# Fastvideo

# Fast CinemaDNG Processor on GPU

TECHNICAL MANUAL
v.0.2.5

# Contents

# 1 About

## 1.1 About this manual

We sincerely hope that this manual can answer your questions, but should you have any further questions or if you wish to claim, please contact your local dealer or refer to the FASTVIDEO support on our website. The purpose of this document is to provide a description of the Fast CinemaDNG Processor software and to describe the correct way to install related software and drivers and to run it successfully. Please read this manual thoroughly before getting started the software for the first time. Please follow all instructions and observe the warnings. This document is subject to change without notice.

# 2 Operation

## 2.1 Software Requirements

Fast CinemaDNG Processor is compatible with the following operating systems:

- Windows 10 (64-bit)

- Ubuntu Linux 18.04, 20.04 (64 bit)

## 2.2 Hardware Requirements

Fast CinemaDNG Processor is compatible with NVIDIA GPUs with Compute Capability 3.0 and higher. These are Maxwell, Pascal and Volta GPUs of GeForce family and Quadro/Tesla GPUs as well. We also support Tegra GPU K1/X1/X2 (Linux4Tegra). To work on laptop, one have to download CUDA and corresponding drivers, which are designed for laptop GPUs. While working, laptop should be connected to the mains to offer maximum performance. If you try to work from internal battery of laptop, the performance will degrade.

## 2.3 System Configuration

### 2.3.1 Minimum system configuration

For a basic operation of Fast CinemaDNG Processor, the following minimum system configuration is required. Please note that bandwidth and processing performance are tied to the hardware configuration and the minimum hardware configuration could lead to reduced bandwidth and limited performance.

- CPU: Intel Core-i3 or better RAM: 4 GB RAM or more

- HDD/SSD: 200 MB of free disc space

- Video: NVIDIA GPU with Compute Capability >=3.0,

- GPU memory 4-6 GB

- Motherboard with PCIe x16 Gen3 slot for GPU

One can also use Fast CinemaDNG Processor with a laptop which has NVIDIA GeForce GPU with Compute Capability >=3.0

### 2.3.2 Recommended standard system configuration

For good processing performance and bandwidth we recommend to use the following system configuration:

- CPU: Intel Core-i7 9700K or better

- RAM: 8-16 GB RAM or more

- SSD: 1000 MB of free disc space

- Video: NVIDIA GPU GeForce RTX 2070, 2080(Ti), 3070, 3080.

- GPU memory 8-12 GB

- Motherboard with PCI-Express x16 Gen3 slot for GPU

For maximum throughput in addition to top-level GPUs we recommend to use motherboards with PCI-Express x16 Gen3 support and Intel IvyBridge CPUs to benefit from PCIe-3.0 technology. To work with PCIE/Thunderbolt cameras or PCI-Express frame grabbers (which are custom for CameraLink, CoaxExpress and 10GigE high speed and high resolution cameras) we recommend to use motherboards with >40 PCIe lanes (socket 2011 or 2011-v3).

## 2.4 Supported Image and Video Formats

### 2.4.1 Input formats

- DNG

- CinemaDNG

- CinemaDNG RAW

- MLV

- CR2

- CR3

- NEF

- ARW

- IOI

### 2.4.2 Output formats

- TIFF

- EXR

- JPEG (8 bit only)

- PNG (8 bit only)

- BMP

- WebP

- MJPEG codec: AVI

- All image and video formats, supported by FFmpeg

## 2.5 GPU Test for Windows

To check available GPUs on PC, one could download freeware TechPowerUp GPU-Z from the following link: https://www.techpowerup.com/gpuz/ GPU-Z is a lightweight utility designed to provide you with all information about your graphics card and GPU. You can also find out the info about PCI-Express connection to PC.

## 2.6  Quick installation guide

- Download and install the latest drivers for your NVIDIA GPU from the following link: http://www.nvidia.com/D

- Run Fast CinemaDNG installer

- Press "Next" button

- Choose destination folder

- Press "Next" button

- Check "Register file extension" check box to enable Windows Explorer integration

- Check "Create desktop icon" and "Create Start menu icon" boxes to create corresponding shortcuts

- Press "Next" button

- Check "Fast CinemaDNG Demo project" to install demo project. This project will be opened at first application run and will never be opened automatically again.

- Press "Next" button

- Read and accept EULA

- Press "Next" button

- Choose start menu folder

- Press "Next" button

- Press "Install" button

- Wait for installation process to finish

## 2.7  Quick Start

You can run Fast CinemaDNG application in the following ways:

1. Run FastCinemaDNG.exe in any way.

2. Double click Fast CinemaDNG project file (.fvproj) in Windows Explorer (this option requires Explorer integration to be done at installation process).

3. Right click on folder containing at least one DNG file or on any DNG file in Windows Explorer and choose "Preview with Fast CinemaDNG" context menu. One can also drag-n-drop a folder with DNGs or any DNG file to the main window of Fast CinemaDNG Processor. In this case temporary project, that contains all DNG files from this folder will be created. Project name will be the same as folder name. Project file will not be created until the project is explicitly saved.

If you have run standalone FastCinemaDNG.exe:

- Create new Project from the Toolbar and specify folder with DNG images, press OK

- Press Run button to see live video in Player window

- Press right button on Player window to see list of available widgets for processing options

- In Benchmarks widget one can see timing for each stage of image processing on GPU

- Press Tab to see Player at full screen mode (to quit the mode, press Tab once more)

- In Project widget set output format as TIFF, JPG, EXR

- Press red button in Player window to save all processed frames to SSD in the specified output format

# 3 Input data formats overview

Fast CinemaDNG Processor application allows to view DNG image series recorded with video and photo cameras. The software can do standard image processing of RAW DNG and CinemaDNG files on NVIDIA GPU in realtime.

Camera output formats could differ significantly. That's why we have created input module which handles various image formats acquired from cameras. We currently support the following DNG (RAW) formats and compression options:

- Uncompressed DNG.

- DNG with lossless compression. It has zero loss of detail, but quite small compression, just around 35% file size reduction for very blurry / underexposed / overexposed images ranging to around 25% file size reduction for well focused, well exposed, detailed images.

- BMD RAW 3:1 compressed lossy DNG. Some image detail are lost, but not much. The compression is usually rate controlled to 3:1, so recording capacities of media are very predictable.

- BMD RAW 4:1 compressed lossy DNG. This is the same as 3:1, but with better compression. The quality is still good, but not as good as 3:1.

- MLV

The following 2 modes for RAW are currently available with the latest Blackmagic cameras:

- CinemaDNG RAW 3:1 RAW (lossy)

- CinemaDNG RAW 4:1 RAW (lossy)

At the moment we support DNG, CinemaDNG, CinemaDNG RAW and MLV formats. Other RAW formats are under development.

To work with other RAW formats, we recommend to use the latest version of Adobe DNG Converter which is able to transform various RAW formats with Bayer pattern to DNG.

Current version of DNG Specification is 1.4.

DNG/CinemaDNG decoding is quite complicated procedure and it could be done in realtime on proper hardware only. To insure the fastest access to DNG data, we need high-performance SSD to be able to read images as fast as possible. This is the reason why very fast SSD is a must (not conventional HDD). Fast decoding is done on CPU, that's why we need powerful CPU with many cores. Multithreaded software is handling image reading, parsing, decoding, sending uncompressed data to GPU for further image processing.

Most of CPU power is spent on raw decoding, that's why any unexpected activities from OS side could cause some delay. To prevent such a situation, the software has a cache with already decoded images.

# 4 Fast CinemaDNG Processor user interface

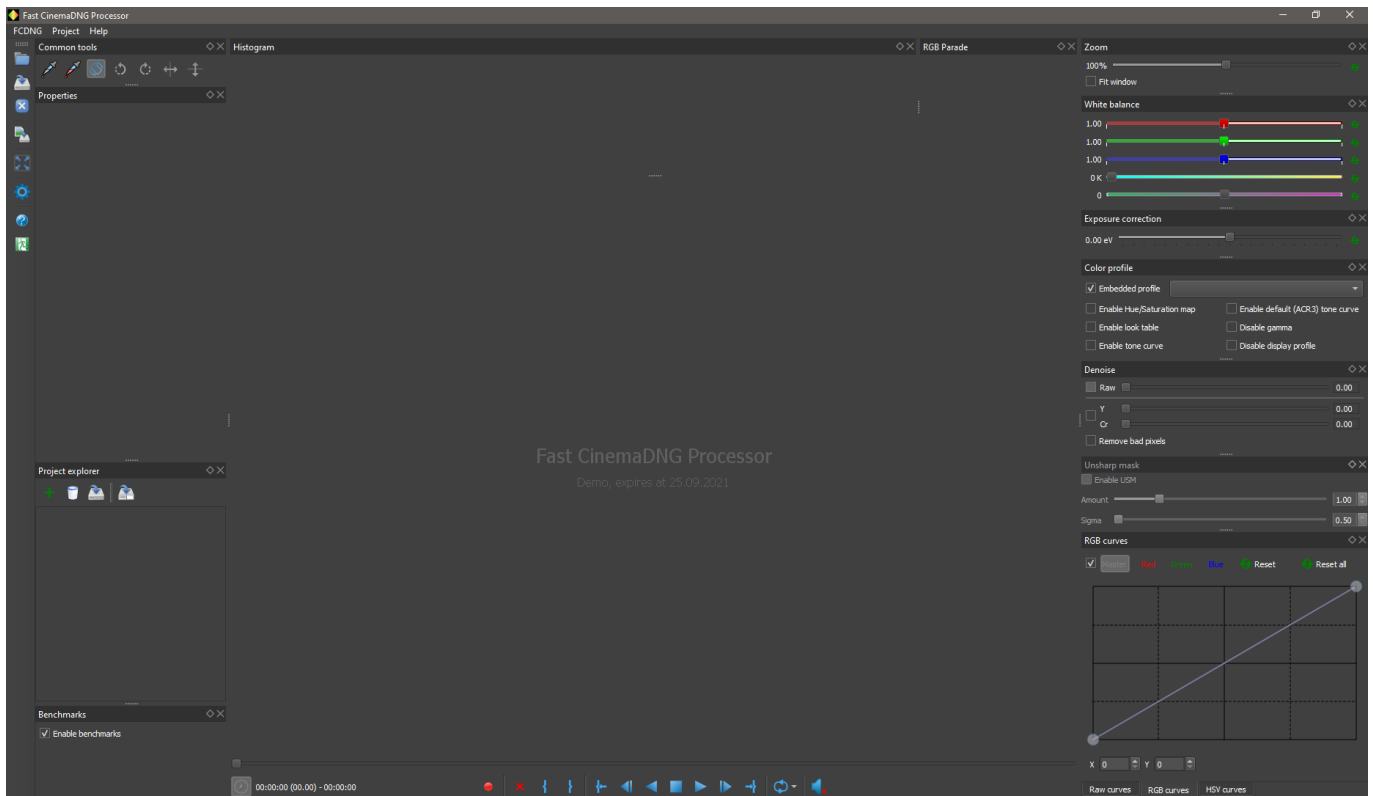Start Fast CinemaDNG Processor application and you will see the main window:



Figure 4.1:

All control elements are arranged in dockable windows (widgets), which could be docked to any side of the main application window.

A dockable window has two possible states:

**Docked.** In the docked state, the window is attached to an edge of the main window. A docked window has a special kind of control bar; you can use this like an ordinary title bar to drag the window to a new location.

**Undocked.** In this state, the window looks like an ordinary window, except that it has slightly smaller caption bar. An undocked window floats above all other windows.

If you want to change the docking position of a docked or undocked window, click on the window's title bar (or on special control bar, if it's already docked somewhere) and drag the window, the same way you would move any ordinary window. Move the mouse cursor where you want to dock the window, while moving possible new docking positions will be highlighted.

You can stack docking windows, so that each window has the entire width or height of the edge. To do this, dock the first window to desirable position. Then, drag the second window so that it's along the same edge, just inside the frame from the first window. For example, dock a window on the bottom edge, then drag another window so it's just above the first window. To switch between stacked dockable windows use tabs at the bottom edge.

9

Figure 4.2:

You can re-order your tabs with the mouse.

To move stacked dockable window, drag corresponding tab with mouse. Dragging title bar will move the whole stack.

To hide docked window, press close button at the top right corner. To show docked window, right click on image display window and select required dock window from context menu.

Some processing parameters (like scaling of red, green or blue components) are bound to sliders. To change these parameters, drag corresponding slider handle until desired effect will met. To reset parameter to default value, press reset ⟳ button.

Some processing parameters (like input Hue and Hue Shift in HSV curves window) are bound to spin boxes. Spin box is designed to handle integers and floating point values.

Spin box allows to choose a value by clicking the up/down buttons or pressing up/down on the keyboard or rotate mouse wheel to increase/decrease the value currently displayed. One can also type the value manually.

# 5 Fast CinemaDNG Processor usage

## 5.1 Setup application parameters

To setup application parameters press ⚙ on the application toolbar. Option dialog will appear. All application parameters are divided into the following tabs: "Common", "Color management", "Export formats", "MLV" and "Output and extensions"

### 5.1.1 Common parameters

Common parameters tab allows to setup default values and actions
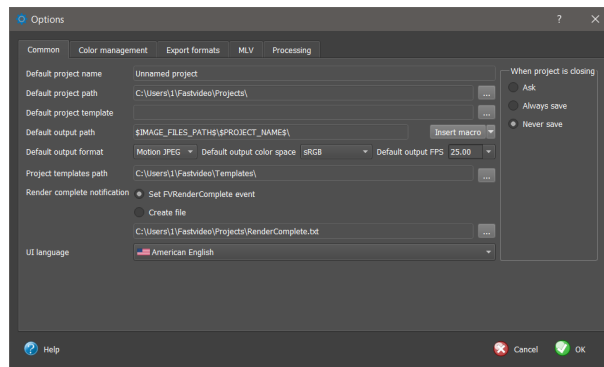
Figure 5.1:

It contains the following parameters:

**Default project name.** Defines default name, that will be used on creation new project via "New project" dialog.

**Default project path.** Defines default path where project files are placed by default. Use " ... " button to browse file system for it.

**Default project template** Defines default project template file, that will be used for new project creation. Use " ... " button to browse file system for it.

**Default output path.** Defines output path where rendered project files will be placed. You can use macros to fit output path to your particular requirements. Macros is a predefined text, enclosed in $ characters (for example $DEF_PROJECT_PATH$). You can add macros manually, or use "Insert macro" list. Selected macro will be pasted into current cursor position. No additional spaces will be added. Output path is compiled each time project is rendered. "Insert macro" list contains "Browse" entry. If you select this entry, file system browse dialog will appear to select existing directory. This directory will be pasted into current cursor position. The following macros are supported:

**Project name** Adds project name ($PROJECT_NAME$ macro)

**Default project file path** Sets default project file path (the value of "Default project path" field) ($DEF_PROJECT_PATH$ macro)

**Actual project file path** Adds path where project file is actually located ($PROJECT_PATH$ macro)

11

**Image files location** Adds path where project image files are actually located ($IMAGE_FILES_PATH$ macro)

**Start frame** Adds number of initial rendered frame ($START_FRAME$ macro)

**End frame** Adds number of final rendered frame ($END_FRAME$ macro)

**Current date** Adds current date ($DATE$ macro). String will be created according to the current locale settings. All separators will be replaced with "_" character

**Curent time** Adds current time ($TIME$ macro). String will be created according to the current locale settings. All separators will be replaced with "_" character

**Default output format** Defines output format that will be used by default on new project creation.

**Default output color space** Defines output color space that will be used by default on new project creation.

**Default output fps** Defines output frame rate that will be used by default on new project creation.

**Default templates path.** Defines path where project template files will be placed.

**Action on project closing** Defines what action should be performed on project closing.

**Render complete notyfication (Pro version only)** Defines the way application notify other applications that project rendering is complete.This is usefull when application is used for bulk project rendering, that is controlled by external script or other application.Available options are:

**Set FVRenderComplete event** Application creates Win32 named event FVRenderComplete and set it to non signal state at the render start and set it to non signaled state on render finish. External application can use WaitForSingleObjec function to wait for project render is complete and next project can be processed.

**Create file** Application creates specified file on project rendering is complete. External application can wait untill the file is created and continue renering next project.

**UI language** Defines user interface language.

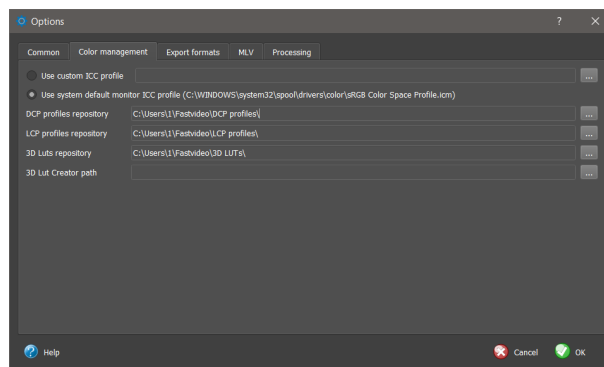## 5.1.2 Color management parameters



Figure 5.2:

Color management tab defines ICC profile, that will be used to view project files on display and paths to application DCP, LCP and 3D RGB LUTs repositories.

- ICC profile settings has no effect on output color profile, that defines color space of the rendered data. If "Use system default ICC profile" is checked, then Fast CinemaDNG Processor application will use currently installed system profile to display project files, despite the contents of "Use custom ICC profile" field. To use another ICC profile, type its path into "Use custom ICC profile" field (or browse with " ... " button) and uncheck "Use system default ICC profile" check box. Currently only matrix ICC profiles are supported.

- "DCP profiles repository" field defines path where application finds DCP profiles. The contents of this folder is displayed in the DCP profiles combobox (see section 5.14 for details). To change this value click "..." button at the right.

- "LCP profiles repository" field defines path where application finds lens correction profiles (.lcp files). The contents of this folder is displayed in the LCP profiles combobox (see section 5.15 for details). To change this value click "..." button at the right.

- "3D LUTs repository" field defines path where application finds 3D RGB LUTs (.cube files). The contents of this folder is displayed in the 3D LUTs combobox (see section 5.22 for details). To change this value click "..." button at the right.

- 3D Lut Creator path field defines path to 3D Lut Creator application, that being installed, could be used to create new and edit existing 3D RGB LUTs. To change this value click "..." button at the right.
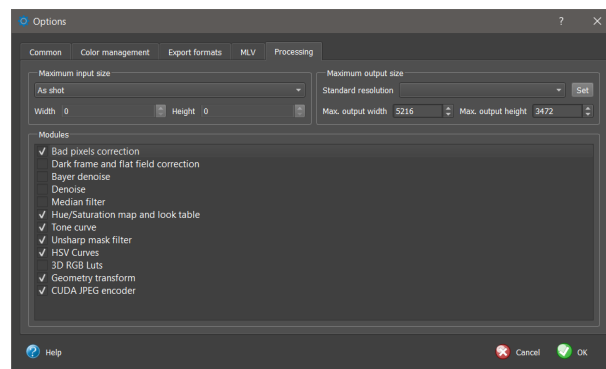
### 5.1.3  Processing



Figure 5.3:

Currently "Processing" tab defines the following groups of parameters:

**Maximum output size**  This group defines maximum image resolution after scaling at the end of image processing pipeline. It has no relationship to project output size and defines maximum possible value. This is done because large image processing takes a lot of GPU memory and it could be impossible to process such images with high scale factors. Maximum scale factor value is limited by this size and image size. For example, if maximum output size is defined as 3840x2160 and input image is 1920x1080, then maximum scale factor is 2 in both directions.

- Standard resolution combo box can help you to set maximum output size from the list of standard resolutions and has no relationship with project output size. Choose maximum output size from this list or type right values for width and height. Default value is 2.5K.

- Fast CinemaDNG Processor application can increase this size if it succeeds in opening project with input size greater than maximum output size. For example, if maximum size is 2.5K and it is possible to open 4K project, then maximum size will be adjusted to 4K.

**Maximum input size**  This group defines maximum image resolu

**Modules.**  This group defines what image processing modules could be added to minimum processing pipeline. Each of these extensions requires to allocate additional GPU memory and to increase overall processing time, so it could be impossible to run all the extensions on low-end GPUs. Also it is possible to switch off some extensions to decrease processing time. Only checked extensions will be included into processing pipeline. You can see details in the Benchmarks window. UI elements which are bound to the disabled extensions are turned to disabled state also.
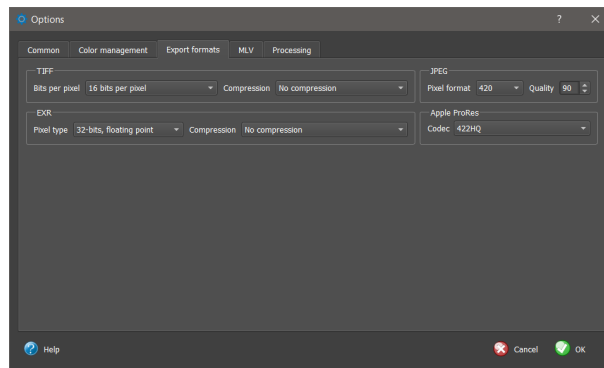
## 5.1.4 Export formats



Figure 5.4:

Export formats tab contains parameters, that will be used to write output image files.

**TIFF**  This group defines parameters for tiff files.

- Bits per pixel. Specify TIFF image pixel size. 8-bit and 16-bit are available.

- Compression. Specify TIFF image compression. Uncompressed or LZW compression are available.

**JPEG**  This group defines parameters for JPEG files.

- Pixel format. Specify JPEG pixel format. 420, 422 or 444 formats are available.

- Quality. Specify JPEG quality. Integer values from 40 to 100 are available.

**EXR**  This group defines parameters for EXR files.

- EXR pixel type. Specify EXR pixel type. 16-bit floating point, 32-bit floating point and 32-bit unsigned integer are available.

- EXR compression. Following compression options are available:
  - No compression
  - Piz-based wavelet compression")
  - Lossy 24-bit float compression
  - Lossy 4-by-4 pixel block compression, flat fields are compressed more

**Apple ProRes**  This group defines parameters for Apple ProRes encoding. It defines codec, that will be used to encode video data. Available codecs are:

- 422HQ

- 422

- 422LT

- 422Proxy

- 4444

- 4444XQ

Currently Fast CinemaDNG encodes video to Apple ProRes in REC.709 or REC.2020 color spaces. If project color space is different, REC.709 will be used.
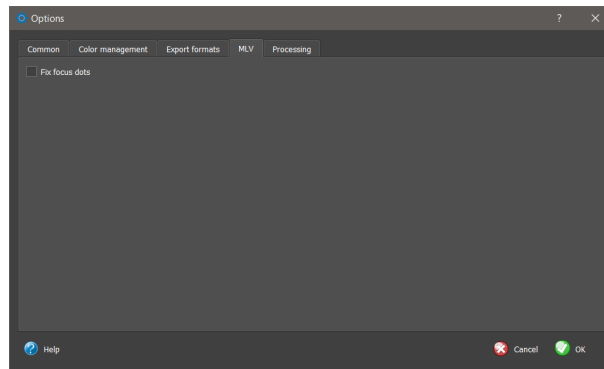
### 5.1.5 MLV (Magic Lantern Video)



Figure 5.5:

Currently "MLV" tab contains only one parameter "Fix focus dots". If this checkbox is toggled, focus dots will be fixed by default on every opening of MLV file/ Focus dots suppresion can be switched off from project property dock panel.

## 5.2 Project operations

Fast CinemaDNG Processor application doesn't deal with DNG files directly. Instead it uses project files, that corresponds to a single footage series. Project file has fvproj extension and can be opened from Fast CinemaDNG Processor UI or via Windows Explorer/

### 5.2.1 Project Create/Open

At the first run, demonstration project will be automatically loaded if corresponding option was enabled at setup process. That project will be opened automatically only once, and will never appear in the future runs. One can open it manually from default projects location.

To Create New Project one have to press menu ≡ button at the Toolbar and select "New CinemaDNG project" menu. Another option is to press Ctrl+N on keyboard.
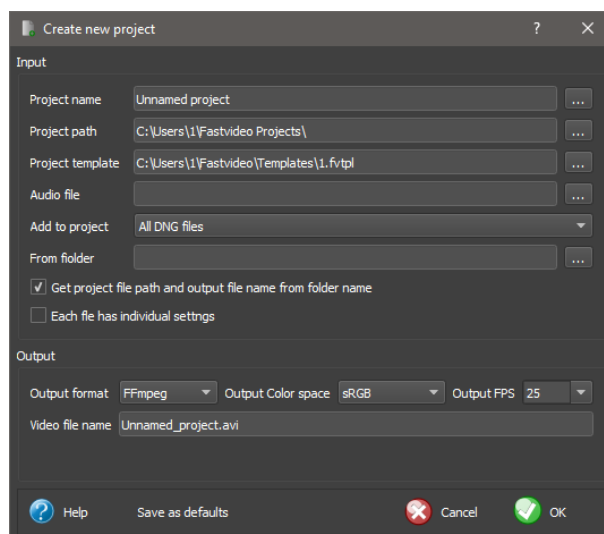
The following dialog will appear:



Figure 5.6:

15

All fields could be very useful, and minimum requirement is to fill path to DNG folder, Project name, Output format and Output FPS (frames per second). Pressing OK will create new project file which has extension *.fvproj. If such a folder exists and it contains proper DNG files, you will see on the monitor the first DNG image.

If you mark checkbox "Get project and output file name from folder name", then project name will be the same as the name of the folder with DNG images. It is important, that this checkbox will be checked before selecting the folder with DNG series. In other case this checkbox will have no effect.

In order to create new project from MLV file one have to press menu ≡ button at the Toolbar and select "New MLV project" menu. Open file dialog box will appear. Select desired MLV file and click OK button to create new project, or press Cancel button to cancel the operation.
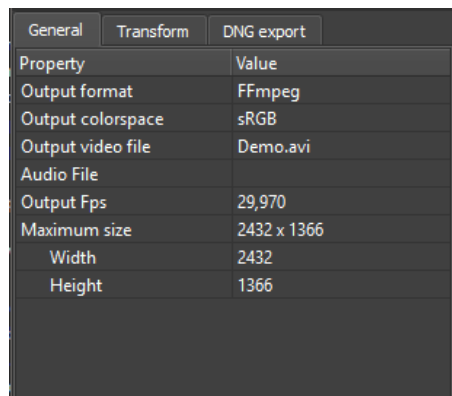
### 5.2.2 How to open existing project

If you have already created a project file earlier, you can click 📁 open button to select project file from file system. To open recently used project, press down arrow at the right side of the open button or press menu ≡ button to select one of 5 recently used projects.

Another way to open an existing project is to find corresponding project file in Windows Explorer and double click with mouse button on it (this option requires Explorer integration to be installed at installation process).

### 5.2.3 Setup project parameters

To setup project parameters use Properties dockable window. This window can show both project or project item (file) properties. To view project properties, double click project name in project explorer window. Project properties are organized into tabs.

#### 5.2.3.1 General tab



Figure 5.7:

This tab contains common project settings:

**Output format** Defines format that will be usen when project is rendered. Fast CinemaDNG Processor application supports the following formats:

    **FFmpeg.** Use FFmpeg to render project. See section 5.4.1 for details.

    **Motion JPEG.** Render project files into Motion JPEG avi file.

    **Apple ProRes.** Render project files into Apple ProRes mov file.

    **TIFF.** Render each project file as TIFF image. TIFF parameters are taken from application setup. See section 5.1.4 for details.

**JPEG.** Render each project file as color 8-bit JPEG image. JPEG parameters are taken from application setup. See section 5.1.4 for details.

**DNG.** Render each project file as DNG image. See section 5.2.3.3 for details.

**EXR.** Render each project file as EXR image. EXR parameters are taken from application setup. See section 5.1.4 for details.

**Output color space** Defines color space that will be used to render project. When Output format is TIFF or JPEG, corresponding ICC profile is embedded into each output file. Currently application supports the following color spaces:

- sRGB
- Adobe RGB
- REC.709
- REC.2020
- BMD Film
- BMD Film 4K
- BMD Film 4.6K

**Output video file** Defines file name that will be used to render project into video formats.

**Audio file** Defines project audio file in WAV or PCM format. If project is rendered into DNG, then audio file is also trimmed according to start and end time, and is moved to output directory. Audio is played if you haven't switched it off with corresponding button on Player.

**Output fps** Defines frame rate for output video. It's also used to calculate trimming boundaries for audio file.

**Maximum size.** This parameter is read only and it displays the size of the largest project file.

### 5.2.3.2 Transform tab

Transform tab defines parameters for cropping and scaling output data when rendering project in any format apart from DNG. Export to DNG uses different processing pipline and is described by parameters from "DNG Export" tab. These transformations are usefull when footage was shot with anamorphic lens. In general, each image is scaled according to scale settings and then scaled image is cropped according to crop settings.
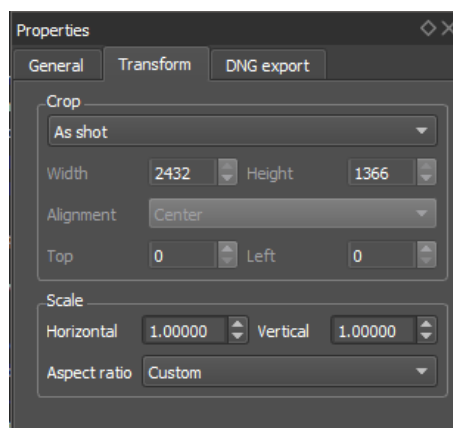


Figure 5.8:

Scale settings are the following:

**Horizontal** Defines scale factor in horizontal direction.

**Vertical** Defines scale factor in vertical direction.

**Aspect ratio** Defines pixel aspect ratio. When set to custom workflow, horizontal and vertical scale factors can be changed independently, otherwise changing one scale factor will lead to automatic change of the other.

Crop settings are the following:

**Crop type list** Defines how each file will be cropped. Available options are the following:

> **As shot.** When "As shot" is selected, each image will be cropped according to DefCropRectangle tags from DNG file header and then will be scaled according to scale settings.

> **No crop.** When "No crop" is selected, no crop is performed. All transformations are limited to scale settings.

> **Custom.** When "Custom" is selected, transformation logic is diferent from the previous two cases. Each image is scaled according to scale settings and then scaled image is cropped according to crop rectangle settings.

**Crop rectangle** These fields are enabled only if "Custom" crop type is set. Crop rectangle is defined by "Width", "Height", "Top" and "Left" fields. If any of these values are out of scaled image bounds, they will be automatically adjusted by application. "Top" and "Left" fields are enabled only if "Custom" alignement is set.

**Alignement** This list is enabled only if "Custom" crop type is set. The list defines how top-left point of the crop rectangle will be adjusted when crop width, crop height or image scale are changed. Available options are the following:

> **Center.** In this mode, crop rectangle is adjusted so, that center of the crop rectangle matches center of the scaled image

> **Top-left.** In this mode, crop rectangle is adjusted so, that top-left corner of the crop rectangle matches top-left corner of the scaled image

> **Top-center.** In this mode, crop rectangle is adjusted so, that center of the top side of the crop rectangle matches center of the top side of the scaled image

> **Top-right.** In this mode, crop rectangle is adjusted so, that top-right corner of the crop rectangle matches top-right corner of the scaled image

> **Right-center.** In this mode, crop rectangle is adjusted so, that center of the right side of the crop rectangle matches center of the right side of the scaled image

> **Bottom-right.** In this mode, crop rectangle is adjusted so, that bottom-right corner of the crop rectangle matches bottom-right corner of the scaled image

> **Bottom-center.** In this mode, crop rectangle is adjusted so, that center of the bottom side of the crop rectangle matches center of the bottom side of the scaled image

> **Left-center.** In this mode, crop rectangle is adjusted so, that center of the left side of the crop rectangle matches center of the left side of the scaled image

> **Custom.** In this mode no adjustment is applied. You can set arbitrary left and top coordinates.
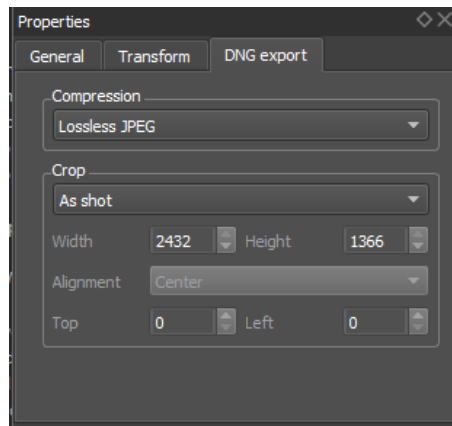
### 5.2.3.3  DNG Export tab



Figure 5.9:

DNG export tab contains parameters, used to render project into DNG. Currently only compression and crop are supported.

Supported compression algorithms are the following:

**Use original.** In that mode, project files are simply copied despite of crop settings

**Lossless JPEG.** In that mode, raw data are compressed with Losseless JPEG algorithm

**BMD RAW 3:1.** In that mode, raw data are compressed with lossy BMD RAW 3:1 algorithm

**BMD RAW 4:1.** In that mode, raw data are compressed with lossy BMD RAW 4:1 algorithm

**BMD RAW 5:1.** In that mode, raw data are compressed with lossy BMD RAW 5:1 algorithm

Crop settings are very similar to transform tab.

**Crop type list** Defines how each file will be cropped. Available options are the following:

    **As shot.** When "As shot" is selected, raw data are not cropped and DefCropRectangle tags from original DNG file header are appended to destination DNG file.

    **No crop.** When "No crop" is selected, raw data are not cropped and DefCropRectangle tags are not included into destination file.

    **Custom.** When "Custom" is selected, raw data are cropped according to crop settings. Crop rectangle settings and DefCropRectangle tags are not included into destination file.

**Crop rectangle** These fields are enabled only if "Custom" crop type is set. Crop rectangle is defined by "Width", "Height", "Top" and "Left" fields. If any of these fields values are out of image bounds, they will be automatically adjusted by the application. "Top" and "Left" fields are enabled only if "Custom" alignement is set.

**Alignement** That list is enabled only if "Custom" crop type is set. That list defines how top-left point of the crop rectangle will be adjusted when crop width or crop height are changed. Available options are the following:

    **Center.** In that mode, crop rectangle is adjusted so, that center of the crop rectangle matches center of the original image

    **Top-left.** In that mode, crop rectangle is adjusted so, that top-left corner of the crop rectangle matches top-left corner of the original image

    **Top-center.** In that mode, crop rectangle is adjusted so, that center of the top side of the crop rectangle matches center of the top side of the original image

**Top-right.** In that mode, crop rectangle is adjusted so, that top-right corner of the crop rectangle matches top-right corner of the original image

**Right-center.** In that mode, crop rectangle is adjusted so, that center of the right side of the crop rectangle matches center of the right side of the original image

**Bottom-right.** In that mode, crop rectangle is adjusted so, that bottom-right corner of the crop rectangle matches bottom-right corner of the original image

**Bottom-center.** In that mode, crop rectangle is adjusted so, that center of the bottom side of the crop rectangle matches center of the bottom side of the original image

**Left-center.** In that mode, crop rectangle is adjusted so, that center of the left side of the crop rectangle matches center of the left side of the original image

**Custom.** In that mode, no adjustment is applyed. You can set arbitrary left and top coordinates.

## 5.3 Project playback

To navigate in the project, use Player panel in the bottom part of the screen.



Figure 5.10:

Press Play ▶ button on the Player or K or Space keyboard buttons to play image sequence on the monitor.

Select loop mode from loop mode menu at the right side drop down list. Available modes are the following:

Loop mode.

Swipe mode

Play to the end and stop

Player has standard control buttons:

play forward (this action is also available via K or Space keyboard button)

load next frame (this action is also available via L keyboard button)

load previous frame (this action is also available via J keyboard button)

play in a loop

set left boundaries to play and save the video (this action is also available via I keyboard button)

set right boundaries to play and save the video (this action is also available via O keyboard button)

set left boundaries to play and save the video

set right boundaries to play and save the video

Red button is necessary to start output recording according to specified project parameters

 Mute button to switch sound on or off if project has audio file attached.

Bottom left corner contains timeline and timeline mode selector. Timeline mode selector allows you to view current frame time in 2 modes:

**Seconds.** In this mode footage time and current position are displayed in seconds. Position inside current second is displayed in frames in parentheses. To use this timeline mode, check  button

**Frames.** In this mode footage time and current position are displayed in frames. To use this timeline mode, uncheck  button

To move directly to any frame of the sequence, drag slider handle which is above Player control panel to desired position.

Right after loading a project you can see the first image in Player window.

By pressing Tab key, you can switch to "image only" screen mode (when all dockable windows are hidden). To get back, one have to press Tab key again.

To zoom output video, press Ctrl+ or Ctrl-, all changes will be applied in realtime.

To control playback and pause, press J, K, L buttons on the keyboard.

The software offers image output to the monitor via OpenGL. As soon as all computations on GPU are done, OpenGL is the fastest way to show the image on monitor because all data are already in GPU memory. You can see smooth video output which could be easily scaled in realtime.

By doing right-button click on the Player window, you can see context menu with the list of installed modules of the software. To show each module at user interface, click on corresponding checkbox.

## 5.4 Rendering project into output format

Fast CinemaDNG Processor application internally supports the following output formats:

- TIFF

- JPEG

- Motion JPEG

- Apple ProRes

- DNG

- EXR

It is possible to use FFmpeg to export to any format which is available in FFmpeg. To use this option, you should install FFmpeg on your PC. Refer to FFmpeg manual for installation procedure and the list of supported formats.

To render project to output format:

- Select desired format from output format list in Project properties window (to render via FFmpeg, select FFmpeg).

- Select desired range by pressing  and  buttons in Player window

- Press  key in Player window. $DATE$ - will be replaced with the current date. String will be created according to the current locale setting $OUTPUT\_PATH$\$OUTPUT\_FILE\_NAME$.

- $TIME$ - will be replaced with the current time. String will be created according to the current locale settings. All separators will be replaced with "_" character.

Progress bar at the bottom of the application window will appear to indicate rendering progress while rendering in any format except FFmpeg.
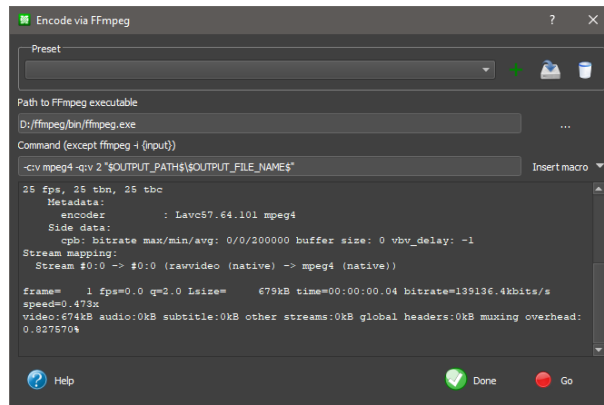
Figure 5.11:

### 5.4.1 Rendering project via FFmpeg

To use FFmpeg rendering you should install FFmpeg in your system. Refer to FFmpeg manual for installation procedure.

If you selected FFmpeg as output format, FFmpeg rendering window will appear on the screen.

This window contains the following parts:

- Preset group contains user defined command lines with predefined codec parameters, for example for encoding into MJPEG, MPEG4 etc. To add command line to preset list, press ✚ button and enter preset name in popup window. To remove preset from the list, press 🗑 button. To save current command line to selected preset, press 💾 button.

- Path to ffmpeg.exe contains path to FFmpeg executable. You can use " ... " button to browse file system for it. If path to FFmpeg is added to system PATH variable, default value ffmpeg or ffmeg.exe is enough.

- Command field contains command line that will be passed to ffmpeg.exe for project rendering. FFmpeg command line in general consists of two parts. The first describes input data format and is formed by Fast CinemaDNG Processor application (for example -y -vcodec rawvideo -f rawvideo -pix_fmt rgb48 -s 2400x1350 -i \\.\pipe\fastvideo_pipe ), the second one describes output format. This part should be entered into "Command" field. Typically it contains video codec parameters and output file. Line -c:v mjpeg -q:v 2 asks FFmpeg to output into Motion JPEG (-c:v mjpeg) with the highest quality (-q:v 2). Refer to FFmpeg manual for complete codecs and command line options list.

Fast CinemaDNG Processor application sends 48-bit RGB data to FFmpeg via pipes. Output parameters are set via command line that will be sent to ffmpeg.exe as command line arguments.

Output path can be directly typed into command line or can be created with macros. Macros is a predefined text enclosed in $ characters that will be replaced with some information when composing command line. To insert macros, use "Insert macro" dropdown list or type it manually. The following macros are supported:

**Project output path** inserts $OUTPUT_PATH$ macro, that will be replaced with project output path

**Output file name** inserts $OUTPUT_FILE_NAME$ macro, that will be replaced with project output file name

**Output file base** inserts name $OUTPUT_BASE_NAME$ macro, that will be replaced with project output file name without extension (out_file.avi -> out_file). This is usefull when you need to do encoding, for example, MPEG4 container when project file extension is AVI

**Project FPS** inserts $FPS$ macro, that will be replaced with project fps

**Current date** inserts $DATE$ macro, that will be replaced with current date. String will be formed according
to current locale settings. All separators will be replaced with "_" sign

**Curent time** inserts $TIME$ macro, that will be replaced with current time. String will be formed according
to current locale settings. All separators will be replaced with "_" sign

It is important to remember, that paths, containing spaces should be quoted, so use "$OUTPUT_PATH$\$OUTPUT_
instead of $OUTPUT_PATH$\$OUTPUT_FILE_NAME$.

Also none of macros contain path separators, so you should type them manually.

If project contains attached audio file and Mute button is not pressed, the sound will be also added to the
output file. You don't need to make any changes in the command line string, except specifying audio codec
(-c:a parameter). If you don't specify audio codec, ffmpeg will use the default one.

To render the project, press ● Go button. You will see FFmpeg output in the log window. When all
done, press ✅ Done button.

## 5.4.2 Rendering project from command line (Pro version only)

Fast CinemaDNG Pro can be used from command line to render projects. This version has additional
command line parameters with respect to standard version:

**-command=<...>** - Currently only"render" command is available. In this case application load and render
the project to format, provided in fvproj file or default render format, set in application parameters, if
not provided, simply loads project.

**-out_path=<...>** - path where you will get final results (it supports macros from application settings)

**-template=<...>** - path to template file, that contains processing settings.

You can call Fast CinemaDNG Pro from console or script as many times as you like, but actual processing
will be done only by first instance of application. Any other instancies will send their command line to first
one and terminates.

While rendering project Fast CinemaDNG Pro will not process any new requests. To synchronize rendering
process, application set FVRenderComplete named event or create file according to application settings.
Calling script should monitor this event or file to determine if it is possible to render next project or not.
Fast CinemaDNG Pro distribution contains FVWait.exe utility, that being run wait for FVRenderComplete
and terminates.

Here is a simple cmd script, that process all folders (and optionally sub folders) in current folder.

```
rem This example shows how to process multiple sub folders in from D:\IMG_DNG\TestRender folde
rem and put results into d:\tmp\TestRender\$PROJECT_NAME$ where $PROJECT_NAME$ will be source
rem refer to FastCinemaDNG manual for macros details
echo off
set SRC_PATH=D:\IMG_DNG\TestRender
set FV_PATH=D:\FastCinemaDNGPro_x64
cd %SRC_PATH%
rem Uncomment for recursive subfolders search
rem FOR /D /r %%G in ("*") DO (
FOR /D %%G in ("*") DO (
echo Processing %%G
%FV_PATH%\FastCinemaDNGPro.exe "%SRC_PATH%\%%G" -command=render -out_path="d:\tmp\TestRender\$
%FV_PATH%\FVWait.exe
)
echo Done
```

## 5.5 Zooming

One can choose arbitrary zoom ratio with the following actions in the "Zoom" window:



Figure 5.12:

- Move zoom slider

- Turn mouse weel with Ctrl key pressed when mouse pointer is over the image window

- Press Ctrl+ and Ctrl-

- Press Ctrl 0 to reset zoom to 100%

One can also mark checkbox "Fit screen".

Press Reset 🔄 button on the right to scaling slider to get 100% scaling ratio.
Zoom is done on GPU with Lanczos resize algorithm to prevent aliasing.

## 5.6 Project templates

Project templates bar allows to apply a set of common settings, stored in the template file. One can also save current project settings to the template file to apply them to newly created and existing projects. Project template files are stored in (home path)\Fastvideo\Templates folder/ (in Windows 10 it is C:\Users\(User Name)). In fact, these files are project files with .fvtpl extension and they don't contain any image files.
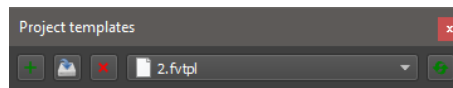


Figure 5.13:

To save current project settings to a new project template, press ➕ button on the project templates toolbar. You will be prompted to input template name, and new template will be saved in the project templates path.

To save current project settings to selected template, press 🔽 button on the project templates toolbar.

To delete selected template, press ✖ button on the project templates toolbar.

To reset project settings to original state (the state before applying the first preset), press 🔄 button on the project templates toolbar.

To apply existing project template to current project, simply select right template from combo box.

## 5.7 Histogram
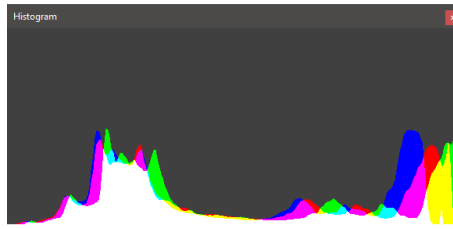
Histogram window shows RGB histogram

Figure 5.14:

General and logarithmic histogram modes are available. To switch histogram mode, right click on histogram and check or uncheck "Logarithmic" context menu.

## 5.8 RGB Parade

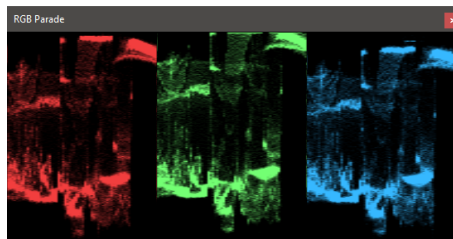RGB Parade is a set of histograms for vertical rows of each RGB component of color image.



Figure 5.15:

This is useful representation of color image data to evaluate white balance and color distribution.

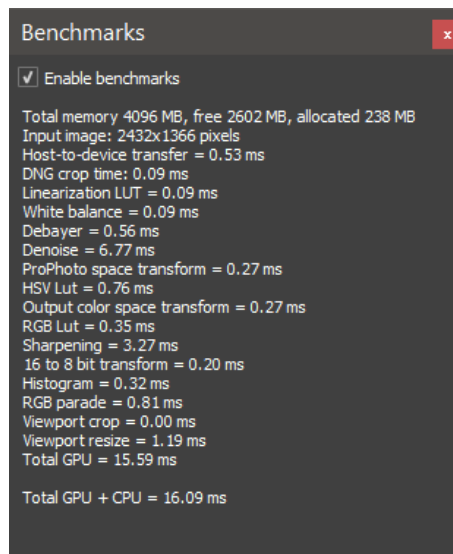## 5.9 Benchmarks (timings for each stage of RAW image processing pipeline)



Figure 5.16:

In the Benchmarks module you can see general information about GPU (total memory, allocated memory, free memory), image resolution and timing for each stage of image processing pipeline and total GPU time.

This is very important to understand what's going on and how much time we spend on any particular stage of image processing on GPU.
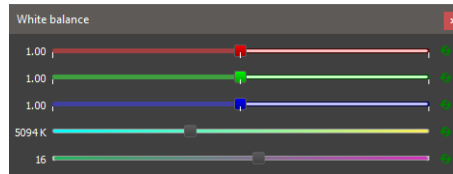
## 5.10 White Balance



Figure 5.17:

One can set White Balance settings by moving RGB sliders independently. Each slider sets corresponding coefficient to be used at White Balance stage of image processing. By clicking on a button which is on the right side from the slider, you will set coefficient from original DNG image.

To check whether your coefficients for RGB components are right, you can have a look at Histogram and RGB Parade windows.

Together with White Balance at that group of controls there are Temperature/Tint sliders. All default values are taken from the current DNG image.

Press Reset 🔄 button on the right side of the slider to set default value.

## 5.11 Exposure Correction



Figure 5.18:

Exposure Correction is applied before debayering and this is the means to control brightness of the picture. Default value is taken from the current DNG image. Positive values correspond to brightness increase, negative values help to darken the image. Exposure correction is measured in eV (F-stops).

Press Reset 🔄 button on the right side of the slider to set default value.
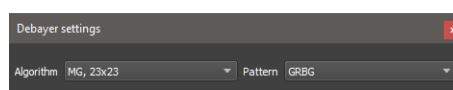
## 5.12 Debayer (Demosaic)



Figure 5.19:

Debayering (demosaicing) is a transformation of a 8/16-bit Raw Bayer image into conventional 24/48-bit RGB format. Demosaicing is required because digital cameras normally don't produce ready-to-go RGB images, instead they store visual information as a set of separate R, B, and G values derived from the image sensor of the camera and the actual color of a pixel in that array is determined by interpolating nearby pixel colors. Demosaicing software does the following:

Converts 8/16-bit Raw Bayer images to 24/48-bit RGB

Can do that really fast on NVIDIA GPU, much faster than on any CPU

All Bayer mosaic patterns for input data are supported (RGGB, BGGR, GBRG, GRBG)

Performs moire suppression

Does precise time and performance measurements immediately

In the software there are three GPU-based Debayer (demosaicing) algorithms: HQLI, DFPD and MG. The first one is the fastest, the third has better quality, but all of them can run faster than in realtime. You can set Bayer pattern manually from dropdown list. Usually the software takes correct pattern from the current DNG image, but user has also an option to set any pattern.

## 5.13 Denoising

There are two denoising modules which could be applied independently. Both of them are wavelet-based, but the first one (RAW spatial denoiser) is applied for RAW data before demosaicing and the second one (RGB spatial denoiser) is applied to color data right after demosaicing.

It is possible to suppress spatial noise for each channel of Raw Bayer image before applying demosaicing. We split Raw Bayer image into 4 planes according to Bayer pattern and then remove spatial noise for each plane separately.

There is also an opportunity to suppress spatial noise for luma and chroma. We convert RGB data to YCbCr before denoising.

To increase denoise level, move corresponding slider handle to the right.

To disable Raw or RGB denoise, toggle checkbox near Raw or Y / Cr sliders.

Also one can suppress hot or dead pixels. To do so, toggle "Remove bad pixels" checkbox.
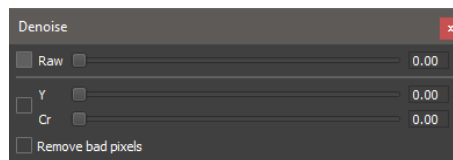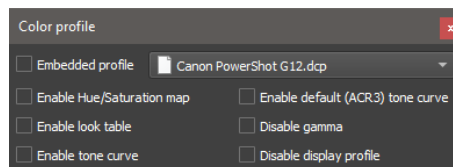


Figure 5.20:

## 5.14 Camera profile



Figure 5.21:

Camera profile widow allows to select dcp profile, that will be used for color transform. It allows to enable or disable Hue/Saturation map, look table and tone curve, which are built into DNG file or into external DCP profile. If profile does not contain corresponding curves, checking / unchecking checkboxes will produce no effect. If your DNG files doesn't contain any information of this kind, you can disable this extension in application parameters to reduce required GPU resources.

- To process file with external dcp profile uncheck "Embedded profile" checkbox and select required profile in profiles list. List content consists of file names from dcp profiles repository. Refer to application parameters to find out exact path to this repository. To add or delete profile to repository, simply copy dcp file to repository folder or delete it from it.

- To produce linear image (without gamma), toggle "Disable gamma" checkbox.

- To view image in output color space (not display color space), toggle "Disable display profile" checkbox.
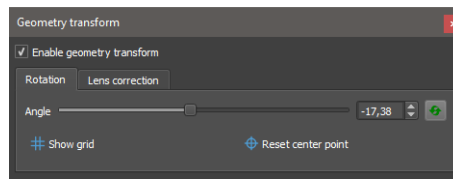
## 5.15  Geometry transforms



Figure 5.22:

Geometry transform docking widow allows to manage image geometry transforms. Supported transforms are Rotation and Lens correction. To enable or disable all geometry transforms, toggle "Enable geometry transform" checkbox.

### 5.15.1  Rotation

Rotation tab allows you to rotate image to an arbitrary angle. The angle value can be changed with "Angle" slider or with spin box. Press Reset ↻ button to set angle value 0 deg.

For fine rotation tuning use "Show grid" ⌗ button. If this button is toggled, the main application window looks like this:
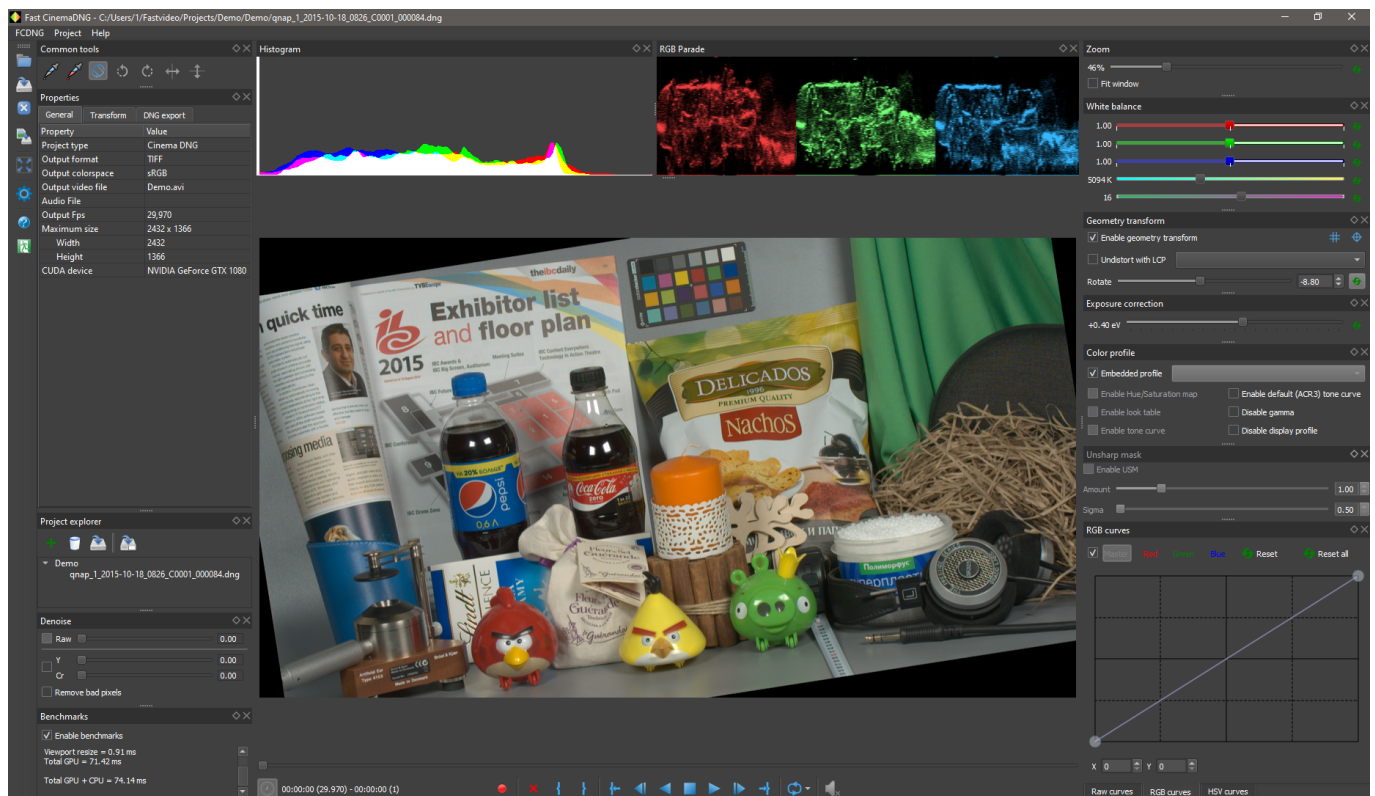


Figure 5.23:

You can adjust rotation angle so that horizontal or vertical lines on the picture become parallel with grid lines.

Also you can adjust rotation center. To do so, move corresponding circle to the desired point on image. To reset rotation center to the center of the image, toggle "Reset center point" ⊕ button.

### 5.15.2 Lens correction

Select "Lens correction" tab to view lens correction parameters. Currently only radial distortion is corrected.
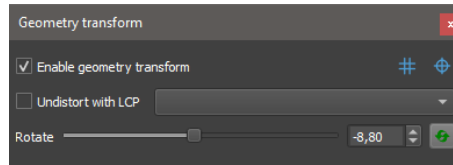


Figure 5.24:

Lens correction is performed by using lens correction profiles (.lcp files). These files should be copied to the LCP profiles repository path. This path is defined at the application's color management parameters (see 5.1.2 for details). The combobox content will be automatically updated when new files are copied to the repository. To perform the correction, select desired profile in the "LCP file" combobox and toggle "Correct radial distortion" checkbox.
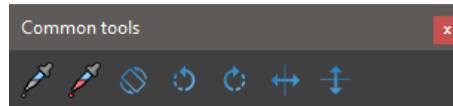
## 5.16 Common tools



Figure 5.25:

Common tools include:

**WB picker.** WB picker is used to adjust white balance by clicking gray area on the image. To perform adjustment select WB picker tool by toggling  tool button on the "Common tools" panel. When WB picker tool is active, click known gray area on the image. Temperature and tint will be adjusted so, that area becomes gray.

**Color picker.** Color picker is used to view color information at the given point. Only RGB 0 - 100% format is supported now. Multiple color pickers can be created. To add new color picker, toggle  tool button on the "Common tools" panel. To remove color picker from the image, click right mouse button on the corresponding picker.

**Orientation setup.** These five buttons allow you to change image orientation:

 rotates image automatically according to the orientation, written to file header

 rotates image to the left

 rotates image to the right

 flips image horizontally

 flips image vertically

## 5.17  RGB Curves
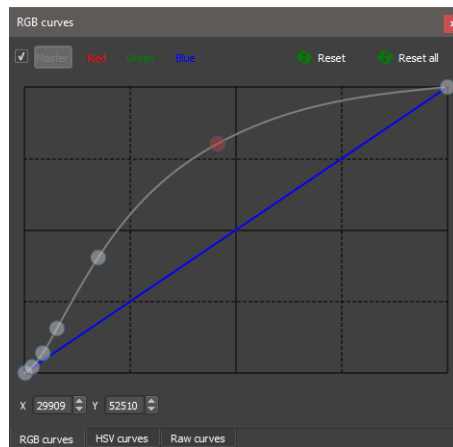


Figure 5.26:

You could apply 1D look-up tables (LUT) for all RGB channels at the same time (gray line) or for each color channel separately. This LUT is applyed to linear RGB data before gamma correction.

- To modify LUT, select desired curve by clicking Master, Red, Green or Blue check button, click at the desired curve location and drag mouse untill the curve gets desired shape. Drag handle will be added automatically.

- To remove drag handle from the curve, double click on it.

- To fine tune handle position, use X and Y text boxes at the bottom of the curve editor. The handle to which thise changes are appllied, is highlighted with red.

- To reset current curve press "Reset" button.

- To reset all curves, press "Reset all" button.

- To temporary disable all LUTs, toggle checkbox at the left of the "Master button"

## 5.18  Raw Curves



Figure 5.27:

You could apply 1D look-up tables (LUT) directly to raw data. This LUT is applied to 16-bit gray data after linearization stage, but before demosaicing. Master LUT is applied to the whole image, Red LUT is

applyed to the red pixels of bayer data, Green LUT is applied to the green pixels of bayer data and Blue LUT is applied to the blue pixels of bayer data.
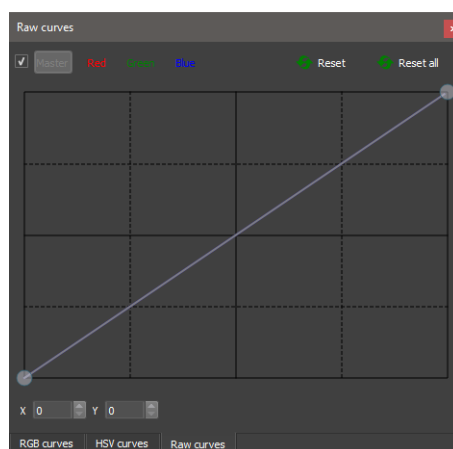
Curve management is quite the same as with RGB LUTs.

## 5.19 Dark Frame subtraction and Flat-Field Correction
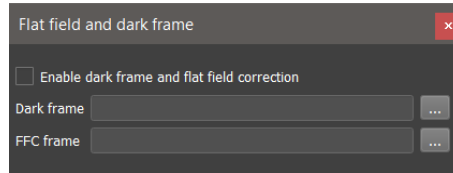


Figure 5.28:

You can apply flat-field correction (FFC) and dark frame subtraction by providing two corresponding linear RAW imeges in PGM or DNG format. To get these images from DNG files you can use dng_validate.exe utility from DNG SDK.

dng_validate -16 -2 FFC <path\to\dng>

This will extract 16-bit linear RAW data into FFC.tiff. The FFC and dark frame width and height must be exactly the same as width and height of the processed RAW file. Otherwise the correction will not work.

To supply FFC and dark frame files, click "..." buttons next to "Dark frame" or "FFC frame" field.

To temporary disable correction, uncheck "Enable dark frame and flat field correction" check box.

To disable whole FFC and dark frame corrections, uncheck "Dark frame and flat field correction" check box in the application processing options.

## 5.20 Bad (hot and dead) pixels removing.



Figure 5.29:

You can remove hot and dead single pixels from image by toggling "Remove bad pixels" check box from the "Denoise" dock panel. This function dynamically removes single pixels which value is significantly greater or less then their neigborhood.

## 5.21 HSV Curves



Figure 5.30:

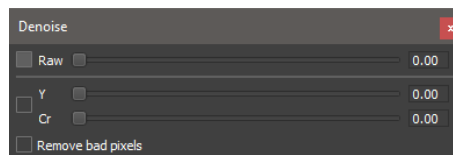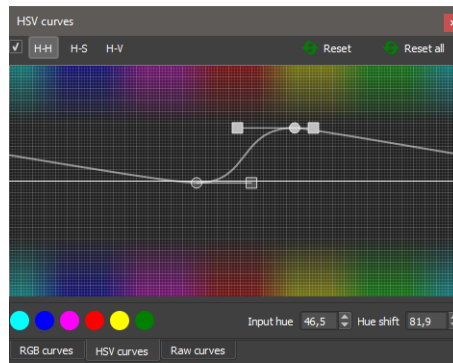HSV LUTs could be used for Hue-Hue, Hue-Saturation and Hue-Value transforms. There are three tabs in that module: H-H (Hue-Hue), H-S (Hue-Saturation) and H-V (Hue-Value). You can create any LUT for each tab and apply all of them to the current image.

Curve is built on the basis of Bezier curves and its editing is quite similar to any vector graphics editor. Each curve has a number of control points and each control point has 2 handles to change curve inclination at particular control point. If curve has only 1 control point, it behaves as a horizontal line.

To put a new control poin on the curve click left button at the desired curve point. New control point with both handles will be added to the curve.

To remove a control point from the curve, double click left button on the desired control point. The point will be removed from the curve.

To simplify adding control points of particular hue (cyan, blue, magenta, red, yellow, green) use six small circular buttons, which designate corresponding colors.

To fine tune control point's position, use fields "Input hue" and "Hue shift" ("Saturation" or "Gain") to move curves by inserting proper values.

To reset current curve, press "Reset" button. To reset all curves, click "Reset all" button.

To temporary disable HSV LUTs, toggle checkbox at the top left corner.

## 5.22 3D RGB LUTs
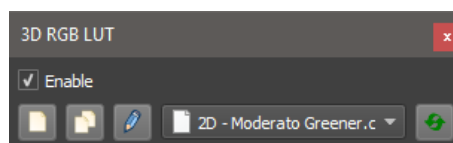


Figure 5.31:

You can use standard 3D RGB LUTs in .cube format for RGB color grading. This transform is a final stage, that occures after all other transformations. If you have 3D LUT Creator application installed, you can use it to create new or edit existing 3D RGB LUTs.

- To apply 3D RGB LUT, select it from combobox. The content of this combobox is loaded from 3D RGB LUT repository path. If you add a new file to the repository, it will appear in the combobox.

- To clear combobox selection, press 🔁 button.

- To temporary disable 3D RGB LUT, toggle "Enable" checkbox.

- To create new 3D RGB LUT click ⬜ button. You will be asked for new LUT name and then 3D Lut Creator application will be started with current image loaded. When 3D Lut Creator is running, Fast CinemsDNG Processor application is unavailable until you close 3D Lut Creator. Adjust new LUT and close 3D LUT Creator. You will be asked either to save new LUT or not. After 3D Lut Creator is closed and the LUT is saved it will appear in the combobox and it will be applied to current image immediately.

- To clone currently selected 3D RGB LUT, click ⬜ button. You will be asked for new LUT name and then 3D Lut Creator application will be started with current image loaded. When 3D Lut Creator is running, Fast CinemaDNG Processor application is unavailable until you close 3D Lut Creator. Adjust new LUT and close 3D LUT Creator. You will be asked either to save new LUT or not. After 3D Lut Creator is closed and the LUT was saved it will appear in the combobox and it will be applied to current image immediately.

- To create new 3D RGB LUT, click ✏️ button. 3D Lut Creator application will be started with current image loaded. When 3D Lut Creator is running, Fast CinemaDNG Processor application is unavailable until you close 3D Lut Creator. Adjust the LUT and close 3D LUT Creator. You will be asked to save new LUT or not.

## 5.23 JPEG/MJPEG Compression

Fast CinemaDNG have CUDA-based implementation of 8-bit JPEG algorithm for compression on NVIDIA GPU according to JPEG Standard. Compressed data could be written to JPEG or Motion JPEG files.

## 5.24 JPEG2000 Compression

Soon we expect to add CUDA-based implementation of JPEG2000 codec for image encoding and decoding according to JPEG2000 Standard. For the same bitrate, image quality of JPEG2000 compression is much better in comparison with Apple ProRes, Avid DNxHR and DNxHR codecs. Current CPU-based implementations of JPEG2000 codec are unable to offer realtime processing, but our GPU-based JPEG2000 encoder is already able to do that.

## 5.25 Compatibility with third-party applications

There is an opportunity to run third-party applications with specified command-line to offer functionality which is absent in Fast CinemaDNG Processor software.

For example, one can specify path to installed FFmpeg (user has to download and to install that software by itself) and to set proper command-line to send processed DNG images to FFmpeg for further processing or compression. As an example, one can see how processed DNG images could be converted on-the-fly to MJPEG with the aid of FFmpeg.

## 5.26 Additional Professional version features

Fast Cinema DNG Professional has a number of additional features:

- Grayscale dng images support

- Blackmagic RawSDI mov files support

- Norpix SEQ files support

- Stream project support for controlling application from scripts

- Additional command line parameters

Stream project

Stream project is a special type of projects, that handles commands instead of files, like other project types. It's basic aim is to automate processing bulk volumes of raw files with external applications, mainly by scripts (cmd, bash, python etc.).

To create new stream project select "New Command Stream Project" from appliocation menu. When command stream project is opened Fast CinemaDNG starts waitng for incoming commands. These commands could be sent by other application / script by

- Invoking another instance of Fast CinemaDNG with additional command line parameters when command stream project is opened.
  FastCinemaDNGPro.exe [options] <ProjectFile> where
    - <ProjectFile> - project file to process. Could be fvprj, dng, cr2, cr3, nef or mlv file, or path to folder with above raw files.
    - Options:
        * -d trace GPU calls in a log file, which is placed int <HOME>\Fastvideo\Logs
        * --template - path to project template file (fvtpl), which contains predefined processing parameters.
        * --command - command to execute when project file is loaded. Possible options: render - render project with parameters from template or with application defaults.
        * --out_path - path where rendering results will be placed.

- Sending command directly with pipe (curently Windows only). In theis case calling application should send to named pipe "fvcontrolpipe" following unicode string
  <action><cr><project file><cr><template file><cr><camera id><cr><out path><cr><debug>, where
    - <cr> is a new line character (\n, character with code 10)
    - <action> - action to be performed (integer number). Currently only value of 1 is supported, which means render project. Sending command with this field set to "1" is like opening regular project and pressing Render button in application UI.
    - <project file> - could be fvprj, dng, cr2, cr3, nef or mlv file, or path to folder with above raw files
    - <template file> - path to project template file (fvtpl), which contains predefined processing parameters.
    - <camera id> - reserved for future use. Must be empty.
    - <out path> - path where rendering results will be placed.
    - <debug> - if set to "1" asks application to trace GPU calls in a log file, which is placed int <HOME>\Fastvideo\Logs

Every time Fast CinemaDNG finishes rendering it set FVRenderComplete named event or creates file according to application parameters (see 5.1.1 for details).

Contact Fastvideo support team for controlling and waiting source code samples.

# 6 Troubleshooting

If you've found a bug, please contact us at fastcinemadng@gmail.com and send the information how to reproduce the bug together with source image and description of other parameters. We will consider the matter asap.

There is a built-in logging system in Fast CinemaDNG Processor. If you run the application with -d parameter, the software will create log file which includes all performed actions. Please send this log file together with DNG source and bug description.

We welcome and encourage your questions and comments concerning our products. Contact us at fastcinemadng@gmail.com

# 7 Disclaimer of Warranty

In addition to the provisions of the EULA of FASTVIDEO the following apply:

Although FASTVIDEO has taken care to ensure the accuracy of the information contained herein it accepts no responsibility for the consequences of any use thereof and also reserves the right to change the specification without prior notice.

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# 8 How to buy

Right after installation Fast CinemaDNG Processor runs in Demo mode. Demo mode is fully functional except rendering projects with resolutions higher then Full HD. When project output resolution is higher then Full HD, watermarks are applied to output image. This limitation is not applyed to player. It still works without watermarks for any resolution. Projects which output width and height are less then Full HD are played and rendered without watermarks.

To ulock restricted features, you need to buy license key, either from that site or directly from Demo software. The licensed software is bound to the Hardware ID of your PC, so you need to generate that ID and it should be done from Fast CinemaDNG Processor software.

To get your Hardware ID?

- Download demo version of Fast CinemaDNG Processor and install it on your PC

- Run demo version of Fast CinemaDNG Processor software

- Check that it's working well at your NVIDIA GPU with sample image series (DNG or MLV)

- Choose Menu - Register

- Fill that Form with your First Name, Last Name and Email address. Hardware ID will be generated automatically

After getting the Hardware ID, you can either copy full info and purchase link to the Clipboard by pressing button or save it disk by pressing button (to make purchase later) or press "Buy" button to go to checkout page immediately.

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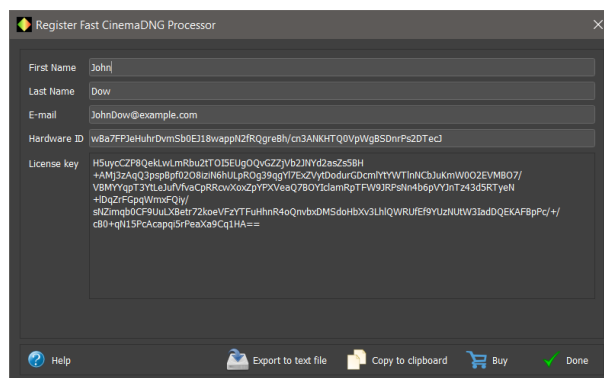


Figure 8.1:

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Go to the same dialog where you got Hardware ID and insert your license key into the appropriate field and press "Done" button. In case of correct license key, the software will run in the licensed mode without watermarks and all other demo restrictions will be removed. If the license key is uncorrect, then software will work in Demo mode.

# 9 Trademarks and Copyrights

Fast CinemaDNG Processor uses NVIDIA CUDA, NVIDIA NPP, NVIDIA driver, Adobe DNG SDK, Fastvideo GPU Image Processing SDK, Qt, FFmpeg, LibXML2 library, OpenGL, libtiff, libjpeg, OpenEXR 2.2.1, Magic Lantern MLV format specification, and Microsoft Visual Studio 2015 runtime library. All trademarks mentioned in this manual are the property of their owners.

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- NVIDIA CUDA-10.2

CUDA Image Processing library.
http://developer.nvidia.com/cuda-downloads

- Adobe DNG SDK 1.4

SDK for DNG image acquisition and parcing.
http://www.adobe.com/support/downloads/detail.jsp?ftpID=5474

- Fastvideo GPU Image & Video Processing SDK (ver. 0.16.4.11)

Library for fast image and video processing on NVIDIA GPUs.
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- FFmpeg (LGPL, ver. 2.1)

Wrapper for MJPEG, MJ2K bitstream writers to AVI, MJ2K and MXF containers (LGPL 2.1 version)
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- Qt 5.13.1

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- MLV format specification (LGPL, ver. 2.1) from Magic Lantern

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section 5.4.1(5.4.1)section 5.4.1