the selected filter(s).
  - To adjust Mask Size: put mouse cursor inside the mask area, press **M** key and use **Mouse Wheel**, then click inside the mask to finish
  - To change Mask Position: put cursor in the mask area, hold **Mouse Left Button** and move the mask
- **D** key and **ESC** key **reset** all filter controls to the **default** (Off) state.
  Stop Button does the same, but also resets the Timeline Position to media file start.
- **Shift + F** toggles On/Off all filters, ***preserving*** all filter controls and settings
- **I** key cycles thru 3 de-interlaced display modes:
  - Interleaved Fields,
  - Top-Bottom Fields
  - Fields Difference
- Display filters can be combined, but filters concatenation order is fixed and can not be changed
- See next slides for detailed description and examples.

Gain Filter

Shift + Mouse Wheel (and **Shift + Up/Down Arrows**) controls displayed image Gain (contrast): x1, x2, x4, x16.
Example below: Gain = **x4** within the Mask area.



*If necessary, use **Ctrl + Shift + Mouse Wheel** to adjust the Slicing Level (brightness offset)*

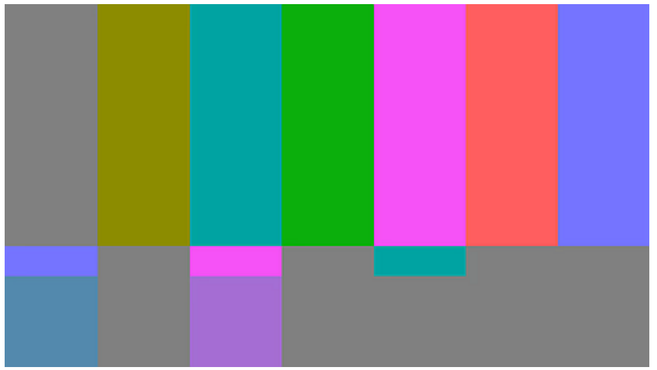
SDR sample video – courtesy of Kate McCartney & Kate McLennan, Australia

Color Components Filters

ESC or **D**: Default RGB Image

Shift + Y: Luminance

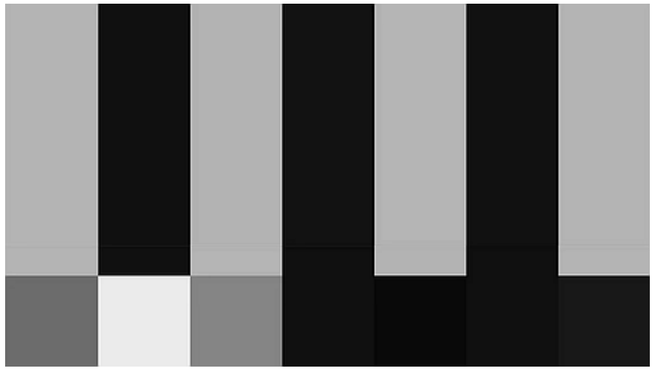
Shift + U: Chrominance (UV)



Shift + R: Red Component

Shift + G: Green Component

Shift + B: Blue Component



Light Levels (LL) Image Filter

Overexposed HDR-PQ Image

Press **1**

to enable the

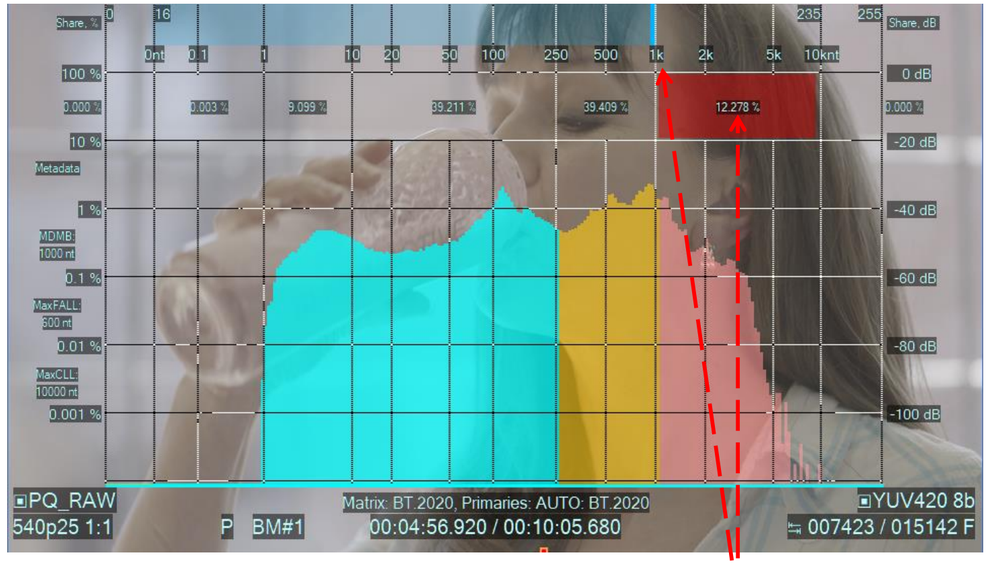
PQ-Raw Mode

Press **H**

to toggle On the

Frame Histogram Overlay

Light Levels Histogram



More than 12%
of pixels are above
1knt threshold

Press **Shift + L**

to enable the **Light Levels** (MaxRGB) Image Filter

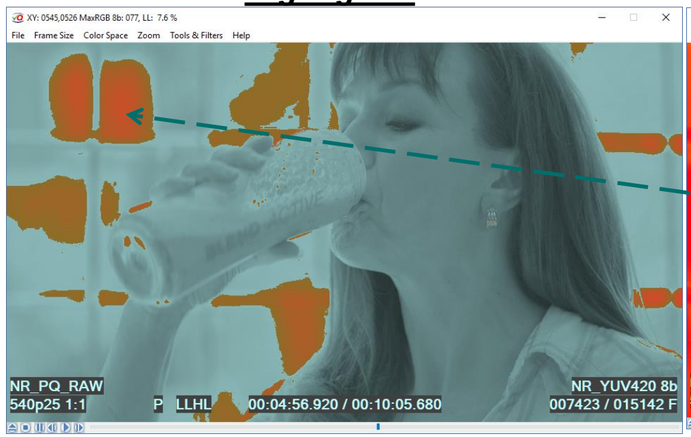
Press **S**

to cycle thru 3 modes:

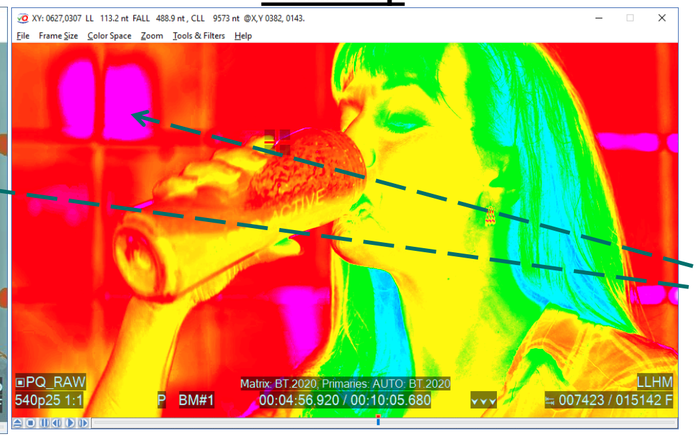
1. **LL** = Light Levels Image
2. **LLHL** = LL + Highlighter
3. **LLHM** = LL + 'Heat-map'

Light Levels (MaxRGB) Image Options:

Highlighter



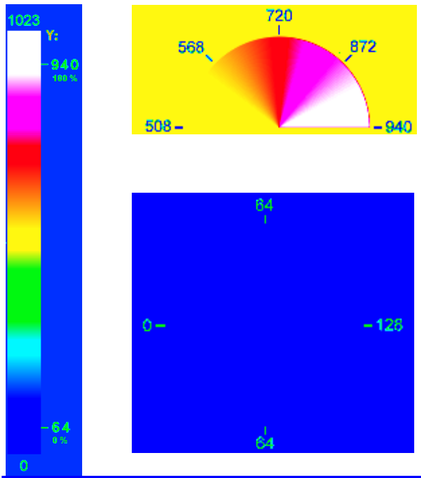
Heat Map



Overexposed areas
are clearly visible

HDR sample video – courtesy of newsbyte.co.uk

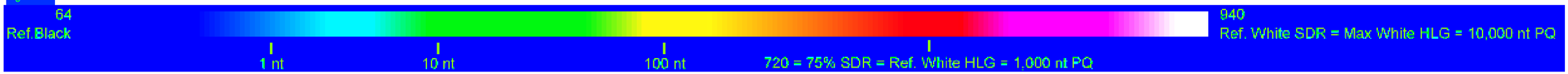
Two Variants of Heat Map Overlay

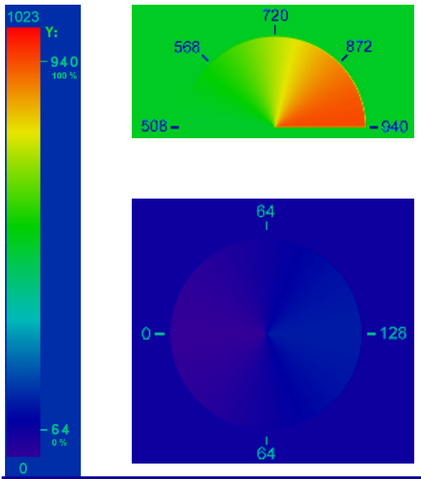


1. HDR Heat Map

auto-selected in RAW HDR-PQ & HDR-HLG Modes

Covers very large range of light levels and provides for easy detection of over-exposed areas.
However, low and medium gradations rendition is rather coarse.

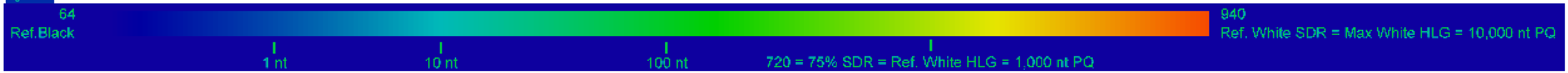




2. SDR & LOG Heat Map

auto-selected in SDR & RAW LOG Modes

Provides for easy detection of over-exposed (above Reference White) and under-exposed (below Reference Black) areas.
Better rendition of low and medium gradations.



HDR sample video – courtesy of newsbyte.co.uk

Checking SDR Light Levels – Light Levels Highlighter

All six 100% Bars have the same 100% Light Level

All six 75% Bars have the same 50% Light Level

Press **Shift + L**

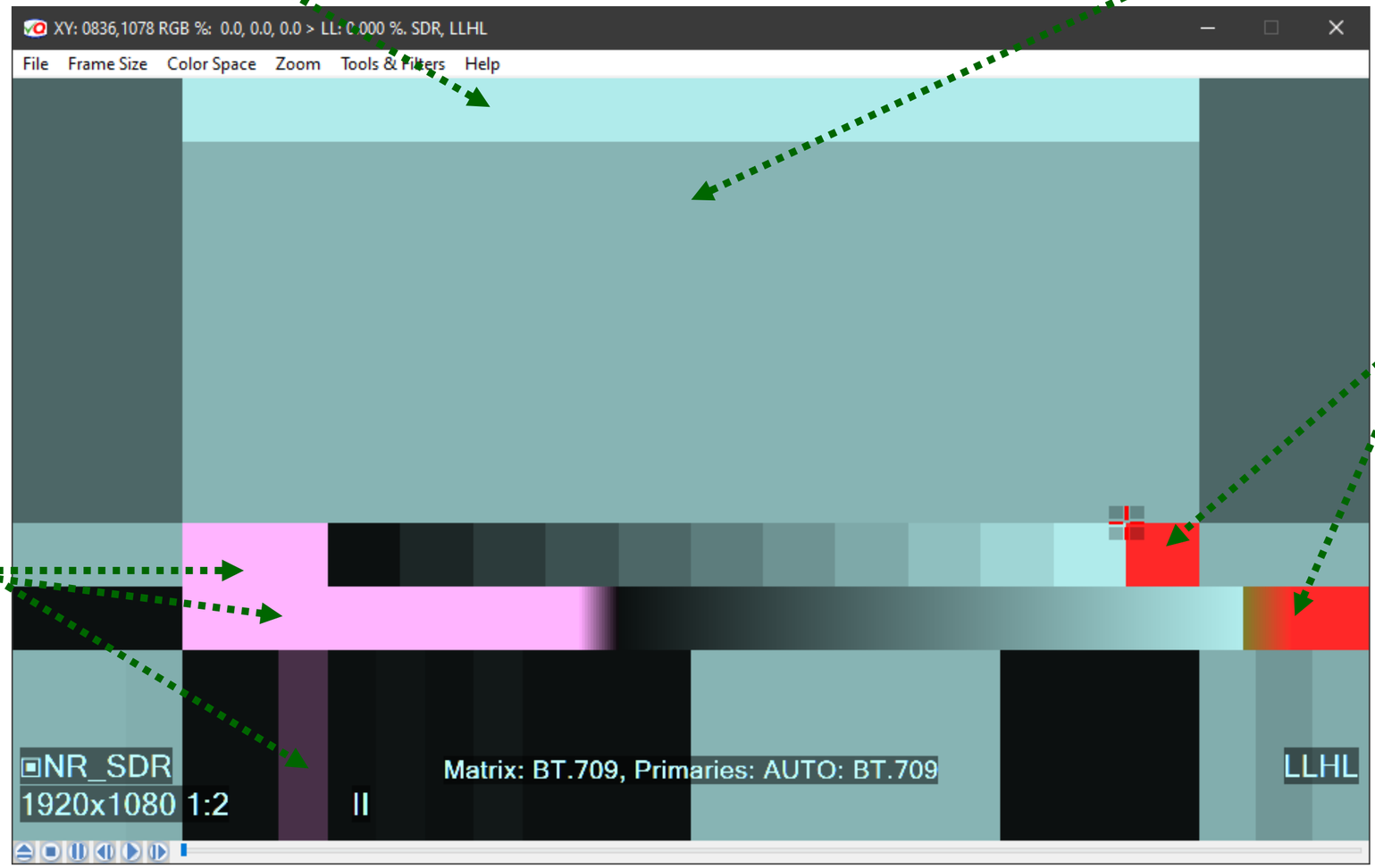
to enable the **Light Levels** (MaxRGB) Image Filter

Press **S**

to cycle thru 3 modes:

1. **LL** = Light Levels Image
2. **LLHL** = LL + Highlighter
3. **LLHM** = LL + 'Heat-map'

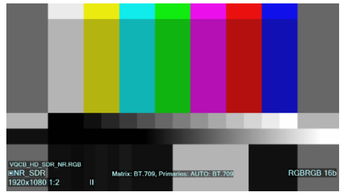
Light Levels **below** Reference Black



Light Levels **above** Reference White

VQCB Test

Narrow Range RGB

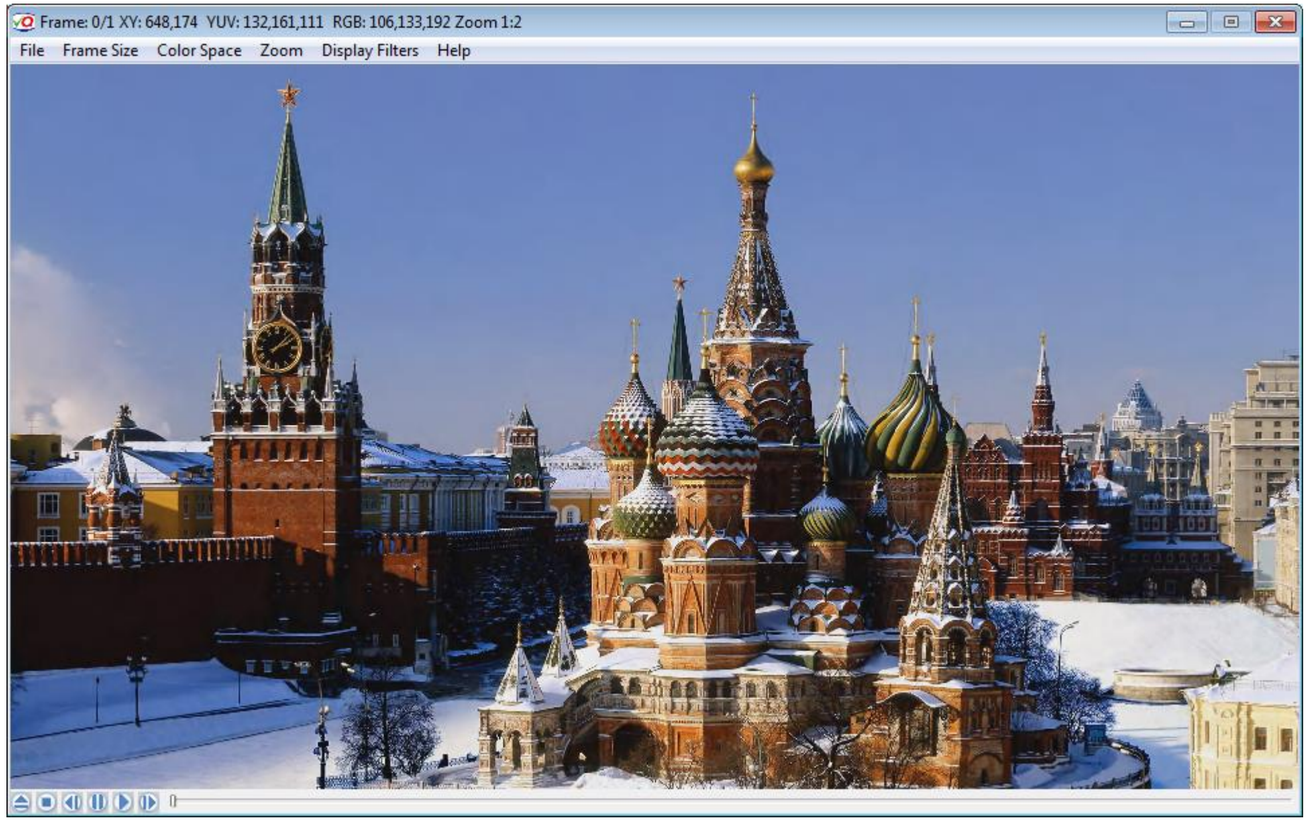


HDR sample video – courtesy of newsbyte.co.uk

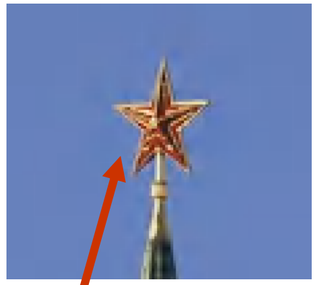
Combined Color, Gain and Mask Filters Example

1. Press **Shift + Y** to select Y color component,
2. Adjust mask size (**M** + **Mouse Wheel**) and position (**Mouse Left Button + Mouse Move**),
3. Adjust zoom ratio (cursor centered): **Z** + **Mouse Wheel**,
4. Adjust the gain: **Shift** + **Mouse Wheel**

1920x1080 image, decoded lossy JP2K, Zoom 1:2

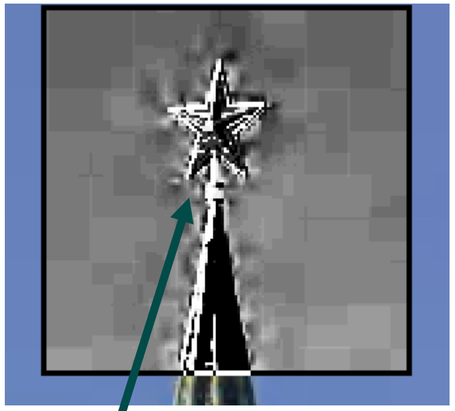


Zoom 2:1



Just noticeable compression artefacts

Zoom 2:1, Y, Gain x16

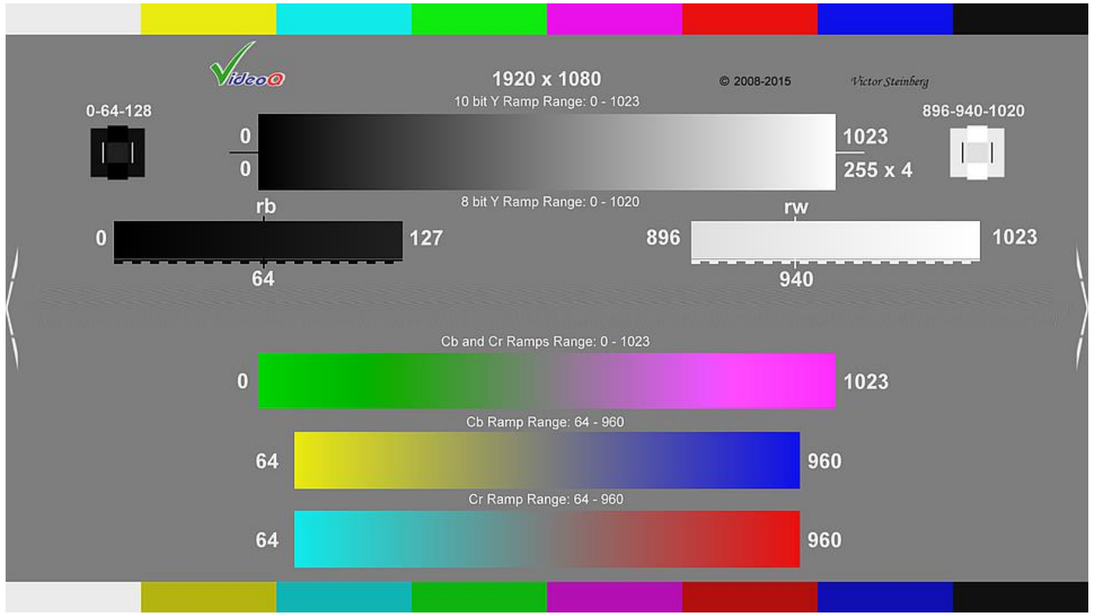


Clearly visible compression artefacts

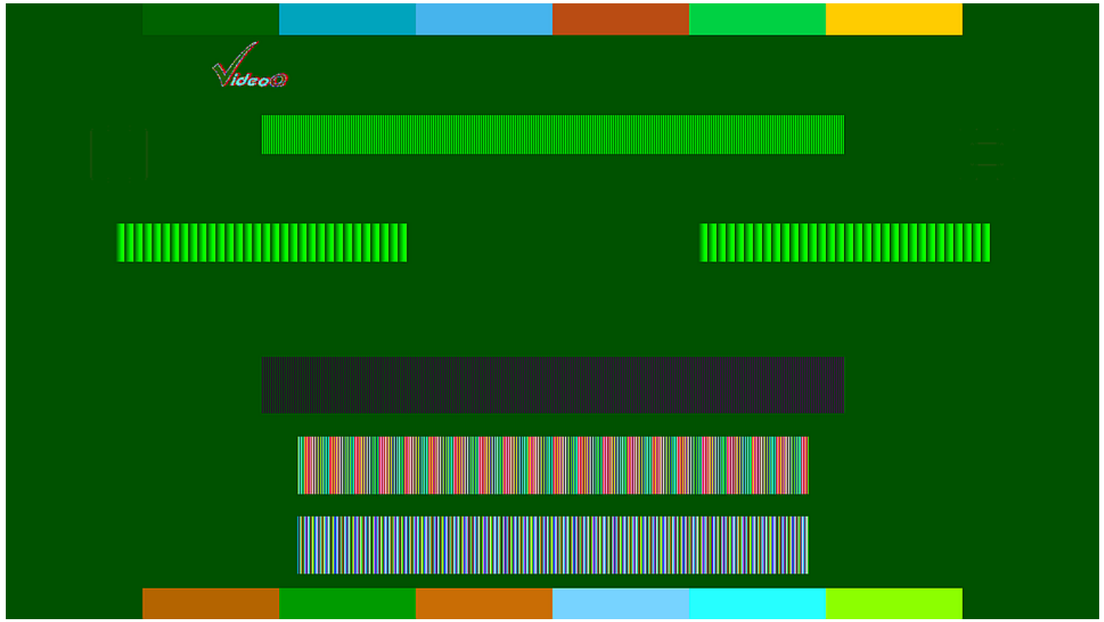
MSB/LSB Filter

Press **8** to toggle between MSB and LSB images (*only if the input bit depth is greater than 8 bit*)

MSB: 8b RGB image derived from 16b RAW YUV media file



LSB: 8b RGB image derived from 16b RAW YUV media file

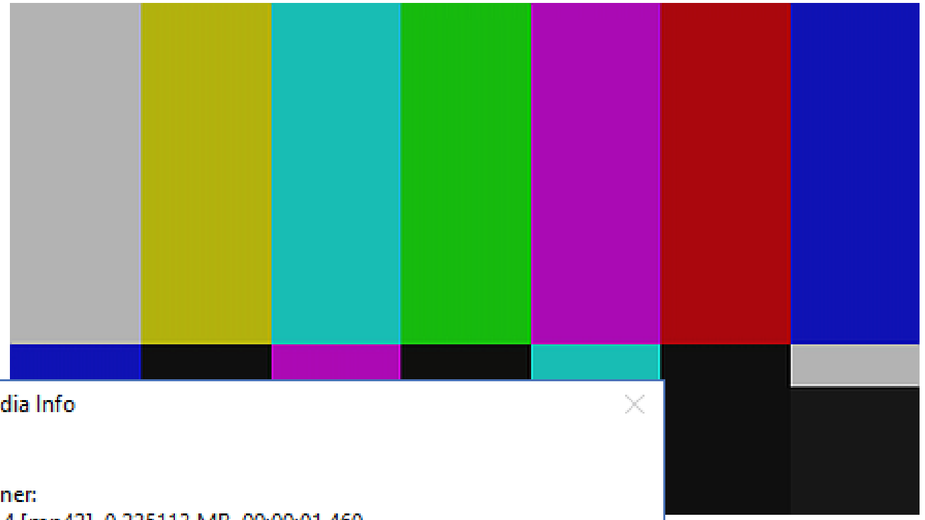


Both MSB and LSB images are equally suitable for VQV filters/meters. For example it s possible to select color components, display video data values of any pixel, apply spatial HPF, etc

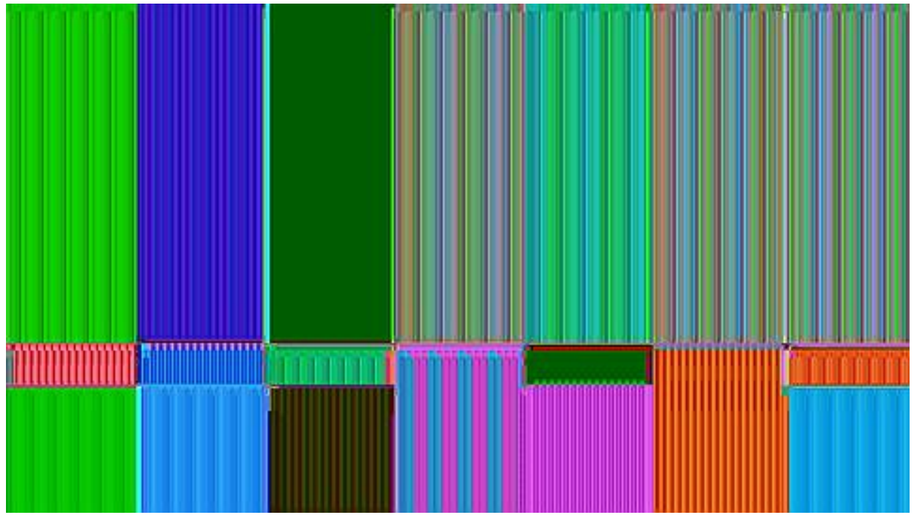
MSB/LSB Filter Application Example

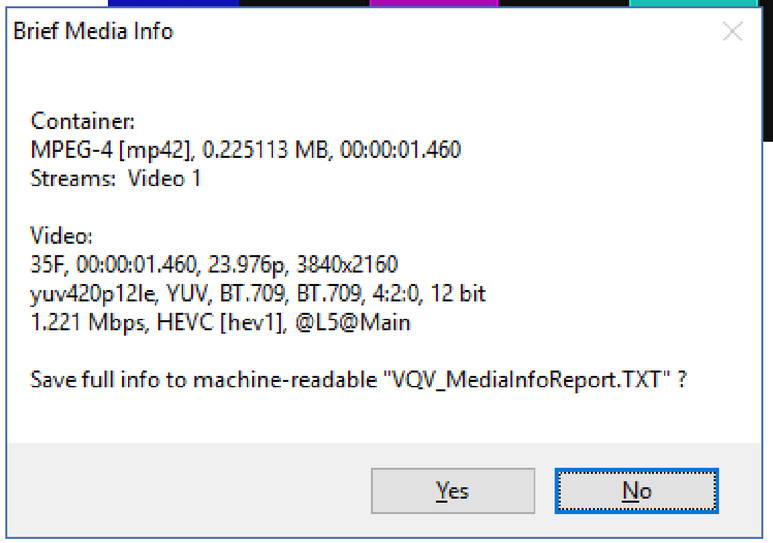
8 toggles between MSB and LSB images (*only if the input bit depth is greater than 8b*)

MSB: 8b RGB image derived from 12b UHD media file



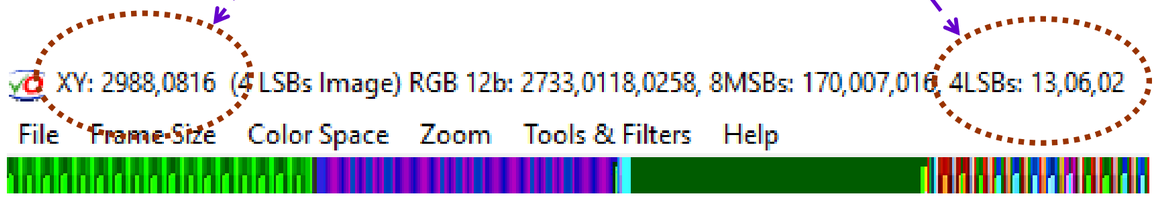
LSB: 8b RGB image derived from 12b UHD media file





Pixel position XY: **2988, 0816**

4 LSBs: **13, 06, 02**

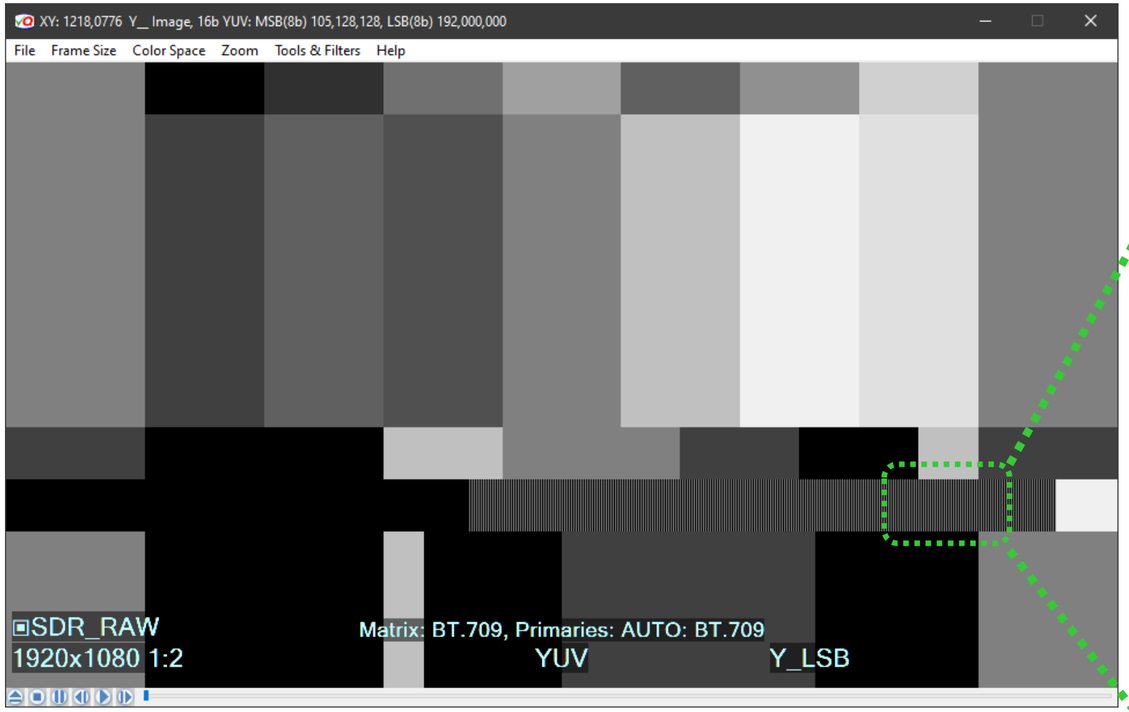


This example shows that used encoder (UHD HEVC) is far from being 12 bit accurate:
even on relatively easy flat color objects 4 LSB values are in fact random – pixel-by-pixel readout displays various numbers from 0 to 15.

Checking VQCB Test HD Version Ramp Bit Depth

8 toggles between MSB and LSB images (*only if the input bit depth is greater than 8b*)

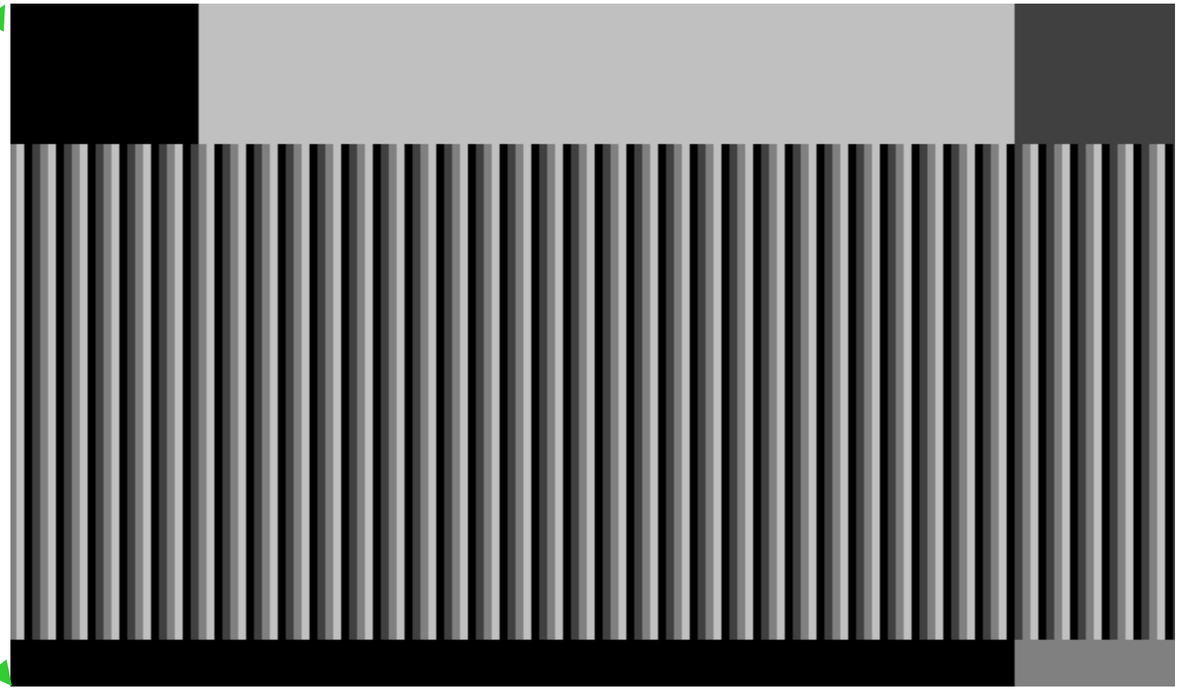
16b YUV source, Y channel 8b LSBs Image



Within the Ramp area

8b LSBs image shows **4 gradations**, i.e. only **2 LSBs** are active.

It means that actual bit depth of the Ramp is: 8 MSBs + 2 LSBs = **10 bit**



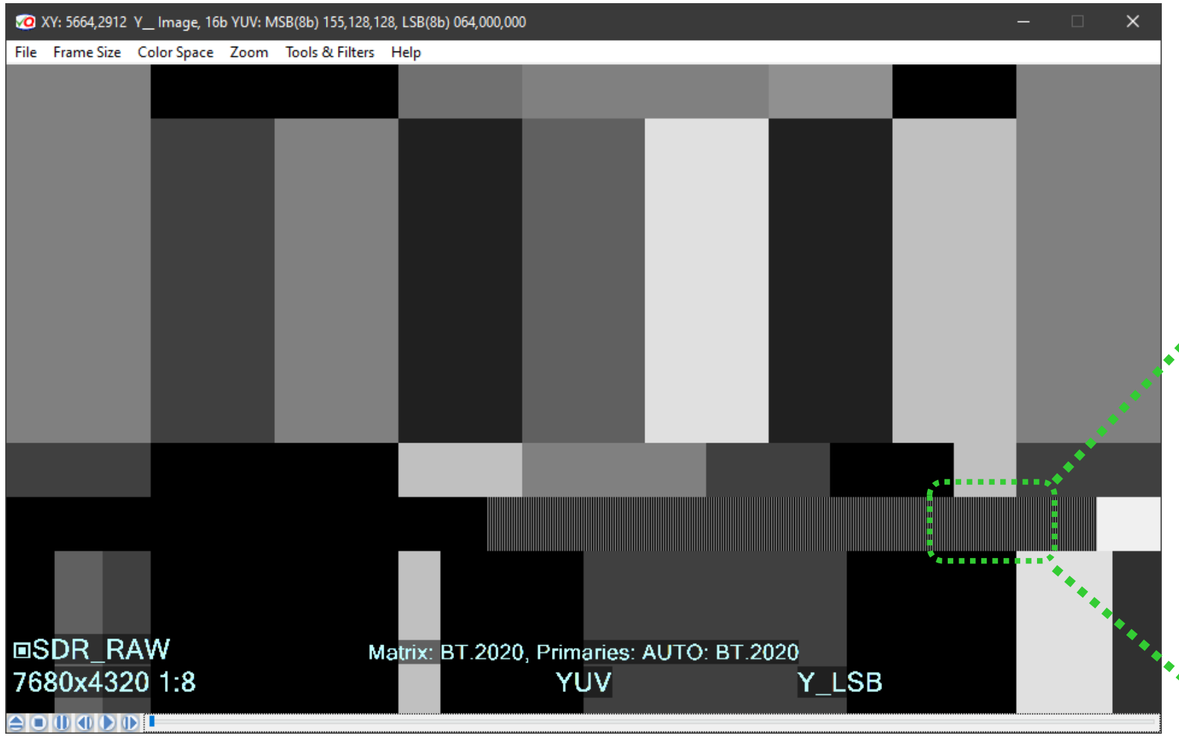
Max 4:1 Zoom centered on the Ramp Area

LSB image gradations pattern is uniform, it means that original data range have been not scaled: – preserving one 10b increment per pixel

Checking VQCB Test 8K Version Ramp Bit Depth

8 toggles between MSB and LSB images (*only if the input bit depth is greater than 8b*)

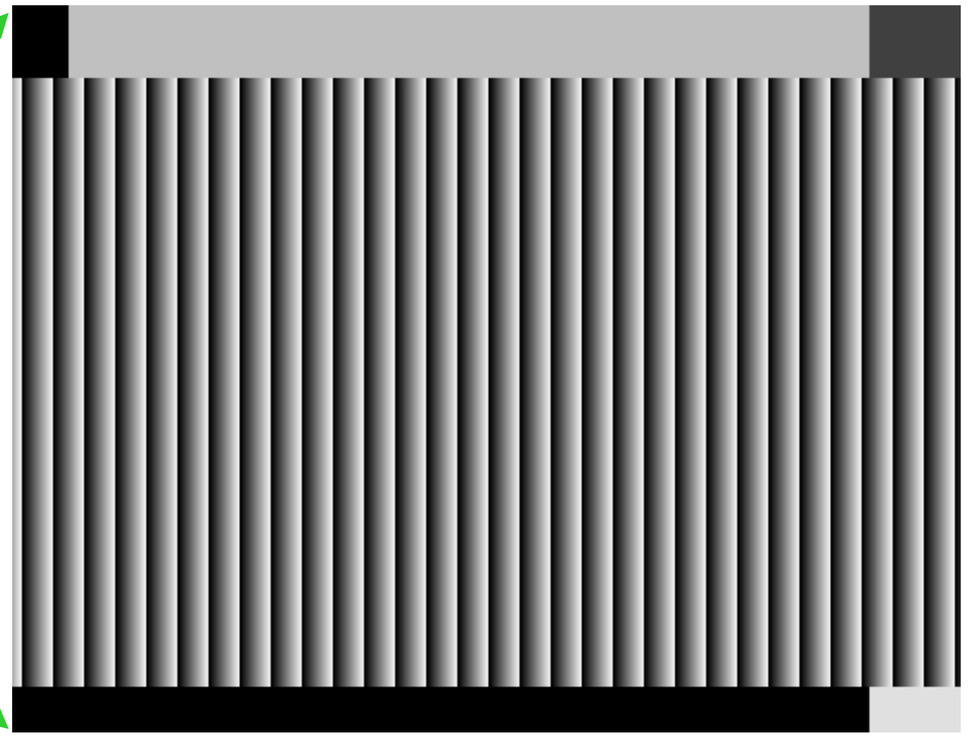
16b YUV source, Y channel 8b LSBs Image



Within the Ramp area

8b LSBs image shows **16 gradations**, i.e. **4 LSBs** are active.

It means that actual bit depth of the Ramp is: 8 MSBs + 4 LSBs = **12 bit**



Max 1:1 Zoom centered on the Ramp Area

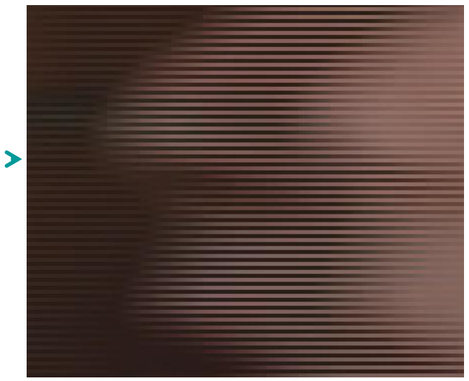
LSB image gradations pattern is uniform, it means that original data range have been not scaled: – preserving one 12b increment per pixel

De-interlaced Display Filter

Press **I** to cycle thru 3 de-interlaced display modes: Interleaved Fields (default), Top-Bottom Fields, Fields Difference

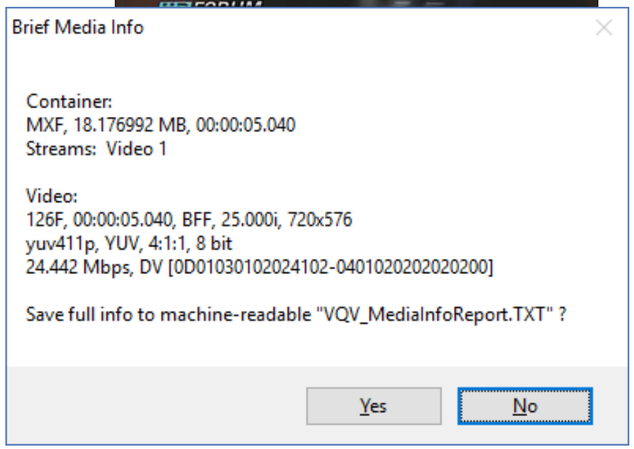
Interleaved Fields

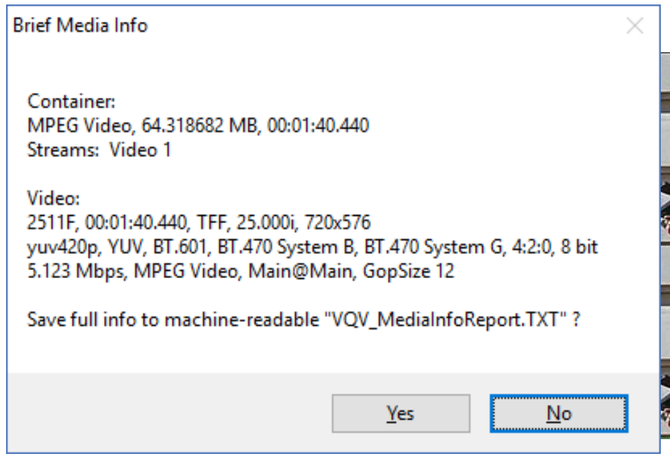
Zoom 4:1 (fragment)

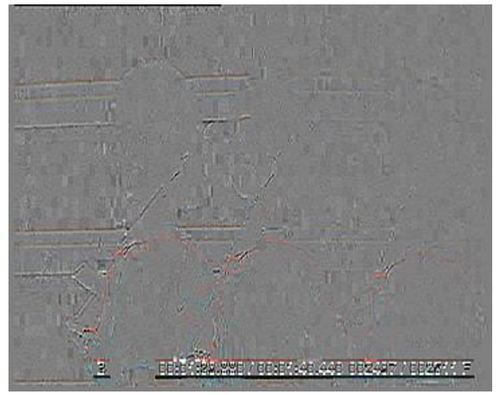


Top-Bottom Fields

Fields Difference







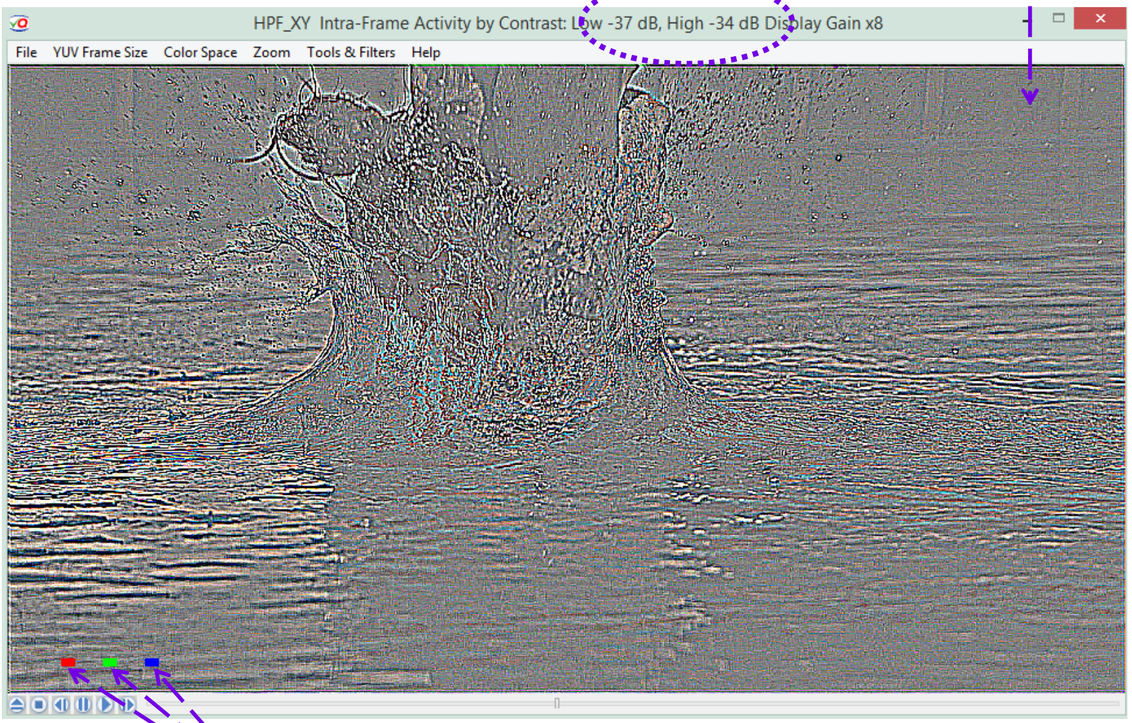
This example shows that despite **the same 25i** declared format, only the content in the1st row is **truly interlaced**,

The 2nd row images are in fact **25psf** (Progressively Scanned Fields), i.e. 25p original was converted to 25i – probably, for distribution purposes.

Spatial and Temporal Filters

Intra-Frame Activity
Readout in dB

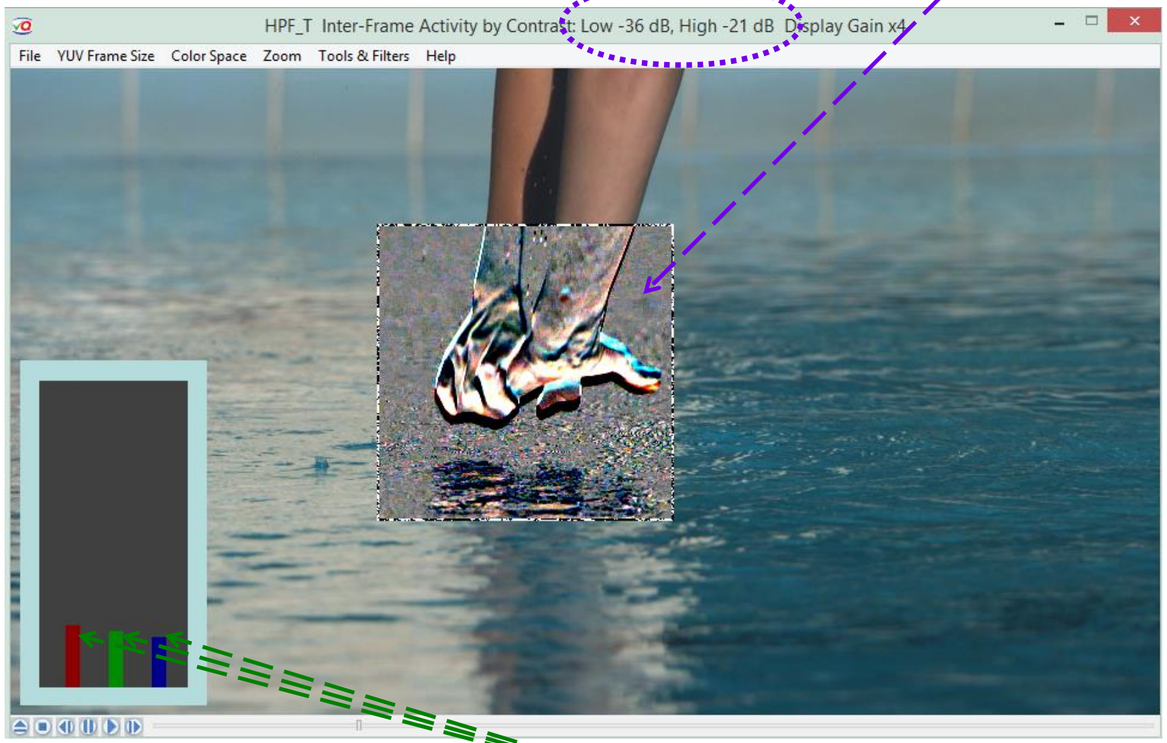
Intra-Frame Activity
Image



Intra-Frame Activity
BarGraph Display

Inter-Frame Activity
Readout in dB

Inter-Frame Activity
Image

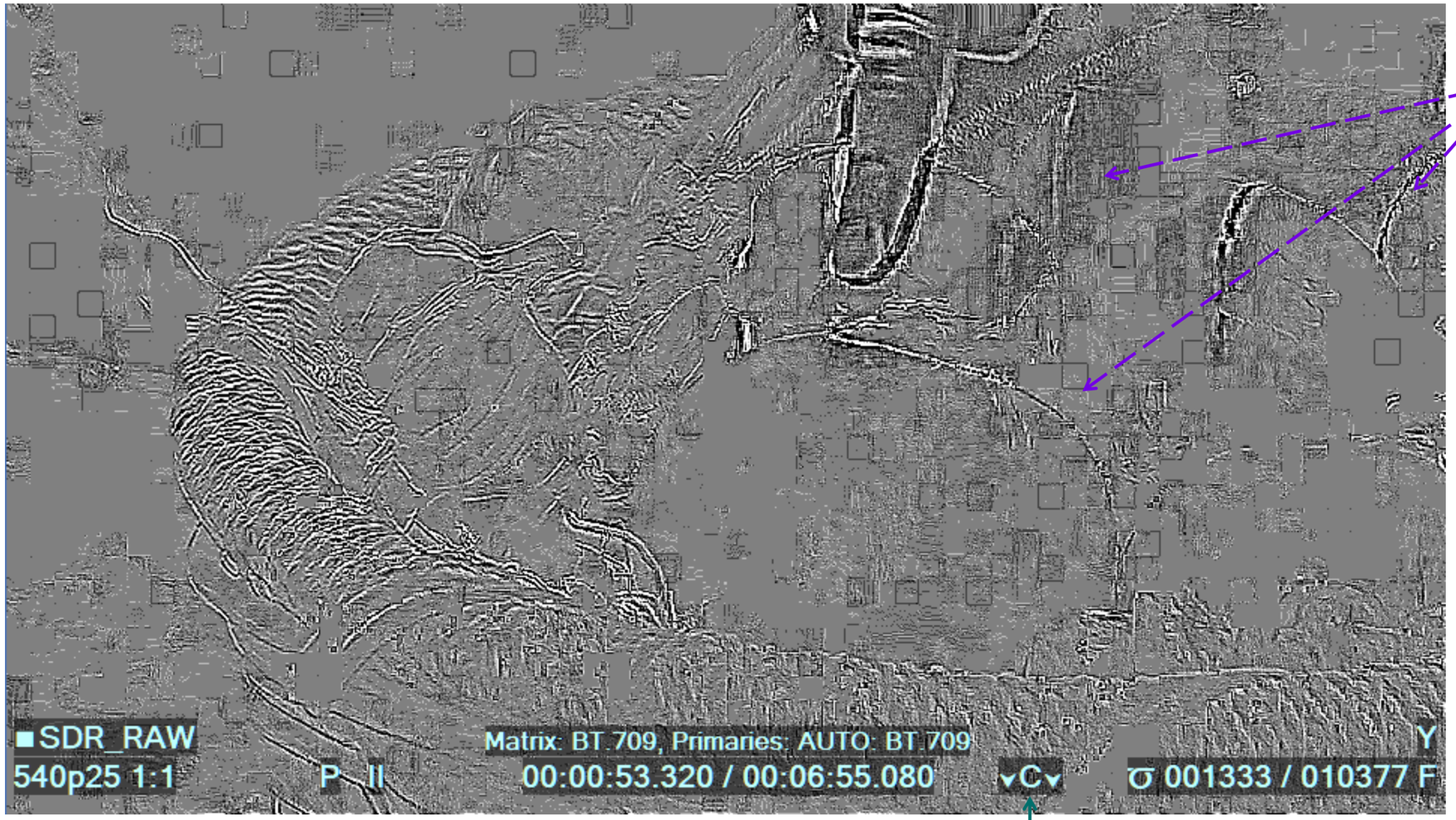


Inter-Frame Activity
BarGraph Display

Press **Shift + X**, and/or **Shift + T** to control spatial and temporal filtering

Compression Artifacts Filter

Press **Shift + C** to toggle this filter On/Off



Compression artifacts are clearly visible

Filter is ON

Press **Shift + F** to disable the filter and see normal picture: 

Reports and Log Files

VQV can display specific reports as pop-up windows:

- **Media Info Report** (**Ctrl + M**), optionally saved in **InFilePath.vqvmi.TXT**
- **Bookmarks Info Report** saved via File menu dialog, default name is **InFilePath.vqvbm.TXT**
- **Metadata Validator Report** (**Ctrl + Shift + M**), optionally saved in **VQV_MetaDataValidator.TXT**
- **Color Workflow Info Report** (**K**), optionally saved in **VQV_ColorWorkflowInfoReport.TXT**
- **Frame Info Report** (**Ctrl + F**), optionally saved in **VQV_FrameInfoReport.TXT**

Some report file names (listed above) are fixed and can not be changed. In such case the existing report will be overwritten/appended, then opened in minimized Notepad window, unless the user deliberately closed Notepad window related to the file.

VQV user can also create/append **VQV.Log** text file:

Press **Ctrl + P** to store in VQV.Log any textual information currently displayed in the Title Bar Message or as an Overlay.

Each time VQV.Log will be immediately opened in minimized Notepad window.

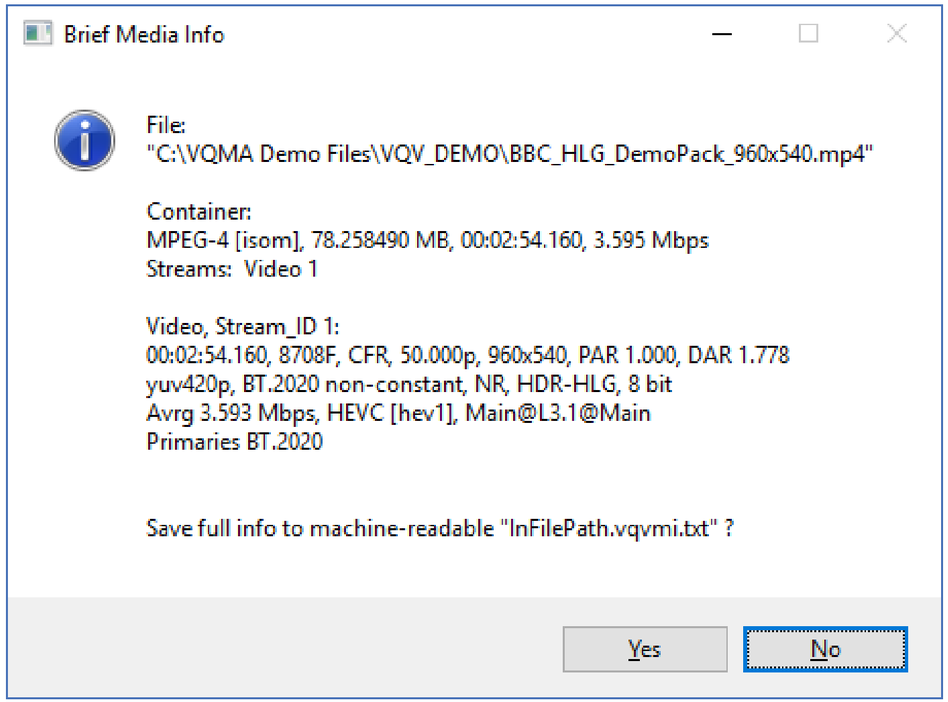
If necessary, user can edit/save/rename/copy/move these text files and copy/paste text data using standard Windows tools.

Media Info Report

Press **Ctrl + M**

to get **Brief Media Info Report** in pop-up window,

More text data can be optionally saved as **InFilePath.vqvmi.txt** and opened in minimized Notepad window.



VideoQ VQV v 2.2.1 copyright (c) 2012-2016.
Media File Info Report
MediaInfoLib - v0.7.92.1
Media Info Report Time = ,2017-03-08T18:49:24
File = ,"C:\Users\VS\Desktop\Mexicana.mp4"
FileExtension = ,MP4

General File Info:

EncodedDate_UTC = ,NULL
TaggedDate_UTC = ,NULL
LastModificationDate_UTC = ,2016-05-04T07:13:20.716Z
LastModificationDate_LOCAL = ,2016-05-03T23:13:20.716
WrittenTime_UTC = ,2016-05-04T07:13:15.137Z
WrittenTime_LOCAL = ,2016-05-03T23:13:15.137
ContainerFormat = ,MPEG-4
ContainerCodecID = ,isom
FileSize_byte = ,41856374
OverallBitRateMode = ,VBR
Duration_ms = ,415123
Duration_TC1000 = ,19:18:00.000
CountOfVideoStreams = ,1
CountOfAudioStreams = ,1
CountOfImages = ,0
CountOfTexts = ,0

Video:

EncodedDate_UTC = ,NULL
TaggedDate_UTC = ,NULL
Duration_ms = ,415080
FramesCount = ,10377
ScanType = ,Progressive
TopFieldFirst = ,NULL
FrameRateMode = ,NULL
FrameRate = ,25.000
FrameWidth = ,960
FrameHeight = ,540
ColorSpace = ,YUV
ColorPixFormat =,yuv420p
ColorMatrix = ,NULL
ColorPrimaries = ,NULL
ColorRange = ,NULL
TransferCharacterstics = ,NULL
ChromaSubsampling = ,4:2:0
BitsPerComponent = ,8
StreamSize_byte = ,34978735
AverageBitRate_bps = ,674159
EncodingFormat = ,AVC
CodecID = ,avc1
EncodingProfile = ,Main@L3
EncodingCABAC = ,Yes
GOPSize = ,M=1, N=50
NumberOfReferenceFrames = ,4

Audio:

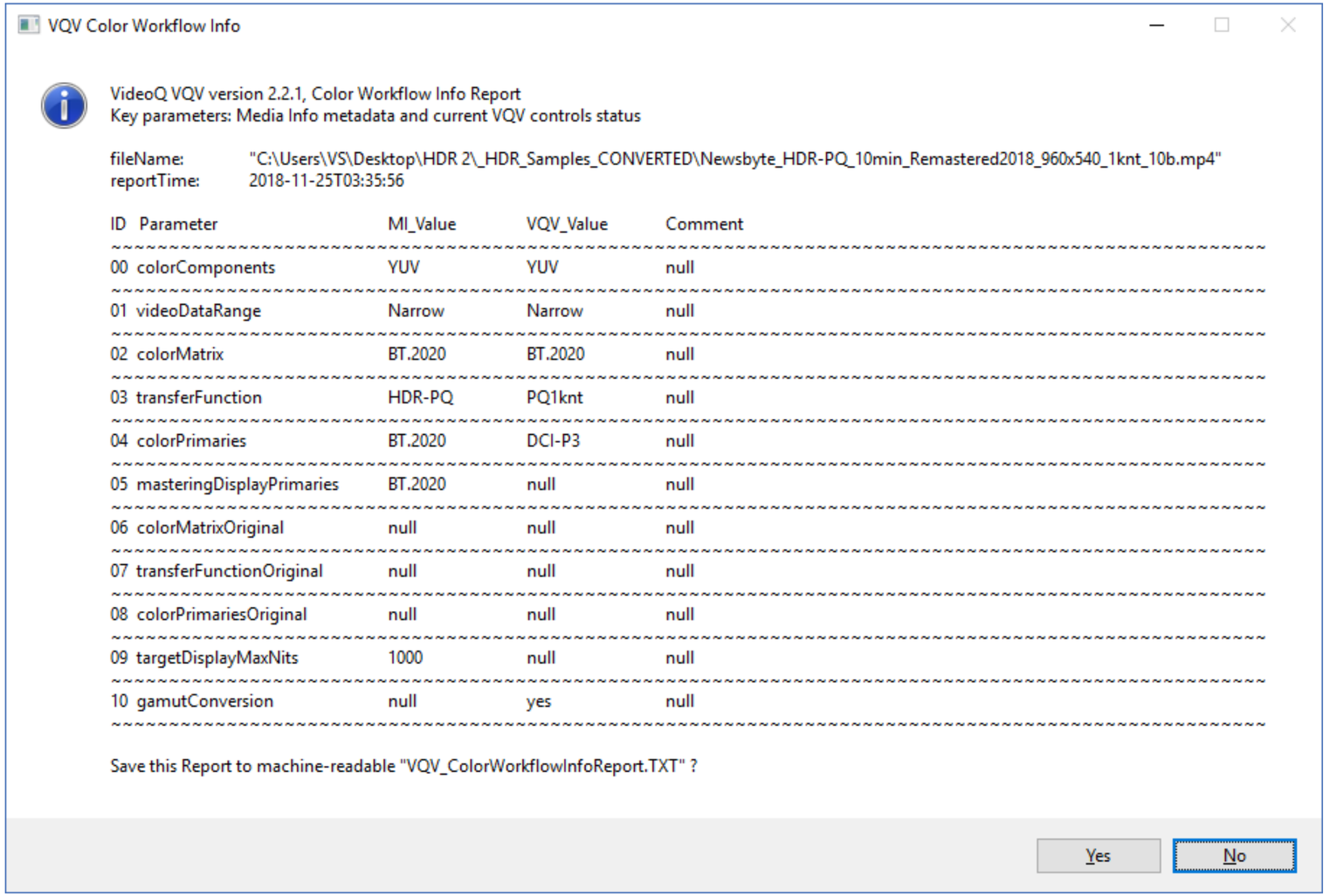
EncodedDate_UTC = ,NULL
TaggedDate_UTC = ,NULL
Language = ,en
Duration_ms = ,415123
StreamSize_byte = ,6642006
ChannelsNumber = ,2
ChannelPositions = ,Front: L R
SamplingRate = ,48000
SamplesCount = ,19925904
FrameCount = ,19459
BitRateMode = ,CBR
BitsPerComponent = ,NULL
BitRate_bps = ,128000
EncodingFormat = ,AAC
EncodingProfile = ,LC

VQV Color Workflow Info Report

Press **K**

to get **Color Workflow Report** in pop-up window, especially important for HDR WCG analysis.

The report data can be optionally saved in **VQV_ColorWorkflowInfo Report.TXT** and opened in minimized Notepad window.

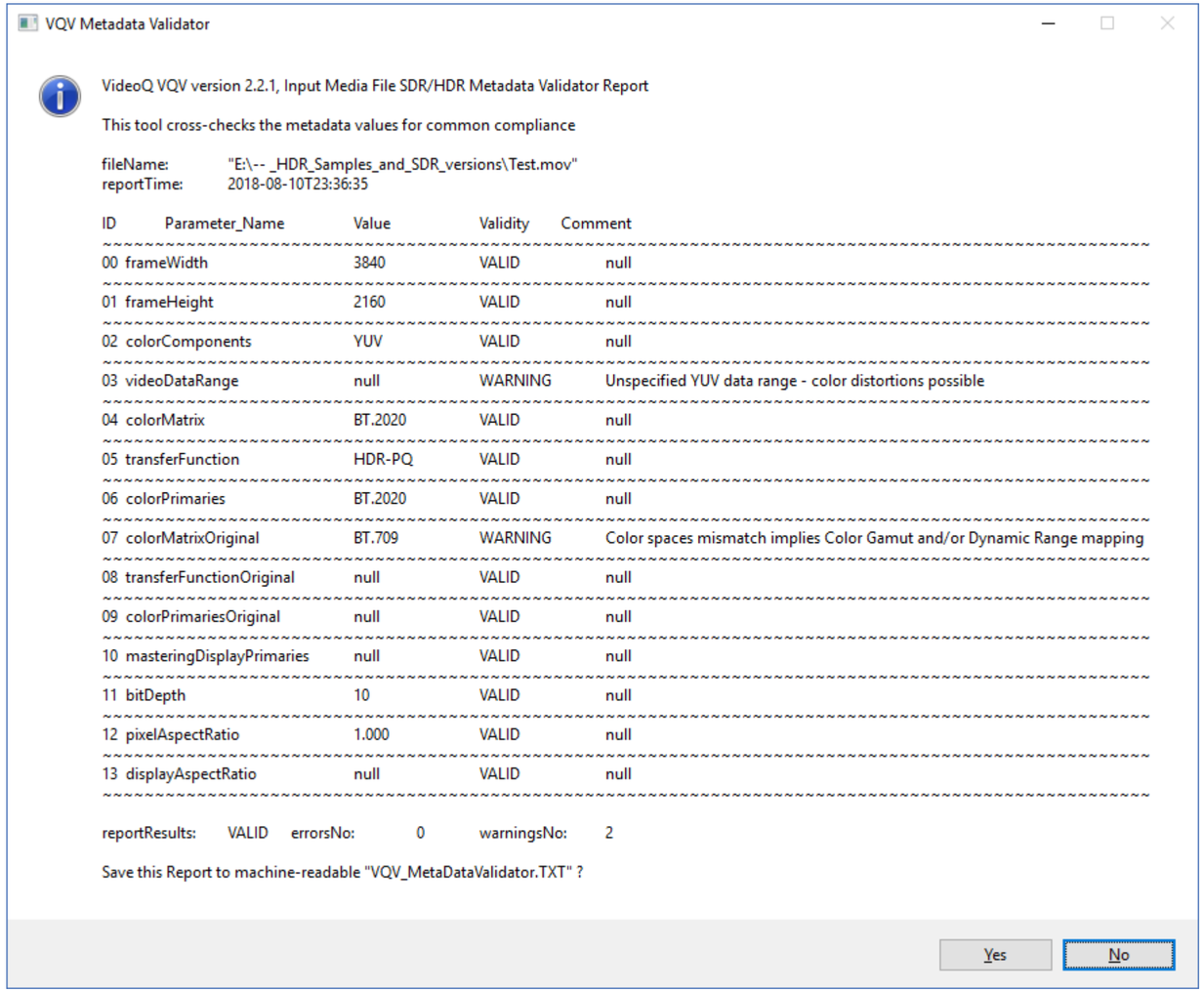


Metadata Validator Report

Press **Ctrl + Shift + M**

to get **Metadata Validator Report** in pop-up window,

The report data can be optionally saved in **VQV_MetaDataValidator.TXT** and opened in minimized Notepad window.



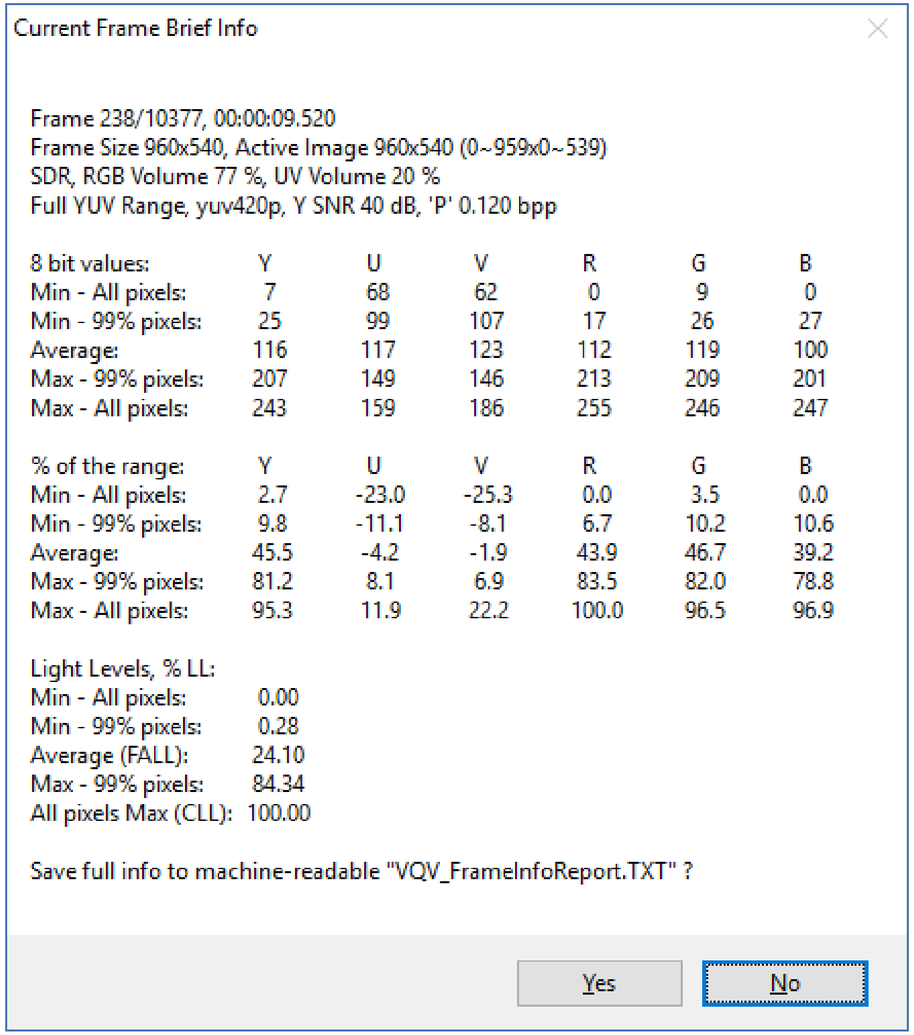
This tool generate **Warnings** and **Errors** Messages in tabular format with appropriate explanatory comments

Frame Info Report

Press **Ctrl + F**

to get **Brief Frame Info Report** in pop-up window,

More text data can be optionally saved in **VQV_FrameInfoReport.TXT** and opened in minimized Notepad window.




```
VQV v 2.2.1, Copyright (c) 2012-2016, VideoQ, Inc.
Frame Info Report Time: ,2017-03-09T00:51:23
File: ,"C:\Users\VS\Desktop\Mexicana.mp4"

Duration_ms ,415080000, Duration_TC1000 ,19:18:00.000
Frame 238/10377, 00:00:09.520 , TimePosition_ms ,9520, TimePosition_TC1000 ,00:00:09.520
Frame Size ,960, x ,540, Active Image ,960, x ,540, (0 ~ 959 x 0 ~ 539)
YUV 8b from file, RGB converted from YUV, Full Range to Full Range , BT.709
Selected RGB Rendering Mode: ,SDR

RGB_Volume_pct ,77, UV_Volume_pct ,20

Video Levels Statistics, 8b values
Channel: ,Y,U,V,R,G,B
Min - All pixels: ,7,68,62,0,9,0
Min - 99% pixels: ,25,99,107,17,26,27
Average:          ,116,117,123,112,119,100
Max - 99% pixels: ,207,149,146,213,209,201
Max - All pixels: ,243,159,186,255,246,247

Video Levels Statistics, Percents of Nominal Range
Channel: ,Y,U,V,R,G,B
Min - All pixels: ,  2.7,  -23.0,  -25.3,   0.0,   3.5,   0.0
Min - 99% pixels: ,  9.8,  -11.1,  -8.1,   6.7,   10.2,  10.6
Average:          ,  45.5,  -4.2,  -1.9,  43.9,  46.7,  39.2
Max - 99% pixels: ,  81.2,   8.1,   6.9,  83.5,  82.0,  78.8
Max - All pixels: ,  95.3,  11.9,  22.2,  100.0,  96.5,  96.9

Special Pixels Counts, percents of Total Pixels Count
Channel: R,G,B
On Min of All Pixels Level: ,   0.0008,   0.0008,   0.0139
On Max of All Pixels Level: ,   0.0008,   0.0008,   0.0023
Below Nominal Black: ,   0.0000,   0.0000,   0.0000
Above Nominal White: ,   0.0000,   0.0000,   0.0000

Light Levels, :
Min - All pixels: ,  0.00
Min - 99% pixels: ,  0.28
Average (FALL): , 24.10
Max - 99% pixels: , 84.34
All pixels Max (CLL): ,100.00

SNR, dB:
R,G,B,Y,U,V, (YUV SNRs derived from RGB)
40,40,41,40,49,52

Inter-Frame Activities, dB:
R,G,B
-22,-22,-21
```

VQV.Log Report

Press **Ctrl + P**

to create/append **VQV.Log** and store in it any text currently displayed in the Title Bar Message or as an Overlay;

VQV.Log will be immediately opened in minimized Notepad window.

```
VQV v 2.2.1. Copyright (c) 2012-2017 VideoQ, Inc.
Selected Analysis Data Items Log Created: 2017-03-09T01:03:05

File Open Time: 2017-03-09T01:03:05
File: "C:\Users\VS\Desktop\Mexicana.mp4"
Item: 0, FrameNo: 325
 Full YUV Range, SDR, Video Volume 77%
 Frame 325 / 10377 Time Code 00:00:13.000 / 00:06:55.080
 Active Image Size Meter: OFF. Analyzed: Full Frame Area 960x540
 Frame Video Levels, 8b: Min 0, Lower 21, Median 114, Upper 217, Max 255
 Frame Video Levels, %: Min -7.31, Lower 2.28, Median 44.75, Upper 91.78, Max 109.13
 Frame Light Values, %: Min 0.000, Lower 0.217, Average (FALL) 23.2, Upper 84.3, Max (CLL) 100.0
 Light Levels Statistics Analysis Start: 238F @ 00:00:09.520
 Overall: Average FALL 26.5 %, Max FALL 28.1 % @ 261F 00:00:10.440
 Overall: Max FrameUpper LL 100.0 % @ 249F 00:00:09.960, MaxMax LL (MaxCLL) 100.0 % @ 238F 00:00:09.520
 Analyzed: 88 Frames from 238F @ 00:00:09.520 to 325F @ 00:00:13.000
Item: 1, FrameNo: 325
Line 0260 StMin~StMax: Original RGB 8b 009~246, RGB % 3.5~96.5, LL: 0.0327~91.7 % LL
Item: 2, FrameNo: 470
 MP4[AVC] 960x540 25p 8b, Media Info: Average  0.674 Mbps, 0.052 bpp
 Current Frame: 470 / 10377F, 00:00:18.800 / 00:06:55.080, 'P',  0.223 Mbps, 0.017 bpp
 Bit Rate Statistics Segment Start: 325F @00:00:13.000
 Current GOP: Start 450F @00:00:18.000, # (Chunk ID) 9, I Frame (Max)  8.859 Mbps
 Last GOP: Size 50F, Average  1.175 Mbps
 Min GOP Size 50F @00:00:12.000, Max GOP Size 50F @00:00:12.000
 Analyzed: 146 Frames from 325F @00:00:13.000 to 470F @00:00:18.800
 Overall: Average  1.197 Mbps, Max 12.501 Mbps @00:00:16.000, GOP Average Max  1.381 Mbps @00:00:16.000

File Open Time: 2017-03-09T01:15:02
File: "C:\Users\VS\Desktop\HDR_10minutes_test_960x540_1000nit_p3.MP4"
Item: 0, FrameNo: 0
 Narrow YUV Range, HDR-PQ Max 1000 nt to SDR, Video Volume 73%
 Frame 0 / 15142 Time Code 00:00:00.000 / 00:10:05.680
 Active Image Size Meter: OFF. Analyzed: Full Frame Area 960x540
 Frame Video Levels, 8b: Min 5, Lower 9, Median 65, Upper 195, Max 255
 Frame Video Levels, %: Min 1.96, Lower 3.53, Median 25.49, Upper 76.47, Max 100.00
 Frame Light Values, nt: Min 0.080, Lower 0.421, Average (FALL) 86.9, Upper 525.3, Max (CLL) 1000.0
```

Full List of VQV Shortcuts 1

'Videola' – Jog & Shuttle Timeline Navigation Tool: **Ctrl** + **Mouse Left Button** + **Cursor Horizontal Position** within Image Area

Cursor position controls the speed selection; preset timeline step values: **+/- 0, 1, 2, 5, 10 F, 1, 2, 5, 10, 20 s, 1 m (60 s)**
In Jog Mode (i.e. starting from pause) – **Seek with variable speed**. On release of Mouse Left Button or Ctrl key – pause at last shown frame;
In Shuttle Mode (during playout) – **Play with variable speed**. On release of Mouse Left Button or Ctrl key – continue playout at last selected speed.
Select fractional playout speeds (slow motion) with **Mouse Wheel or Left/Right Arrows**: **+/- 0.1, 0.2 and 0.5** of media file frame rate

Key	Result	Shift + Key	Ctrl + Key	Ctrl + Shift + Key
Mouse Wheel	Jog Mode: **+/- 1 frame**, Shuttle Mode: **Speed** up/down,	Display **Gain**: up/down		Display Gain Filter Brightness **Offset**: up/down
Mouse Move	In Active Image: **Pixel Value** readout, In Mask Area: **Masked Filter** readout			
Mouse Middle Button	**Jog/Shuttle** toggle			
Mouse Left Button + Mouse Move	In Active Image: **Image Position** In Mask Area: **Mask Position**	Click in the image area: **Start/Stop playout**, speed: **+1F**	Hold and move the slider: **Timeline Scroll**	Click in the image area: **Continue playout**, reset speed: **+1F**
M + Mouse Wheel	**Mask Size** up/down			
Z + Mouse Wheel	**Zoom** up/down *(cursor centered)*			
Mouse Right Button	In Active Image: **Context Menu**			
Up/Down Arrows	**Zoom** up/down *(image centered)*	Display **Gain**: up/down	**VQV** to/from **VQMP** message	Display Gain **Slicing Level** up/down
Right/Left Arrows	Jog Mode: **+/- 1 frame**, Shuttle Mode: **Speed control**	Jog Mode: **+/- 10 frames**	In Jog Mode**:** **Seek, variable speed**	
PageDown/PageUp	Jog Mode: **+/- 1 s**	Jog Mode: **+/- 10 s**	Jog Mode: **+/- 1 m**	Jog Mode: **+/- 10 m**
0	**SDR RAW**	**Clear all Bookmarks**	**Segments Info** On/Off	
1	**HDR-PQ RAW**	**Record Bookmark #1**	**Go to Bookmark #1**	
2	**HDR-PQ ⇒ SDR**, Max **1000 nt**	**Record Bookmark #2**	**Go to Bookmark #2**	
3	**HDR-HLG RAW**	**Record Bookmark #3**	**Go to Bookmark #3**	
4	**HDR-HLG ⇒ SDR**, Max **100% LL**	**Record Bookmark #4**	**Go to Bookmark #4**	

Full List of VQV Shortcuts 2 (continued)

Key	Result	Shift + Key	Ctrl + Key	Ctrl + Shift + Key
5	**HDR-LOG RAW**	**Record Bookmark #5**	**Go to Bookmark #5**	
6	**HDR-LOG ⇒ HLG Compatible SDR**	**Record Bookmark #6**	**Go to Bookmark #6**	
7	**HDR-LOG ⇒ SDR**	**Record Bookmark #7**	**Go to Bookmark #7**	
8	**MSB / LSB Image** toggle (if media file > 8 bit)	**Record Bookmark #8**	**Go to Bookmark #8**	
9	**Full / Narrow YUV Range** toggle (RGB <> YUV conversion mode)	**Record Bookmark #9**	**Go to Bookmark #9**	
Space Bar	**Jog / Shuttle** toggle *(same as Play Button)*	**Jog / Shuttle** toggle speed reset to default **+1F**		
A	**Auto-select Primaries** for: - Color Gamut Converter - ChromaScope	Active Image Size **Markers** Show / Hide toggle	**Active Image Size Meter** (Black Bars Detector): Detect once & store results; also enables Active Image Area Analysis Mode	**Analyzed Area** toggle: **Active Image / Full Frame** Applies to most meters; Active Image Size Meter results are not affected
B	**Bookmark** current **Timeline Position** and **copy** it to **Clipboard**	**B** component Image (**Blue**)	**Go to** the **last used Bookmark**	Create the **Bookmark** from **Clipboard** data
C	**C-Bar** (Compression Analyzer) toggle On/Off	**ChromaScope Primaries**	**ChromaScope** On/Off	
D	All **Filters Off, same result as ESC key:** *settings reset to defaults*	**- Fast Draw Mode (FDM)** **- Aspect Ratio Correction** (**ARC**)	**Duplicate** currently opened file in new VQV window	
E	**Enhanced Rendering Mode** On/Off, **Color Vector Correlation ™** (CVC) processing		**AV Sync Error** Meter (on *MPC Test Pattern)*	
F	Frame Profile Waveform **Filtering Modes**,	All **Filters** On/Off *(settings preserved)*	**Frame Info** Report pop-up, *or* **Line Range Selection Mask**	
G	**Gamut** Conversion On/Off	**G** component Image (**Green**)		
H	**Histogram** Overlay toggle On/Off	**RGB / Light Levels Histogram** toggle	**Histogram Mode** toggle	**HDR10+ Analyzer** On/Off, also enables **L-Bar**

Full List of VQV Shortcuts 3 (continued)

Key	Result	Shift + Key	Ctrl + Key	Ctrl + Shift + Key
I	Cycle thru 3 **Deinterlacing Modes**			
L	**L-Bar** toggle On/Off	**Light Levels** (MaxRGB) Image, **S**: Highlighter / Heat-Map	**Transfer Function** Plot: On/Off	
M	WFM **Mask** toggle: Full Frame/Line Select, **Mask Size** control, ChromaScope **Modes**	Filters **Mask** On/Off	**Media Info** Report pop-up or WFM **Mask** Controls	
N	**Navigation** Control Panel pop-up (Go to Timeline Position & Bookmarks)	**Noise** Meter toggle On/Off	File Open in **New** Window	
O			File **Open** Dialog	
P	ChromaScope & WFM **Persistence**	Select **Primaries** for: **-** Color Gamut Converter - ChromaScope	**Print** analysis data to: *VQV.Log, VQV_Statistics.TXT, etc.*	
Q			**Quit** (Exit) VQV	
R		**R** component Image (**Red**)	**Release / Reopen** media file *same as 'Eject' button*	
S	**Switch / Start / Select** Text Messages / Display Modes		*Select **Video Stream** # if the number of video streams > 1*	
T	**Text Overlay Messages** On/Off	**T-Filte**r (Temporal High Pass)	**Text Overlay Auto-hide** On/Off	
U	Histogram, WFM, FrameScope and ChromaScope **Units** selection	**UV** components Image	Graticule Grid **Units** toggle: ***RGB** % vs. **Light Level** % or nits*	
V	**VV-Bars** toggle On/Off	Cycle thru 3 **VV Bars Modes**	**VectorScope** toggle On/Off	
W	**FrameScope** On/Off		**Waveform Monitor** On/Off	
X		**XY-Filter** (Spatial HPF/LPF)	**Exit** (Quit) VQV	
Y	Waveform Monitor: **RGB/YUV** toggle	**Y** components Image		
Z	**Zoom** with **Mouse Wheel** – *see above*			

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