Elecard HEVC Analyzer v.1.x

User Guide

Notices

Elecard HEVC Analyzer v.1.x User Guide

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CONTENTS

1. INTRODUCTION....4

1.1 Preface....4
1.2 Using this Guide....4
1.2.1 Purpose....4
1.2.2 Topics Covered....4
1.2.3 Related Documentation....4
1.3 System Requirements....5
1.3.1 Hardware Requirements....5
1.3.2 Software Requirements....5
1.4 Licensing and Technical Support....5

2. GETTING STARTED....6

2.1 Installing Elecard HEVC Analyzer....6
2.2 Uninstalling Elecard HEVC Analyzer....6
2.3 Running Elecard HEVC Analyzer....6

3. DESCRIBING ELECARD HEVC ANALYZER....7

3.1 Overview....7
3.2 Specifications....7
3.2.1 Supported Formats....7
3.3 Features....7

4. USING ELECARD HEVC ANALYZER....9

4.1 Introduction....9
4.2 Describing Elecard HEVC Analyzer GUI....9
4.2.1 ToolBars....9
4.2.2 Navigation Controls....11
4.2.3 Hex Viewer....13
4.2.4 Stream Viewer....14
4.2.5 Prediction Panel....15
4.2.6 Pixels Panel....15
4.2.7 VPS, SPS, PPS, Slice Panel....16
4.2.8 Picture Panel....17
4.2.9 Stream Panel....18
4.2.10 CU Panel....19
4.2.11 CTU Tree Panel....20
4.2.12 CTU Presenter Panel....21
4.2.13 DBP Panel....22
4.2.14 Buffer Panel....22
4.2.15 Video Out Panel....23

1. Introduction

1.1 Preface

Elecard HEVC Analyzer is a powerful software tool designed for professionals and prosumers in video compression field. Elecard HEVC Analyzer enables the user to perform an effective in-depth analysis of video sequences. Elecard HEVC Analyzer provides a visual representation of the encoded video features and a stream structure analysis of HEVC/H.265 (ISO/IEC 23008-2 MPEG-H Part 2) Video Elementary Stream (VES).

1.2 Using this Guide

1.2.1 Purpose

This guide is intended to help HEVC video encoder developers quickly analyze HEVC-compliant video streams.

1.2.2 Topics Covered

The following lists the topics covered in this document:

- **Section 1: Introduction** – provides a general overview of the Elecard HEVC Analyzer program and describes the purpose of the document and its contents.
- **Section 2: Getting Started** – describes how to install, uninstall, and run the Elecard HEVC Analyzer program.
- **Section 3: Describing Elecard HEVC Analyzer** – provides a detailed description of the Elecard HEVC Analyzer program including features and supported stream formats.
- **Section 4: Using Elecard HEVC Analyzer** – describes the Elecard HEVC Analyzer GUI.

1.2.3 Related Documentation

For additional information, review the following documents:

- ISO/IEC 23008-2 MPEG-H Part 2
- ITU-T Recommendation H.265

1.3 System Requirements

1.3.1 Hardware Requirements

- 4 GB RAM for video resolution below HD
- 8 GB RAM for HD video (or higher)

1.3.2 Software Requirements

- 32-bit Windows® operating system for SD video
- 64-bit Windows® operating system for HD video (or higher)
- Microsoft .NET Framework 4.0 (or higher)

1.4 Licensing and Technical Support

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2. Getting Started

The following section details the procedures for installing and running Elecard HEVC Analyzer.

2.1 Installing Elecard HEVC Analyzer

1. Run **Elecard HEVC Analyzer Setup.**
2. To complete installation, follow the onscreen instructions.
   When setup has finished installing all of the necessary files on your computer, the *Elecard HEVC Analyzer has been successfully installed* dialog box will appear, and the program is ready to run. You do not need to reboot your computer.

2.2 Uninstalling Elecard HEVC Analyzer

To uninstall Elecard HEVC Analyzer

1. Click *Start->Programs->Elecard->Elecard HEVC Analyzer X.X->Uninstall Elecard HEVC Analyzer X.X.*
2. Follow the on-screen instructions to complete the Elecard HEVC Analyzer unistalling.

2.3 Running Elecard HEVC Analyzer

To run Elecard HEVC Analyzer click *Start->Programs->Elecard->Elecard HEVC Analyzer X.X->Elecard HEVC Analyzer X.X.*

3. Describing Elecard HEVC Analyzer

3.1 Overview

Elecard HEVC Analyzer enables the user to perform an effective in-depth analysis of video sequences. Elecard HEVC Analyzer provides a visual representation of the encoded video features and a stream structure analysis of HEVC/H.265 (ISO/IEC 23008-2 MPEG-H Part 2) video.

With navigation down to the deepest levels of an encoded stream HEVC Analyzer enables powerful and efficient debug for development of next-generation H.265 video codec. Detailed display of information includes frames types and sizes, coded units data, visualization of slice and tile boundaries, partition, motion vectors, types, bit sizes, quantizers etc along with a quick-to-capture summary of encoded data against the reference raw data.

3.2 Specifications

Elecard HEVC Analyzer operates with HEVC/H.265 video.

3.2.1 Supported Formats

Elecard HEVC Analyzer supports the following formats:

- HEVC/H.265 (ISO/IEC 23008-2 MPEG-H Part 2) VES

3.3 Features

Elecard HEVC Analyzer provides the following features:

- Display and saving of stream summary and picture information.
- Display of decoded, predicted, and unfiltered frame data (YUV and single plane).
- Display of residual, transform, and dequantized coefficients.
- Saving of decoded, predicted, unfiltered and residual information.
- Display of VPS, SPS, PPS, Slice headers with offsets and bit size indication (as in the Standard documentation).
- Display of Coded Tree Unit data: location, slice index, tile index, sizes, coded, prediction, transform unit info.
- Visualization of slice and tile boundaries, partition, motion vectors, types, bit sizes, quantizers.

- Navigation via chart bar or thumbnails.
- Display of bit distribution inside video stream. Ability to choose bitstream elements to display.
- Stream navigation and display in I, P, B, IP and Key Frames modes.
- Display of reference frames.
- Display of Decoded Picture Buffer (DBP) information.
- Analysis and display of the Decoder Video Buffer parameters.
- Hex viewer.
- Stream viewer – file content (header level) presentation in text mode.
- Viewing of reference raw data.
- Metrics calculation.
- Visual comparison with reference raw data (Temperature, Subtraction, Compare, Block PSNR modes).

4. Using Elecard HEVC Analyzer

4.1 Introduction

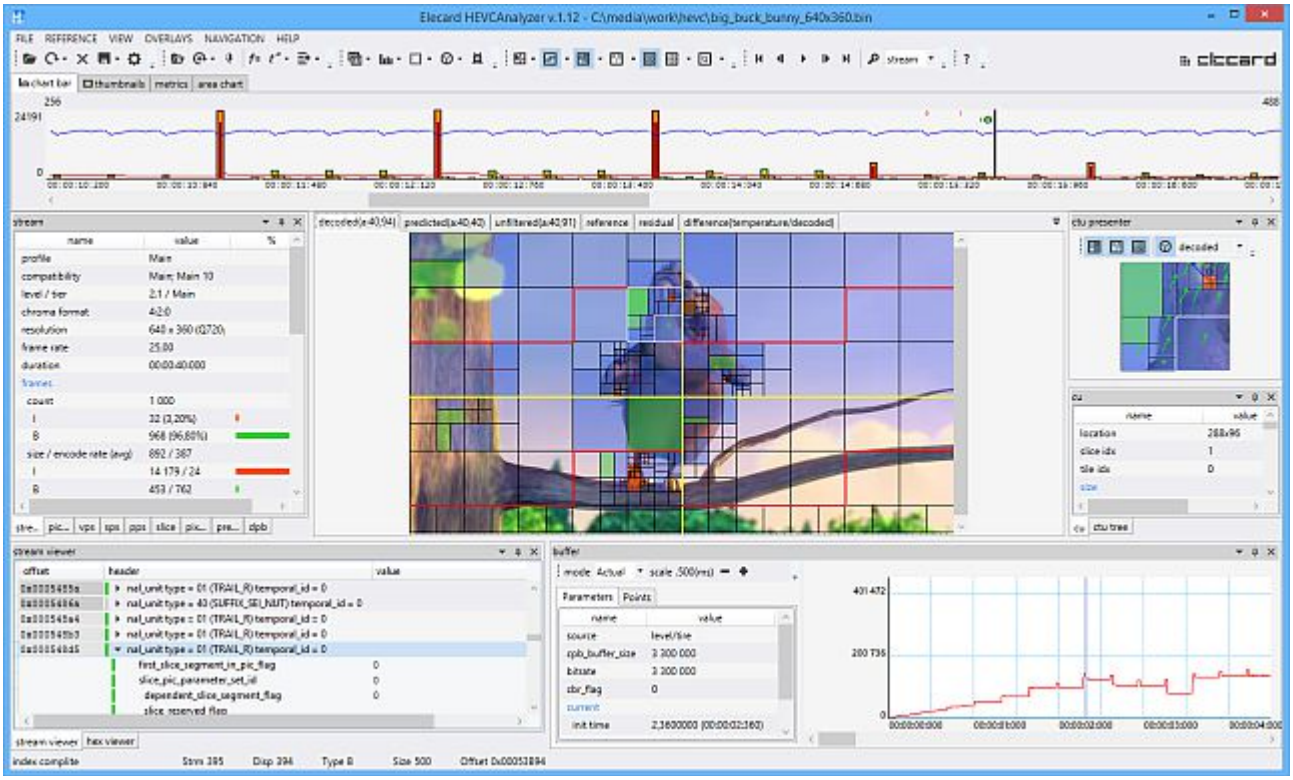
The following section describes the Elecard HEVC Analyzer program GUI.

The Elecard HEVC Analyzer program has a simple user friendly interface that allows the user to perform a number of operations including: opening media stream for analyzing, visualization and saving of various information, stream navigation, etc.

4.2 Describing Elecard HEVC Analyzer GUI

The following section describes the Elecard HEVC Analyzer GUI.

Figure 1. Elecard HEVC Analyzer GUI − Main Window



4.2.1 ToolBars

The following table describes the Elecard HEVC Analyzer toolbars.

Table 1. Elecard HEVC Analyzer GUI - Toolbars

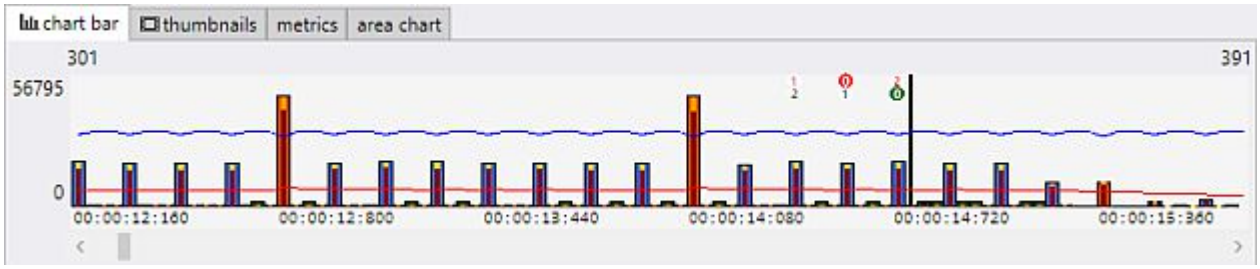
File	
	Opens HEVC for analyzing.
	Opens the recently opened file.
	Closes the file.
	Saves stream info, picture info,YUV data (decoded, predicted, unfiltered, residual).
	Opens the program settings dialog.
Reference	
	Opens reference stream (raw YUV data).
	Opens the recently opened reference stream.
	Opens the raw data stream automatically, if the HEVC stream is opened.
f=	Displays the difference result video out: • *None* – displaying is not used. • *Temperature* – absolute difference (pixel-by-pixel subtraction) with colors (black-blue-green-red). • *Compare* – pixel-by-pixel comparison of two frames. If two pixels are matched, the result is 0. Otherwise the result is equal to the maximal value. • *Subtraction* – pixel-by-pixel subtraction. The result is equal to the difference value. • *PSNR* – the result is the PSNR values (from 0 to 100) for corresponding CU partitioning blocks. • *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.
	Selects frame type for the difference displaying (Decoded, Predicted, Unfiltered).
View	
	Opens auxiliary information panel. Info: • *Stream* – summary stream info • *Picture* – summary frame info • *CU* – selected CU info Headers: • *VPS* – display of VPS header set relating to the frame • *SPS* – display of SPS header set relating to the frame • *PPS* – display of PPS header set relating to the frame • *Slice* – display of Slice header set relating to the frame Tools: • *Pixels* – display of pixel YUV values for different encoding steps (decoded, predicted, unfiltered) and coefficient values (residual, transform, dequantized) • *Prediction* – display of prediction types distribution • *Hex Viewer* – hex viewing of the stream • *Stream Viewer* – text viewing of the stream
	Sets the Chart Bar presentation parameters: Bitrate line, Reference marker, Sizes, Quant, Chart BarScale.
	Sets the video scaling coefficient: 50%, 100%, 200%, 400%.
	Selects displayable color space: YUV, Y, U, V.
Visualization	
	Selects auxiliary info to display with marker in the video out panel: • *Prediction* – display of prediction grid for Coded Tree Unit (CTU) • Type – display of CU type
	Display of subdivision into slices and tiles.
	Display of prediction and transform units.

	Display of intra prediction mode, motion vectors.
	Display of CU types.
	Display of sizes relating to CU, PU, TU.
	Display of quantization parameter.
Navigation	
	Sets the current position to the first frame in the stream.
	Sets the current position to the previous frame.
	Starts the stream playback.
	Sets the current position to the next frame.
	Sets the current position to the last frame in the stream.

4.2.2 Navigation Controls

Chart Bar:

Figure 2. Elecard HEVC Analyzer GUI − Chart Bar Control



The **Chart Bar** navigation control visualizes (frame-type) the currently opened video stream. The bar height illustrates the frame size (in bytes) and the bar color indicates the frame type (red – I, blue – P, green - B).

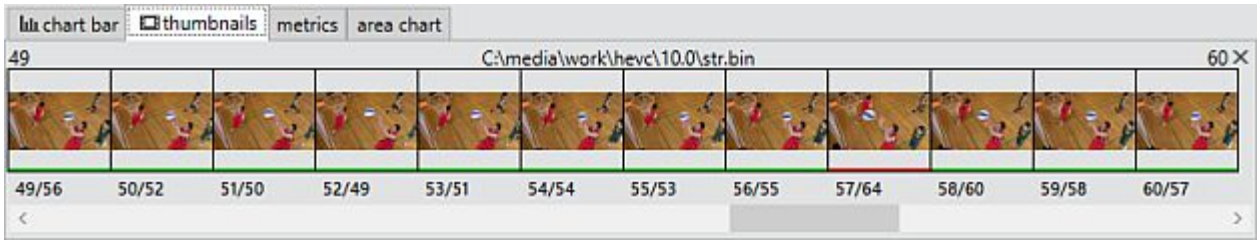
To set the stream position to a frame, click the corresponding bar.

The toolbar button allows you to set the following visualization options:

- *Bitrate line* – displays red line
- *Reference marker* – circles visualize reference list for the current frame (red – L0, green – L1). If mouse points to the frame with reference marker, the corresponding PUs are highlighted in the video out panel. And vice versa, if PU is pointed in the video out panel, the corresponding reference markers are highlighted (on the previous figure the PU with BiDirection prediction L0=0, L1=0 is selected).
- *Sizes* – visualizes bit distribution in the stream according to the following groups: transform, intra prediction, inter prediction.
- *Quant* – visualizes the frame mean quantizer value (blue line).
- *Scale* – sets bar width (1, 2, 4, 8, 16 pixels).

Thumbnails:

Figure 3. Elecard HEVC Analyzer GUI − Thumbnails Control

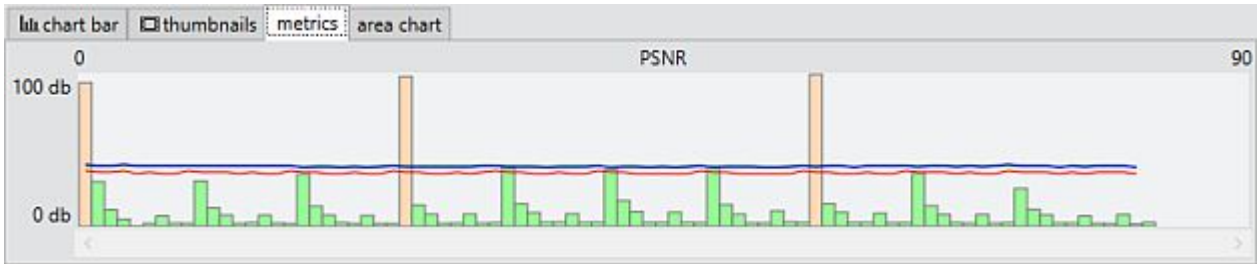


The **Thumbnails** navigation control visualizes the currently opened video stream using the frame thumbnails. The thumbnails are underlined. The underline color corresponds to the frame type (red – I, blue – P, green – B). The stream/display frame order is indicated with digits below thumbnails.

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

Metrics:

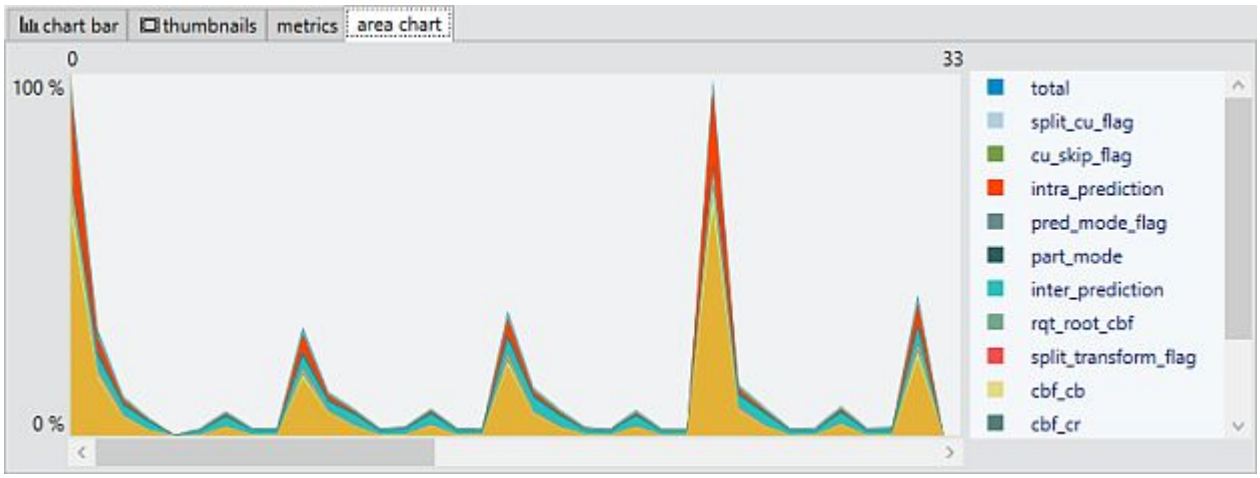
Figure 4. Elecard HEVC Analyzer GUI − Metrics Control



The **Metrics** navigation control visualizes frame metrics in the currently opened video stream. The bar height illustrates the metrics value (in db).

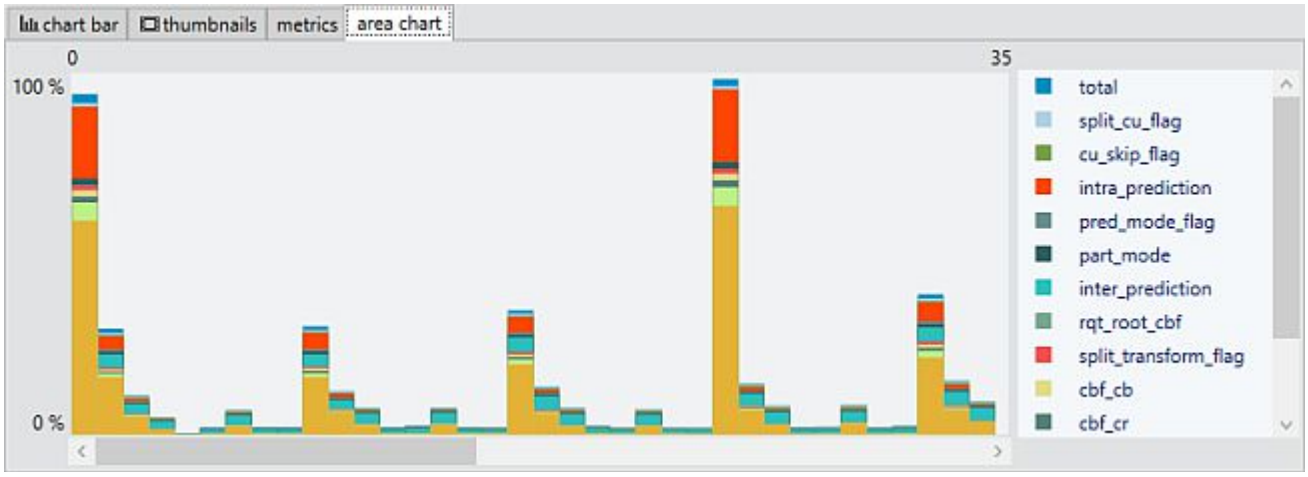
Area Chart:

Figure 5. Elecard HEVC Analyzer GUI − Area Chart Control



The **Area Chart** navigation control visualizes bit distribution in the currently opened video stream. The control provides ability to choose bitstream elements to display. The chart type (area\bars) is configurable via the program settings.

Figure 6. Elecard HEVC Analyzer GUI − Area Chart Control (Alternate View)



If mouse points to a frame, the frame detailed info is displayed.

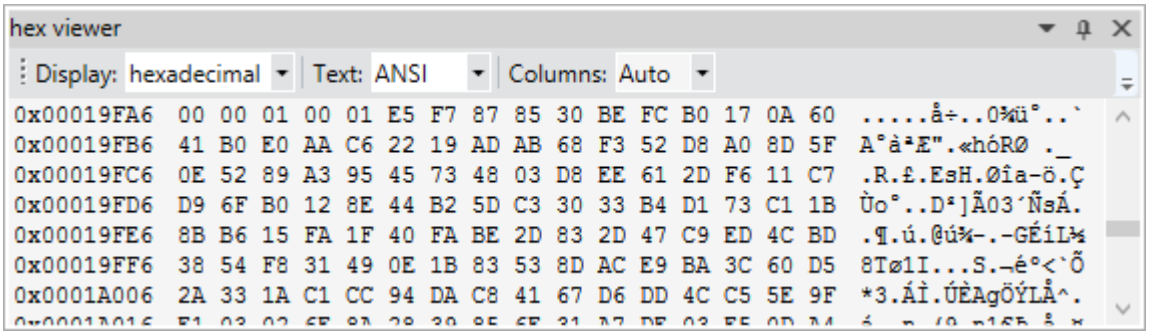
Figure 7. Elecard HEVC Analyzer GUI − Frame Information Window (Example)

stream	25
display	32
type	I
size	17 707
distribution (bits)	
total	141656
split_cu_flag	1495
cu_skip_flag	0
prediction	
intra_prediction	28814
pred_mode_flag	0
part_mode	2701
inter_prediction	0
transform	
rqt_root_cbf	0
split_transform_flag	1953
cbf_cb	2646
cbf_cr	2791
cbf_luma	7349
transform	91135

4.2.3 Hex Viewer

The hex viewer allows direct viewing of the opened file data.

Figure 8. Hex Viewer



The **hex viewer** panel contains the following information blocks:

- Offset (from the file beginning) of the line displayed in the next block.
- Part of the file data in the hexadecimal mode. The unsigned decimal mode is available too (is set in the **Display** box).
- Part of the file data in the text mode (ASCII).

The following table describes the **hex viewer** tuning controls.

Table 2. Hex Viewer Controls

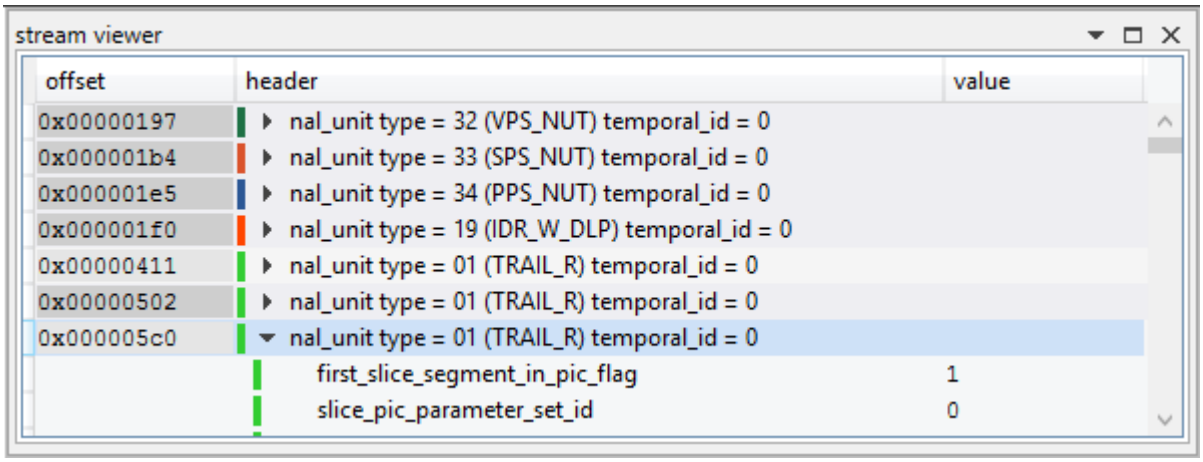
Control	Description
Display	Specifies view of the second information block: • *hexadecimal* – sets the hexadecimal mode • *unsigned* – sets the unsigned decimal mode • *no data* – disables the block displaying
Text	Specifies view of the third information block: • *ANSI* – sets the ASCII text format • *no data* – disables the block displaying
Columns	Specifies data amount (number of bytes) displayed in each line. If the *Auto* value is set, the lengths of lines are fitted to the HEX viewer panel width.

The panel content is synchronized with the stream position.

4.2.4 Stream Viewer

The stream viewer displays the opened stream in the text mode. The stream internal structures are expandable. Access units are separated with alternative background colors.

Figure 9. Stream Viewer

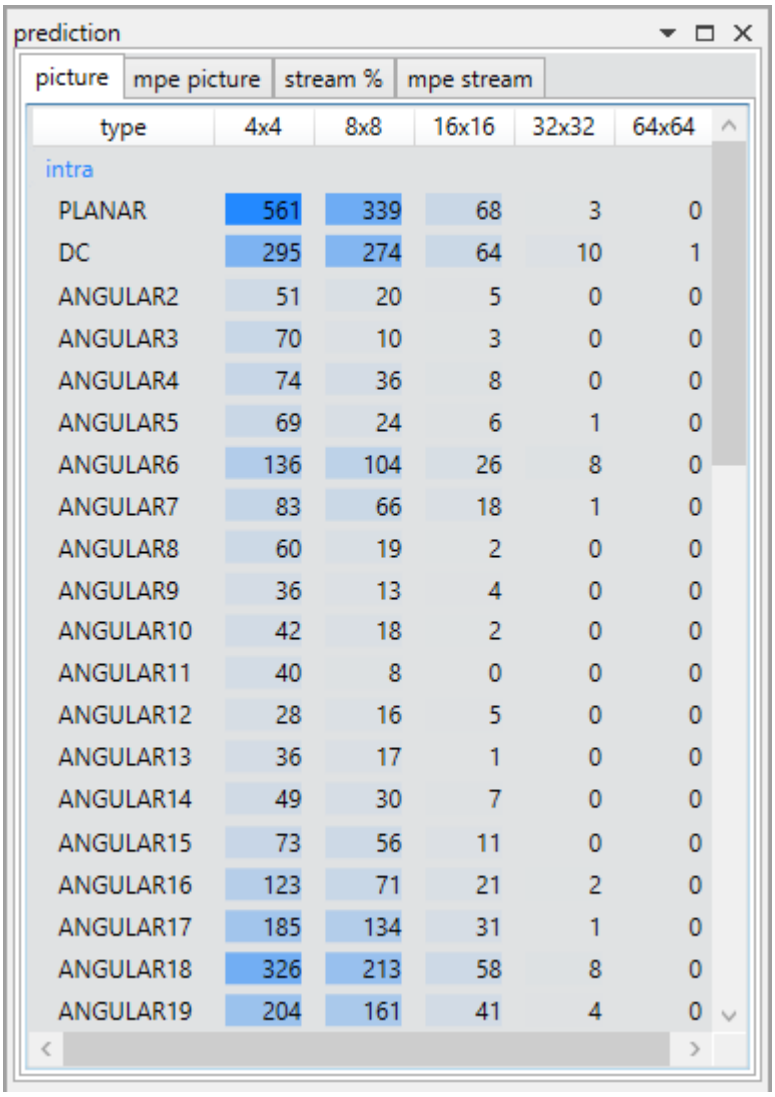


The panel content is synchronized with the stream position.

4.2.5 Prediction Panel

The **prediction** panel displays prediction types distribution.

Figure 10. Prediction Panel



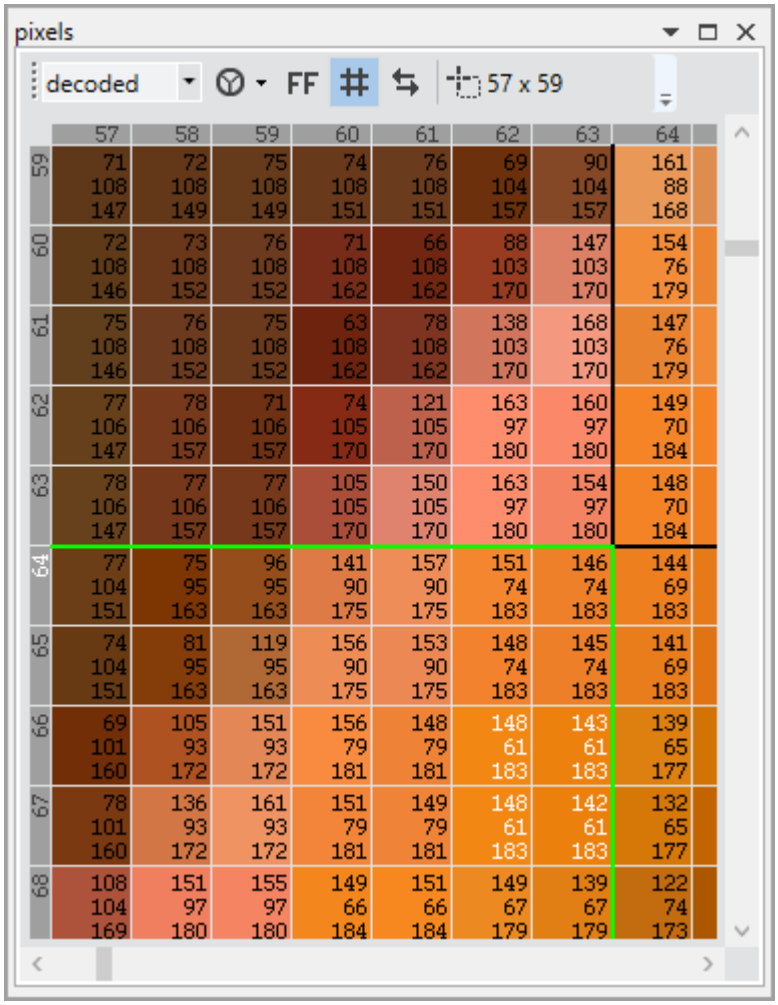
The **picture** tab indicates numbers of predictions in the frame for various CU sizes. The **stream %** tab indicates percentage of various prediction types in the stream.

The mean prediction error (MPE) is the residual mean absolute value. The value describes the prediction mean (for pixel) deviation from the decoded picture, that is characterizes the prediction quality.

4.2.6 Pixels Panel

The **Pixels** panel displays pixel YUV values for different decoding steps (decoded, predicted, unfiltered) and coefficient values (residual, transform, dequantized).

Figure 11. Pixels Panel



The following table describes the **Pixels** panel controls.

Table 3. Pixels Panel Controls

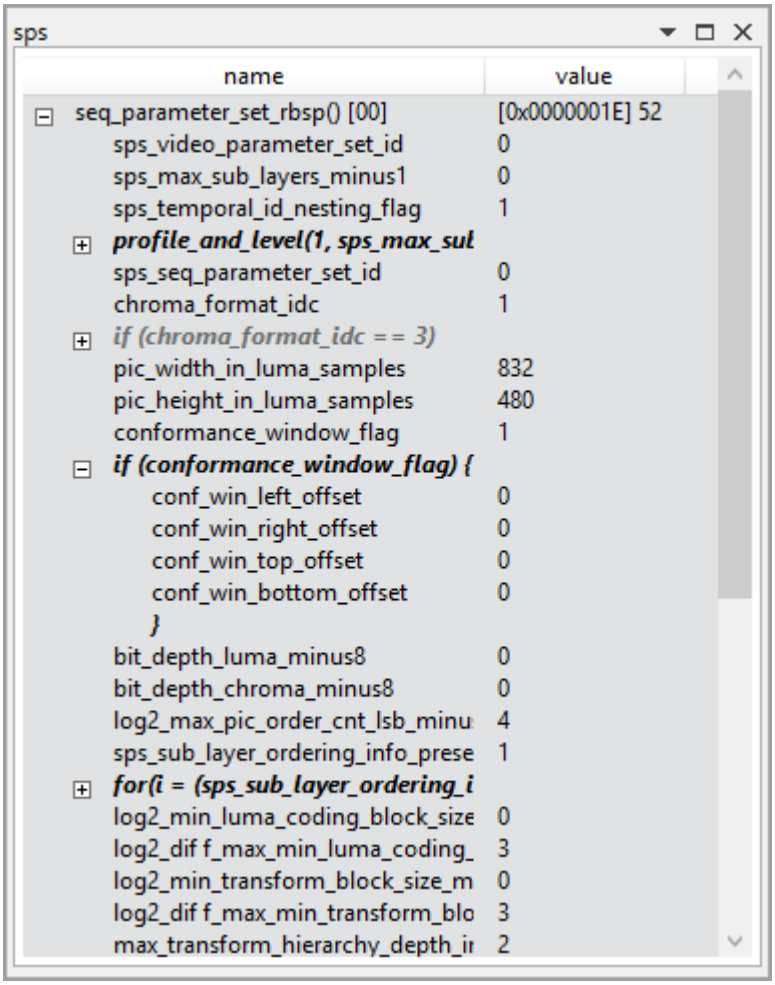
Control	Description
	Selects YUV components for visualization. The background color corresponds to the pixel color.
FF	Displays data in decimal\hexadecimal mode.
	Displays grid.
	Synchronizes visualization mode according to the active tab of the Video Out panel.

To select visualization area, use left mouse button.

4.2.7 VPS, SPS, PPS, Slice Panel

The panel displays the VPS, SPS, PPS, Slice headers with offsets and bit size indication (as in the Standard documentation).

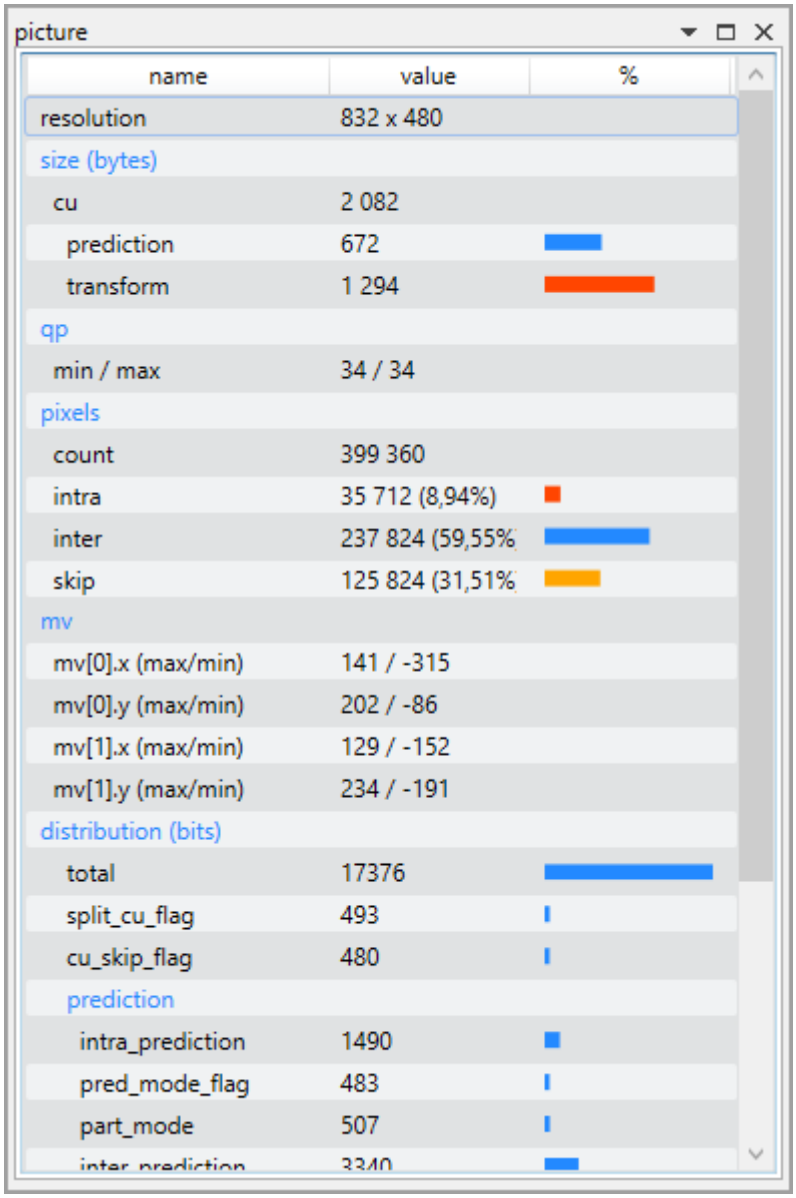
Figure 12. SPS Panel



4.2.8 Picture Panel

The **Picture** panel displays the current frame summary information: CU, PU, TU size (in bits); max\min QP; pixel distribution into encoded type (intra, inter, and skip); motion vectors range; bit distribution in CU.

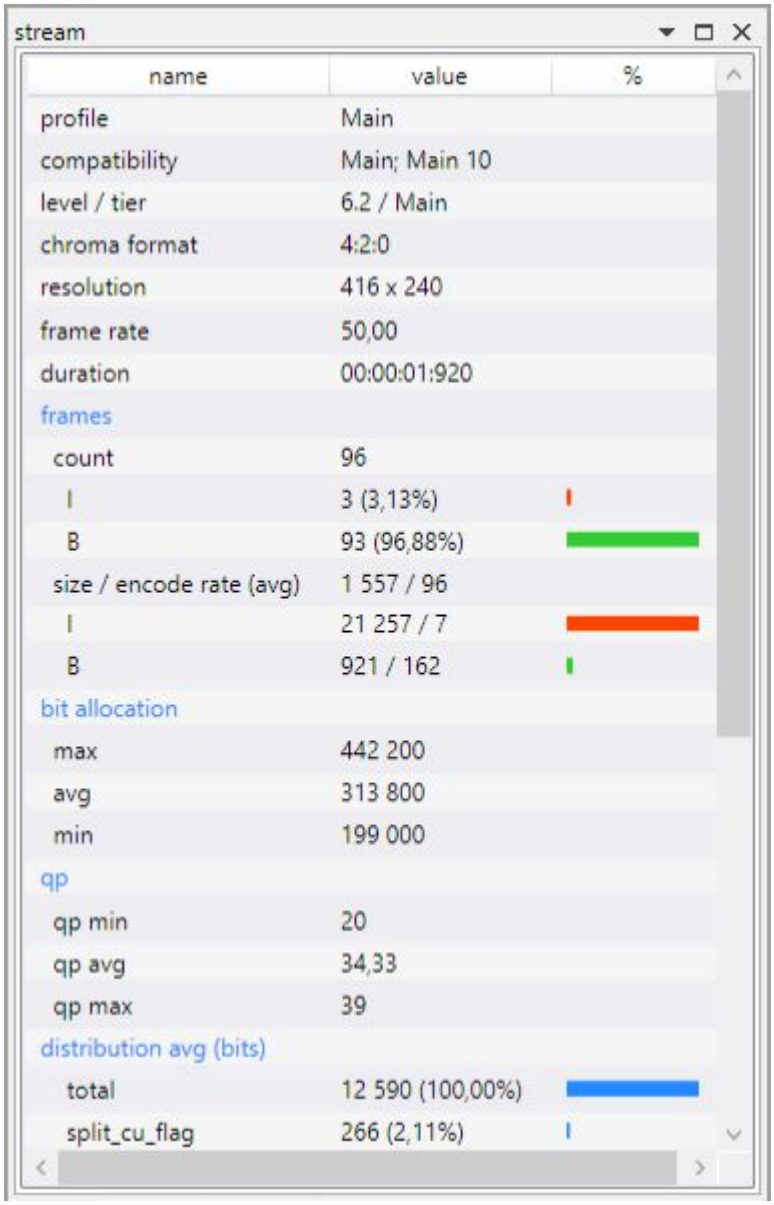
Figure 13. Picture Panel



4.2.9 Stream Panel

The **Stream** panel displays the current stream summary information: profile, compatibility flags, level, tier, chroma format, resolution, frame rate, duration, frame types, average frame sizes; range of quantizer values; bit allocation info; frame average bit distribution in CU.

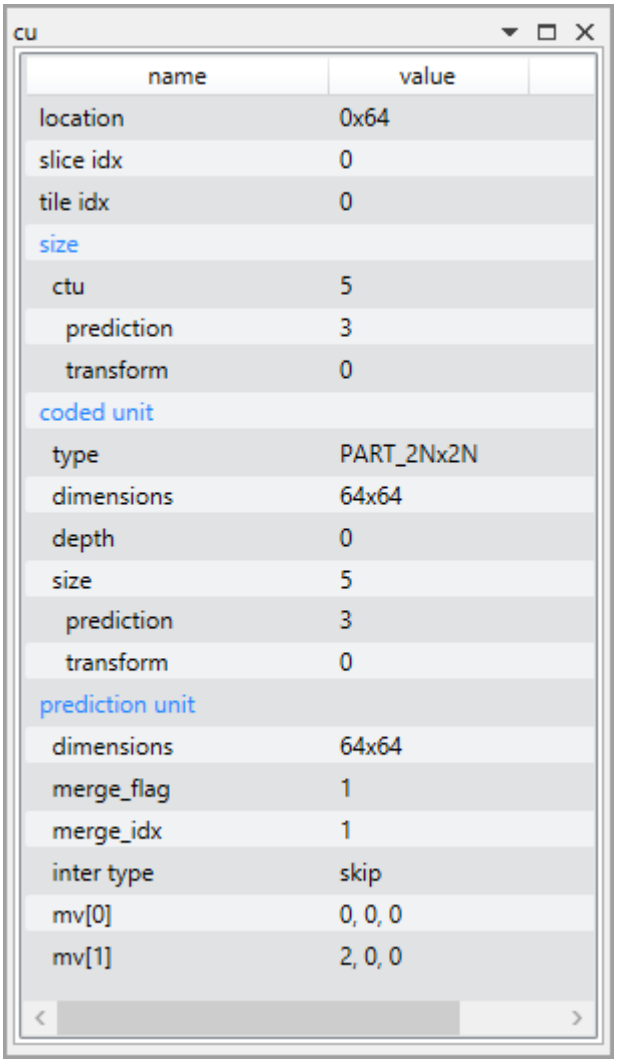
Figure 14. Stream Panel



4.2.10 CU Panel

The panel displays CU information: location, slice idx, tile idx; sizes; coded unit, predicted unit, transform unit info.

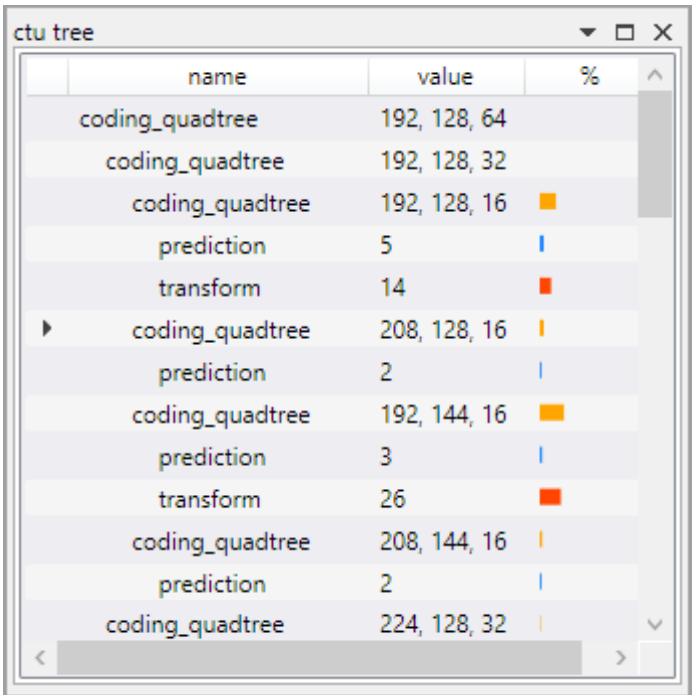
Figure 15. CU Panel



4.2.11 CTU Tree Panel

The **CTU Tree** tab opens the **CTU Tree** panel. The panel displays the CU tree representation of CTU that indicates prediction and transform sizes.

Figure 16. CTU Tree Panel



4.2.12 CTU Presenter Panel

The **CTU Presenter** panel provides the CTU visualization for smooth navigation and detailed information on different CU parameters.

Figure 17. CTU Presenter Panel

The following table describes the **CTU Presenter** panel controls.

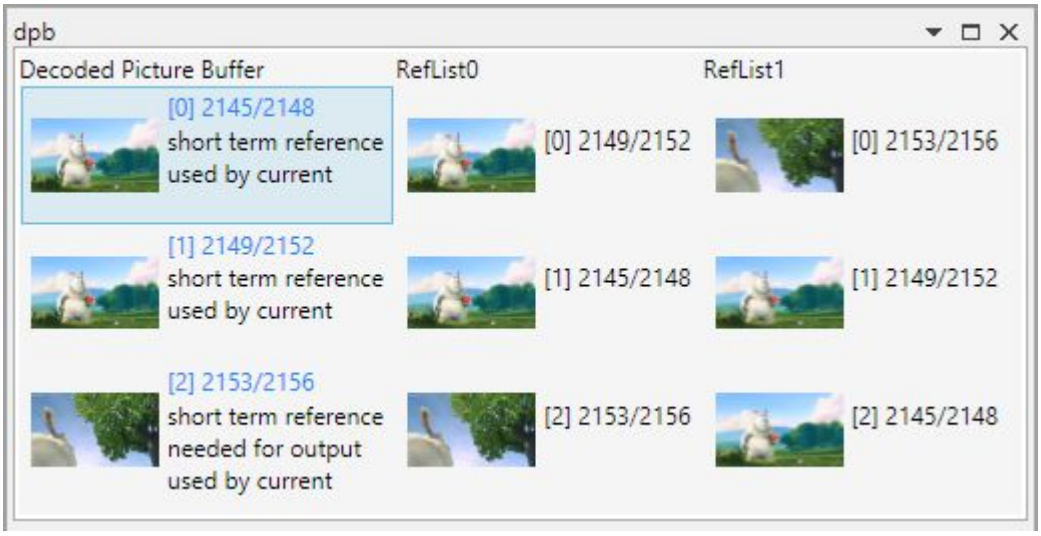
Table 4. CTU Presenter Panel Controls

Control	Description
	Displays prediction and transform units.
	Displays motion vectors in the intra prediction mode.
	Displays CU types.
	Displays the corresponding picture portion as the chart background, selects source of the displayed information (decoded, predicted, unfiltered, residual).

4.2.13 DBP Panel

The **DBP** panel indicates the Decoded Picture Buffer information for the current frame.

Figure 18. DBP Panel



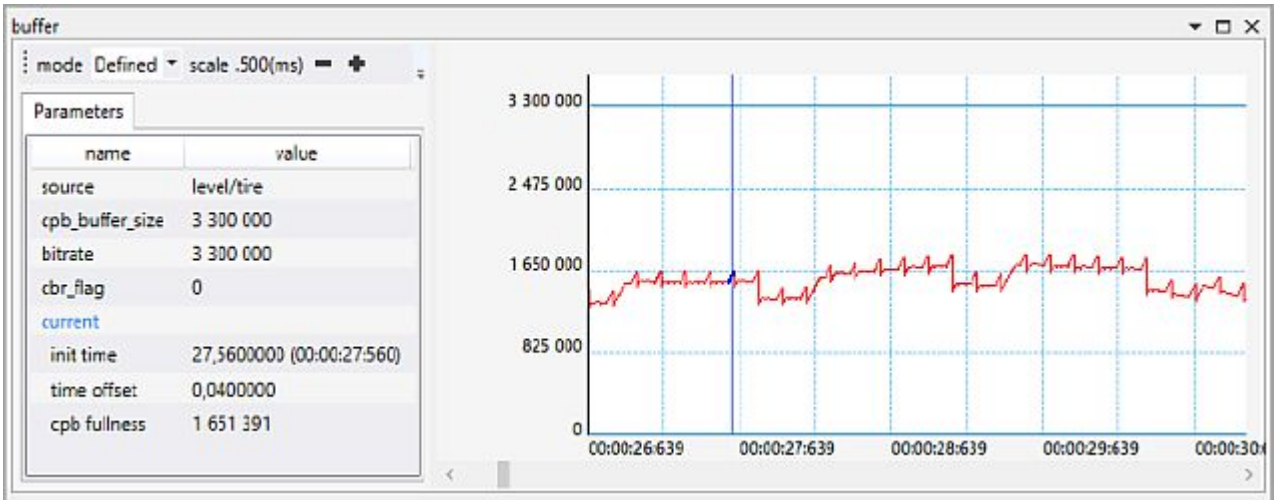
4.2.14 Buffer Panel

To ensure the system operation stability, the Decoder Video Buffer parameter analysis is performed. The **Buffer** panel displays results of the analysis. The buffer parameters are based on the SEI values. If SEI is not available, the parameters are reconstructed using the stream level\tire.

The following controls are available on the **Buffer** panel:

- **Mode** – sets the chart vertical scaling mode (*Defined* – relative to the *cpb_buffer_size* value; *Actual* – relative to the current buffer minimum and maximum sizes).
- **Scale** – specifies the chart horizontal scale.
- **Parameter**s – indicates the main parameters that are used for the buffer calculation, and the current parameter values.

Figure 19. Buffer Panel



4.2.15 Video Out Panel

The panel displays decoded information at various steps (decoded, predicted, unfiltered, residual), corresponding reference frame, and selected difference.

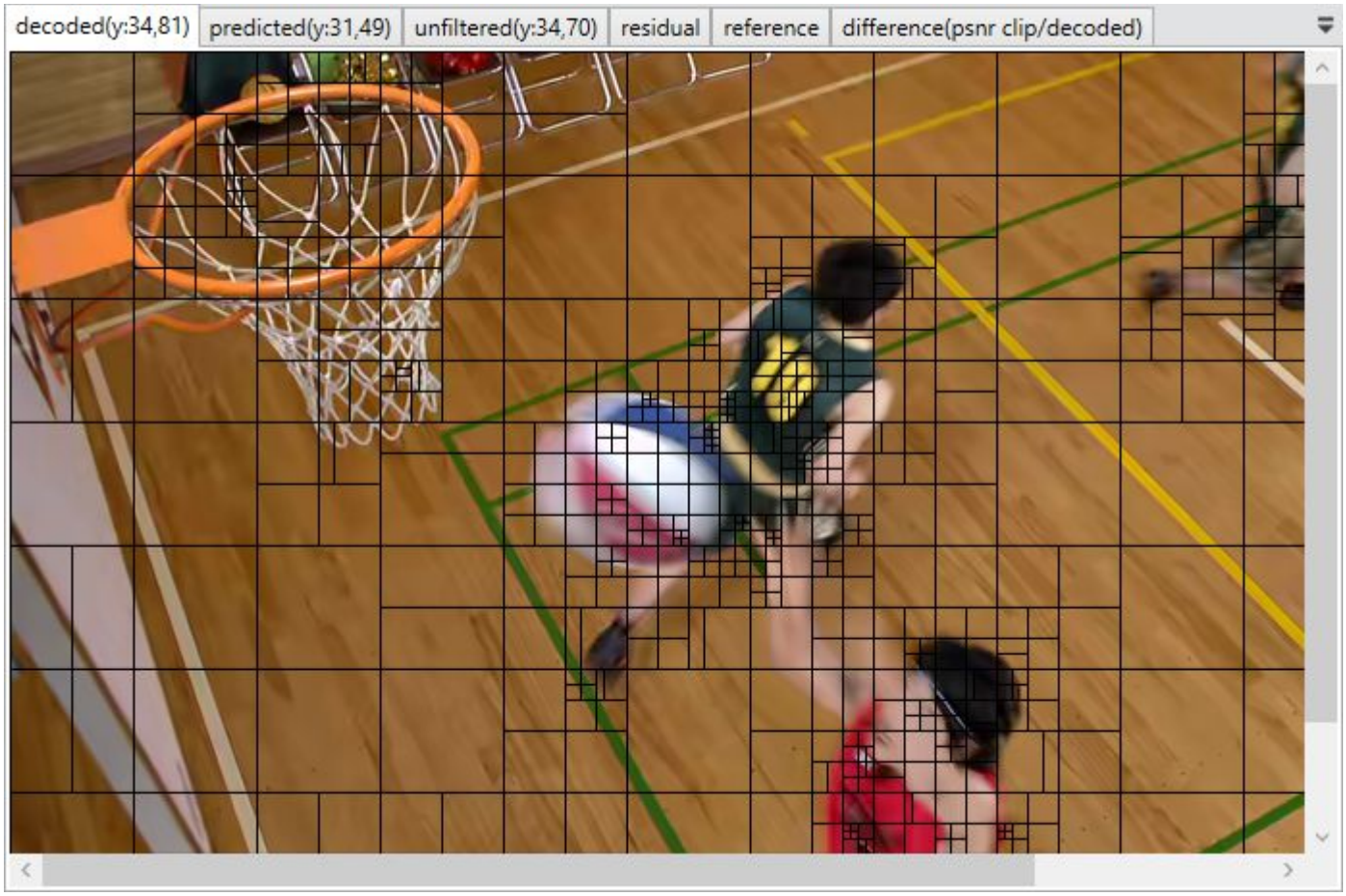
For decoded, predicted, and unfiltered tabs, indication (in the tab name) of PSNR calculated with reference for Average, Y, U, V is available (adjusted in the program settings).

The CTRL+Weel Button combination allows the video scaling from 50% to 400%.

Click the selected CU, to fix it position.

Drug is used to select an area.

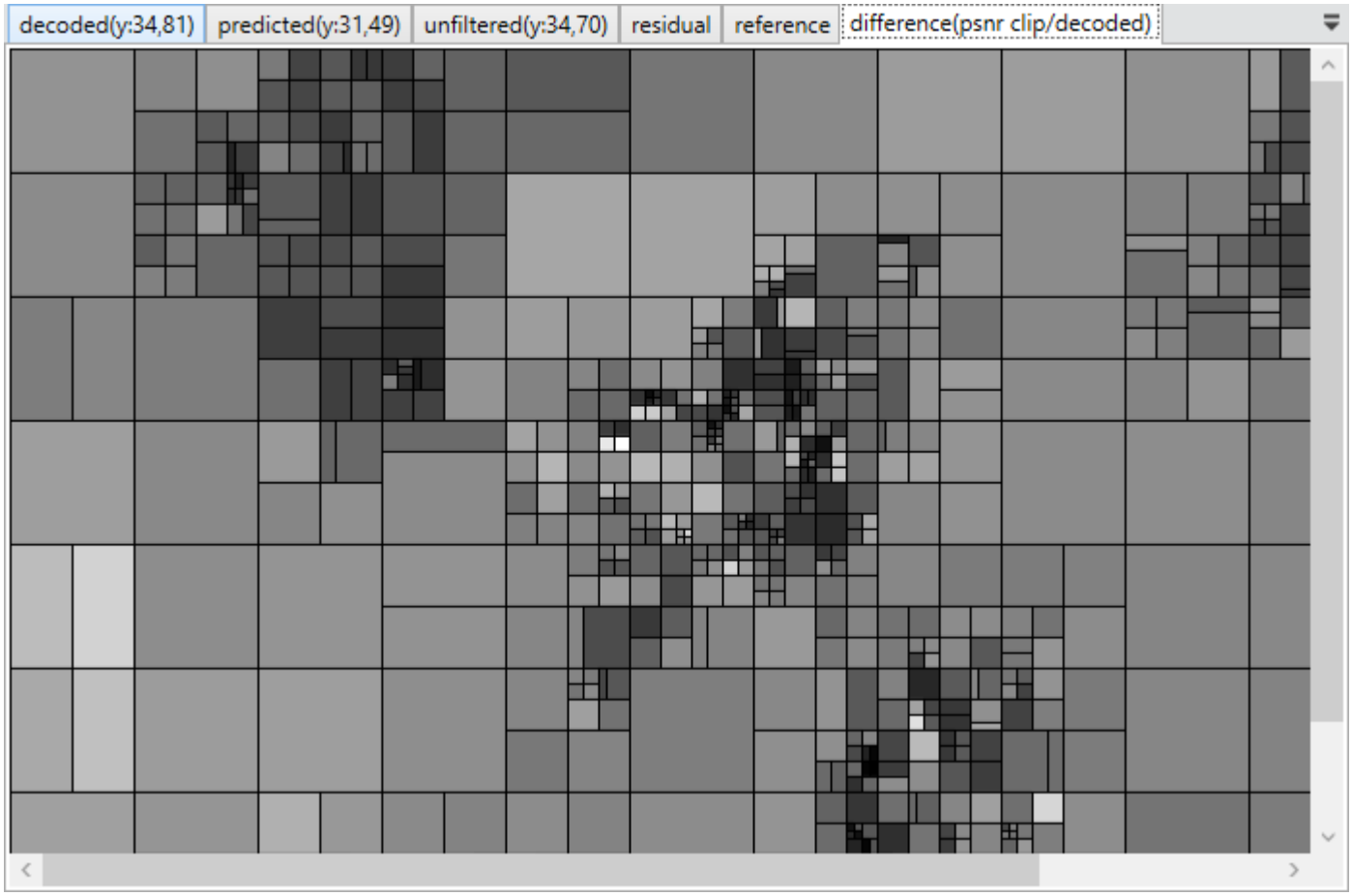
Figure 20. Video Out Panel – Decoded Tab



The following hot keys are used for the tab switching:

- ALT+1 – opens the **decoded** tab
- ALT+2 – opens the **predicted** tab
- ALT+3 – opens the **unfiltered** tab
- ALT+4 – opens the **residual** tab
- ALT+5 – opens the **reference** tab
- ALT+5 – opens the **difference** tab that displays the selected difference (for instance psnr clip or decoded)

Figure 21. Video Out Panel – Difference (PSNR Clip/Decoded) Tab



Point to the selected CU in the **difference** (**psnr clip/decoded**) tab, to display in tooltip the PSNR values for Y,U,V components.