Elecard Video Quality Estimator 2023

User Guide

User Guide Notices

Elecard Video Quality Estimator 2023 (4.6) User Guide

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For information, contact Elecard.

More information can be found at: https://www.elecard.com

For Technical Support, please contact the Elecard Technical Support Team: tsup@elecard.com

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1. Introduction

1.1 Preface

Elecard Video Quality Estimator is a powerful tool designed for professionals and prosumers in the video compression field.

Elecard Video Quality Estimator allows the user to calculate objective video quality metrics, such as PSNR, APSNR, SSIM, DELTA, MSE, MSAD, VQM, NQI, VIF, VMAF and VMAF phone to compare two streams with referenced RAW data, analyze differences, and identify the code portion causing the quality change.

1.2 Describing Elecard Video Quality Estimator

The following section defines the specification and features of Elecard Video Quality Estimator.

1.2.1 Supported Video Formats

- MPEG-1 Video stream,
- MPEG-2 Video stream,
- AVC/H.264 Video stream,
- HEVC/H.265 Video stream,
- VVC/H.266 Video stream,
- VP9 Video stream,
- AV1 Video stream,
- AVS3 Video stream,
- MPEG-2 Transport Stream (MPEG-1/2, AVC, HEVC),
- MPEG-2 Program Stream (MPEG-1/2, AVC, HEVC),
- AVI file container (MPEG-1/2, AVC, HEVC),
- MP4 file container (MPEG-1/2, AVC, HEVC, VP9, AV1),
- MKV file container (MPEG-1/2, AVC, HEVC, VP9, AV1),
- WebM file container based on MKV (VP9, AV1),
- IVF file container (VP9, AV1),
- FLV file container (AVC, HEVC),
- MXF file container.

1.2.2 Supported Raw Formats

- I444
- I422
- IYUV
- NV12
- NV21
- P444
- RGB24
- RGB32
- UYVY (Y422, UYNV, HDYC)
- V210

- V400
- V444
- Y42B
- YUY2 (YUNV, V422, YUYV)
- YV12
- YV16
- YVYU

1.2.3   Metric Types

- **PSNR** – Peak Signal-to-Noise Ratio.
- **APSNR** – average values of PSNR results calculated for a sequence and based on mean values of MSE results.
- **VQM** – Video Quality Measurement Techniques – a metric designed to calculate video quality and measure perceptual effect of video distortions.
- **SSIM** – Structural SIMilarity. This metric is based on measuring three components (luminance similarity, contrast similarity and structural similarity) and combining them into result value.
- **DELTA** – the value of this metric is the mean difference of the color components in the correspondent points of image.
- **MSE** – Mean-squired-error based metric.
- **MSAD** – the value of this metric is the mean absolute difference of the color components in the correspondent points of image.
- **NQI** – New Quality Index - is a metric designed to calculate video quality by combining three components: correlation loss, luminance and contrast distortion.
- **VIF** - Visual Information Fidelity - is a full reference image quality assessment index based on natural scene statistics and the notion of image information extracted by the human visual system.
- **VMAF** – Video Multimethod Assessment Fusion is an objective full-reference video quality metric developed by Netflix in cooperation with the University of Southern California.
- **VMAF phone** – a metric designed to predict the quality of videos displayed on mobile phones.

1.2.4   Features

- Calculation of video quality metrics (PSNR, APSNR, MSAD, MSE, SSIM, DELTA, VQM, NQI, VIF, VMAF and VMAF phone);
- Selection of ROI (region of interest) for metrics calculation;
- Display of essential statistics of encoded streams;
- Automatic selection of the similar first frame in two streams for analysis synchronization;
- Comparison of two encoded frames from different streams with a reference stream;
- Sharing comments between application instances and/or applications of Elecard StreamEye Studio set;
- Synchronization between applications of Elecard StreamEye Studio set (Binding mode);
- Bit distribution display;
- Command line tool;
- Saving data into CSV or text files;
- Display of comparison results in graphs: quantizer, frame size, bit allocation etc.

1.3 Using the Guide

1.3.1 Purpose

This guide is intended to help the user utilize Elecard Video Quality Estimator. It describes the Video Quality Estimator GUI, settings and functions and provides instructions for using Video Quality Estimator.

1.3.2 Topics Covered

The following lists the topics covered in this document:

- **Section 1: Introduction** – provides a general overview of Video Quality Estimator and describes the purpose of the document and its contents.
- **Section 2: Getting Started** – describes how to install, uninstall and run Video Quality Estimator.
- **Section 3: Using Elecard Video Quality Estimator** – describes the Video Quality Estimator GUI, provides instructions for comparing video streams and viewing the results of comparison.
- **Section 4: Command Line Tool** – covers advantages and features of Command Line Tool, and describes a list of commands applied for automatic analysis of media streams.

1.3.3 Related Documentation

For additional information, review the following documents:

- ISO/IEC 11172-2 for MPEG-1 video
- ISO/IEC 13818-2 for MPEG-2 video
- ISO/IEC 14496-10 for AVC/H.264 video
- ISO/IEC 23008-2 MPEG-H Part 2
- ITU-T Recommendation H.265
- H.266 Versatile video coding
- A VP9 Bitstream Overview for Google VP9
- AV1 Bitstream & Decoding Process Specification
- AVS3 (Information Technology Intelligent Media Coding (T/AI 109.2 — 2021) by Industry Alliance Standard)

1.4 System Requirements

1.4.1 Software Requirements

- Ubuntu 18.04/20.04/22.04 LTS x64;
- CentOS 7.6 x86_64.

1.5 Licensing and Technical Support

By installing, copying, or otherwise using the SOFTWARE PRODUCT or any UPDATES, you agree to be bound by the terms of the "Elecard" End-User License Agreement ("EULA"). This EULA is a legal agreement between you (either an individual or a single entity) and Elecard for the "Elecard" software product(s) accompanying this EULA, which include(s) computer software and may include "online" or electronic documentation, associated media, and printed materials ("SOFTWARE PRODUCT").

For technical support, please contact Elecard Technical Support Team: tsup@elecard.com

![elecard]

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For sales and licensing information, contact Elecard Sales Department: sales@elecard.com

1.6   Activating Elecard Video Quality Estimator

1.6.1   Sentinel License Protection

Make sure that Sentinel License Manager software has been installed on your computer. License Manager is provided within the product installation pack for Windows OS and macOS and installed automatically.

License Manager is provided as a separate installation pack for Linux OS and should be installed manually.

Please note, *Linux OS reinstallation will make the activated product license invalid.*

To check that License Manager is properly installed, go to Sentinel Admin Control Center at http://localhost:1947. If you see your license information, the installation is successfully completed.
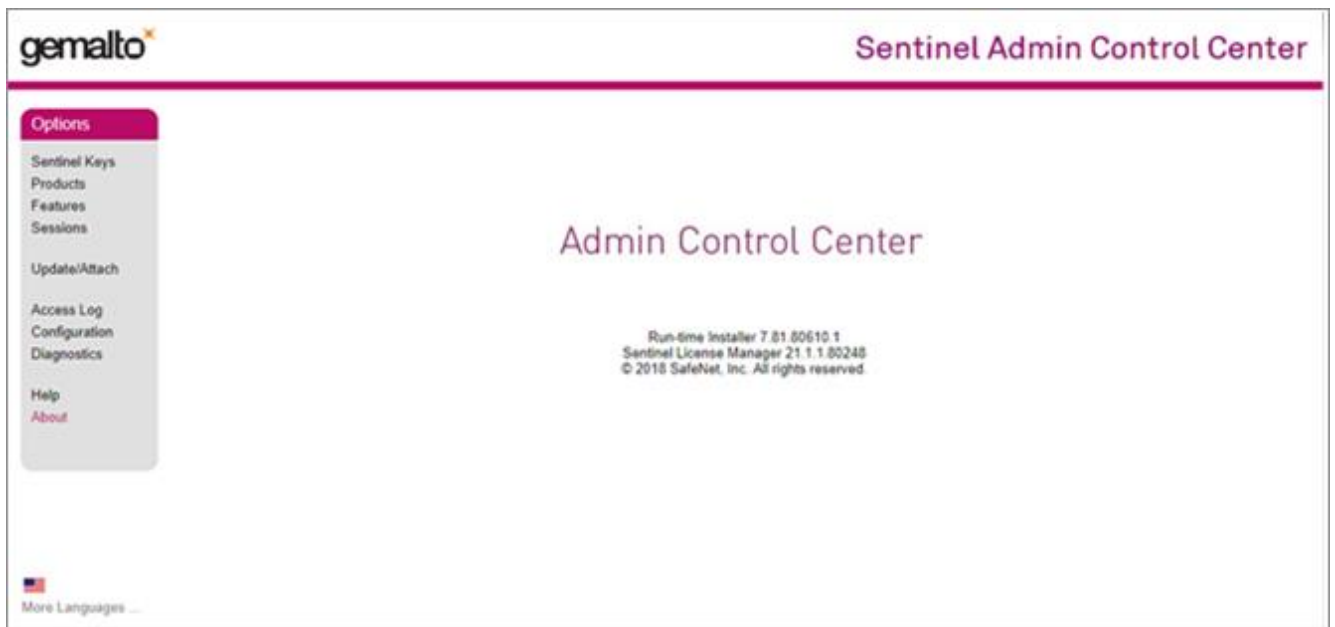

Figure 1.   The License Manager with license information

License Manager allows configuring, controlling, monitoring and looking through a list of available licenses. For more details on License Manager operation click the Help tab.

Note, each page contains the Help tab related to this page only.

You can activate Elecard Video Quality Estimator offline via following steps:

For Elecard Video Quality Estimator activation, a C2V (client-to-vendor) file should be created. To create the C2V file follow the steps:

1. Open the **File** tab and select **Options** in the drop-down menu.
2. A dialog window should open. Open the **License** tab.
3. Select HASP-SL for PC-based or HASP-HL for dongle-based activation in the *Offline activation with license files* field. Note, if you select a PC-based (HASP-SL) activation, full featured activated Elecard Video Quality Estimator will run only on this particular hardware. If you have Elecard dongle, plug it into a free USB port on your computer and select dongle-based (HASP-HL) activation. It will be possible to use Elecard product on any hardware with the dongle plugged in.
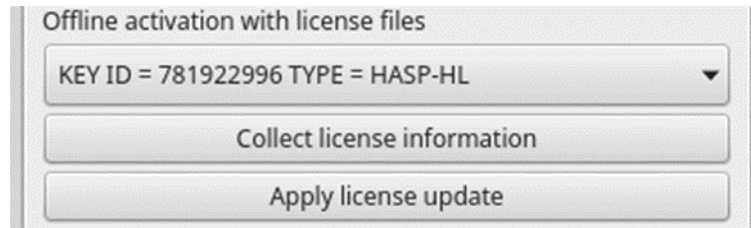
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Figure 2.   Offline activation with license files

4. Click the **Collect license information** button. The *Save File* dialog box should open. Click **Save** and save the C2V file to a required directory. Send the saved C2V file to Elecard Sales at sales@elecard.com.
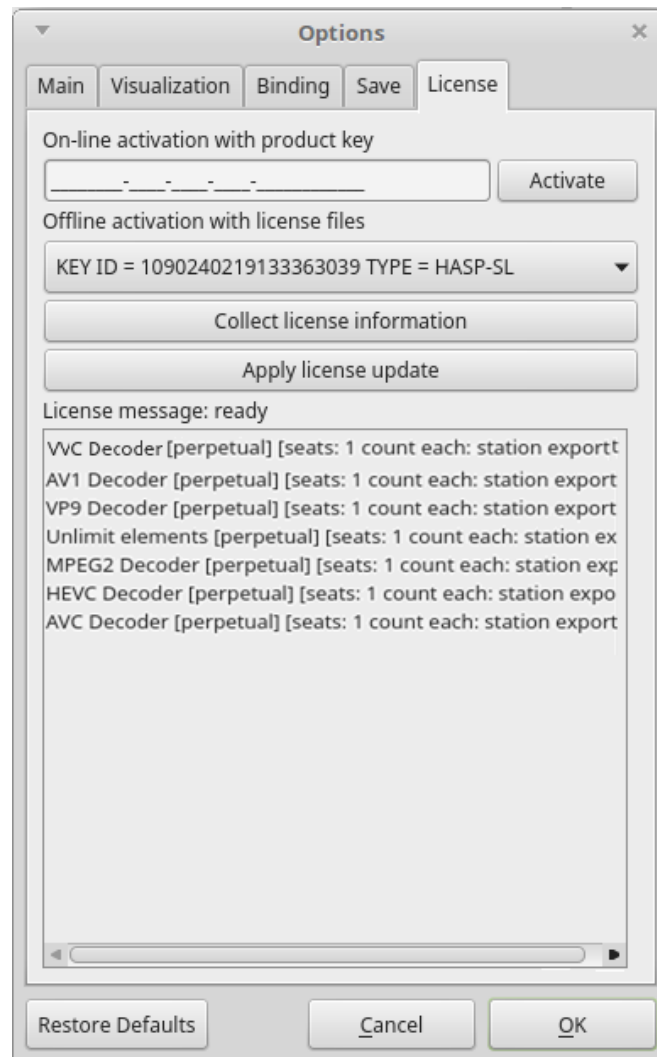

Figure 3.   Creating a C2V file: License tab

5. After receiving the V2C file containing license information back from Elecard Sales save the received file to a required directory. Open the **File** tab and select **Options** in the drop-down menu again. Open the **License** tab and click **Apply license update** (see Figure 4). The file selection dialog box should appear. Choose the received V2C file and click **OK**. Your application is successfully activated.

2. Getting Started

The following section details the procedures for installing and running Elecard Video Quality Estimator.

2.1 Installing Elecard Video Quality Estimator

Elecard Video Quality Estimator is supplied as part of Elecard StreamEye Studio or as a standalone application. The application is installed via Elecard StreamEye Studio or Elecard Video Quality Estimator installer.

Depending on the purchased product or version, the installation file is located:

- in /opt/Elecard/VideoQuest/bin folder as a separate application;
- in /opt/Elecard/Elecard StreamEye Studio/VideoQuest/bin folder as part of Elecard StreamEye Studio.

The console is located in /opt/Elecard/VideoQuest/bin folder.

To install Video Quality Estimator on Linux OS, follow the steps below:
- Install the Video Quality Estimator software by running the VideoQualityEstimator-4.x-Linux.deb file.
- Install Sentinel Runtime (Sentinel License Manager allows using the license).

2.2 Uninstalling Elecard Video Quality Estimator

Elecard Video Quality Estimator can be uninstalled as part of Elecard StreamEye Studio or as a standalone application

Depending on the operating system, there are two options of uninstalling the application.

1. To delete the Elecard application from Ubuntu:
    - Enter the command in the terminal: `sudo apt remove <application>;`
    - Or using the *Ubuntu Software* icon:
        - When *Ubuntu Software* opens, click the Installed button at the top.
        - Select the application that you want to delete, click Remove and Confirm the application remove.
        - You will be asked to authenticate by entering your password. After authentication the application will be removed.
2. To delete the Elecard application from CentOS:
    - Enter the command in the terminal: `sudo yum remove <application>.`

2.3 Running Elecard Video Quality Estimator

To run Elecard Video Quality Estimator, click *Menu → Applications → Elecard StreamEye Studio → Elecard Video Quality Estimator*.

To run Elecard Video Quality Estimator, click *Menu → Applications → Elecard Video Quality Estimator*.

3. Using Elecard Video Quality Estimator

3.1 Introduction

The following section describes Elecard Video Quality Estimator GUI (graphical user interface).

The Elecard Video Quality Estimator program has a simple user-friendly interface that allows the user to perform a number of operations including: opening 2 encoded streams and 1 raw stream for analysis, comparison and displaying the results of comparison along with basic parameters of the encoded streams.

3.2 Describing Elecard Video Quality Estimator

The following section describes Elecard Video Quality Estimator GUI.
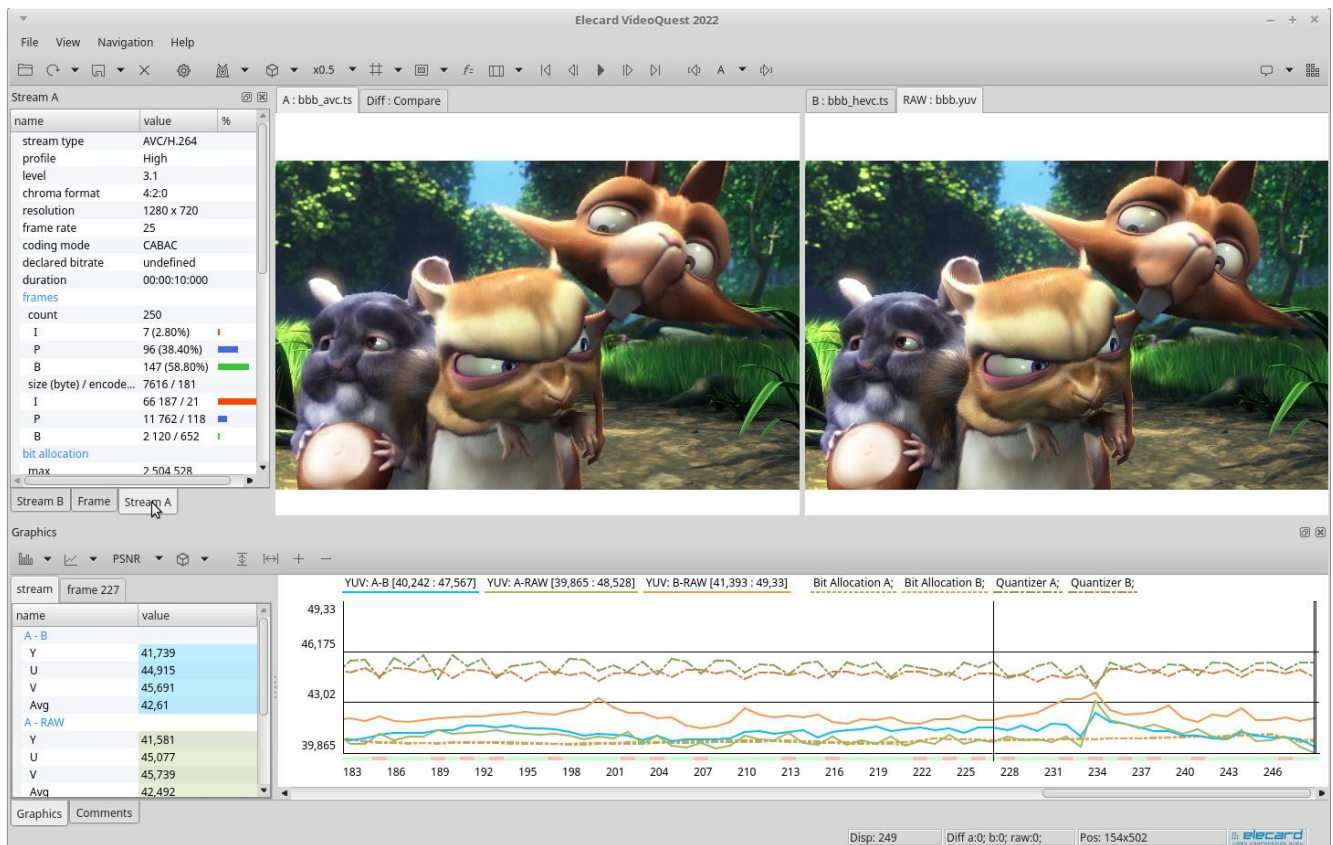
Figure 4.   Elecard Video Quality Estimator GUI − Main Window

3.2.1 ToolBars

The following table describes Elecard Video Quality Estimator toolbars.

Table 1. Elecard Video Quality Estimator GUI - Toolbars

Menu item	Button	Description
File		
Open file	🗀	Opens media for analysis.

|		
Reopen	↻	Opens the recently opened files.
Close	✕	Closes the files.
Save	⊓	Allows selecting parameters for saving and saves data: • stream parameters of the whole file (metrics info, index info, stream info) in a .csv file (file stores tabular data (numbers and text) in plain text. Each line of the file is a data record. Each record consists of one or more fields, separated by commas or semicolon); • current frame parameters (YUV data and image including A, B, RAW, Difference) as YUV or .png files. The saving parameters can be also configured in the Options tab.
Options	⚙	Opens the program settings dialog. Allows setting the number of files in a list, selecting color theme, enabling the *delete missing recent files automatically* function, and configuring the saving parameters.
Binding	🔒	Enables or disables the Binding mode: • Leader – allows sending comments, commands on interface or positioning changes to other applications; • Follower – allows receiving comments, commands from other applications.
View		
Color space	⬡	Selects color space to be displayed: YUV, Y, U, V.
Scale	x1	Sets the video scaling coefficient: x0.25, x0.5, x1, x2, x4, x8.
Grid	♯	Displays grid for convenience: none, 4x4, 8x8, 16x16, 32x32.
ROI	▣ / ▣	Region of interest (ROI) – limits analysis to the specified field: Normal / Inverse. Values of ROI: X: -1; Y: -1; W: -1; H: -1.
Output	▥	Output – shows and activates the current window (A / B / RAW / Difference)
Difference	*f=*	Enables/disables the comparison of Streams A and/or B with the Raw stream. The combo-boxes Difference Mode, Source 0, Source 1 are displayed. The following Difference modes are available: • Compare – pixel-by-pixel comparison of two frames. If two pixels are matched, the result is 0. Otherwise the result is equal to the maximum value. • Subtraction – pixel-by-pixel subtraction. The result is equal to the difference value. • Temperature – absolute difference (pixel-by-pixel subtraction), results are highlighted (black-blue-green-red), where black corresponds to zero difference, blue corresponds to slight difference, green corresponds to medium difference and red corresponds to the biggest difference. • PSNR – the result is the PSNR values (from 0 to 99.99) for corresponding CU partitioning blocks, where black color corresponds to 0 value, and white color corresponds to the value of 99.99 and higher. • PSNR Clip – the same as the PSNR, but minimum result value is the minimal PSNR among all blocks in the frame and maximum – the maximal PSNR, respectively. Black color corresponds to minimal value, white color corresponds to maximal value, and blended colors correspond to intermediate values. The following Source 0, Source 1 values are available: A, B, Raw.
Navigation		
Go to begin	◁|	Go to beginning - sets the current position to the first frame in the stream.
Step backward	◁‖	Previous - sets the current position to the previous frame.
Play	▶	Play - starts and stops the stream playback.
Step forward	‖▷	Next - sets the current position to the next frame.
Go to end	▷|	Go to end - sets the current position to the last frame in the stream.

Offset Decrement / Increment	⊲₁ ₁⊳	Offset decrement / increment. Allows adjusting stream position relatively to others.
File	A ▼	Allows choosing between streams: A, B, RAW.
Help		
Feedback	⊡	Sends the Video Quality Estimator feedback via e-mail with the following subjects: *Submit an Idea, Ask a Question, Report a Bug*.
About	▦	Shows the **About** window.
Graphics		
Barchart Configuration	▥	Shows a stream type and frame size: None, Clustered, Overlapping, Bit Allocation, Quantizer, Graphics mode.
Graphics	⬈	Displays stream graphics: A-B, A-RAW, B-RAW
Metric type	**PSNR**	Visualizes all metric types selected when opening streams in the New Task window: PSNR, APSNR, MSAD, MSE, SSIM, DELTA, VQM, NQI, VIF, VMAF and VMAF phone. *None* is displayed when no streams are selected.
Color space	⬡	Selects color space for display: YUV, Y, U, V.
Horizontal range	|↔|	Adjusts graphics to the current panel size horizontally.
Vertical range	⬍	Adjusts graphics to the current panel size vertically.
Zoom In / Out	+ / —	Scaling up and down.

3.2.2 Graphics panel

To open the Graphics panel, click the View tab and select Graphics. A dialog window will open.

Graphics:
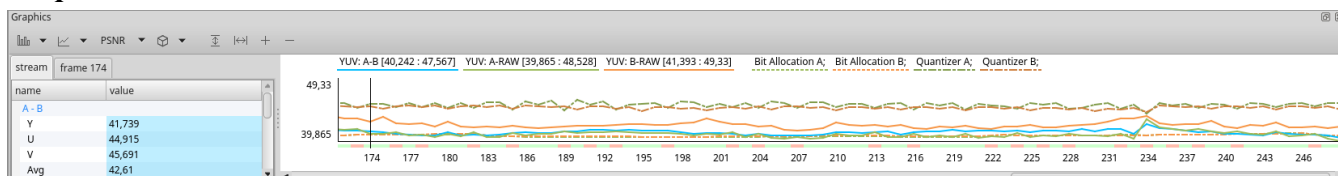
<p align="center">*Figure 5.   Elecard Video Quality Estimator GUI − Graphics*</p>

The ***Graphics panel*** displays the video streams being analyzed. The bar height illustrates the frame size and the bar color indicates the frame type (red – I, blue – P, green - B). The values displayed above the graphics correspond to minimum and maximum calculated values for the selected metrics of the component(-s).

To set the stream position to a frame, click the corresponding bar.

The ***Bar Chart Configuration*** button ▥ – allows configuring Bar Chart presentation mode to display additional information about the streams, including: frame size and type, bit allocation and quantizer:

- *None* - is displayed when no configurations are selected.
- *Clustered* – displays chart bars by A-B pairs under the corresponding display number;
- *Overlapping* – displays overlapping (overlaid) chart bars showing variance between them;
- *Bit allocation* – number of bits that are processed per a unit of time.
- *Quantizer* – displays the frame mean Quantizer value.
- *Graphics mode* – decreases chart bar brightness to focus attention on graphics. This option is switched on by default.

To select stream graphics between A-B, A-RAW, B-RAW, click the ⬈ toolbar button and enable

checkboxes.

To see all the metric types selected for graphics displayed, click the Metric type tab PSNR ▼. *None* is displayed when no metric types are selected.

To choose the component which metrics will be displayed in graphics, click the ⬡ button and select the required streams. Click the |↔| or ⬍ button to adjust the graphics to the reference window size horizontally or vertically, the minimal size is 1 pixel per frame. Click the ＋ / － buttons for upscaling or downscaling the graphics.

Hover a cursor over a frame, the frame metric info is displayed.

Figure 6.   Elecard Video Quality Estimator GUI − Frame Metric Information Window

3.2.3 Comments Panel

The **Comments** panel is designed for team work: share comments on a specific frame or group of frames in the stream, navigation and switching between different instances of the same application or different applications contained in Elecard StreamEye Studio.

To edit, remove or send comments using the Binding mode, open the context menu by right-clicking. The Send option enables you to pass the selected comment to the other application of StreamEye Studio set or the other instance of Video Quality Estimator. To select an application from which messages should be received or to select a type of messages to be received, go to the Options tab – Binding or see more details in the Options Dialog section.

Figure 7.   Elecard Video Quality Estimator GUI – Comments Panel

3.2.4 Stream Panel

The **Stream** panel displays the current stream summary information: stream type, profile, compatibility flags, level, tier, chroma format, resolution, frame rate, declared bitrate, duration, epsnr, frame types, average frame size, range of quantizer values bit allocation info, frame average bit distribution in CU, prediction and transformation data.

Stream A		
name	value	%
stream type	HEVC/H.265	
profile	Main	
compatibility	Main; Main 10	
level / tier	3.1 / Main	
chroma format	4:2:0	
resolution	1280 x 720	
frame rate	25.00	
declared bitrate	undefined	
duration	00:00:10:000	
frames		
count	250	
I	7 (2.80%)	
P	52 (20.80%)	
B	191 (76.40%)	
size (byte) / enc...	4519 / 305	
I	33 393 / 41	
P	8 147 / 169	
B	2 473 / 558	
bit allocation		
max	1 178 800	
avg	887 800	
min	438 400	
qp		
qp min	21	
qp avg	30.37	
qp max	35	
distribution (bits)		
total	35 129 (100.00%)	
split_cu_flag	1 026 (2.92%)	
cu_skip_flag	1 065 (3.03%)	
prediction		
intra_prediction	349 (0.99%)	
pred_mode_flag	142 (0.41%)	
part_mode	263 (0.75%)	
inter_prediction	0 (0.00%)	
transform		
rqt_root_cbf	607 (1.73%)	
split_transform...	560 (1.60%)	
cbf_cb	666 (1.90%)	
cbf_cr	2 278 (6.49%)	
cbf_luma	5 395 (15.36%)	
transform	22 774 (64.83%)	

Figure 8.   Elecard Video Quality Estimator GUI − Stream Panel

3.2.5 Frame Panel

The **Frame panel** displays the current frame summary information: stream / display number, type, sizes, qp. If A and B streams are open, information for both streams is displayed simultaneously for better user experience in analysis and comparison. The red color corresponds to the A stream, the blue color corresponds to the B stream.

Figure 9.   Elecard Video Quality Estimator GUI − Frame Panel

3.2.6 New Task

To open new media files for analysis and comparison, click the ⬚ button or click the File tab and select the corresponding menu item. A dialog window will open.

Add the required streams to the File A, and/or File B and file RAW fields from the **Open file** dialog window by clicking the browse button or clicking the recently opened files button. Select the required parameter for the RAW file in a drop-down box.

Select metrics by enabling the corresponding checkboxes.

Enable checkboxes for ROI (region of interest), auto synchronization and start quality estimation after closing the dialog, if required. Specify ROI values and choose normal or inverse type of the analyzed area. Specify the frames range for auto synchronization mode.
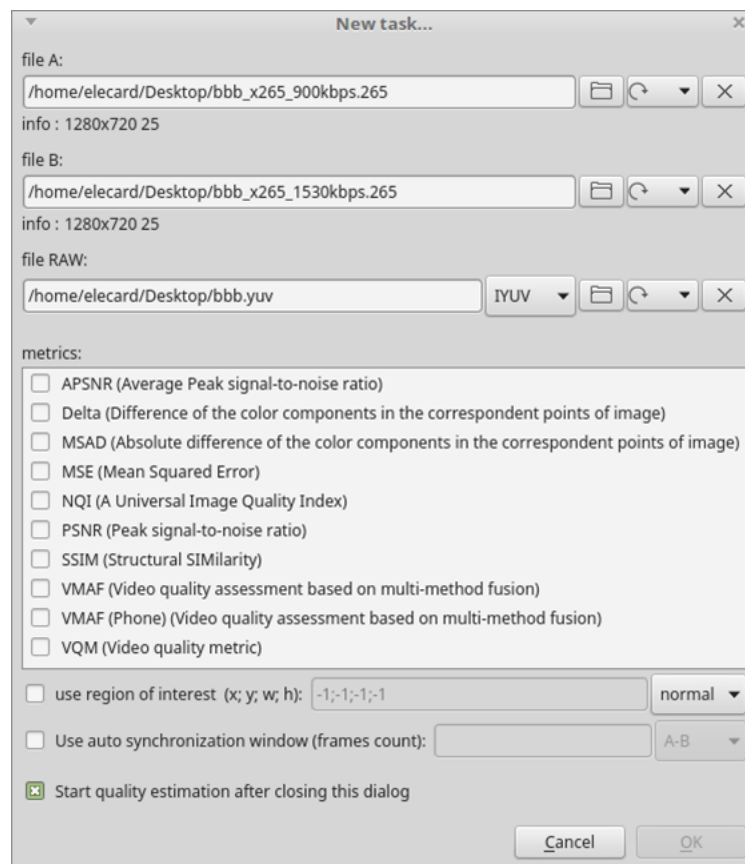
Figure 10.   Elecard Video Quality Estimator GUI − New task window

Note*: All input files should have the same resolution. If files differ in length, then the shortest length is*

taken for calculation: metrics are not calculated for the frames beyond the shortest file length.

3.2.7 Options Dialog

To configure file settings, binding and saving modes, open the **Options** dialog by clicking the ⚙ button or selecting the corresponding **File** menu command, and choose the required tab.
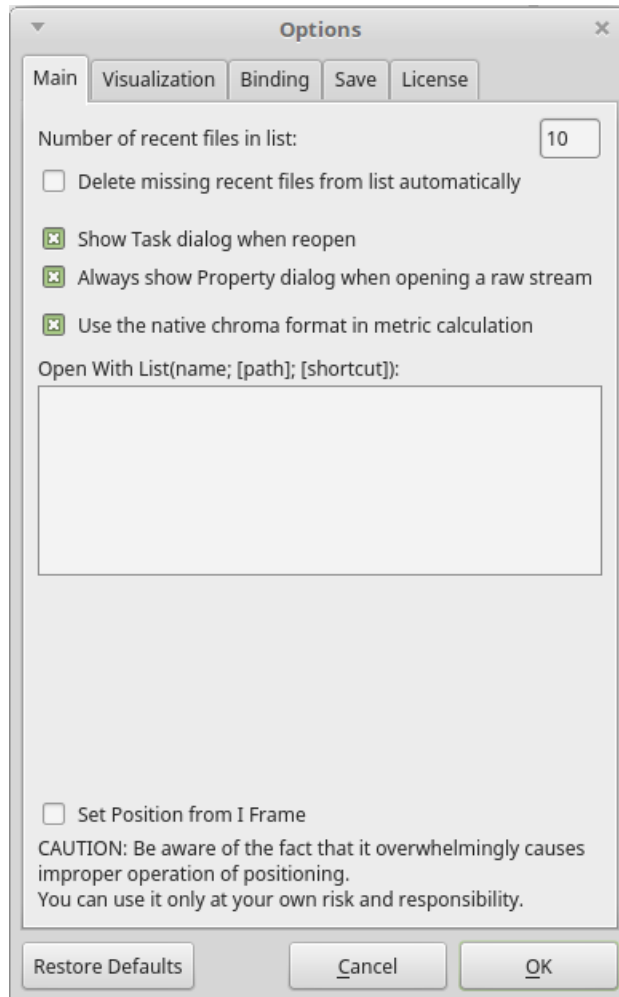
Figure 11.   Elecard Video Quality Estimator GUI – Options – Main Tab

The following table describes the Main tab in the Options dialog.

Table 2. Elecard Video Quality Estimator – Options dialog – Main tab

Control	Function
Number of recent files in list	Shows a number of recent files being saved in a list.
Delete missing recent files from list automatically	Allows deleting missing files from the recent list automatically when opening a file from the list.
Show Task dialog when reopen	Allows reopening the task dialog with previously saved configurations.
Always show Property dialog when opening a raw stream	Allows displaying the Property dialog when opening a raw stream
Use the native chroma format in metric calculation	Allows specifying parser initialization buffer.

_____

Open with list	Allows opening the file currently opened in Video Quality Estimator with another application (see details below).
Set position from I frame	Allows starting calculation from the first I frame in a stream. Note: Be aware of the fact that it overwhelmingly causes improper operation of positioning. You can use it only at your own risk and responsibility.

The **Options Dialog** allows opening a file with an external application. To open the file currently opened in Video Quality Estimator with another application, specify its name and path in the **Open with list** field according to parameters specified there. The parameters path and shortcut are optional. If the path parameter is not specified, default application or player supporting a file format and installed in the system is opened. Each string specified in the **Open with list** field corresponds to an individual item in the menu **File – Open with**, that allows easy switching between applications or players after configuring the field.

*Note: The **Restore Defaults** button allows you to reset set options to their original values. Functionality of this button is not applicable to the **License** tab.*
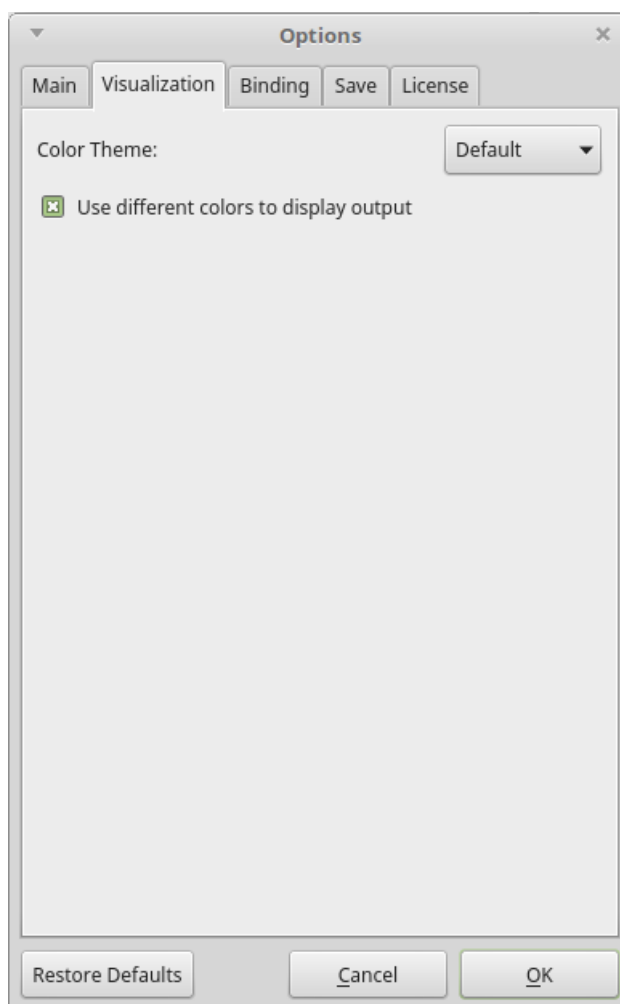
Figure 12.   Elecard Video Quality Estimator GUI – Options – Visualization Tab

The **Visualizaion** tab allows configuring the display of the application interface. By switching to the *Dark* Color Theme, the VideoQuest interface is displayed in the dark mode (by *Default* the light background is set). The *Use different colors to display output* option enables colorization of output values with different colors in the Frame and Stream panels.

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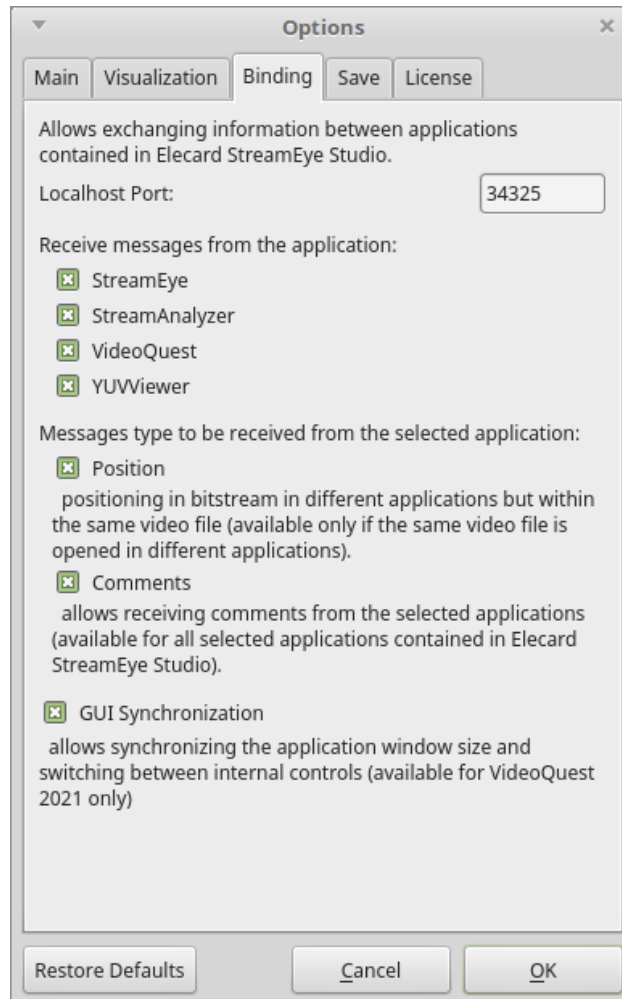
Figure 13.   Elecard Video Quality Estimator GUI – Options – Binding Tab

The **Binding** tab contains settings that allow configuration of the interaction between Elecard StreamEye Studio applications. In the **Binding** Mode, exchanging information between applications is provided via a specified port. By activating checkboxes, you can select which applications should send messages and set messages type that should be communicated. Additionally, the synchronization of applications window size and switching between controls can be enabled.
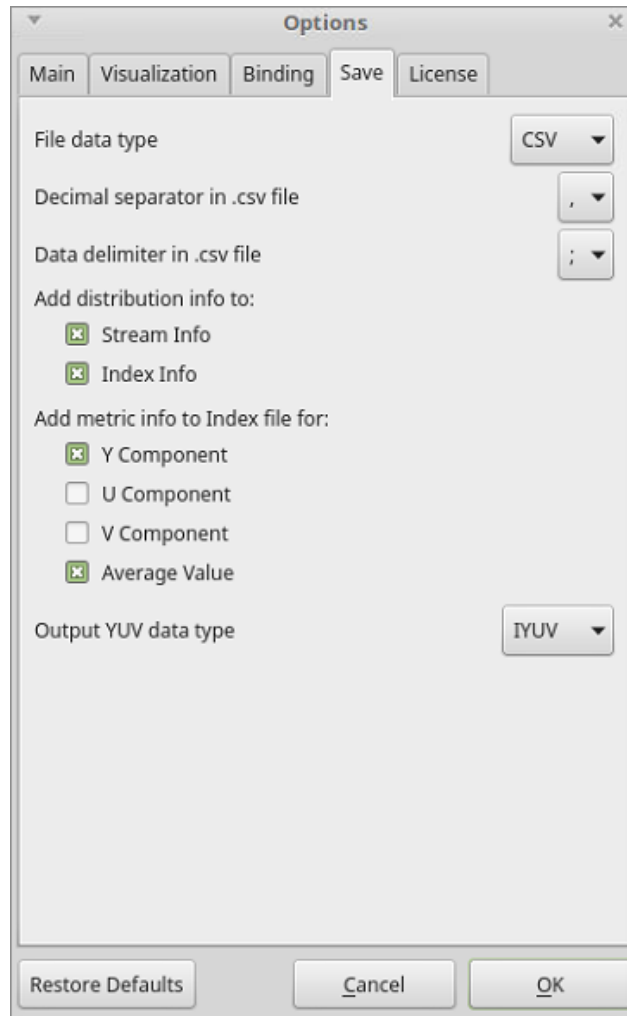
Figure 14.   Elecard Video Quality Estimator GUI – Options – Save Tab

The following table describes the Save tab in the Options dialog.

Table 3. Elecard Video Quality Estimator – Options dialog – Save tab

Control	Function
File data type	Allows selecting the format in which metrics data should be saved (the CSV or JSON format).
Decimal separator in .csv file	Allows selecting decimal comma or decimal dot to separate an integer part from a fractional one of a real number.
Data delimiter in .csv file	Allows selecting comma or semicolon to specify boundaries in data stream.
Add distribution info to	Allows adding distribution info when saving a file: Stream Info, Index Info.
Add metric info to Index file for	Allows adding metric info for the selected parameters when saving: Y component, U component, V component or Average Value.
Output YUV data type	Allows saving YUV data in one of the following formats: I444, I422, IYUV, NV12, NV21, P444, RGB24, RGB32, UYVY (Y422, UYNV, HDYC), V210, V400, V444, Y42B, YUY2 (YUNV, V422, YUYV), YV12, YV16, YVYU.

3.2.8 Hot Keys

For tabs, functions and modes switching press hot keys described hereto.

- Ctrl + O   – opens a **media file.**
- Ctrl + R   – opens the **recently opened file**.

The following hot key combinations are used for **Navigation**:

- Ctrl + Shift + Left   – starts the **Go to beginning** function.
- Alt + Left   – goes to the **Previous** frame.
- Ctrl + Space   – starts and stops the **Play** function.
- Alt + Right   – goes to the **Next** frame.
- Ctrl + Shift + Right   – starts the **Go to end** function.

To change **View** configuration of panel controls, use the following hot keys:

- F2   – shows / hides **all controls.**
- F3   – shows **all** (controls).

For configuring **information panels**, use the following hot key combinations:

- ALT+1   – shows / activates the **stream A** panel.
- ALT+2   – shows / activates the **stream B** panel.
- ALT+3   – shows / activates the **frame** panel.

The following hot keys are used for switching **Output Panels**:

- CTRL+1   – activates the **A** panel.
- CTRL+2   – activates the **B** panel.
- CTRL+3   – activates the **RAW** panel.
- CTRL+4   – activates the **Difference** panel.

4. Command line tool

Elecard Video Quality Estimator Command Line tool is designed for insight into MPEG-1/2, H.264/AVC, H.265/HEVC, H.266/VVC, VP9, AVS3, and AV1 video compression standards and ever fast quality and compliance check.

Video Quality Estimator Command Line tool allows automatic analysis of video arrays. You can customize a sequence of commands to perform your specific tasks and automate your routine tasks.

Get to the command prompt by clicking Start->Run and type 'cmd'. Then enter the command to start the application first and proceed with the command line options. In general, the syntax is as follows:

```
./videoquest-cli config.xml /inA:input.avc /out:output_avc /ref:ref_input.yuv
```

Note: You should not relocate the <product> console without all the other applications of the product contained in the installation pack, otherwise the console application will not start.

4.1 Configuration File

Configuration file – contains all the commands performed by the application and reflects overall operation results:

```xml
<?xml version="1.0"?>
<VQ version="1">
      <inputA file="…" stream="-1(default)" offset="0(default)"/>
      <inputB file="…" stream="-1(default)" offset="0(default)"/>
      <reference file="" type="IYUV(default)/[*Upsampler Type]"
      offset="0(default)" step="1(default)"/>
      <output separator=".(default)/," delimiter=";(default)/," file="…"/>
      <roi x="0" y= "0" width="0" height="0" inverse="true\false"/>
      <sync window="0(default)" source="AB/ARaw/BRaw"/>
      <range span="all(default)/start - stop"/>
      <info>
            <stream distribution="on(default)/off" file="…"/>
            <index distribution="on(default)/off" file="…"/>
            <metrics data="All(default)|AB|ARaw|BRaw"
            nativeChroma="Yes(default)/No" component="All(default)|Y|U|V|A"
            type="PSNR(default)|APSNR|SSIM|… " file="…"/>
            <data source="A|B" format="IYUV(default)/YV12" file="…"/>
            <difference type="compare/subtraction/temperature/psnr/psnr clip"
            source="AB/ARaw/BRaw" format="IYUV(default)/YV12" file="…"/>
            <message source="A|B" level="all(default)/message/warning/error"
            file="…"/>
      </info>
</VQ>
```

4.2 List of Commands

List of commands contains information on the commands and all parameters, which may be used within a command, and their description.

Command	Description
<input1/> **<input2/>**	The tag is used to configure the input file; Specifies the elementary video stream number, if number of streams exceeds one. «-1» — first available elementary video stream. It is set by default.

stream offset	Starting frame for further calculation. Offset from the beginning up to the specified frame in the stream. It is expressed in frames.
\<reference/\> type file offset step	The tag is used to configure the reference file; Defines the format of the raw data. (YV12 (is set by default) / IYUV are used now. More formats to be supported in the next updates.); Sets the path to the reference file. Offset from the beginning up to the specified frame in a reference stream. It is expressed in frames. "0" is set by default. Coefficient used for calculation of a successive frame number for further analysis. "1" is set by default.
\<output/\> separator delimiter file	The tag is used to configure the output file; Allows selecting decimal comma or decimal dot to separate an integer part from a fractional one of a real number. Allows selecting comma or semicolon to specify boundaries in data stream. Sets the output file path.
\<roi/\> normal inverse	Region of interest selected for measurement; Measures the specified field of the frame; Measures the whole frame field except the specified part
\<sync/\>	Specifies the frames range for auto synchronization mode. "0" is set by default.
\<range/\> span	The tag is used to define the range of analyzed frames; Defines the range of frames (all (by default) /start - stop), 'start' - number of the first analyzed frame, 'stop' - number of the last analyzed frame.
\<stream/\> distribution file	The tag is used to output general information about the analyzed stream; Contains information on data distribution by type of coding units (on (by default) / off); Sets the path for the output stream information.
\<index/\> distribution file	The tag is used to output information about frames (offset, frame type, frame size, average quantizer, etc.); Contains information on data distribution by type of coding units (on (by default) / off); Sets the output file path where information on frames will be saved.
\<metrics/\> data type file	The tag is used to output information on quality metrics; Specifies the type of the streams selected for metrics calculation and saving: All (by default) | AB | ARaw | BRaw; Specifies the metric type: PSNR (by default) | APSNR | SSIM | DELTA | MSAD | MSE | VQM | NQI | VIF| VMAF | VMAF phone. Sets the output file path where information on metrics will be saved.
\<data/\> source format file	The tag is used to save output decoder information on any decoding step; Defines the type of the source for metrics calculation: A | B | Raw Defines the format for saving data (IYUV (by default)); Sets the output file path where the data will be saved.
\<difference/\> type source file	The tag is used to output information on difference metrics Defines the type of difference (compare/subtraction/temperature/psnr/psnr clip). This is the required parameter for this tag. Its default value should be set. If the value is not set, this tag will be skipped; Specifies the source type for difference calculation: AB | ARaw | BRaw; Sets the output file path where information on difference will be saved.

4.3 Features of Command Line Tool

- Analysis the whole array of video files automatically;
- Addressing specific and complex challenges with a few lines of commands;
- Retrieving submitted results as a text file in CSV format for easy viewing in Excel;

- Customizing a sequence of commands to perform your specific tasks;
- Accelerating and automating your regular tasks.