User Guide for the mcpro24fps Application

Version 034kd

Welcome, mcpro24fps user!

We want to thank you for using our app and we want to help you get the hang of it as quickly as possible. We have tried to make the most detailed instructions on the interface, settings and functions of the application.
This is not the final version of the manual. We plan to supplement and update it as much as possible. So, if you have noticed a feature/settlement you do not understand, please refer to the newest version of the manual. Probably it contains the information you need.
If you don't find the answer in the manual, don't hesitate to ask questions:
at info@mcpro24fps.com
in Telegram chat https://t.me/mcpro24fps_en
on Facebook Page https://www.facebook.com/mcpro24fps

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About the App

We all know that the Android OS is a sea of possibilities and a great range of freedom. At the same time, there are also a lot of problems. The cause of the problems is most often the diversity of the fauna of the Android planet. It is not easy to create a product, which will work on different versions of Android, on devices with different performance levels, developed on different SoC (Snapdragon, Exynos, Kirin, MediaTek). Even the proportions of the screen can make life very difficult for a developer.

There are two kinds of developers in the market of applications for this OS.

The first ones give their applications a lot of possibilities, but control the performance is shifted to the user.

Others are trying to limit the user's access to everything that may not work correctly. Most often, this applies to those developers who are engaged in porting applications from Apple's iOS operating system. That is where the policy of restrictions prevails.

We try to take the best from both. In other words, we take some of the control over the functionality of the application and leave some of it to the user. In this way, we try to cover as many Android devices as possible and find a certain balance, so that both flagman-devices and modest models are able to shoot mobile movies.

Until recently, there was only one king in the world of mobile video. Over the years, he has gathered many fans who still worship only him by habit to this day. No one else previously thought to claim his crown. But in vain.

Today, we're proud to be slowly but surely changing the balance of power in the world of mobile video. And many Android devices have the opportunity to talk about mobile video recording more seriously. We aim to keep going in the same direction.

The advantages of the mcpro24fps app are based on the developer's deep knowledge of the topics of shooting and processing video, the operation of camera sensors and the principles of Log profiles, knowledge of non-linear editing programs, color correction and color grading. Ongoing practical research allows us to improve the quality of the application.

At that moment, the application requires Android OS 7 and higher. The minimum OS version may increase in the future.

For using GPU OpenGL ES 3.1 is required.

Getting Started

When the app first starts, the user will be asked to confirm three permissions: to use the camera, to use the microphone, and to access to the storage.
Each of these requests needs to be approved in order for the application to work properly.

1. Interface
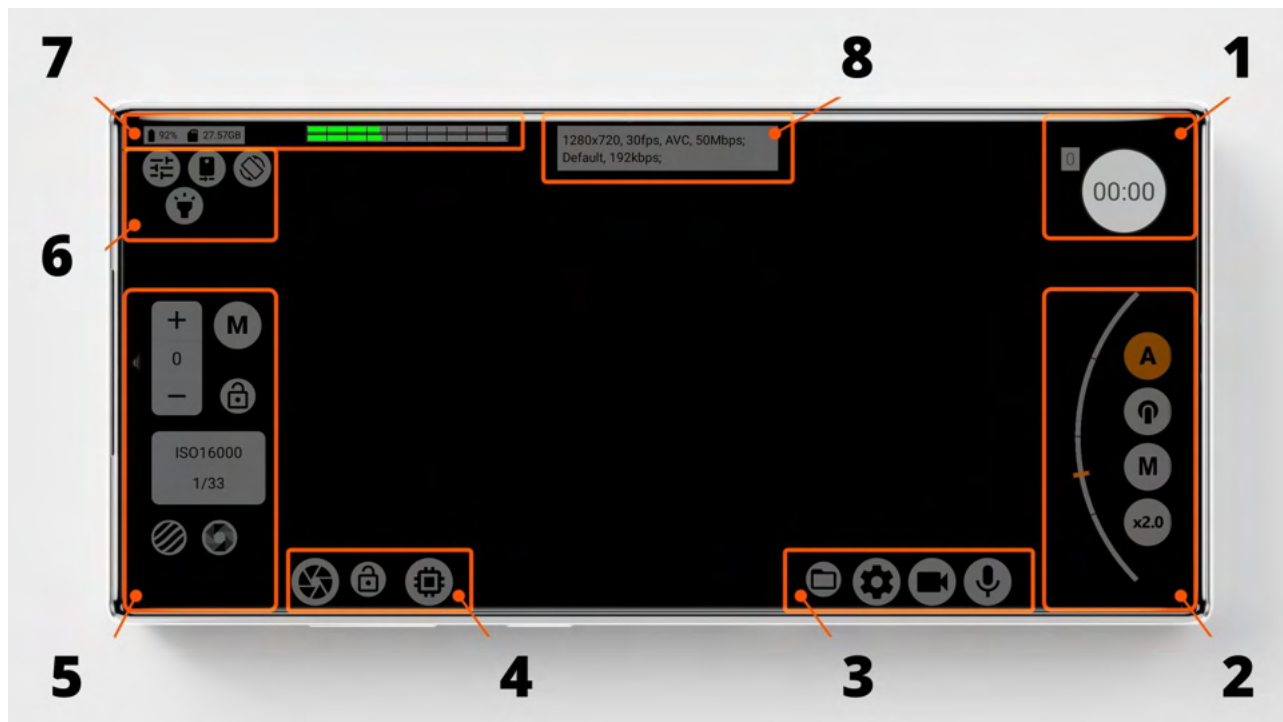
1 - Record Button Area; 2 - Focus and Zoom Area; 3 - App Settings, Record and Access to Recorded Videos Area; 4 - Image Settings Area; 5 - Exposure Settings and Control Area; 6 - Quick Access Area; 7 - Indication Area; 8 - Basic Settings Information Window.

1.1. Record Button Area

This area contains the record button and dropped frames counter.
The record button contains indicators of the recording time and size of the information being recorded. In the preview mode the button is light gray and only the time indicator is visible.
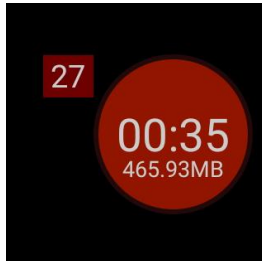
When recording, the button is highlighted in red, the timer starts counting the time, and the recorded information size indicator appears below it.
The counter of dropped frames counts the frames that are not in the video.
Drops of frames depend on many parameters, but mainly on the load. Too high a load, too sudden scene changes, uncontrolled activity of background processes - all these can influence the number of frames dropped out.
The dropped frames counter is not reset after the recording ends, so that the operator can determine the level of damage.
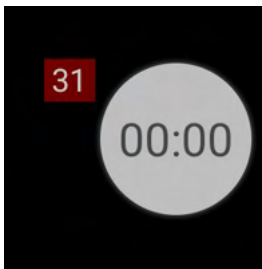
1.2. Focus and Zoom Area

Before describing the buttons and functions: Note that not all buttons may be available on a single device. Their availability depends on the camera2 API settings of a particular sensor. Within a single device, each individual sensor has its own characteristics and capabilities. The functionality of the secondary sensors is often reduced in comparison to the primary sensor.

1.2.1. Infinite Autofocus
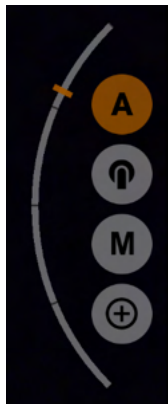
The first button with letter A on it is continuous autofocus. This mode is fully automatic and works based on the camera libraries that the manufacturer has integrated into the device. The focus techniques also depend on the device. When the scene changes in this mode, the focus resumes searching until it decides it is in focus.
To the left of the buttons is a focus position indicator. The focus on distant objects is the top of the indicator and the focus on near objects is the bottom.

1.2.2. Touch Focus
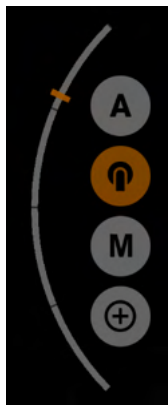
The second button with the finger symbol on it is the touch focus. Tap the screen where the object you want to focus on is located. Focus will go into search mode and focus on the subject after a while. Focus accuracy depends on many variables. The focus technology, just like in autofocus mode, depends on the device. The only difference is that you select the focus area yourself, and the focus is triggered only once. Only the next touch will make it resume its search. The focus area in touch focus mode has a certain size, and it can change depending on the proximity setting. The higher the proximity, the larger the focus area.

The focus area has three color-coded states.

Gray means that the focus area is in search mode.

Yellow-orange means that the focus has stopped searching, thinks it has focused, but is not 100% sure
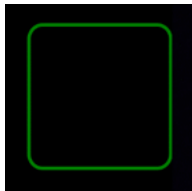
Green color means that the focus has stopped searching because it is sure of the focus found.

1.2.3. Manual Focus

The third button with letter M is the manual focus mode. The focus range is adjusted with the wheel (1). In manual focus mode, it is possible to "stretch" the wheel by double-tapping a certain area on the screen. You can read more about this function in section 2.8. Zooming in on the subject with a double tap.
Long tap the manual focus button activates the infinity focus mode. This mode is activated by changing the button icon to the Latin letter M with the infinity symbol in the upper right corner.
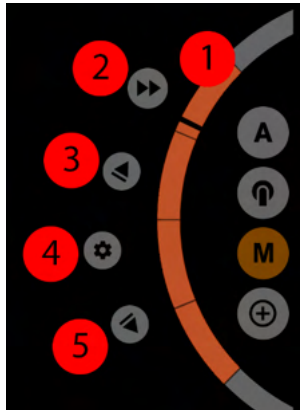
The picture on the left shows the following controls:
1 - Control wheel; 2 - Simultaneous automated focus and zoom start button; 3 - Automated focus-out button; 4 - Focus settings menu button; 5 - Automated focus-in button.

1.2.3.1. Control wheel

Directions of the wheel-regulator (1): up - far, down - close.

1.2.3.2. Simultaneous start button for focus and zoom

The simultaneous start button (2) is used to start the automated focus and automated zoom at the same time. Pressing it again stops the movement. Since the button has no direction, the direction of movement of each regulator is chosen according to the greater remaining distance. If the regulator has more distance to go up, the regulator will go up, otherwise it will go down. That is, you may get a situation where, for example, the focus goes far away and the zoom regulator moves down. Therefore, it is important to keep an eye on where the focus and zoom regulator positions are before simultaneous start.

1.2.3.3. Button for automated focusing to the far side and setting the upper limit of the control wheel

The automated focus up button (3) is used to start the automatic upward movement of the manual focus control wheel. The first tap starts the movement, a second tap stops the movement.
Long tap this button reassign the upper limit of the manual (and automated) focus control. The focus will not go beyond this limit. In this case, the control wheel does not visually change in any way, but the upper limit now has a new value. So, the new stroke of the wheel extends over the entire orange area. Repeated long tap resets the upper limit.

1.2.3.4. Focus settings menu button

The focus settings menu button (4) brings up a menu with currently only two items: speed and gamma curve. In the infinity focus mode, the infinity focus value block is added to them.
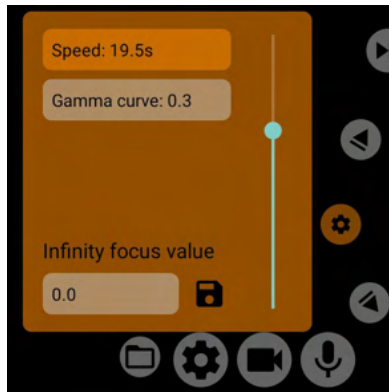
Speed is the time it takes the focus slider to travel from the lower limit to the upper limit (or back) when you tap the auto-focus buttons (3) and (5). The speed does not take into account the present position of the control, always calculated with the entire gap in mind.

The gamma curve allows you to distort the speed of the focus movement slightly. A value of 1.0 performs a linear focus movement, i.e. the focus speed is the same as the speed of the control wheel (1). Values below 1.0 speed up the focus speed at close range and slow down the focus speed at far range. Values like this are a great help when you want to focus more accurately far away because they stretch the top of the adjuster-ring stroke. Values above 1.0, on the other hand, slow down close focusing and speed up far focusing. Adjusting the gamma curve applies to both automated focus and manual focus control.

The infinity focus value block only appears when the manual focus mode is activated in infinity focus mode. See section 1.2.3.6. for more information on the infinity focus mode.

1.2.3.5. Button for automated focusing to the close side and setting the lower limit of the control wheel

The automated focus down button (5) is used to start the automatic downward movement of the manual focus control wheel. The first tap starts the movement, a second tap stops the movement.

Long tap this button reassign the lower limit of the manual (and automated) focus control. The focus will not go beyond this limit. In this case, the wheel control does not visually change in any way, but the lower limit now has a new value. So the new stroke of the wheel extends over the entire orange area. Repeated long tap resets the lower limit.

1.2.3.6. Infinity focus mode

This mode is for those units in which focusing to infinity does not work when the wheel control is moved to the highest position. That is, distant objects in the image are not in focus.

You should pay attention here so that the upper limit of the wheel control is not set.

Activating this mode will cause the official upper limit to be cleared and set to 0.0 or the value previously saved by the user, as the focus value at infinity. This takes the focus to a level that is outside of the official manual focus limits. In this way it is possible to adjust the focus to infinity. Deactivating this mode resets the manual focus to the official limits.

This mode should be perceived only as a "duct tape" for those devices, which manufacturer did not take care to specify correct manual focus limits so that they coincide with the capabilities of automatic focus.

1.2.3.6.1. Instructions for the most convenient mode setting
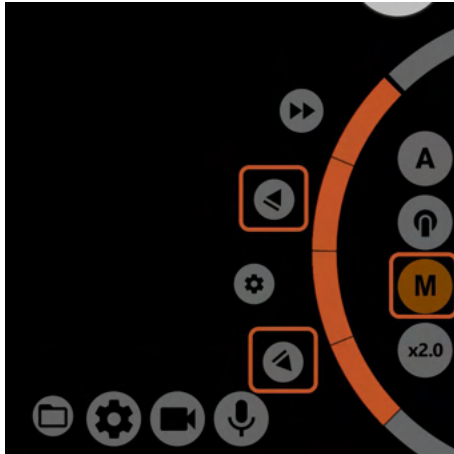
1. Turn on the normal manual focus mode.
2. Make sure that all the focus limits are off. Other words the up and down arrows are not illuminated in orange.
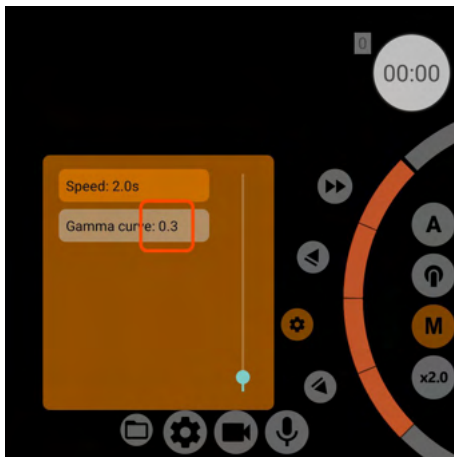
3. Open the focus settings menu and set the gamma curve to 0.3. This will make the slower change in the upper positions than in the lower positions.

4. Move the wheel control as close as possible to the upper limit, but not to the maximum.
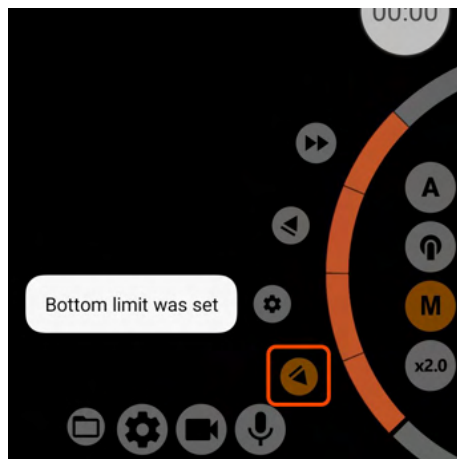
5. Long tap the arrow down to define the selected position as the lower limit, the arrow should light up in orange and a message will appear at the bottom of the screen stating that the lower limit has been set. Now we have the entire controller running from near the upper limit to 0.0. That is, we have the ability to adjust the focus to infinity as accurately as possible.
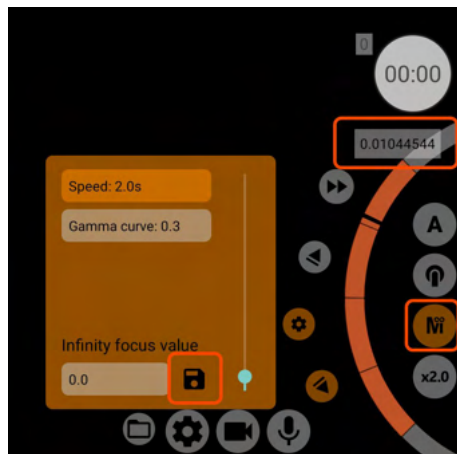
6. We turn on the infinity focus mode and use the adjuster ring to select the position that gives maximum sharpness to the furthest objects.

7. Once we have chosen the position which gives maximum sharpness to the furthest objects, we need to save it. To do this we open the focus adjustment menu and at the very bottom of the window that opens we click on the floppy disk icon. The system will ask if we want to overwrite the old value.
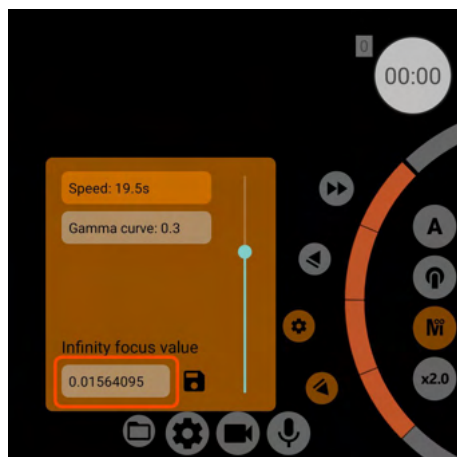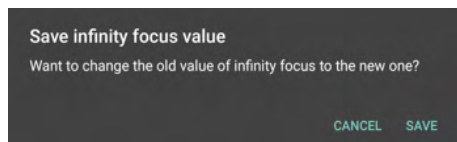
8. After confirming in the infinity focus mode, the upper limit will be the value we just saved.

9. You can remove the lower limit and check how the infinity focus works.

1.2.4. Zoom In/Out via Digital Cropping

The fourth button is the zoom in/out mode. This button can have several icons depending on the selected zoom type. The zoom is adjusted with the ring (1).
The zoom has four modes of maximum zoom.

 Maximum zoom to the width of the video. If the video is 3840 pixels wide, the maximum possible cropping on the sensor is 3840 pixels.

 Maximum zoom to video size is divided by 1.5. If the video is 3840 pixels wide, the maximum possible cropping on the sensor is 2560 pixels.

 Maximum zoom to the video size is divided by two. If the video is 3840 pixels wide, the maximum possible cropping on the sensor is 1920 pixels.

 The maximum possible zoom as much as Camera2 API parameters allow.

You can change the zoom modes in the settings (see "Maximum zoom") or by long tap the zoom selection button. Each long tap changes the modes one by one in a circle.
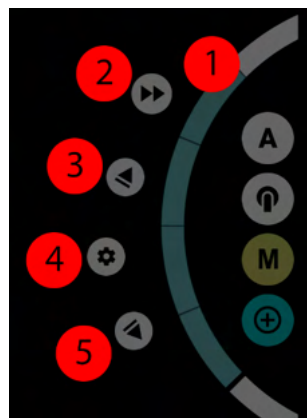
 The picture to the left shows these controls:
1 - Control wheel; 2 - Simultaneous Focus and Zoom Start Button; 3 - Automated Zoom-in Button; 4 - Zoom Settings Menu Button; 5 - Automated Zoom-out Button.

1.2.4.1. Control wheel

The directions of the control wheel (1): up - zoom in, down - zoom out.

1.2.4.2. Button for simultaneous start of automated focus and zoom

The simultaneous start button (2) is used to start the automated focus and automated zoom at the same time. See the manual focus section for more information about this button.

1.2.4.3. Automated zoom-in button

The automated zoom in button (3) is used to start the automatic upward movement of the zoom control wheel. The first top starts the movement and the second tap stops the movement. Long tap this button reassign the upper limit of the manual (and automated) zoom control wheel. The zoom will not go beyond this limit. In this case, the control wheel does not visually change in any way, but the upper limit now has a new value. So, the new stroke of the wheel extends over the entire green area. Repeated long tap resets the upper limit..

1.2.4.4. Zoom settings menu button

The zoom settings menu button (4) brings up a menu with only two items at the moment: speed and gamma.

The speed is the time it takes the zoom controller to travel from the bottom limit to the top limit (or back) when you tap the Automated zoom buttons (3) and (5). The speed does not take about present position of the controller, it is always calculated with the entire gap in mind.

Gamma curve allows a slight distortion of the approaching velocity. A value of 1.0 performs a linear approximation motion, i.e. the rate of change of the frame coincides with the rate of movement of the wheel control (1). Values below 1.0 accelerate the approaching motion at the beginning and slow the approaching motion at the end. Values above 1.0, on the other hand, slow down the approach at the beginning and speed up the approach at the end. Adjustment of the gamma curve concerns both automated zooming and manual zooming control.

1.2.4.5. Automated zoom-out button

The automated zoom out button (5) is used to start the automatic downward movement of the zoom control wheel. The first tap starts the movement, a second tap stops the movement. Long tap this button reassign the lower limit of the manual (and automated) focus control. The focus will not go beyond this limit. In this case, the wheel control does not visually change in any way, but the lower limit now has a new value. So the new stroke of the wheel extends over the entire green area. Repeated long tap resets the lower limit.

1.3. Area of Application Settings, Recording and Access to Recorded Video Files

1 - [Button to call the list of recorded video files](#); 2 - [Button to call the menu of general settings](#); 3 - [Button to call the menu of video and codec settings](#); 4 - [Button to call the menu of microphone and sound settings](#); 5 - [Aperture switch button](#).

Buttons 1-4 on screens with small resolution or in vertical orientation can be hidden under the one button, shown on the left.

1.3.1. File Manager Button

The File Manager button (1) opens the window with the list of the previously recorded video files.
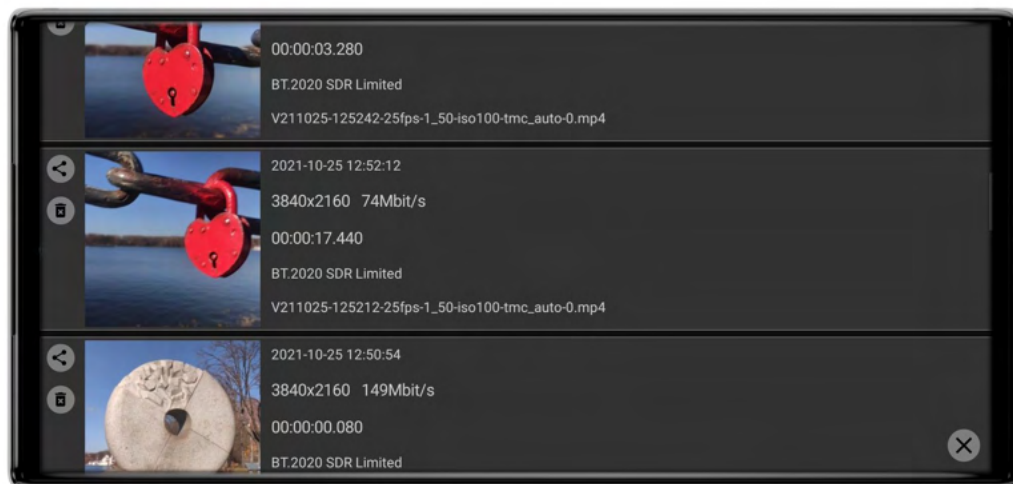
The peculiarity of this list is that the file list is displayed depending on the selected storage device. If the memory card is currently selected, the file list will be displayed from the memory card. If internal memory is selected, respectively, files from internal memory will be displayed. You can close the window by clicking the cross at the bottom right. Also you can find a lot of information about any file in its description.
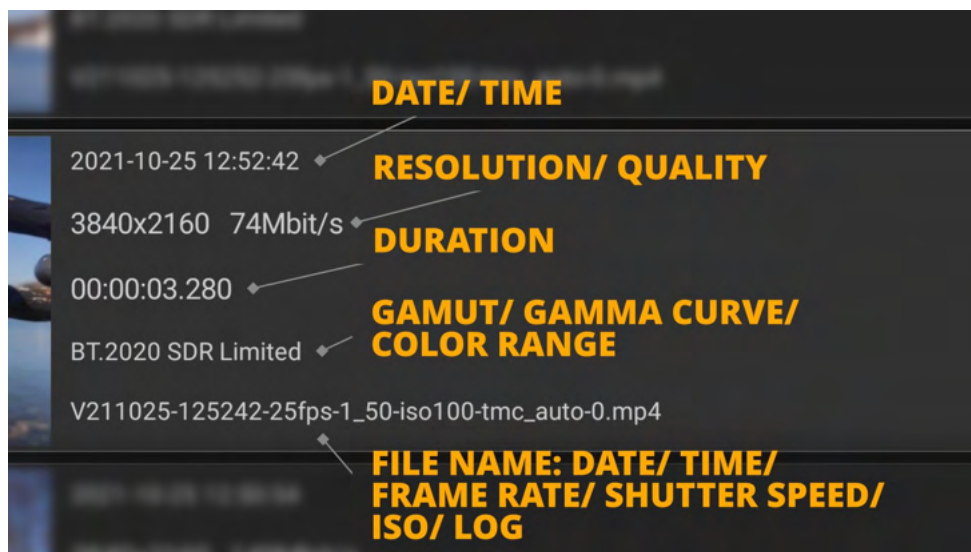
We have already made a detailed video about the File Manager on our YouTube channel. Check it out and do not forget to subscribe to the channel so as not to miss new useful tutorials.

1.3.2. General Settings Menu Button

The general settings menu (2) opens a settings window which contains settings for the viewfinder, controls, interface and other settings not related to the camera, codec, microphone and sound.
Below we will look at each menu item separately.

1.3.2.1. Section "Viewfinder Settings"

This section contains settings about what kind of image and what kind of indicators the user sees on the screen. Below you will find a description of the menu items in this section.

1.3.2.1.1. Use GPU

All display and image manipulation requires the use of the GPU. But at the same time the load on the phone increases. Therefore, this menu item has three values instead of two: No, Yes, Preview mode only.
The value "No" disables the viewfinder signal pass through the GPU. In this mode there is no possibility to use indicators and image modifiers.
"Yes" turns the viewfinder signal through the GPU on. In this mode, the viewfinder works through the GPU in both Preview and Record mode. If "Skip (video) through GPU" is selected in the video settings menu, this value is forced and cannot be changed.
The value "Only in preview mode" disables skipping the viewfinder signal through GPU at the start of recording, before recording the viewfinder works through GPU.
It should be note, that on all mobile devices with Android OS version 11 and above, this menu item is set to "Yes" by default. On Samsung devices it is hidden, and cannot be changed.
When you turn on the viewfinder signal skipping through the GPU, all the previously selected settings, which require the GPU for their work, are automatically enabled.

1.3.2.1.2. On-Screen LUT (if possible)

When you apply a Log Profile to an image, the image becomes gray and dim, making it more difficult to control. At this point you can choose which gamma curve to convert the viewfinder image to for easier control. It is worth noting that the LUT can be forcibly turned off if it is not possible to output the reverse curve for the selected Log-profile.
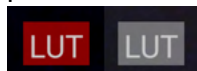
 When the LUT is turned on, provided that it is currently working, a red indicator appears on the screen with the word "LUT". A single tap to this indicator disables the LUT, the indicator turns gray, a second tap enables the LUT, the indicator turns red again. Switching the LUT on and off through the indicator is possible only if the LUT can be superimposed at all at this moment. If overlay is not possible, the "LUT" indicator disappears from the screen. As about the color space, it converts the image to the Rec.709 color space at any gamma curve.
At the moment 4 gamma curves are possible: Rec.709 (scene), Gamma 2.2, Gamma 2.4, sRGB.

1.3.2.1.3. Resolution limit in Preview Mode

Specifies the maximum height resolution of the viewfinder (at horizontal position) when recording is not on. Available values: Screen Size (takes the horizontal screen height), 720p, 1080p, 1440p, 2160p, Video Size (takes the height selected in the video settings), Maximum (takes the maximum available height on the sensor in pixels). You should not abuse this setting because the higher the resolution, the harder it is for the device to process the signal, especially when the signal goes through the GPU. The most popular value is 1080p, which is the width (in the vertical position) that most mobile device screens have. You can leave the default "Screen Size" setting on such a device.

1.3.2.1.4. Resolution limit when Recording

Specifies the maximum height resolution of the viewfinder (in the horizontal position) when recording. Available values: Screen Size (takes the height of the screen horizontally), 720p, 1080p, 1440p, 2160p, Video Size (takes the height selected in the video settings), Maximum (takes the maximum available height on the sensor in pixels). This setting is even more insidious than the previous one, because during recording the device processes two images at the same time: the one that goes into the codec and other that is displayed on the screen. The most popular value is 1080p, which is the width (in the vertical position) most of the screens of mobile devices have. You can leave the default setting of "Screen Size" on such a device.

1.3.2.1.5. Histogram (before preview LUT)

This item allows you to turn on the histogram display on the screen to control exposure. It has three options: OFF, ON, and Preview only. The last option enables the histogram only for preview state, the histogram is turned off and disappears from the screen when you start recording. The histogram works until the on-screen LUT is superimposed, i.e. its superposition has no effect on the histogram, it continues to control the image that goes into the file.
To use the setting, the GPU for the viewfinder must be turned on.

1.3.2.1.6. Histogram type
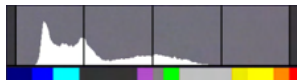
There are two types of histogram: luminance and RGB.
The luminance histogram uses a mechanism to calculate the brightness of each pixel and adds the values to a graph.
The RGB histogram calculates the luminance for each RGB channel separately and displays a different histogram for each individual channel. The histogram overlap locations are added together. Red with green gives yellow, blue with red gives pink, blue with green gives turquoise, and all together gives white.
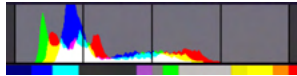
1.3.2.1.7. EV of scene (before preview LUT)

The setting is currently disabled, under development.

1.3.2.1.8. Temperature of scene (before preview LUT)

The setting includes a scene temperature indicator in Kelvin. The image transmitted to the viewfinder is used to estimate the scene temperature. The temperature estimate has nothing to do with the selected temperature compensation settings, nor does it display the selected settings in any way, but the white balance settings in the sensor settings affect the scene being captured, which means the indicator will respond to their change. This indicator acts as a thermometer and only that is, it shows the temperature of what it sees at the moment on the screen. A kind of frame temperature histogram. The indicator changes color depending on the displayed temperature.

6100K This indicator can be used to set the image to match as closely as possible on two different devices. Also, this indicator can be used to determine what temperature the automatic white balance setting for a particular scene tends to reach. You can use this indicator to select the desired temperature for yourself and choose such white balance settings to get the scene at the desired temperature.
The setting has three values: OFF, ON, Preview mode only. The last setting disables scene temperature measurement during recording to reduce the load, i.e. scene temperature measurement requires GPU resources.
Scene temperature measurement works before the on-screen LUT is overlaid, i.e. its overlay has no effect on the measurement, the indicator continues to show the temperature of the image that goes into the file.
To use the setting, the GPU for the viewfinder must be turned on.

1.3.2.1.9 Focus peaking

This setting turns on an assistant for more precise focusing. Focus peaking is based on a method of searching for contrasting object boundaries, so be aware that it may not work accurately or at all in dark, low-contrast scenes. On the screen, focus peaking looks like a colored (often yellow in the darker parts of the frame and blue in the lighter) outline of the edges of objects. At the point of focus, you can usually see more small circles. By moving the focus control back and forth, you can see how the focus area moves.
You cannot change the color of the focus peaking. In normal mode, the backlight is yellow/blue, while in false color mode it has a complementary color to the color of false color.

Focus peaking has three values: OFF, ON, Only in preview mode.
The last setting disables focus peaking during recording to reduce the load, i.e. focus peaking requires GPU resources.
To use the setting, the GPU for the viewfinder must be turned on.

1.3.2.1.10 Focus peaking mode

A setting that specifies when to display focus peaking if it is turned on. The setting has two values: by touching the focus control wheel and Continuous. If you select the first setting, focus peaking is only displayed while the operator's finger is on the manual focus control wheel. When the second setting (Continuous) is selected, the focus peaking is displayed all the time.

1.3.2.1.11. Focus peaking strength

The higher the number, the fatter the contrasting borders of objects are illuminated. The darker the scene, the higher the recommended value. The default value is 2.0.
When the focus peaking is increased, the image itself may become yellowish, highlighting details that are not very noticeable.
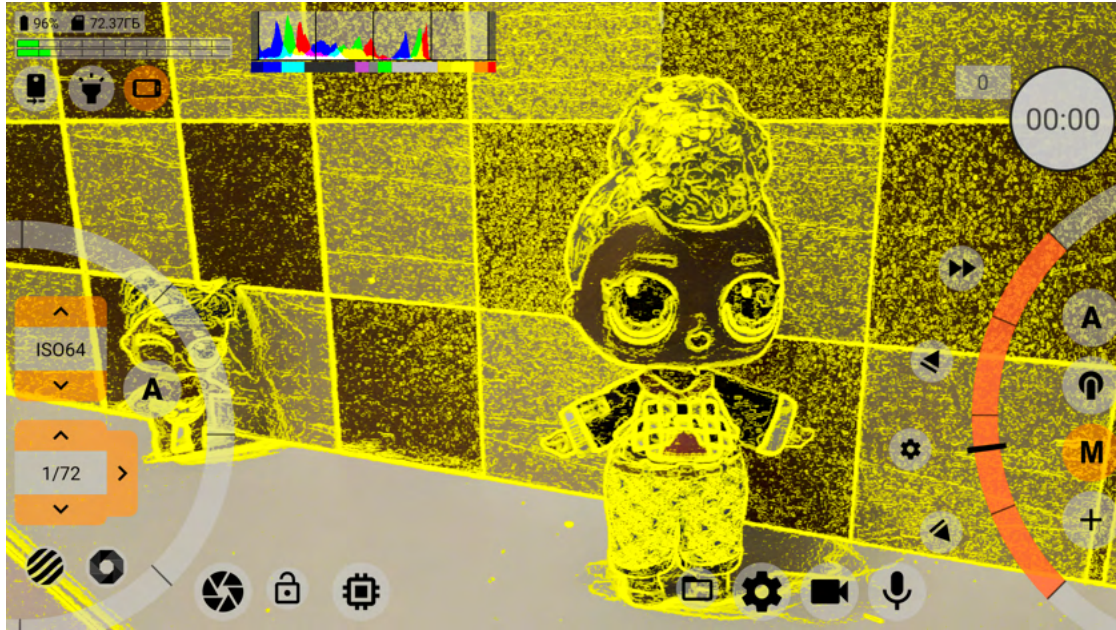
1.3.2.1.12. Expo-peaking (before preview LUT)

The setting superimposes visual exposure control directly on the image. Named by the general public to bring two types of control under its umbrella (at the moment): zebra and false color. The setting has three values: OFF, ON, Only in preview mode.
The last setting disables expo-peaking during recording to reduce the load, i.e. expo-peaking consumes GPU resources.
Expo-peaking works before the on-screen LUT is overlaid, i.e. its overlay has no effect on the indication. Expo-peaking continues to show an indication of what will be in the file.

The main peculiarity of expo-peaking mcpro24fps is that it tries to work within the sensor limits and reacts to artificial black point or white point decrease by means of a Log Profile (gamma curve). What does this mean? It means that when the gamma curve of the Log-profile lowers the white point from 100% IRE to, for example, 70% IRE, exposure-peaking begins to show overexpose at 70%, not leaving it at 100%. That is, the range between 0% black and 100% white narrows to a range of 0-70%. This is correct, because all gamma curve manipulations occur at the RAW signal level, the ready signal from the sensor with all underexposed and overexposed. With this in mind, it is impossible to "pull out" with the gamma curve help what is beyond the sensor's capabilities. If the highlights on the sensor is knocked out, no amount of lowering the white point will bring back the knocked out highlights. And that means that the expo-peaking has to follow the white point manipulation, so that the operator sees the real picture of the overexposure. The same goes for the black point. We strive to determine the limits of expo-peaking in automatic exposure mode as well.In automatic exposure mode, it is more difficult to determine the

artificial change in black and white points, so failures can occur. For example, Samsung devices in 10-bit mode as the automatic gamma curve uses the PQ curve (and not the real one), which has a white point lowered to about 70% of 100%. Expo-peaking tries to take this into account. In the case of Xiaomi devices, the automatic gamma curve most often remains Rec.709. And this is what expo-peaking tries to take into account.

To use the setting, the GPU for the viewfinder must be turned on.

1.3.2.1.13. Expo-peaking type

This setting allows you to select in which view the operator wants to control the exposure. There are currently two types: zebra and false color.

1.3.2.1.13.1 Zebra

A zebra pattern is a red, right-sloping stripe in an over-exposed area.

and light blue stripes sloped to the left, slightly different thickness in the areas of underexposure.
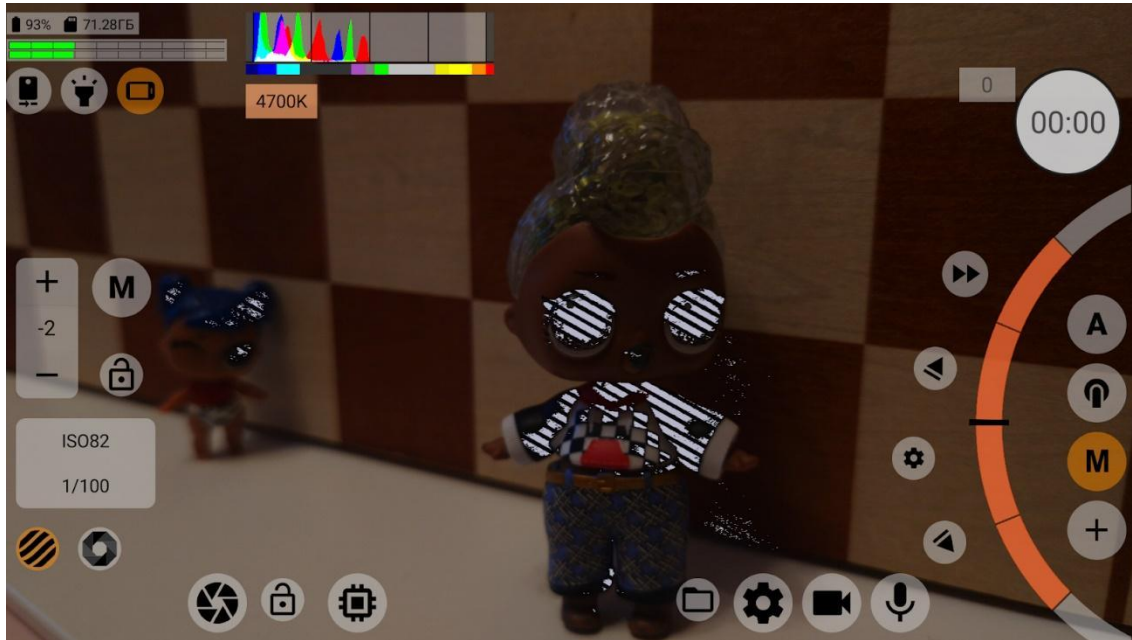
The zebra helps the operator to choose the balance between the darkest and brightest areas, and to choose what to sacrifice and what to be sure to keep.

1.3.2.1.13.2. False Color

False Color is the process of selecting areas of a certain brightness with a specified color.
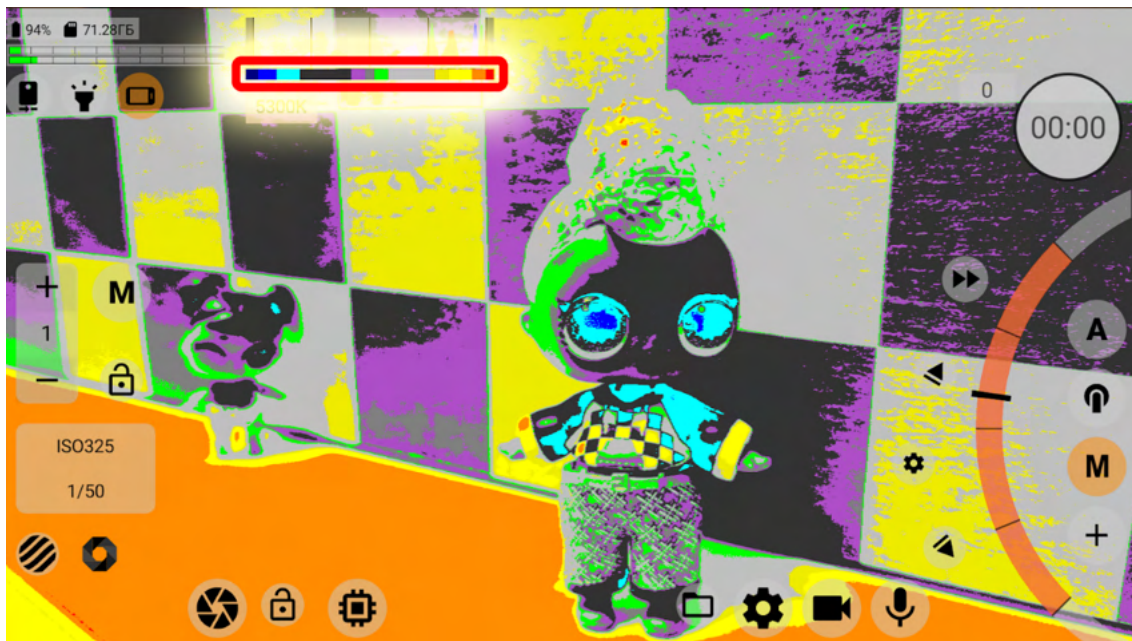
How colors are distributed brightness-wise, you can see on the diagram below the histogram. The histogram must be on for this to work.

The special buttons in the Exposure Control and Adjustment Area (see 1.5. Exposure Adjustment and Control Area) can overwrite the expo-peaking type, but only for the duration of

this session. After exiting the application and returning back, the expo-peaking type will be reset to the one specified in the settings.

1.3.2.1.14. Bottom and top limits

In this menu item you can specify the levels at which the zebra will be triggered. The higher the value of the lower limit, the faster the zebra for underexposed areas will trigger. The lower the value for the upper limit, the faster the zebra will be triggered for overexposed areas. We recommend setting these values with a small margin.

1.3.2.1.15. Expo-peaking mode

A setting that specifies when to display expo-peaking if it is on. The setting has two values: by touching the ISO control wheel and Continuous. If you select the first setting, expo-peaking is only displayed as long as the operator's finger is on the ISO control wheel. If you select the second setting (Continuous), the expo-peaking is displayed all the time.
The special buttons in the Exposure Control and Adjustment Area (see 1.5. Exposure Adjustment and Control Area) can overwrite the expo-peaking mode, but only for the duration of this session. After exiting the application and returning back, the expo-peaking mode will be reset to the one specified in the settings.

1.3.2.1.16. Safe area

This setting allows you to specify the proportions of the safe area beyond which you do not want the subject to be taken. The second setting after OFF, "By Viewfinder Size", is not useful and was introduced at the request of users for purely decorative purposes. Some people find it helpful to see the edges of the frame in bright sunlight.
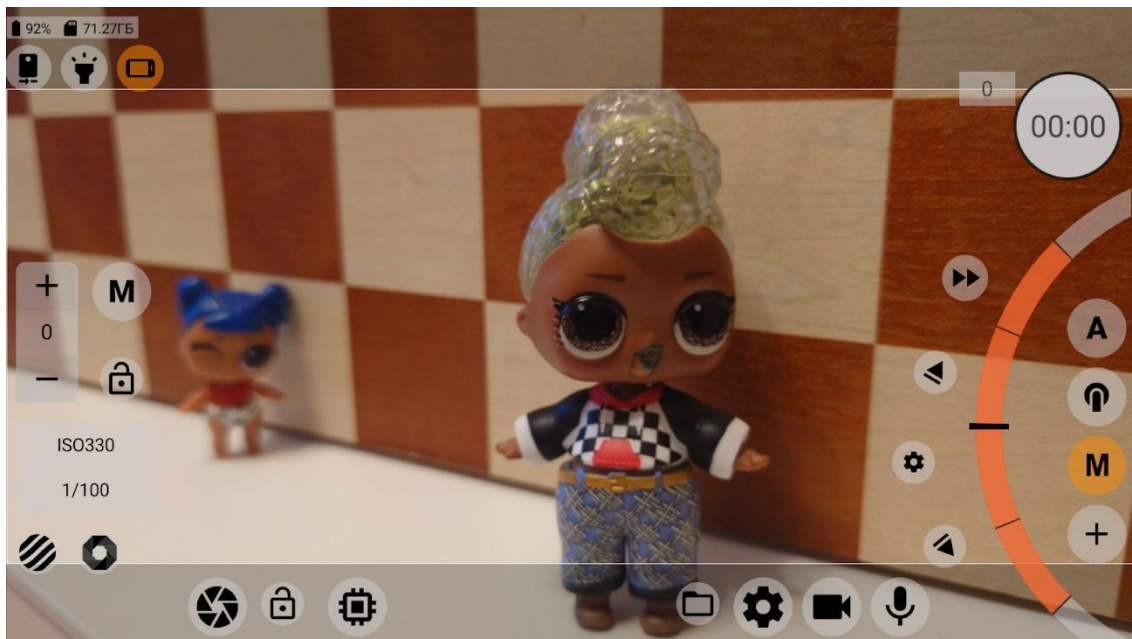
When this setting is turned on, the proportions of the safe area fit into the proportions of the video (the viewfinder has video proportions by default). The area outside the safe area is dimmed slightly.

1.3.2.1.17. Grid

Allows you to select a guide pattern to make it easier to build a frame. The grid will always fit within the viewfinder when safe area or desqueezing is disabled.
If desqueezing is on (see description of next menu item), the grid will fit in the desqueezed (compressed) area of the image.
If safe area is enabled (see description of the previous menu item), the grid fits into the dimensions of the safe area.

Selecting the safe area prevails over desqueezing in terms of the grid display. If both desqueezing and safe area are enabled at the same time, the grid will fit into the safe area.

1.3.2.1.18. Desqueeze viewfinder
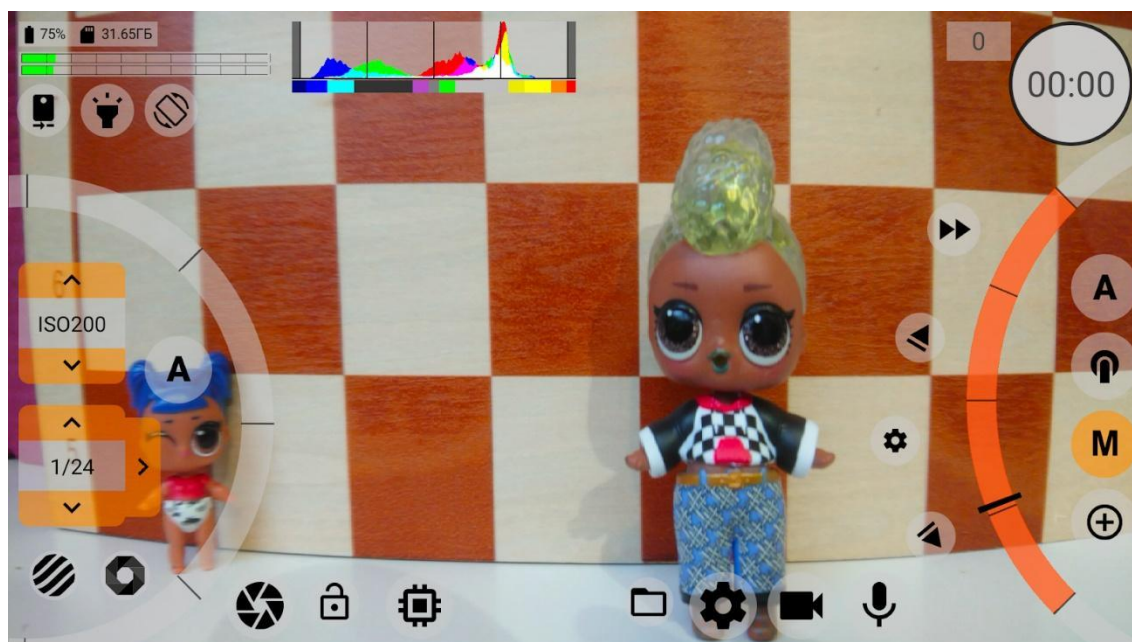
When using phone anamorphic lens, this setting returns the lens distorted image to an image with the correct proportions. This setting affects the viewfinder only and does not affect the recorded image. If desqueezing is turned on in the video settings (1.3.3.4.2. Desqueeze Video), this setting is disabled and the value specified in the video settings is forced.
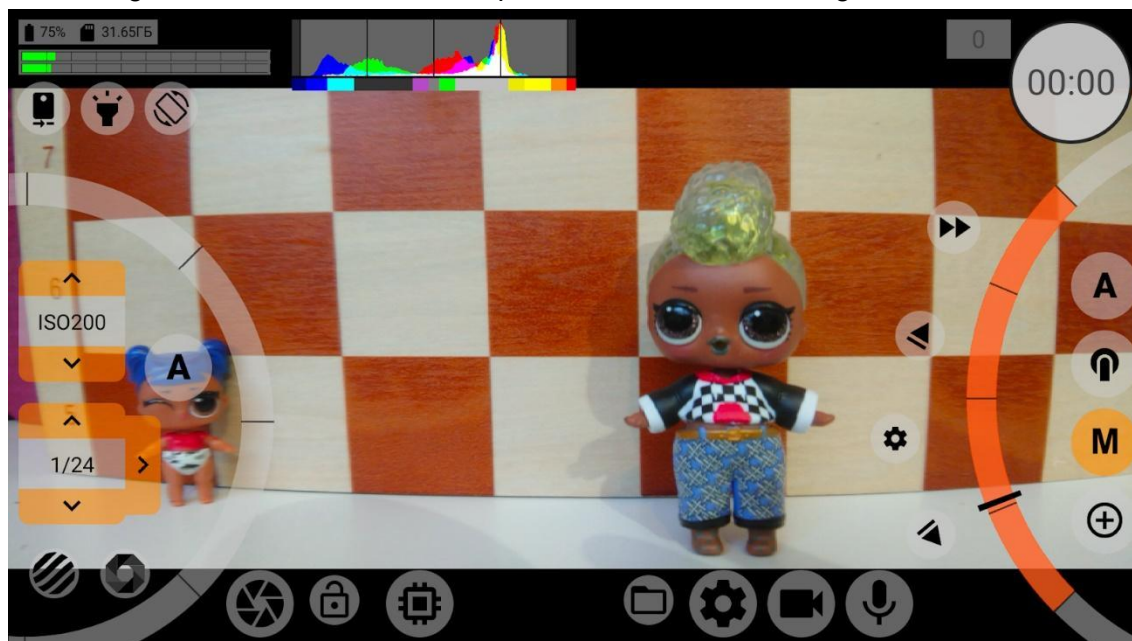
This setting has several values: None, 1.25x, 1.33x, 1.43x, 1.55x. The first one, of course, disables desqueezing. The second and fourth values fit some Chinese-made lenses. We have tried to adjust for everything that is currently on the market.
Most often this setting is used when the desqueezing process is performed in post-processing. To use the setting, the GPU for the viewfinder must be turned on.

1.3.2.1.19. Audio level indicator

Enables the display of the audio level meter on the screen. The setting has three values: OFF, ON, Preview mode only. The audio level meter does not require the GPU to be turned on for the viewfinder, but because it is constantly visually changing and because the GPU is involved in displaying it, the user has the option of turning it off for the duration of the recording to take the load off.

1.3.2.1.20. Audio level indicator type

This setting allows selecting the location and type of the audio level meter. The setting has two values:
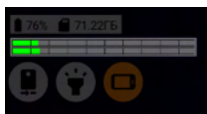
 Horizontal at the top;
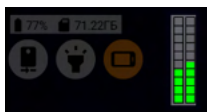
 Vertical.

1.3.2.2. Section "Control"

This section contains the settings of the controls. Below you will find a description of the menu items of this section.

1.3.2.2.1. Stop recording by

This setting allows you to select the method of stopping the recording. It may be useful when you want to additionally protect the recording from being accidentally stopped. The setting has three values: Single tap (record button), Double tap (record button), Long tap on record button. We hope that each of these is sufficiently clear without further explanation.

1.3.2.2.2. Automatic locking of auto WB

This setting allows you to lock the automatic white balance when you start recording. The setting has three values:
"No" means never lock;
Only during recording. When you stop recording, the lock is released and the white balance works automatically again;
Once and forever. The first time you start recording, the white balance will lock and even after you stop recording, the lock will remain.
Keep in mind that the white balance lock is released when you exit the application (even when the application simply loses system focus when you move from application to application).

1.3.2.2.3. Automatic locking of auto exposure

Works in the same way as auto white balance locking. It has exactly the same values and the same reset conditions.

1.3.2.2.4. Maximal zoom

This setting duplicates the functions of the zoom in/out button (see "[1.2.4. Zoom in/out via digital cropping](#)"). This setting has three values:
Maximum. It allows you to zoom in as much as Camera2 API parameters allow.
Up to video size (x1.0). Allows you to zoom in to the video width, when the width of the cropping on the sensor is equal to the width of the video selected in the video and codec settings.
x1.5 of the video size. Allows you to zoom in as in the previous point, only the width of the cropping is limited by the width of the video divide by 1.5. If the width of the video is 3840 pixels, the minimum width of the crop is 2560 pixels.
x2.0 of the video size. Allows you to zoom in as in the previous point, only the width of the crop is limited to half the width of the video. If the width of video is 3840 pixels, then the minimum width of the crop is 1920 pixels.

1.3.2.2.5. Infinity focus mode

Duplicates the functionality of the [manual focus selection button](#). On some devices the manual focus stroke is different from the auto focus stroke. And we often hear that it is impossible to focus to infinity in manual focus mode. This item solves this problem if it is possible to solve this problem on the selected device. Selecting "ON" switches the manual focus mode to the

extended focus range when the upper focus limit is removed. The extended range allows you to turn the manual [focus to infinity](#) and keep its value as the upper focus limit. When "OFF" is selected, the manual focus works as the manual focus limit values according to the information in the Camera2 API suggest.

1.3.2.2.6. Volume buttons

This setting allows you to enable response to volume button presses. The setting has five values:
OFF;
Start/Stop recording. Applies the recording button functionality to the volume buttons;
Start/Stop programmable focus and zoom. Applies focus and zoom simultaneous start button functionality to the volume buttons (see [1.2.3.2. Simultaneous start button for focus and zoom](#));
Start/Stop Programmable Focus. Pressing the volume buttons starts the automatic focus in the direction of the greater remaining distance of control wheel. Pressing the volume buttons again stops the auto focus;
Start/Stop programmable zoom. Pressing the volume buttons starts the auto zoom in the direction of the greater remaining distance of control wheel. Pressing the volume buttons again stops the auto zoom.
This setting also works for Bluetooth buttons. The Bluetooth buttons mimic the volume buttons. The Bluetooth buttons do not mimic the camera button. Therefore, if you want to start recording with a Bluetooth button, you must select "Start/Stop recording" in this setting.

1.3.2.2.7. Camera button

This setting does the same as the item above, with one difference that all reactions are linked to the camera button. Very few devices, in particular Sony smartphones, have separate camera buttons.
Warning! This setting does not work for Bluetooth buttons. The Bluetooth buttons mimic the volume buttons. There are no Bluetooth buttons that mimic the camera button.

1.3.2.3. Section "Interface"

This section contains settings for the interface and how it reacts to changes in other application settings.

1.3.2.3.1. Margin left (top)

Changing the value to plus moves the left side of the interface toward the center. The feature is useful for two things:
When a clothespin with a hinged lens covers the interface;
When the left side control is too close to the edge and you have to twist your left thumb hard. This problem affects phones with very thin screenframe.

1.3.2.3.2. Margin right (bottom)

Changing the value to plus moves the right side of the interface toward the center. The feature is useful for two things:
When a clothespin with a hinged lens covers the interface;
When the right side control is too close to the edge and you have to twist your right thumb hard. This problem affects phones with very thin screenframe.

1.3.2.3.3. Position of top block

This is a block, which includes various kinds of indicators, including a bar graph and quick access buttons for some functions. The block can be located on the left and in the center. It can be convenient to move this block to the center because the lens clip covers it. When you move this block to the center, in the horizontal orientation of the interface, the block with the text information moves down. In the vertical orientation of the interface, the text block is always to the left below the block discussed in this paragraph.

1.3.2.3.4. Interface settings for hiding blocks

Next are the settings concerning the way different blocks in the interface are displayed. Each separate item is responsible for a particular block. And each item has the same possible values:
Always display. This means that this block will always be displayed.
Switch by touch/swipe. This value will cause this block to hide (disappear) when you touch an empty part of the interface. To display the block again, you must touch the screen again.
Switch by touch (swipe) when recording. The block will be hidden only during recording. The block will remain visible in preview mode.
Use these settings when the clutter of controls on the screen disturbs you too much.
Below you can see the numbered blocks indicated in the menu.
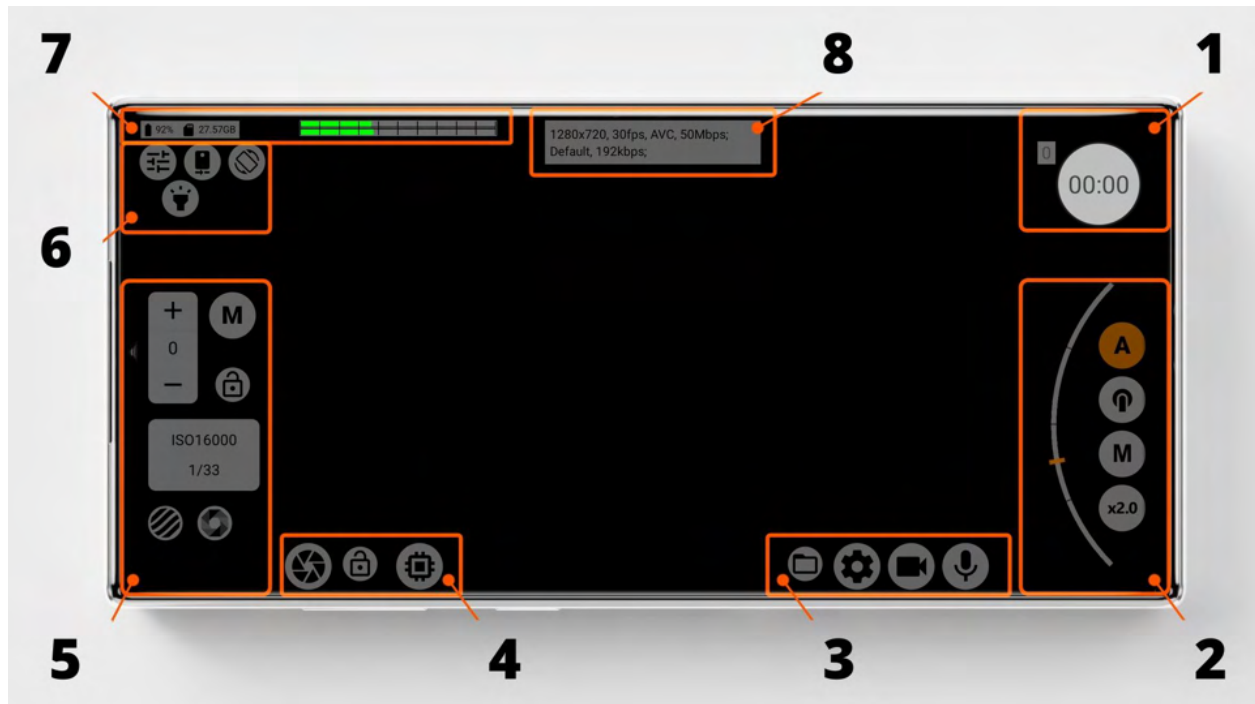
Top buttons - 6; Picture buttons - 4; Settings buttons - 3; Focus/Zoom control - 2; Exposure control - 5; Record button - 1; Indicators - 7+8.

By controlling these settings you have the ability to hide absolutely all the controls. This option may be suitable for those who are trying to record video via an external recorder.

1.3.2.3.5. Show information

Here you can select the information that you want to display in box 8 in the figure above.
At the moment, you can select the following items (from left to right from top to bottom):
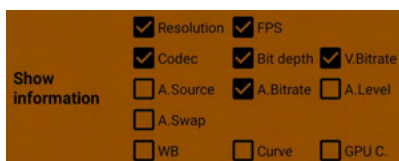
- Resolution (the size of the video selected in the video settings; desqueezing or cropping the frame affects the size displayed);
- Frames per second (if slow motion is selected, this will also be displayed in the information);
- Codec (AVC/HEVC);
- Video Bit Depth;
- Video Bitrate;
- Audio Source;
- Audio Bitrate;
- Audio level, if it was changed;
- Stereo audio channel swapping;
- White Balance (includes the name of the preset or selected temperature);
- Gamma curve selected in the sensor settings;

- Gamma curve selected in the GPU settings.

1.3.2.4. Section "Other settings"

Here you can see the settings that you did not manage to place in other sections.

1.3.2.4.1. Screen orientation

This setting helps to lock the camera interface in position. The setting has four values:
System. Totally depends on the system settings.
Horizontal. Locks the interface in the horizontal position, the camera unit is usually on the upper left in relation to the screen.
Vertical. Locks the interface in a vertical position, the camera unit is usually on the top right in relation to the screen.
Horizontal reverse. Locks the interface horizontally upside down, the camera unit is usually on the bottom right in relation to the screen.

1.3.2.4.2. Screen brightness

This setting allows you to adjust the brightness of the screen. The setting has three values:
System. When the brightness depends on the system settings.
Always maximum. The brightness of the screen is always maximum. This setting is recommended for proper exposure and control during recording.
Preview - maximum; Recording - system. When you start recording the brightness is switched to the system brightness. When you stop recording in Preview mode, the maximum brightness operates.

1.3.2.4.3. Storage

Allows you to choose where to record video files: to the internal memory of the phone or to the memory card.
On Android version 9 files to the memory card are written to the "sandbox", which is located at the path SD://Android/data/lv.mcprotector.mcpro24fps/Files/Videos. In the internal memory files are written in DCIM/mcpro24fps.
Starting with Android 10, video files are written to DCIM/mcpro24fps, and some WAV audio files are written to Music/mcpro24fps. This applies to both the internal memory of the phone and the memory card.
Warning! The memory card must match the speed required for the selected video quality, multiplied by two. Also, the device must have sufficient bandwidth for transferring information between the RAM and the storage device.

1.3.2.4.4. Divide into parts (about)

This setting allows dividing the recorded material into files of a certain size. Many devices prior to Android 11 have a limit of 4GB video file size. This limitation applies only to recordable video files. Therefore, to prevent errors and broken files, you should not select "No limit" on such

devices. In addition to the value indicated above, available options include: 512MB, 1GB, 2GB, 3.7GB (this value is convenient for devices with a video file recording limit of 4GB).

1.3.2.4.5. Recording with overlapping

This setting only works if you selected the limitation in the previous menu item.
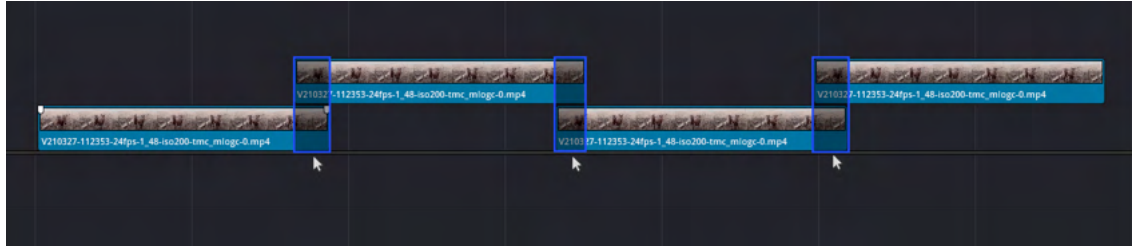
Setting it to "Yes" allows you to duplicate a portion of frames from one piece of video into another. These two files will contain the same set of frames, one at the end and one at the beginning. There is an overlap, so you don't lose any frames in the transition from one file to the other.

The "No" value assumes recording files one after the other without a common set of frames. Each successive file does not contain the same part as the previous one. The files are written one after the other. Under favorable conditions, when there was no frame drops, when there was no mismatch of video and audio, such files can be stacked one by one in post-processing. And there should be no gaps between them. This frees you from searching for a common part and fitting, as happens with files that are recorded with overlap.

It is worth considering the fact that sound also has its own frame rate. And at the end of each file there may be a place where there is no sound, because the sound fits into the timing of the video. This happens when the duration of the next sound frame, if inserted, goes beyond the video. If you do this, the last frame of the video will be doubled, and this frame will be recorded in MediaInfo statistics as dropped out. That is why we decided that it is better to omit audio than to spoil video.

1.3.2.4.6. Firebase statistics

Application usage statistics, including statistics on errors and crashes of the application. Two values are available:
Deactivate when recording. When recording starts, the statistics is deactivated so as not to take up the application's resources from the device.
OFF. Disables the statistics completely. Recommended for fans of tin foil hats.

1.3.2.4.7. Clear all settings

Pressing the trash can icon button resets all previously selected settings to their default values.

1.3.2.4.8. Technical information at the bottom of the menu

Rarely needed. But to solve some problems with a particular device we can ask for it.

1.3.3. Video Recording Settings Menu Button

The video and codec settings menu button (3) opens a settings window which contains video size, quality and codec settings.
Below we will consider each menu item separately.

1.3.3.1. Resolution and FPS
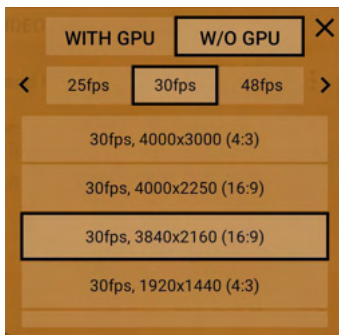
Taping an area with resolution and frame rate values opens a separate menu which is divided into two items: With GPU and Without GPU. Each item stores its own frame rates and video sizes.

There are three types of capture sessions based on frame rates in Android:
- Standard includes all frame rates up to and including 30 fps.
- High frame rate session is capturing at speeds above 30 fps up to and including 60 fps.
- High speed recording session is shooting above 60 fps, more often 120, 240, 480 and 960. These frequencies are always marked in red because their performance often depends on combinations of parameters that cannot be predicted. Performance can be affected by exposure mode (auto or manual).
Each type has its own structure and differs from the others by the mechanism of work. Camera2 API often contains information about the standard type and high-speed recording. And almost never about the possibility of recording with high frame rate. That is, information about such frequencies as 48, 50 and 60 fps is almost never available.
We add these frequencies separately, after test users have checked and verified that they work. If such frequencies are not available on your device, it means that your smartphone has not been tested or your device cannot activate recording at higher frame rates.
Also, problems can occur with high-speed recording. Each manufacturer pays as much attention to Camera2 API support as it sees fit, and often in the amount required for the native application to work. Support for third-party applications is most often not in the manufacturers' interests.
This is not a complaint about life, it is a bitter truth that we feel it is right to mention.

Frame rates may be marked in red. This means that the manufacturer has not declared support for that frequency, but it is present in the application and you can try to use it. We do not guarantee that red frequencies will work correctly.
If it turns out that the frequency, even if it is red, works well, it will still remain red, and its color in this case will not change until the manufacturer itself has not declared support for it.
Smartphones from Huawei (Honor) should be mentioned separately. Almost all devices (except last) of this company, even with the specified support, have problems with frequencies 24 and 25 fps. Therefore, on these devices we recommend to use a frequency of 30 fps.

The same problem is found on OnePlus smartphones of recent generations. The difference is that the manufacturer does not specify support for these frequencies, and they definitely do not work.

When you select any frame rate, a list of available sizes for that frame rate appears at the bottom. The size may also be marked in red. More often than not, this is because the frame rate itself is marked red, or because the given size has some kind of limitation, such as only working in autoexposure mode.

We once again draw your attention to the fact that the frequencies and sizes in "With GPU" and "Without GPU" can be very different, so there is no possibility in the application to easily and simply switch to GPU support or turn it off.

To select a size, you have to select all three options. First "With GPU" or "Without GPU", then the desired frame rate and then the desired size. Only after selecting the size will the application apply the selected settings, the rate and size menu will close automatically, returning you to the video and codec settings menu.

All available sizes are taken from the Camera2 API. It is possible to add sizes to the "With GPU" tab forcibly. In the "Without GPU" tab dimensions cannot be added, codec works only with dimensions defined in Camera2 API. The only exception is one manufacturer - OnePlus, on some devices there is an option to specify an arbitrary video size.

It is also worth mentioning that many users perceive frame rates separately from bitrate. But we draw attention to the fact that the quality of a single frame depends on the selected frame rate. UHD picture quality at a bitrate of 160 Mbps and 24 frames per second will be many times higher than at a frame rate of 60 fps. Because in the first case we fit 24 frames into 160 megabits (20 megabytes), and in the second case 60. No matter how you spin it, 20/24(0.83 MB per frame) is more than 20/60(0.33 MB frame).

1.3.3.1.1. With GPU

This item contains sizes and frame rates, which are specified in Camera2 API parameters as supported, as well as those frequencies and sizes, which were forcedly added. Due to the fact that we have no information on the actual performance of the GPU on each individual device, it is not possible to cross out the sizes and speeds that are not supported by the GPU. Therefore, we have to keep in mind that each device has its own performance limit. And this leads to the fact that some sizes may not work.
There are situations when the size and frame rate only work through the GPU, even though the size is listed as supported. This situation is found on Google Pixel 4 devices, 60 fps work only with GPU support.
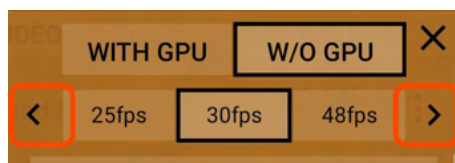
At any given time, you can see three frame rates on the menu. If there are more than three speeds available on the device, arrows appear on the sides of the speed bar, which

you can use to switch the speed list to the next (previous) three speeds.

Warning. Choosing to process information through the GPU changes the other settings available. For example, when you enable GPU, you lose the ability to record video in 10 bit mode. And vice versa, you have the opportunity to crop the frame, desqueeze video and apply some filters.

Also, when you enable GPU processing, the color and contrast of the recorded material may change. This is due to the fact that the GPU does not give information to the codec that it receives if the signal comes directly from the sensor.

When recording with signal processing through the GPU, the load on the device increases, which, in turn, may affect the stability of the recording.

1.3.3.1.2. Without GPU

This item contains the sizes and frame rates, which are specified in the Camera2 API parameters as supported, as well as those frequencies and sizes, which were forcedly added. As much as we don't want everything to work as specified by the manufacturer, there are situations when the sizes specified in the Camera2 API parameters do not work. In modern devices this problem is less and less common, but we must keep in mind that it is possible. There are three frame rates visible in the menu at any given time. If there are more than three speeds available on your device, arrows appear on the sides of the speed line, using which you can switch the speed list to the next (previous) three speeds.

Important: If your device supports 10 bit recording, only when recording without GPU will this bit rate be available.

When shooting without signal processing through the GPU, the load on the device is reduced and the recording should be more stable.

1.3.3.2. Section "Codec Settings"

In this section we tried to collect those settings that somehow can affect the operation of the codec.

1.3.3.2.1. Codec

There is not much of a choice here: AVC (h264) or HEVC (h265).Only in h265 it is possible to record 10-bit material. Therefore, the color depth item is blocked when h264 is selected.

1.3.3.2.2. h264 profile

This option allows you to select the highest possible profile for the h264 codec or leave it up to your system (the device system, not the application). For h265 there is no such option, it always encodes in the highest available profile.

1.3.3.2.3. Bitrate (quality)

This option allows you to select a target bitrate (desired, approximate but not guaranteed). Bitrate marked in red means that the manufacturer has specified a maximum bitrate limit below this one.

On devices with a processor up to Snapdragon 855, you can select a "red" bitrate and it will work if the system expects such a bitrate to work, and will generate an error if the system prohibits such a bitrate. The maximum available bitrate can only be determined by a fitting. Starting with Snapdragon 855, the bitrate is limited to 160 Mb/s, and regardless of the selected bitrate in the application, the system will set the maximum 160 Mb/s.

Samsung devices on Exynos processors, starting with the S10 work with very high bitrates, even 500 MB/s (maximum in the application) for them is not the limit. But the stability of the recording at such a bitrate is another matter.

Devices with processors from other companies (Kirin, MediaTek), unfortunately, have the opposite problem - the specified available bitrates may not work. It is worth noting here that on some Huawei devices it is possible to get a very high bitrate if keyframes (1.3.3.2.7. I-frames) are set as often as possible.

It is important to keep in mind that the bitrate of the recorded file strongly depends on the scene being shot. The system decides what bitrate to keep, and there is no way to influence it. Keep in mind when setting the bitrate that it affects the size of the recorded file. Higher bitrate means larger file size per second.

Keep in mind when setting the bitrate that this bitrate will give much lower quality results than the same bitrate selected in the nonlinear editing program. Keep in mind that in this case the codec works live without being able to think and calculate for a long time, so the bitrate selected for recording should be several times higher than the bitrate used to encode movies, for example.

It is also worth mentioning that many users perceive bitrate separately from frame rate. But we draw attention to the fact that the quality of a single frame depends on the selected frame rate as well. UHD picture quality at the bitrate of 160 Mbps and 24 frames per second will be many times higher than at the frame rate of 60 fps. Because in the first case we fit 24 frames into 160 megabits (20 megabytes), and in the second case 60. No matter how you spin it, 20/24(0.83 MB) is bigger than 20/60(0.33 MB).

1.3.3.2.4. Bitrate mode

Android offers three bitrate modes: variable, constant, constant quality. The last mode is not available in normal resolution on mobile android devices, so this setting is not in the app. Variable bitrate means that the system tries to allocate a different bitrate for each frame depending on the incoming data.
Constant bitrate means that the system tries to keep the bitrate so that each frame gets roughly the same amount of bitrate. Note the word "tries" here. You will always see a variable bitrate in the recorded file in MediaInfo. Some devices are not friendly with constant bitrate (Huawei), and some, on the contrary, are more stable, with fewer dropped frames (Sony).

1.3.3.2.5. Color depth

This item allows you to select the bit depth (color depth). If your device supports 10 bit recording (2.3. 10 bit), this item will appear in the menu (i.e., if you see this item, your device is writing 10 bit).
This menu item may be locked. This means that the selected settings do not allow your device to record at 10 bit color depth.
Prerequisites to activate this item: the HEVC codec (h265), the GPU is disabled (1.3.3.1.2. Without GPU) in the video settings menu, a certain resolution (on Sony smartphones, for example, not more than 3840*2160), a certain frame rate (on Sony Mark I smartphones not more than 30 fps). When the above conditions are present, the item becomes active and you have the option to select recording with a color depth of 10 bits.

1.3.3.2.6. I-frames

If we do not go too deep into the codec's information compression algorithms, its work can be represented as a sequence of reference (key, I) frames and a group of secondary (more often consisting of P, less often P and B, we are talking about Android) frames. The key frame is the frame which contains the maximum amount of information about the image; it is a full resolution in full size. The secondary frame is a slice of the key frame. The secondary frame contains only that part of the image which differs from the image in the key frame. If you have a static video with a couple of swinging tree branches, the secondary frames will contain only those branches, and everything else will be taken from the key frame.
You could logically assume that the more I-frames you set, the better quality, because every frame will be whole, and the codec will not try to guess motion direction and bring its artifacts into the image. But in reality we have such an important parameter as bitrate.
When we select keyframe "each", this bitrate is splitted by the number of frames per second. For example, we have a bitrate of 100Mb/s and 25fps, each keyframe have 100/25=4Mb=0.5MB per frame. The advantage of this choice is that the editing program does not have to strain to

decode the intermediate frames. On the other hand, this is what the editing codecs are for, and transcoding the recorded material into which, solves the issue with the load.

When we choose a keyframe every two seconds, the intermediate frames require less bitrate for the same level of quality because, as we found out above, they contain only chunks that are different from the keyframe. As a result, more bitrate can be allocated to the keyframe, making it of higher quality. The codec distributes the bitrate independently. This choice (rare keyframe) may cause problems with dynamic scenes, if codec incorrectly detects direction of movement, compression artifacts may appear. If codec incorrectly defined bitrate for keyframes, they can "pulsate" when you notice quality degradation on keyframe.

This setting may not work accurately at high load. Keyframes can be set at the codec's discretion. If resources are scarce, keyframes are automatically set less frequently.

On some devices frequent keyframes may cause uncontrolled bitrate increases. Until recently, on Huawei devices, setting the bitrate to 50Mbps and I-frames to "every" resulted in bitrate increases of up to 300Mbps or higher. With the new updates, Huawei has limited this capability. Given all of the above, it is up to the user to choose the appropriate value for this setting.

1.3.3.3. Section "Metadata Settings"

This section contains settings and modes for implementing which you want to overwrite or correct the metadata of an MP4 file. All settings in this section require you to enable the "Metadata" option.

1.3.3.3.1. Metadata

This setting is about adding and correcting metadata. When this setting is activated the information about the settings selected during recording is added to the video file. You can easily read this data with MediaInfo.
At the moment the metadata includes the following information: device brand and model, OS version, frame rate, color depth, bit rate, white balance, temperature (if selected), gamut, gamma curve, dot density, exposure type, ISO value and shutter speed (in manual exposure mode), GPU usage, GPU gamma curve (if GPU was used). This list will be added to as far as possible.
About metadata correction. We are trying to bring the metadata to a normal form, so that they can be determined equal by different players. This includes Color space, Gamma curve, and Color range. Depending on the selected settings, the metadata is adjusted for them. If HLG curve is selected in gamma curves, it will be specified in the metadata, and not the curve that codec enters by default based on system settings. This makes it possible to use different standardized gamma curves and color spaces correctly. The Android API provides these manipulations, and in theory everything can be done without manipulating metadata. But in reality, device manufacturers are not very keen on making devices work according to the Android API documentation. As a result, all the fine-tuning often doesn't work, with very few exceptions.
Today metadata correction only works with the h265 codec. But we will definitely not stop there and will try to implement it for the h264 codec.
Activating this menu item opens the rest of the settings of this section.

1.3.3.3.2. Target frame rate (no audio in MP4)

This item allows you to recalculate the frame rate after recording. It can be used both to decrease the frame rate and to increase it.
Once again, please note that it does not affect the recording speed, it affects the playback speed. A device that records at a maximum of 30 fps in this application will not suddenly start recording at 60 fps.
Activating this item deactivates the "Constant frames per second mode" item, because "Target Rate" always tries to bring the file to a constant frame rate.

1.3.3.3.3. Constant FPS mode

Almost all more or less advanced users have at least once heard about stable (constant) frames per second. Many of them are very disappointed in Android OS when they see floating FPS in MediaInfo.
We created this setting to do something to help solve this issue for users in tin foil hats.
We can assume that the device can't cope and starts to lower the frame rate. But these are fairy tales from the world of computer games.

The camera sensor works at a constant frequency that is close to perfect. The problem arises at the system level, when it fails to cope with the processing of the frame, not having time to process and encode the frame in the allotted time.

H264 and h265 codecs were created with a view to be used in web broadcasts, one of the subspecies of this is broadcasting of the games, cyber-competitions. As we know floating FPS accompanies the gaming industry all the time, reviewers of smartphones are oriented to the stability of FPS. Codecs h264 and h265 are able to work with any frequency, with any change in it, to record what was actually there. This is their feature, not a disadvantage.

Here we have to turn our minds upside down and clarify how these codecs work with fps. We are all used to the concept of "frames per second", but when it comes to these codecs we should switch to the opposite concept of the same essence - "frame duration". h264 and h265 work with frame duration. Floating FPS is nothing but different frame durations. Everyone's favorite application MediaInfo translates frame duration into fps. So we see a minimum rate, a maximum rate and an average rate. These are the very metrics that advanced users are so afraid of.

To MediaInfo have target frame rate of 30 fps, but minimum rate 15 fps, you only need to drop one frame at any place in the video. In the place where the system has lost a frame, the duration of the previous frame is doubled. If you had the frame duration equal to 30 fps, one frame droped out and the duration of the previous one doubled, so the frame rate of the previous frame was recalculated to 15 fps. Now you see a minimum value of 15 fps in MediaInfo.

This setting tries to arrange frames according to the timecode of the target frequency. I.e. the duration of the frame has deviated by a small value, it is assigned a new time and a new duration so that the frame rate is not violated.

Exactly the same happens when importing a file to the timeline of the Blackmagic Davinci Resolve video editor program. The program automatically arranges frames according to the timecode of the target frequency of the project.

If the video contains frames with a duration 20% higher than the target frequency, it is automatically considered as a frame dropout, and the duration is increased by 2 times. As a result, there is no way to see a stable frame rate in MediaInfo.

When you activate this setting on some smartphones, you can observe a mismatch of video and audio. This occurs due to the fact that the smartphone does not keep the selected frequency, overestimates it or underestimates it by 0.5-1 fps. On Xiaomi and OnePlus smartphones, it was noticed that when selecting 60 fps, the device holds a frequency of 61 fps. On Huawei smartphones, it has been noticed that when selecting 24 fps, the device holds at 24.8 fps. Because of this, over time there is a difference between the target frequency and the real one. The sound is recorded without distortions, corrections and recalculations, with the real (target) speed.

When sound is recorded at 24.8 fps, and the setting puts frames at 24 fps, at the end the sound is likely to lag behind the video (the speed will run ahead).

About the above described problem warns a special message under this menu item. The message disappears if the "Target Frequency" setting is enabled or sound recording is disabled.

1.3.3.3.4. Timecode

A timecode which is inserted as a separate track into an MP4 file. Helps to synchronize files automatically by timeline in one click.
Actual solution works solely with the time of the phone and does not receive signals from any external synchronization devices.
By far the most obvious use is for overlapping recording. Previously, all the individual pieces had to be adjusted manually. Now a non-linear editing program will do it for you, based on the timecode specified in the files. The second variant of application is the synchronization of video from different devices. Yes, in this case, the accuracy of the timecode will depend on the coincidence of time on the selected devices.
It is worth paying attention to the constant frame rate mode. If this mode is enabled, but the timecode is guided by the number of recorded and dropped frames. If this mode is disabled, the timecode tries to adjust to the floating frame rate by reading the system time.

1.3.3.3.5. Delete HDR metadata

One of the most popular video editors Premiere Pro has a problem with HDR10 metadata (this is not really a problem, more of a standards compliance, because working with HDR video requires an HDR monitor). It tries to work with such files as HDR files, as a result increasing brightness by 10 times. We solved this problem by editing the metadata so that Premiere Pro understands the file as just a 10-bit file and does not apply any gamma conversion to it.

1.3.3.4. Section «GPU settings»

This section contains settings that become available only when the GPU is used for signal processing (1.3.3.1.1. With GPU).

1.3.3.4.1. Crop to

With this setting you can select the desired aspect ratio and the video will be cropped to those proportions. This menu item lists all the most popular aspect ratios.

1.3.3.4.2. Desqueeze video

This item is for adjusting the aspect ratio (desqueezing) when applying an mobile anamorphic lens. If you are not engaged in post-processing and want to get a correct image at once, this option is your choice.
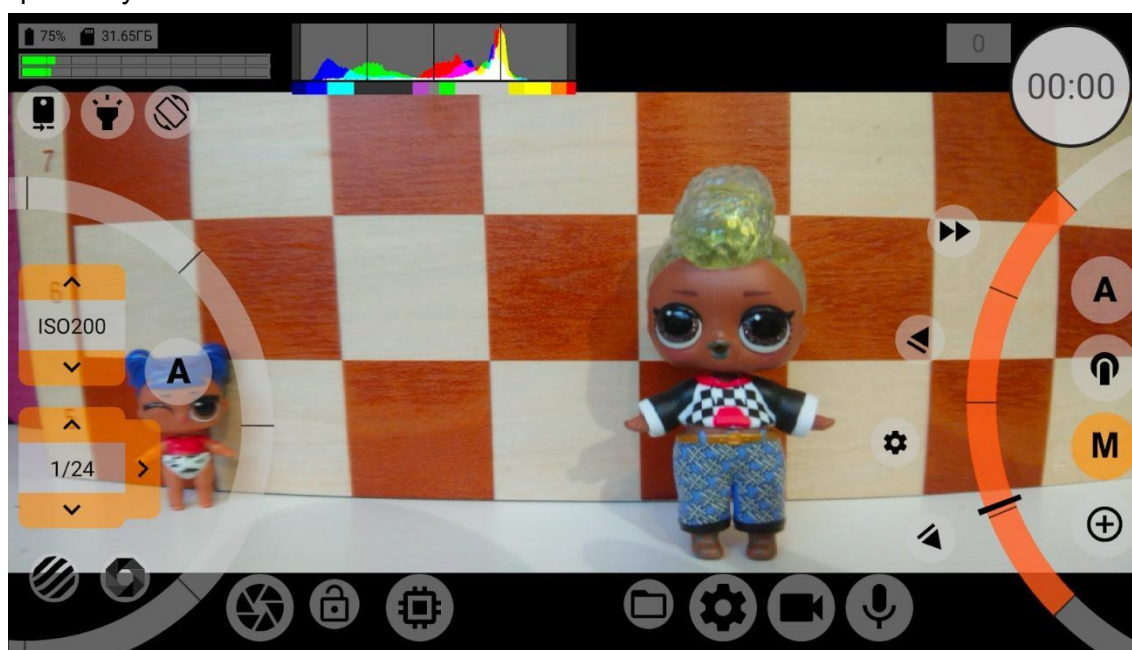
This setting has several values: None, 1.25x, 1.33x, 1.43x, 1.55x. The first one, of course, disables desqueezing. The second and fourth values fit some Chinese-made lenses. We've tried to adjust for everything currently on the market.
Turning on this setting blocks the viewfinder desqueezing setting (1.3.2.1.18. Desqueeze viewfinder) and the value from this item is forcibly applied to the viewfinder.

1.3.3.4.3. How to desqueeze

You have the choice of whether you want to desqueeze an image by shrinking its height (width remains the same), i.e. vertically, or by stretching its width (height remains the same), i.e. horizontally. Vertical desqueezing almost always works, but there is a problem with horizontal desqueezing because in this case the width of the image may exceed the available limits of the codec. If there is a problem, you will see a message saying that the selected settings exceed the capacity of the codec. Horizontal desqueezing problems are less and less common on modern devices.

1.3.3.5. Section "Hardware Settings"

This is a section of settings that depend mostly on the capabilities of your device. And to a lesser extent on the application.

1.3.3.5.1. DOF adapter

When you use a DOF Adapter the image on the screen is reversed upside down. To return the image to its normal appearance, you need to apply this setting.
Two DOF adapters for mobile devices are currently known: Ulanzi and BeastGrip.

1.3.3.5.2. Distortion correction

A hardware configuration option to correct lens geometric distortions. Only appears on those devices where it is available. It depends on the camera libraries provided by the manufacturer.
In this item, the "Quick" value is omitted as being unnecessary.

1.3.3.5.3. Noise reduction

The hardware noise reduction setting. It has several values: OFF, Fast, Best, Minimum. On modern devices, "fast" and "best" are most often the same thing. Previously, they differed in that "fast" reduced its influence if the system noticed a high load, the priority was given to frame rate stability.
The quality of this setting depends on the camera libraries provided by the manufacturer.

1.3.3.5.4. Hot pixels correction

Hardware correction of the hot pixels. Hot pixels are pixels that have a higher-than-normal value. They are most often seen in the image as bright white dots.
Enabling this setting causes the device to find and average such pixels. On some devices it works correctly only in combination with noise reduction.
The quality of this setting depends on the camera libraries provided by the manufacturer.

1.3.3.5.5. Sharpness

Hardware sharpening. It has three values: OFF, Fast, Best. "Fast" decreases its influence if the system notices a high load, priority is given to frame rate stability. For modern devices, it is most often irrelevant.
The quality of this setting depends on the camera libraries provided by the manufacturer of this device.

1.3.3.5.6. Stabilization

Setting the stabilization for the hardware. This is a very controversial setting because of the high level of indifference to it on the part of manufacturers.
Stabilization is divided into two kinds: optical and digital. Optical stabilization is designed to compensate for minor shake. Digital compensates for more serious fluctuations. Modern devices in native applications most often use hybrid stabilization, when both are activated at the same time.

This setting offers four values: OFF, Optical, Digital, Optical+Digital. Each of these options is activated depending on what the Camera2 API tells the application.

With optical stabilization problems are rare. What cannot be said about digital stabilization. The functionality of digital stabilization is ignored by almost all manufacturers. In 99% of cases digital stabilization does not work.

Today reliably known only a couple of manufacturers who have approached the issue responsibly - Sony and Huawei. New Huawei smartphones have non-disable stabilization, i.e. one or both of them will always work. LG, Samsung, Xiaomi, Vivo, Oppo, OnePlus smartphones have a problem with digital stabilization.

On some devices it is possible to activate some settings by applying "duct tapes" to bypass Camera2 API (2.6. In the native app...). But specifically with digital stabilization, it hasn't happened yet.

The quality of this setting depends on the camera libraries provided by the manufacturer.

1.3.3.5.7. Anti-banding (auto exposure)

There is such a phenomenon in video as flickering of incandescent lamps (current frequency). A problem arises when the frame rate and exposure time of the video do not match the flicker of the lamps.

This setting, depending on the value selected, helps get rid of this problem. This setting only works when you let the system control the exposure setting (in manual exposure mode, you will have to deal with this problem yourself). Then the system sets such a shutter speed (and maybe even a frame rate) in order to level out the effects of the light sources.

The quality of this setting depends on the camera libraries provided by the manufacturer.

Some more information about lamp flicker can be found in section 1.5.2.4. Shutter speed switch.

1.3.3.5.8. HDR

This setting is available on two brands of devices: Sony and LG. On Sony smartphones up to and including the Xperia XZ3, it only works in auto exposure mode.

On newer Sony Xperia and LG smartphones, starting with the V35, it only works in 10-bit bit mode.

More often than not, HDR mode works as a double exposure. At the moment we do not know what technology is used for this, the increase in pixel brightness through analog signal amplification or through different shutter speeds. But what is reliably known is that at this point individual pixels have different "sensitivity".

What does turning on this setting entail? Deterioration of image quality, ugly plumes in dynamic scenes. But it adds at least half a stop in brightness. Suitable for static scenes.

On smartphones Sony Xperia 1/5 Mark 2 for contrasting dynamic scenes, it is better to disable this setting.

1.3.4. Microphone and Sound Settings Menu Button

The Microphone and sound settings menu button (4) opens the settings window, which contains the microphone settings, audio codec settings, and sound processing settings available in android.
Below we will look at each menu item separately.

1.3.4.1. Section "Audio recording settings"

There is only one section at the moment, but in the future the settings will be placed in sections. The bit depth of the audio record is fixed at 16-bit, so there is no option to select the bit depth. This is due to the complexity of implementing 32-bit recording. 24-bit in Android does not exist as a class.

1.3.4.1.1. Source

There are several logical sound sources in the Android system. Not all of them are applied in the application, but the most basic ones are available.
OFF. Sound is not recorded.
Default. The system selects the sound source and what effects and corrections to apply.
Unprocessed. The system selects the sound source, but does not apply any corrections or effects.
Camcorder. The Android documentation tells you that this is the source for recording video sound. When you select this value, the system must control the orientation of the device's position, and adjust the sound channels accordingly. Experience shows that the sound source will always be the device's built-in microphone(s).
Microphone. The system writes from the device's microphone, even if other physical sound sources are available. Somewhat similar to Camcorder. Most often writes in mono.
Bluetooth. The application tries to write sound from a Bluetooth headset or Bluetooth microphone. The application does not connect the sound source, this must be done first at the system level. This item is not available until a Bluetooth audio source is registered on your system. Once there is a Bluetooth source on the system, you can switch to it in the app.

1.3.4.1.2. Level

Sound level processing item. A word of caution is worth making here. This setting works with already recorded sound. If there is already overload in the source material, it will remain even after lowering the level.
Therefore, it is recommended to use this item with an unprocessed sound source, and raise the level to the desired level instead of lowering it.
This feature adds a load to the recording. The audio signal is processed on the fly.

1.3.4.1.3. Swap channels

On some devices the positions of the stereo audio channels may be incorrect. One can only guess why the manufacturer has made this decision.
The user has the possibility to swap the channels so that justice can be done.
This feature adds to the recording load. On-the-fly processing of the audio signal takes place.

1.3.4.1.4. Sample rate

The sampling frequency of the audio being recorded.
For AAC compressed to MP4 you can select the sampling rate up to 48KHz (it is a system limitation).
For a single WAV sampling rate is limited to 192KHz. Here it is worth noting that not every device can work with this frequency, so it makes sense to check if the device can handle it.

1.3.4.1.5. Bitrate (quality)

The quality of compression, as in the case of video. The maximum bitrate limit is determined by the system. Usually it is 510Kb/s for AAC.
In the same item, you choose to record to a separate WAV file, as well as the maximum bitrate. And it is actually the maximum, because WAV is basically a raw audio signal. The WAV file is recorded from the beginning of recording to the end of recording, even when the video files are split by, say, 3.7GB.
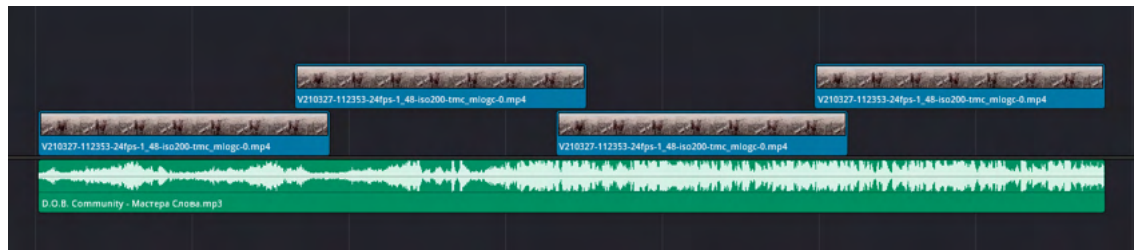
1.3.4.1.6. Duplicate to MP4 (WAV remains)

This setting allows you to import recorded WAV into an MP4 container after you finish recording. Setting values are AAC bitrate (quality) into which WAV will be compressed inside MP4. Important: When this setting is enabled a limit on the number of video files will come into effect. You can only record one video file at a time. Once the maximum allowed video file size is reached the recording will be stopped forcibly and the recorded WAV will be imported into MP4.

1.3.5. Aperture Switch Button

As far as we know, this button works only on some Samsung smartphones. On some Huawei (Honor) smartphones it is displayed, but does not give any result. Why they specified in Camera2 API the availability of multiple aperture values remains a mystery.

1.4. Image Settings Area

In this area there are buttons that deal mainly with color, image.

What distinguishes a "big" camera from a smartphone besides the size of the sensor and interchangeable lenses? Lack of GPU. We decided to change the concept, to move away from the common approach, when on smartphones everything is mixed in a bunch.

We separated the RAW sensor signal and GPU image processing, and put each type of processing under a separate button.

The "big" cameras try to make the most of the sensor's capabilities, getting the best possible quality. Subsequent image processing takes place on the computer, where the GPU comes into play.

In our case, the GPU is both good and bad.

The disadvantages are that the GPU increases the load many times over, GPU deprives us of recording in 10-bit color depth.

Recording video in RAW is not available, which means that the material will be compressed with a 4:2:0 sub-sampling codec. Image processing through the GPU gives the opportunity to process the 4:4:4 signal before compression by the codec. Those who want to get a finished picture, those who do not have a device that records with 10-bit color depth, it makes sense to try to get additional benefit from signal processing through the GPU.

Once again reminde about the load. The GPU requires a lot of resources. So please evaluate the capabilities of your mobile device adequately.

1.4.1. Image Settings Button on the Sensor

Beneath this button are the settings for working with color at the sensor or RAW signal level.

1.4.1.1. Selecting the white balance mode
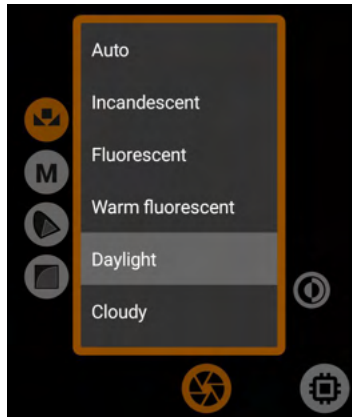
This menu contains the white balance modes preset by the manufacturer. Almost always the "Daylight" and "Incandescent" modes are available. The availability of the "Manual" mode is highly dependent on what the manufacturer has specified in the Camera2 API. In all modes except Manual, the device can engage in automatic micro-corrections.

The white balance mode is saved for each sensor separately. When selecting the Manual mode, the second and third buttons are activated.

1.4.1.2. Manual white balance settings

In order to activate this menu you will need to select "Manual" in the white balance mode settings.
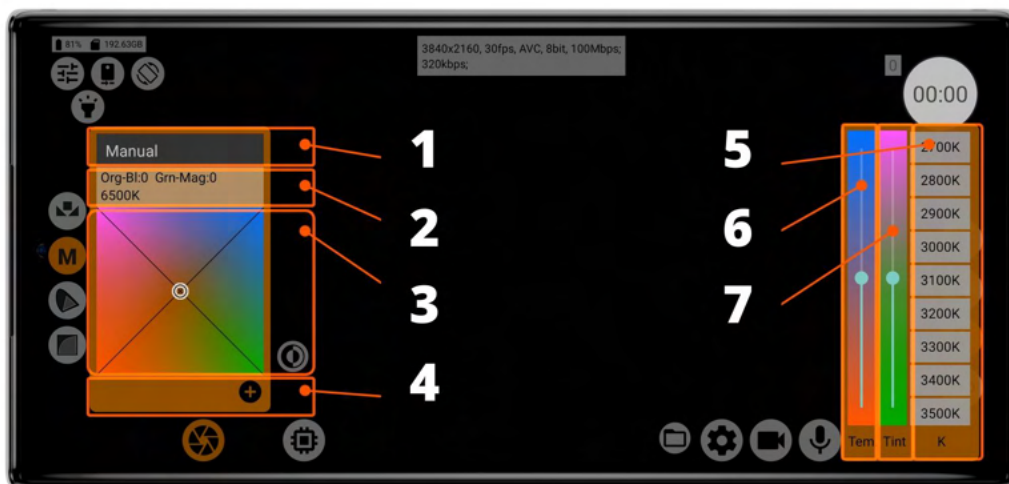
1 - drop-down menu of saved manual white balance settings; 2 - coordinate information on the touchpad and approximate conversion to light source temperature; 3 - white balance touchpad; 4 - button for saving manual white balance settings; 5 - preset light source temperatures; 6 - auxiliary temperature control (orange to blue axis); 7 - auxiliary tint control (green to purple axis).

The first thing to agree on is that everything about temperature in the manual white balance menu refers to the light source. Selecting a temperature causes the application to try to compensate for the selected temperature. That is, the user does not select the temperature he or she wants, but the temperature of the environment that is currently illuminating the subject. The drop-down menu (1) of the saved settings contains the presets saved by the user.

The window with information (2) contains three parameters for better orientation, for whom it is more pleasant to see the figures: orange-blue axis coordinates (Org-Blue), green-violet axis coordinates (Gr-Flt) and the approximate temperature of the light source (which you should choose in the right menu to get approximately the same orange-blue axis coordinates, i.e. without taking into account the hue).

The color touchpad (3) is for quick and precise correction of the white balance.

The save button (4), logically, brings up the preset save window. In the same row the buttons for deleting a preset and returning to the default settings may also appear.

The preset temperature list (5) is for quickly selecting a specific light source temperature.

The temperature control (6) is for adjusting the color on the orange-blue axis.

The tint control (7) is for adjusting the color on the green-purple axis.

That is, the right side of the manual white balance menu helps you adjust some controls more precisely.

In Manual White Balance mode, all micro-corrections are most often turned off and a hardware-like preset may be slightly different from a hardware preset. It therefore makes sense to abstract away from hardware presets when using manual white balance mode, and not even try to compare it to any other mode.

We are often struck by the desire of users to achieve such perfect white balance that they can calibrate the monitor with a smartphone. This seems to us to be too demanding, and hence the striving itself is seen as pointless.

Warning! If the selected settings have not been saved to a preset, there is no guarantee that they will remain in the next session of using the app. The application tries to save the last selected settings, but more often than not, the selected preset, if it has been changed but the changes have not been saved, resets the settings to its saved settings. For example, you selected 5600K, saved that to preset01, changed the settings to 5000K and quit the app. When you return back, you are likely to find the settings at 5600K because the selected and saved preset has applied them, ignoring the last temporary changes.

1.4.1.3 Selecting gamut

This is where the topic of "Big" logarithmic profiles begins. The first video-devices with the ability to select log profiles did not split this concept into two parts: gamma curve and gamut. The user simply chose what he was given to choose and used it. And in post-processing used the LUTs prepared by the device manufacturer.

Over time, it became necessary to separate the selection of gamut (color space) and gamma curve. The reason was the increase in the number of combinations of these two parameters, and it became easier to select them separately, than to combine ready log-profiles with all possible combinations. In our case, it can lead to chaos.

And so, a gamut is almost the same as a color space, with the only difference being that a gamut is a conditional color space with the same CIE coordinates, but not limited by anything. Most often the concept of gamut is found in video recording, and color space in digital content broadcasting. The camera sensor does not have such hard limitations as a monitor, the information from the sensor, relying on its color depth, can be stretched to any color space. In

principle, each color space has some conditional color depth requirement. For example, Rec.709 is enough 8 bits, Rec.2020 requires at least 10 bits, so that the color does not have "holes" and banding. And if you take some Red Wide Gamut, the color depth requirement may increase to 14 bits.
In any case, it is not an axiom, and you are free to choose any gamut. But all of the above is worth taking into account.

To the left is the list of gamuts; to the right are the brightness and saturation controls.
On some devices, brightness may not work depending on the situation. The fact is that most Android devices suffer from clipping in the lights when the sensor settings go beyond a certain level. Sony smartphones and a few models from Samsung have no problem with this.
Saturation has the same limitations as brightness, but that still doesn't prevent it from having a larger working range than brightness. Brightness defaults to 1, saturation to 1. To reset one of the settings, you have to double tap on the acronym of the setting. Brightness and saturation are saved automatically for each gamut separately.

Gamut selection is possible only in the manual white balance mode, because it is in this mode that the necessary sensor control becomes available.
Almost all Huawei (Honor) devices do not have a manual white balance mode, so they do not have gamut selection available.

1.4.1.3.1. sRGB/Rec.709
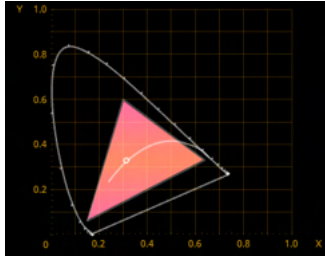
The standard gamut used by default on almost all mobile devices. Doesn't change anything in the color of the image. D65 white point. Good match with gamma curves: Standard, Rec.709 and sRGB.

1.4.1.3.2. P3-D65
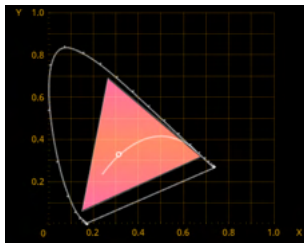
A color space which is now a receiver of Rec.709. Almost all modern HDR video content is created within this color space. If you have plans to work further with HDR, it makes sense to look at P3. D65 white point.
Good match with gamma curves from HDR-video standards: HLG and PQ 1000.

1.4.1.3.3. Rec.2020/2100.
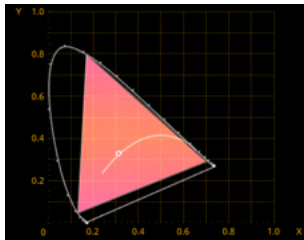
Gamut, which contains colors only available to lasers. No monitor, projector or TV today can display this color space. In most cases, Rec.2020, which we see in the metadata of 10-bit video files, is the container for the smaller P3 gamut. But no one is stopping us from shooting video in this gamut. Its advantage is that it is wide, clear and easy to interpret. D65 White Point.
Goes well with gamma curves from HDR-video standards: HLG and PQ 1000.

1.4.1.3.4. A Wide Gamut
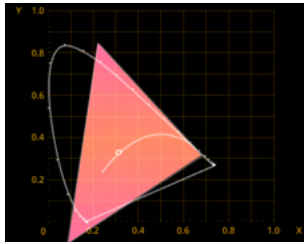
The first gamut of the technical series. It is as close as possible to the famous gamut from Arri - Alexa Wide Gamut. When interpreting, for example, in Blackmagic Davinci Resolve, it is recommended to choose the gamut from Arri. D65 white point.
Good match with gamma curve: mLog-C.

1.4.1.3.5. C Cinema Gamut
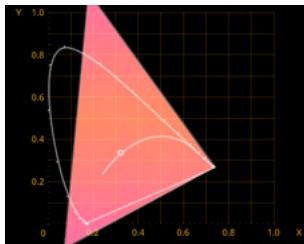
A gamut very close to Canon's famous Cinema Gamut. Accordingly, it is recommended to use it when interpreting. D65 white point.
Good match with gamma curve: mC-Log3.

1.4.1.3.6. P V-Gamut.
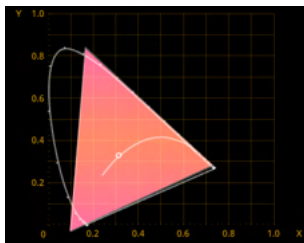
Gamut, as close as possible to the well-known Panasonic gamut - V-Gamut. It is the one we recommend to use when interpreting. D65 white point.
Good match with gamma curve: mV-Log.

1.4.1.3.7. R Wide Gamut
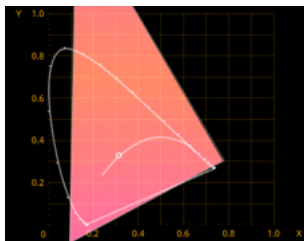
Gamut, as close as possible to the famous gamut from RED - Red Wide Gamut. It is recommended to use it for interpretation. Very wide gamut, not recommended to use in 8 bit mode. D65 white point.
Good match with gamma curve: mLog3G10.

1.4.1.3.8. S-Gamut/-3
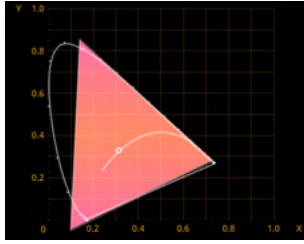
Gamut as close as possible to the one of the same name from Sony. You can use the gamut from Sony for interpretation. D65 white point. Good match with gamma curve: mS-Log2.

1.4.1.3.9. S-Gamut3.Cine.
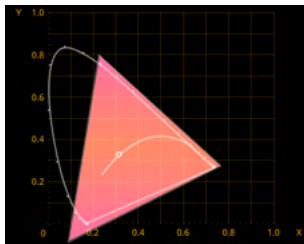
Gamut as close as possible to the one of the same name from Sony. You can use the gamut from Sony for interpretation. D65 white point. Good match with gamma curve: mS-Log3.

1.4.1.3.10. ACES AP1
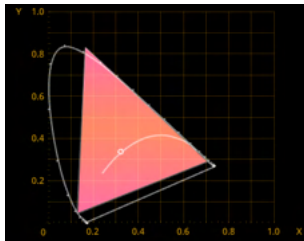
Gamut of the ACES standard. It is very rarely used for recording nowadays. But trends in video production hint that the day when this gammut may become the standard for all camcorders is not far off. It differs from the others in that its white point is D60. And that means that adjusting the white balance will be a little more difficult. Good match with gamma curve: ACEScct.

If you are using Premiere Pro for editing, which does not have a choice of gamut separately from gamma curves, then it makes sense for you to follow the recommendations for compatibility, because you will most likely have to use LUTs from "big" camera manufacturers. Davinci Resolve has a functionality that allows you to select gamut and gamma curve separately when interpreting. In this case, you can combine any gamut with any gamma curves.

The mcpro24fps application stands out strongly for its approach to gamma curves. The first difference is the application of gamma curve at the RAW-signal level, the second is the huge selection of preset curves, and the third is the possibility to "draw" your own gamma curve. Gamma curve is a graph of the change in brightness of the image from "was" to "became". All users who have at least once encountered RAW photos should be well aware of the difference in plasticity and flexibility for processing between RAW and JPG. This menu item contains a lot of gamma curve settings at the RAW signal level. This means that we are not editing a finished picture, much less a compressed one, but the raw material taken from the sensor. We have the opportunity to enhance a signal which, after conversion to RGB, may no longer be available (cut off). This is most often the case with shadows.

Here it is worth noting that RAW is what the sensor was able to get, and it is impossible to pull from it what the sensor is not able to capture. If you overexpose the image, you will be dealing with an overexposed image in the gamma curves, where the information in the lights may be lost. The same goes for shadows. If you have underexposed the image and there is no shadow information in the RAW signal, no gamma curves will bring it back.

Many users believe that the gamma curve of the Log Profile is designed to "extend" the dynamic range. But it is not. In video, the sensor is responsible for the dynamic range, and the gamma curve Log profile is responsible for what information and in what proportions of brightness gets into the video file encoded by the codec. If you are shooting pure uncompressed video-RAW, you do not need a Log profile (neither gamut nor gamma curve). Log profiles (Gamut and Gamma Curve) are used only where the signal from the sensor will be compressed before saving to a file. Compression can take place both already at the level of the codec and at the level of the RAW signal, when the RAW signal is compressed by color depth (to reduce the size), additional processing is applied, such as gamma coding (gamma curve is applied). As a result, we get quite flexible material, many people consider it a RAW, but it is still not the same RAW that would be without intermediate processing. Such a RAW is called a compressed RAW. Compressed RAW is available on many "big" cameras. On mobile devices, unfortunately, only the codec is available. So it makes no sense for us to distinguish between compressed and uncompressed RAW.

The same applies to compact cameras, which are popular with today's videographers. Such cameras can only record codec-compressed material. That is why they introduced the concept of a Log Profile. The manufacturers tried to find a way to prevent the codec from losing something that could be useful. The codec does not like too dark parts of the frame and too light. It has trouble distinguishing neighboring pixels in these parts, so it tends to average the pixels and compress them into squares, large single-color patches. The gamma curve on semi-professional cameras shifts most of the brightness of the image to the middle, where the codec is most accurate.

- So? - You ask. - Can we get the same thing on the phone as videographers with semi-professional cameras?

Absolutely not. Mobile sensors do not reach the sensitivity or dynamic range of "big" cameras. But that doesn't change the fact that a non-standard gamma curve can help save more than what the device's default system offers.

1.4.1.4.0. Parameters of gamma curves

1.4.1.4.0.1. Point density

This parameter can be found in all gamma curves except automatic.
Even though the gamma curve may look smooth on the graph, it really is not. The user gamma curve, which are all gamma curves presented here, except automatic, in Android consists of points connected to each other by straight segments. Each device is limited to its number of points. This is a technical parameter that is assigned by the manufacturer and cannot be changed, with few exceptions. The ideal number of points is equal to the brightness levels of the bit used. For 8 bits it is 256, for 10 bits it is 1024. But it is worth noting here that mobile sensors are almost always 10-bit, so the ideal is 1024 points. We have seen 128, 256 and 512 points on different devices, but 1024 nowhere and never.
In this case, unpleasantly surprised by Samsung devices on Exynos processors. Since the S6 family devices, all Samsung Exynos devices have only 32 points of the gamma curve at their disposal.
Why is the number of points so important? The more points, the smoother the gamma curve, the smoother the transition from color to color, the less artifacts like posterization.
Considering all of the above, we decided to let users decide where to send more points, where to add more smoothness. This is what the parameter "Point Density" is responsible for. Shifting this parameter sideways changes the brightness pattern of the scene, some parts of it can become lighter or darker.
Let us have a look at the example with 8 points. Note that the same formula is used for drawing the gamma curves.
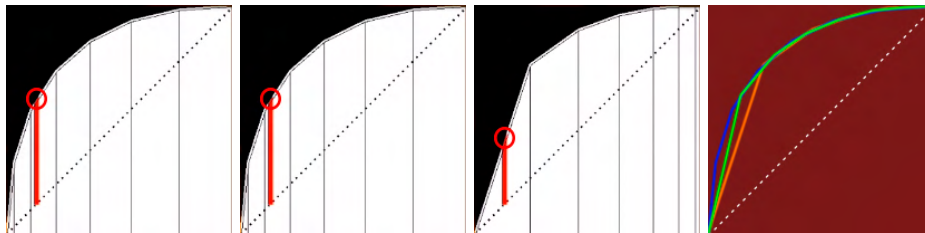
The first figure with a value of -100, the second is 0, the third is 100, and the fourth is the difference between the three gamma curves. Note the red bar. It is a segment showing the change in incoming brightness to outgoing brightness. And it is different in each case. The fourth figure shows that if for the highlights (right part) these changes are not so critical, then for the shadows (left part) at each of the values you get a completely different curve. It may seem that at 128 points and above the changes will probably not be noticeable, but no, even the smallest shift can give a very noticeable difference in the brightness of the frame. Changes become imperceptible at the available 512 points.
This parameter is saved automatically for each gamma curve separately.
The positions of the points on the X axis are shown by the black bars below the graph.

1.4.1.4.0.2. Brightness

Curves the gamma curve into an arc along its entire length. The peculiarity is that the arc is symmetrically shaped, being part of a circle. Affects the midtones the most, shadows and highlights the least. The black and white points remain in place.

1.4.1.4.0.3. Gamma (γ).

Curves the gamma curve into a logarithmic arc. The standard formula is y=x/γ. Affects the area of brightness that is considered most important to our vision. This is somewhere between the shadows and the midtones. The black and white points remain in place.

1.4.1.4.0.4. Contrast and pivot

Two parameters that are inseparable from each other.
Contrast is an S-curve. When it is positive, it curves shadows downwards and highlights upwards, i.e. it darkens shadows and brightens highlights. And vice versa when it is negative.
At 1.0 it looks like a linear straight line.
The contrast pivot determines the boundary where shadows end and highlights begin.
The contrast divides the curve into two parts, so there is no notion of averages.
When you adjust the contrast through the S-curve, the black and white points remain in place.

1.4.1.4.0.5. Shadows

The parameter affects the lower third (shadows) of the gamma curve, slightly affecting the midtones. A positive value raises the shadows without changing the black point. A negative value darkens the shadows, but push down the black point at the same time.

1.4.1.4.0.6. Midtones

The parameter affects the middle third (midtones) of the gamma curve, slightly overlapping both the shadows and the highlights. A positive value raises the midtones. A negative value darkens the midtones. Does not affect the black and white point in any way.

1.4.1.4.0.7. Highlights

The parameter affects the upper third (highlights) of the gamma curve, slightly affecting the midtones. A positive value brightens the highlights, but push up the white point at the same time. A negative value darkens the highlights, but has no effect on the white point.

1.4.1.4.0.8. B(lack), black point

The default black point is at [0,0], i.e. bottom left.
The control is limited to the bottom because negative values don't make sense because we are always trying to pull more out of shadows. The positive value raises the black point up, and the black becomes gray. The higher the value, the grayer the black. Affects the entire brightness range.

1.4.1.4.0.9. W(hite), white point

The default white point is [1,1], i.e. top right.
The positive value push up the white point, also raising the overall brightness of the frame. The negative value push down the white point, also lowering the overall frame brightness. It affects the whole range of brightness. It is worth noting here that the gamma curve in the application always tries to soften the over highlights (apply a soft-clip) if such are formed when adjusting the user curve.

1.4.1.4.0.10. R(ed), G(reen), B(lue)

These controls allow you to change the brightness of each channel individually. Like the overall brightness, the parameters do not affect the white and black points of the individual channels. There is a smooth effect from shadows to highlights with a peak in the midtones.

1.4.1.4.0.11. Upper bound

This control is displayed at several gamma curves close to gamma curves from "big" cameras. Since mobile devices are capable of much less than "big" cameras, gamma curves have to be adjusted to their capabilities. All "big" Log-profiles have very aggressive gamma curves, designed for very wide dynamic ranges. For this reason, they may not be suitable for mobile devices.
We decided to give users the ability to influence the aggressiveness of the gamma curve.
The upper boundary adjusts the white point. The higher the white point, the brighter the frame.
The changed value is saved automatically for the selected gamma curve.

1.4.1.4.0.12. Lower bound

The lower boundary, like the upper boundary, is displayed for several gamma curves approximating the gamma curves from "big" cameras.
Adjusts the black point. The higher the black point, the brighter the frame.
You can use these two controls to shift the entire brightness range to the middle or upper part of the brightness range.
The changed value is saved automatically for the selected gamma curve.

1.4.1.4.1. Auto

This is the gamma curve that the device system draws by default. On devices with only 8-bit recording, most often it is the Rec.709 gamma curve.
Until recently, almost all devices had Rec.709, even in 10-bit recording mode. But with the arrival of version 11 of the Android operating system, everything began to change.
Samsung devices in 10-bit recording mode use the PQ gamma curve.
LG devices in 10-bit recording mode use gamma curve PQ, and modify as they get depending on the selected HDR mode and frame rate.
Sony devices compare favorably to others in this case in that they always have Rec.709 at 8 bit, always HLG at 10 bit.
The other devices have not been seen to apply any particular gamma curve. So the application keeps it as Rec.709 for all sorts of conversions.
The main advantage of the automatic gamma curve is that the number of points available tends to infinity.
The automatic gamma curve is that gamma curve, which at any time can change to whatever seemed right to the manufacturer. This is the case when we put the responsibility for the use of the function on the user.

1.4.1.4.2. Linear
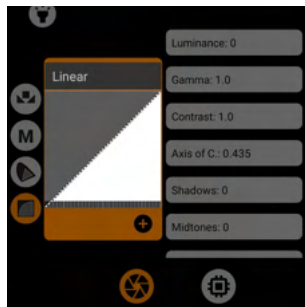
Gamma curve displaying the frame as the sensor sees it. A starting point for implementing your own gamma curve. All parameters are reset to default values. The graph simply shows a straight line from the lower left corner to the upper right corner (i.e., from [0,0] to [1,1]).
It is logical not to use this curve for capturing material.
This gamma curve contains all parameters in default values for custom gamma curve setting: brightness, gamma, contrast and contrast axis, shadows, averages, lights, black point, white point, RGB, point density.

1.4.1.4.3. Standard
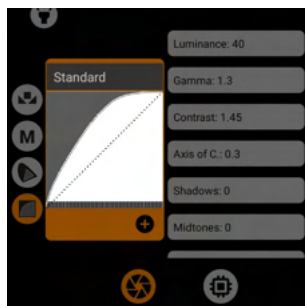
Was developed as a replacement for the commonly used Rec.709. The modern user likes good contrast, but does not like sagged shadows. The purpose of this curve is not to fail shadows, leaving the overall contrast good.
The curve is "drawn" with standard controls, so it can be used as a starting point.
Used parameters: brightness 40, gamma 1.3, contrast 1.45, contrast axis 0.3. Does not change the black and white points.
Works best with the Rec.709 gamut.

1.4.1.4.4. mLog 60%
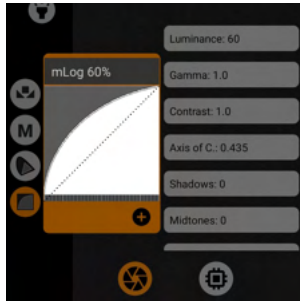
This curve takes advantage of the brightness slider: the intervals between points are about the same length, which reduces the chance of posterization. Also, as befits a logarithmic profile, the black point is slightly raised, it helps to get a little more detail in the shadows.
The curve is "drawn" using standard controls, so it can be used as a starting point.
The parameters used are brightness 60, black point 16. It doesn't change the white point.

1.4.1.4.5. mLog 80%
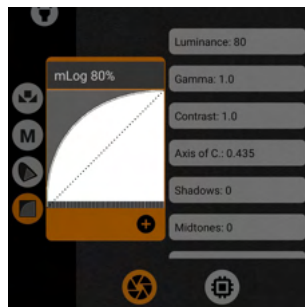
This curve differs from mLog 60% in the strength of the effect, but the working principle is the same.
The curve is "drawn" with the standard controls, so it can be used as a starting point.
Used parameters: brightness 80, black point 20. Does not change the white point.

1.4.1.4.6. mLog 100%
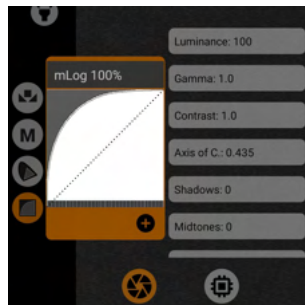
This curve has even more effect on the image than mLog 80%, but the principle is the same.
The curve is "drawn" using standard controls, so it can be used as a starting point.
Used parameters: brightness 100, black point 25.5. Does not change the white point.

1.4.1.4.7. Rec.709

Standard curve from ITU-R BT.709 specifications. Commonly it is also called Rec.709 (Scene). This curve is used for recording video up to now. All other standards, in one way or another affecting Rec.709, relate exclusively to image transmission.
It goes well with the Rec.709 gamut.
Since the curve cannot be displayed with the standard controls, only the point density is available for adjustment. Does not change the black and white point.

1.4.1.4.8. sRGB

Another curve from the common standards. Typically used as a gamma curve for images (single frames, not video) and as an image translation curve.

It is not usually used for video recording. But no one is stopping you from starting if you know what you are doing.

Combines well with the Rec.709 gamut.

Since the curve cannot be displayed with the standard controls, only point density is available for adjustment. Does not change the black and white point.

1.4.1.4.9. HLG 87%
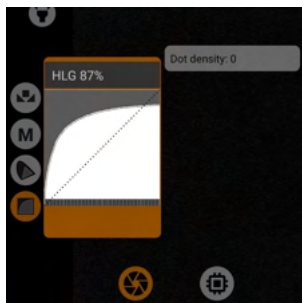
The curve is based on the commonly available gamma curve formula of the HLG standard. The black point is raised to 20 (in 10-bit), the white point is lowered to 890.

Since the curve cannot be displayed with the standard controls, only the point density is available for adjustment.

The shape is similar to the gamma curve of the HLG 1 from Sony.

Due to the lowering of the white point, it can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign.

The problem goes away when manual white balance is selected, it is possible to stop clipping. In this case, there will be no warning sign.

1.4.1.4.10. HLG 95%.

The curve is based on the publicly available gamma curve formula of the HLG standard. The black point is raised to 20 (in 10-bit), the white point is lowered to 972.

Since the curve cannot be displayed with the standard controls, only the point density is available for adjustment.

The shape is similar to the gamma curve of the HLG 2 from Sony.

1.4.1.4.11. HLG 100%
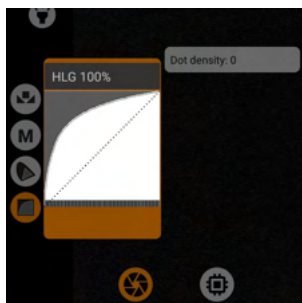
The curve is based on the commonly available gamma curve formula of the HLG standard. The black point is raised to 20 (in 10-bit), the white point does not change.

Since the curve cannot be displayed with the standard controls, only the point density is available for adjustment.

The shape is similar to the gamma curve of the HLG 3 from Sony.

1.4.1.4.12. HLG.

HLG gamma curve from Rec.2100 specification, which contains recommendations for working with HDR-video signal.

This curve should be used to record HDR-video. It is this curve that is used in the acclaimed DolbyVision standard used in Apple iPhone video recording devices. It goes well with the P3-D65 and Rec.2020 gamut.

Since the curve cannot be displayed with the standard controls, only the point density is available for adjustment.

1.4.1.4.13. mCineLog

A curve, very similar to LG's CineLog curve. Works well with the P3-D65 and Rec.2020 gamut.

Since the curve cannot be displayed with the standard controls, only the point density is available for adjustment.

Due lowering of the white point can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign. The problem goes away when you select manual white balance, it becomes possible to remove clipping artifacts. In this case, there will be no warning sign.

1.4.1.4.14. PQ 1000
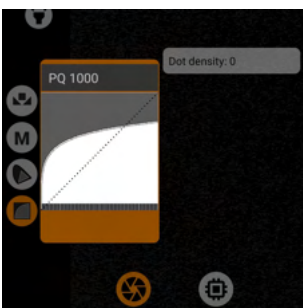
The second gamma curve used in HDR video standards such as HDR10 and DolbyVision (real). The vast majority of devices specify exactly this curve in their 10-bit file metadata. The only exception is Sony devices that use HLG for 10-bit HDR video.

Works well with the P3-D65 and Rec.2020 gamut.

Since the curve cannot be displayed with the standard controls, only point density is available for adjustment.

Due lowering of the white point can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign. The problem goes away when you select manual white balance, it becomes possible to remove clipping artifacts. In this case, there will be no warning sign.

1.4.1.4.15. mSLog 82%
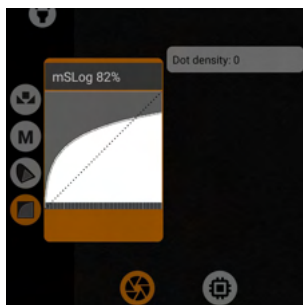
A gamma curve approximating Sony's S-Log1 curve and adapted for mobile devices. The 87% in the name means that the white point is lowered to 890 (in 10-bit).

Since the curve cannot be displayed with the standard controls, only the point density is available for adjustment.

Due lowering of the white point can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign. The problem goes away when you select manual white balance, it

becomes possible to remove clipping artifacts. In this case, there will be no warning sign.

1.4.1.4.16. mSLog 92%
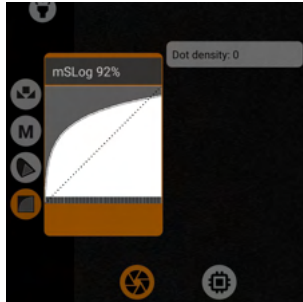
Gamma curve close to the S-Log2 curve from Sony and adapted for mobile devices. The 92% in the name means that the white point is reduced to 942 (in 10-bit).
Since the curve cannot be displayed with the standard controls, only the point density is available for adjustment.

1.4.1.4.17. mSLog 100%
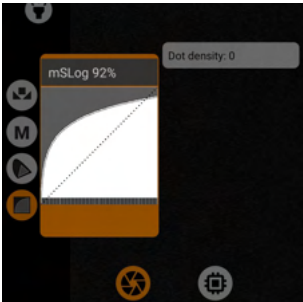
Gamma curve close to the S-Log3 curve from Sony, and adapted for mobile devices. The white point does not change.
Since the curve cannot be displayed with the standard controls, only the point density can be adjusted.

1.4.1.4.18. mSLog Extreme
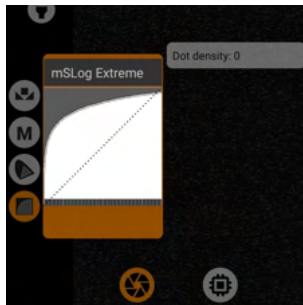
Gamma curve based on the mSLog 100% gamma curve formula. The difference is the aggressive convexity of the curve for extreme shadow elevation. Lighter shadows mean more noise, you have to keep that in mind.
The white point is at 983 (in 10-bit). The black point is raised to 28.
Since the curve cannot be displayed with the standard controls, only the point density is available for adjustment.

1.4.1.4.19. ACEScct.

Gamma curve of the ACES standard. Very rarely used today for video recording, but in the future we are promised that this standard will be used for recording video intended for post-processing.
For better adaptation for mobile devices, two parameters were introduced: upper and lower bounds.
It fits well with the ACES AP1 gamut.
Since the curve cannot be displayed with the standard controls, only the border and point density settings are available for adjustment.
Due lowering of the white point can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign. The problem goes away when

you select manual white balance, it becomes possible to remove clipping artifacts. In this case, there will be no warning sign.

1.4.1.4.20. mLog-C

A gamma curve close to the Log-C gamma curve from Arri. It is Log-C that is recommended for interpretation in non-linear video editing programs.

For better adaptation for mobile devices, two parameters were introduced: upper and lower bounds.

Combines well with A Wide Gamut.

Since the curve cannot be displayed with the standard controls, only the border and point density settings are available for adjustment.

Due lowering of the white point can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign. The problem goes away when you select manual white balance, it becomes possible to remove clipping artifacts. In this case, there will be no warning sign.

1.4.1.4.21. mC-Log3

A gamma curve close to Canon's C-Log3 gamma curve. It is C-Log3 that is recommended for interpretation in non-linear video editing programs.

For better adaptation for mobile devices, two parameters were introduced: upper and lower bounds.

Combines well with the C Cinema Gamut.

Since the curve cannot be displayed with the standard controls, only the border and point density settings are available for adjustment.

Due lowering of the white point can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign. The problem goes away when you select manual white balance, it becomes possible to remove clipping artifacts. In this case, there will be no warning sign.

1.4.1.4.22. Cineon Film

Gamma curve by the Cineon Film formula. Cineon Film is recommended for interpretation in non-linear video editing programs.

For better adaptation for mobile devices, two parameters were introduced: upper and lower bounds.

Since the curve cannot be displayed with the standard controls, only the border and point density settings are available for adjustment.

Due lowering of the white point can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign. The problem goes away when you select manual white balance, it becomes possible to remove clipping artifacts. In this case, there will be no warning sign..

1.4.1.4.23. mF-Log
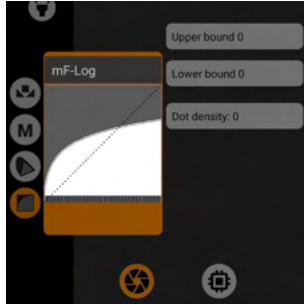

Gamma curve close to the F-Log gamma curve from Fuji. It is F-Log that is recommended for interpretation in non-linear video editing programs.

For better adaptation for mobile devices, two parameters were introduced: upper and lower bounds.

Combines well with gamut Rec.2020, aka F-Gamut.

Since the curve cannot be displayed with the standard controls, only the border and point density settings are available for adjustment.

Due lowering of the white point can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign. The problem goes away when you select manual white balance, it becomes possible to remove clipping artifacts. In this case, there will be no warning sign.

1.4.1.4.24. mV-Log

Gamma curve approximating to Panasonic's V-Log gamma curve. V-Log is recommended for interpretation in non-linear video editing programs.

For better adaptation for mobile devices, two parameters were introduced: upper and lower bounds.

Combines well with the P V-Gamut.

Since the curve cannot be displayed with the standard controls, only the border and point density settings are available for adjustment.

Due lowering of the white point can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign. The problem goes away when you select manual white balance, it becomes possible to remove clipping artifacts. In this case, there will be no warning sign.

1.4.1.4.25. mLog3G10

A gamma curve close to the Log3G10 gamma curve from RED. Log3G10 is recommended for interpretation in non-linear video editing programs.

For better adaptation for mobile devices, two parameters were introduced: upper and lower bounds.

Combines well with the R Wide Gamut.

Since the curve cannot be displayed with the standard controls, only the border and point density settings are available for adjustment.

Due lowering of the white point can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign. The problem goes away when you select manual white balance, it becomes possible to remove clipping artifacts. In this case, there will be no warning sign.

1.4.1.4.26. mS-Log2

Gamma curve close to S-Log2 gamma curve from Sony. S-Log2 is recommended for interpretation in non-linear video editing programs. For better adaptation for mobile devices, two parameters were introduced: upper and lower bounds.

Combines well with the S-Gamut/-3.

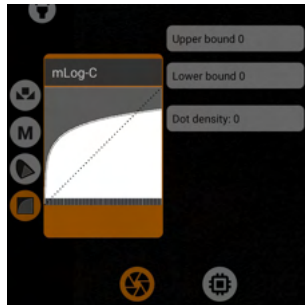Since the curve cannot be displayed with the standard controls, only the border and point density settings are available for adjustment.

Due lowering of the white point can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign. The problem goes away when you select manual white balance, it becomes possible to remove clipping artifacts. In this case, there will be no warning sign.

1.4.1.4.27. mS-Log3

Gamma curve close to the S-Log3 gamma curve from Sony. It is S-Log3 that is recommended for interpretation in non-linear video editing programs.

For better adaptation for mobile devices, two parameters were introduced: upper and lower bounds.

Combines well with the S-Gamut3.Cine gamut.

Since the curve cannot be displayed with the standard controls, only the border and point density settings are available for adjustment.

Due lowering of the white point can lead to clipping artifacts on most mobile devices. Therefore may be marked with a warning sign. The problem goes away when you select manual white balance, it becomes possible to remove clipping artifacts. In this case, there will be no warning sign.

1.4.1.4.28. Saving user-defined gamma curve.

To save the user curve to the preset you must click on the button with the plus sign.

1.4.2. Auto White Balance Lock Button

This button appears only in auto white balance mode and allows you to lock the white balance in the position it is currently in. Pressing it again cancels the lock and the white balance continues to change depending on the scene.

1.4.3. GPU Image Processing Settings Button

The GPU is a rather powerful tool for image processing. Its only drawback is its voraciousness. It requires a lot of resources. But at the same time it allows you to do with the image everything the developer can think up and implement. In our case we are forced to observe the economy mode. Taking into account the current demand for UHD resolution, the number of possible processes is drastically reduced.

If you need to use everything possible, it makes sense to give up UHD in favor of FHD, even if you think your device is a rocket.

The GPU has the ability to handle the signal more neatly, but it is very dependent on what it gets from the sensor. It is the RAW signal from the sensor that is the foundation of the basics. If we lose information to the GPU, the GPU can't get it back. Below under "Reverse tonemaping" there is an exaggerated example of what we are talking about here.

1.4.3.1. Adjusting GPU noise reduction and GPU sharpness

This section of GPU filters contains a rather primitive noise modifier and primitive sharpening. Why are they primitive? Because it is impossible to make a proper blur or add sharpness in one pass. And no mobile GPU today is able to do more than one pass of 4K image processing. This feature was added for those cases where anything is better than nothing. We can't say this feature is completely useless. No. It is balanced as much as possible for mobile devices. We have tried to make sure that it performs its function, but the load remains within adequate limits. The two presets don't change anything or offer anything. "OFF" tells the app that the function is disabled. "Blank" is an empty preset that is designed to be set from scratch. Both items do not add any load as long as no controls are shifted.

1.4.3.1.1. Radius of blur

The radius of the circle around the target pixel to calculate and replace it with the average pixel. If the blur strength is at 0, the blur radius has no effect on anything.

1.4.3.1.2. Strength of blur

Determines how much blur will be noticeable.

1.4.3.1.3. Radius of sharpness

The radius of the circle around the target pixel to calculate and replace it with a higher contrast pixel. Yes, sharpness is the contrast of neighboring pixels. With the radius you define how far apart the pixels defined as neighboring are from each other.

1.4.3.1.4. Strength of sharpness

Determines how much of the change in sharpness will be visible. Sharpness is applied after blurring.

1.4.3.2. Selecting and adjusting the GPU-gamma curve

This section does not differ much from the section of the same name. The only difference is the number of points of the gamma curve. Here they range from 1024 to 4096 depending on the unit. I.e. the curve itself works more accurately and smoothly. The exact same formulas are used for the curves.
Therefore, many of the items will refer to the same items from the gamma curve settings section of the sensor.

1.4.3.2.0. GPU gamma curve settings

1.4.3.2.0.1. Reverse tonemaping.

This setting was introduced on the principle of non-linear editing programs. The process of reducing a logarithmically encoded image to a standard form, such as the commonly used Rec.709, is called source material interpretation.
Reverse toning works only with the gamma curve selected in the sensor settings, i.e. it does not consider the gamut and interprets the signal into a linear one, i.e. it does not take a second step in applying the target gamma curve.
The choice of the target gamma curve is up to the user. The selection of the gamma curve from the list is the second step of interpretation.
Why would this be necessary? If a signal comes to the GPU with lost information, the flexibility of such material is lost and all further image processing can lead to artifacts. We have an opportunity to "ask" the sensor to deliver to us, before the image is converted into 8 bits, more information, more details in shadows. We, in turn, bring the image to 0 (linear) through reverse toning. From the linear signal we start to draw what we want with more information on the input. That is, we are able to reproduce the whole image post-processing process on the fly before the codec compresses the image.
Here it is important to understand that the less information you get from the sensor through the sensor settings, the less possibilities you will have when working with the GPU.
Let's look at an exaggerated example.

In the GPU-gamma-curve settings the reverse toning and gamma-curve Rec.709 are selected. And we do not change these settings from frame to frame. On the sensor the gamma curve mLog 100% is selected for the first frame, for the second - brightness -50, for the third - brightness -100. We are able to observe how the signal from the sensor affects what the GPU receives for processing. The lower the brightness of the RAW signal, the less detail and color the GPU receives. At the same time the same manipulations in the GPU-gamma curve do not lead to a loss of color and detail (brightness -100). Once again, it makes sense to get more from the sensor, then the GPU will have more opportunities to process the signal.

The second function of reverse tonemapping is to fight the problem of small number of gamma curve points on the sensor. If we have 128 points, reverse toning turns a broken curve of 128 points into a smooth gamma curve of 4096 points (in some cases 2048 or 1024, but not lower).

1.4.3.2.0.2. Brightness

See [1.4.1.4.0.2. Brightness](#)

1.4.3.2.0.3. Gamma (γ)

See [1.4.1.4.0.3. Gamma (γ)](#)

1.4.3.2.0.4. Contrast and pivot

See [1.4.1.4.0.4. Contrast and pivot](#)

1.4.3.2.0.5. Shadows

See [1.4.1.4.0.5. Shadows](#)

1.4.3.2.0.6. Midtones

See [1.4.1.4.0.6. Midtones](#)

1.4.3.2.0.7. Highlights

See [1.4.1.4.0.7. Highlights](#)

1.4.3.2.0.8. B(lack), black point

Unlike the control in the sensor settings section, there is no limitation from below, i.e. you can both push up the black point and push down it. See [1.4.1.4.0.8. B(lack), black point](#)

1.4.3.2.0.9. W(hite),white point

See [1.4.1.4.0.9. W(hite), white point](#)

1.4.3.2.0.10. R(ed), G(reen), B(lue)

See [1.4.1.4.0.10. R(ed), G(reen), B(lue)](#)

1.4.3.2.1. OFF

This preset disables the GPU-gamma curve, taking the load off the device.

1.4.3.2.2. Linear

Does not change anything in the image. Can be used as a basis for a custom gamma curve. See [1.4.1.4.2. Linear](#)

1.4.3.2.3. mLog 60%

See [1.4.1.4.4. mLog 60%](#)

1.4.3.2.4. mLog 80%

See [1.4.1.4.5. mLog 80%](#)

1.4.3.2.5. mLog 100%

See [1.4.1.4.6. mLog 100%](#)

1.4.3.2.6. rec.709

See [1.4.1.4.7. Rec.709](#)

1.4.3.2.7. sRGB

See [1.4.1.4.8. sRGB](#)

1.4.3.2.8. HLG 87%

In contrast to the gamma curve in the sensor settings does not cause clipping artifacts. See [1.4.1.4.9. HLG 87%](#).

1.4.3.2.9. HLG 95%

In contrast to the gamma curve in the sensor settings, does not cause clipping artifacts. See [1.4.1.4.10. HLG 95%](#).

1.4.3.2.10. HLG 100%

See [1.4.1.4.11. HLG 100%](#).

1.4.3.2.11. HLG

See [1.4.1.4.12. HLG](#).

1.4.3.2.12. mCineLog

Unlike gamma curve in sensor settings does not cause clipping artifacts. See [1.4.1.4.13. mCineLog](#).

1.4.3.2.13. PQ 1000

Unlike gamma curve in sensor settings does not cause clipping artifacts. See [1.4.1.4.14. PQ 1000](#).

1.4.3.2.14. mSLog 82%.

Unlike gamma curve in sensor settings does not cause clipping artifacts. See [1.4.1.4.15. mSLog 82%](#).

1.4.3.2.15. mSLog 92%

Unlike gamma curve in sensor settings does not cause clipping artifacts. See [1.4.1.4.16. mSLog 92%](#).

1.4.3.2.16. mSLog 100%

See [1.4.1.4.17. mSLog 100%](#).

1.4.3.2.17. mSLog Extreme

See [1.4.1.4.18. mSLog Extreme](#)

1.4.3.2.18. ACEScct.

Unlike the gamma curve in the sensor settings, it has no border controls and does not cause clipping artifacts. See [1.4.1.4.19. ACEScct](#)

1.4.3.2.19. mLog-C.

Unlike the gamma curve in the sensor settings, it has no border controls and does not cause clipping artifacts. See [1.4.1.4.20. mLog-C](#)

1.4.3.2.20. mC-Log3.

Unlike the gamma curve in the sensor settings, it has no border controls and does not cause clipping artifacts. See [1.4.1.4.21. mC-Log3](#)

1.4.3.2.21. Cineon Film

Unlike the gamma curve in the sensor settings, it has no border controls and does not cause clipping artifacts. See [1.4.1.4.22. Cineon Film](#)

1.4.3.2.22. mF-Log

Unlike the gamma curve in the sensor settings, it has no border controls and does not cause clipping artifacts. See [1.4.1.4.23. mF-Log](#)

1.4.3.2.23. mV-Log.

Unlike the gamma curve in the sensor settings, it has no border controls and does not cause clipping artifacts. See [1.4.1.4.24. mV-Log](#)

1.4.3.2.24. mLog3G10.

Unlike the gamma curve in the sensor settings, it has no border controls and does not cause clipping artifacts. See [1.4.1.4.25. mLog3G10](#)

1.4.3.2.25. mS-Log2.

Unlike the gamma curve in the sensor settings, it has no border controls and does not cause clipping artifacts. See [1.4.1.4.26. mS-Log2](#)

1.4.3.2.26. mS-Log3.

Unlike the gamma curve in the sensor settings, it has no border controls and does not cause clipping artifacts. See [1.4.1.4.27. mS-Log3](#)

1.4.3.3 Additional GPU filters and controls

This section contains filters that have no mathematical formulas, as it works in gamma curves. All actions are performed through addition or subtraction of pixels, their brightness, or individual RGB values.
In the future, absolutely everything that doesn't fit into the concept of gamma curves and gamuts may appear here. All the way up to Instagram filters, as they are also called Look's.
The two presets change nothing and offer nothing. "OFF" tells the app that the feature is off. "Blank" is an empty preset that is meant to be customized from scratch. Both items do not add any load as long as no controls are shifted.

1.4.3.3.1. Saturation

This differs from the saturation in the gamut settings in that a purely mathematical approach is taken here. The same as in the nonlinear editing programs.

1.4.3.3.2. Chroma

Tries to bring up the saturation in the most unsaturated areas. Very similar to the Color Boost parameter in Davinci Resolve.

1.4.3.3.3. Contrast

Contrast with an approach through addition and subtraction of pixel brightnesses rather than applying an S-curve. You could say that it works less aggressively than the contrast in the gamma curve.

1.4.3.3.4. Shadows

Brightens or darkens shadows via pixel brightness addition. Works less aggressively than the gamma curve parameter of the same name.

1.4.3.3.5. Highlights

Brightens or darkens highlights via pixel brightness addition. Works less aggressively than the gamma curve parameter of the same name.

1.4.3.3.6. R(ed), G(reen), B(lue)

Adjusts the white point of each channel. The black point of each channel remains in place. Thus the channel brightness is compressed or stretched across the brightness range, affecting the lights more, shadows less.

1.4.3.3.7. ACES (deprecated)

A filter designed to bring the image into ACES AP1 colors. Since both gamut and gamma curve ACES appeared in the application, this weird filter is no longer needed. It will be removed in future versions.

1.4.3.3.8. Saturation of shadows and highlights

You can decrease the saturation of shadows and highlights. The lower the saturation, the closer the shadows are to pure black, and the closer the lights are to pure white. Can create the effect of correct white balance even where it is not correct at all. This trick is common in filmmaking.

1.5. Exposure Adjustment and Control Area

In this area, the exposure and quick control thereof are adjusted. Exposure adjustment can be left to the system or can be controlled completely manually.
Note: The automatic and manual modes are not interrelated at all. It is not possible to leave settings of automatic mode after switch to manual mode. These are two separate modes.

1.5.1. Auto Exposure Mode

Auto exposure mode assumes that the user trusts his device to adjust the brightness of the picture. But at the same time has some set of tools to slightly adjust the automatic result. Automatic mode does not involve locking the shutter speed and ISO separately. These two parameters work in tandem. There are some devices where you can use "duct tape" to lock one of the parameters, but in this case, there is no need for that as the application is designed more for manual control.

1.5.1.1. Automatic exposure compensation controller

If the manufacturer of the device allows it, the automatic exposure can be corrected either to the plus or minus. The range depends on the device, but usually does not exceed ±2 stops. Logically, increasing the value to the plus side, increases the exposure, makes the image brighter, and decreasing the value to the minus side, decreases the exposure, makes the image darker.
It's worth noting that automatic exposure can have a larger range of shutter speeds and ISO. This is one of the reasons why it's not easy to combine automatic mode with manual mode. We have no idea why the manufacturer does this and why they don't give the same range of settings for manual control.

1.5.1.2. Exposure mode button

Pressing this button switches the exposure mode to manual.

1.5.1.3. Automatic exposure lock button

The user has the ability to "freeze" the shutter speed and ISO value.
The locked exposure gives a more professional feel to the video.
On some devices, you may see a wrong response to locking the exposure. In particular, on Samsung Exynos devices you can observe a decrease in the brightness of the picture in the case of locking. This is a problem exclusively of a particular device.

1.5.1.4.. Automatic exposure information window

In this window you can see what values the automatic exposure control selects for shutter speed and ISO.

1.5.1.5. Fast access to expo-peaking buttons

There are two buttons for quick access to exposure control: [zebra](#) and [false color](#). You cannot activate both exposure controls at the same time; each one disables the previous one.
Note that these buttons do not overwrite the settings [selected in the menu](#). Every next session, the settings from the menu will be applied and the expo-peaking selected with these buttons will be reset.

1.5.2. Manual Exposure Control Mode

1.5.2.1. ISO setting wheel

Allows you to fine tune the ISO setting. The peculiarity of this control is that the values change slowly at the lower values and in larger steps at the higher ones.

1.5.2.2. ISO setting switch

This switch helps you to change the ISO values in half steps. Each successive step increases the value of the previous step by 50%.

1.5.2.3. Exposure mode button

Pressing this button switches the exposure mode to automatic.

1.5.2.4. Shutter speed switch

The switch has three buttons with arrow icons. The up arrow increases the shutter speed by about half a stop, leaving a shutter speed multiple of the frame rate. The down arrow decreases the shutter speed by about half a stop, leaving a shutter speed that is a multiple of your frame rate. If the shutter speed must have a fractional denominator value in order to maintain the multiplicity, the fractional part is discarded. I.e. in the case of 25 fps frame rate, after 1/25 the next shutter speed will be 1/37, not 1/37.5.
The right arrow to the right switches the multiplicity modes. There are a total of three modes of magnification: 24, 25 and 30. In situations where a frequency other than these three is selected, all three modes will be available to be switched by the right arrow. When 24 fps is selected it means that 24 fps is the main mode, and the right arrow makes the other two modes available. In multiples of 25 (25 and 50 fps), only one mode is available to the right - multiples of 30.
The frame rate modes are a tribute to the tradition when shutter speed was determined by the angle of the shutter. The 25 and 30-frame rate modes are an attempt to help get rid of incandescent flicker. 25 for 50 Hz grid (Europe and Russia), 30 for 60 Hz grid (USA).
In the case of incandescent flicker, you must keep in mind that the multiplicity mode helps up to a certain limit, usually not shorter than 1/100. To properly fight the flicker of incandescent lamps, you should choose not only a shutter speed that is a multiple of the mains frequency, but also a frame rate. For Russia and Europe, it is 25 fps and multiples of that. For the U.S. it's 30 fps and multiples of that.
The next thing to keep in mind is that LED lights can have absolutely any flicker frequency. And here the shutter speed is probably not helpful. Here we are talking about the right choice of luminaires.

1.5.2.5. Quick access buttons for exposure control

There are two buttons for quick access to exposure control: [zebra](#) and [false color](#). Both types of exposure control can`t be activated at the same time, each next one disables the previous one.

Note that these buttons do not overwrite the settings [selected in the menu](). Each subsequent session will apply the settings from the menu and reset the expo-peaking selected with these buttons.

1.6. Quick Access Area

At the moment there are only 3 buttons in this area. But in the future their number and their composition may change.

1.6.1. Button of the List of the Available Sensors

Opens a list of available sensors. This list consists of available logical (not physical) cameras that the manufacturer has registered in the device system. We try to make sure that only available and functioning sensors are displayed there, but sometimes a non-working or duplicated sensor may be on the list.
The first time the app runs, it scans for available sensors and saves the list in its settings to speed up subsequent runs.

1.6.1.1. Feature of working with cameras in the application

Each camera in the mcpro24fps application is a separate working unit. Each camera has its own character and its own specific features. Therefore, there are a certain number of settings that are automatically saved within a single camera.
Such as:
- Video resolution (size) and frame rate
- Target frame rate
- Exposure mode and settings
- White balance mode
- Manual white balance preset
- Gamut
- Gamma curve preset
- Focus mode
- Manual focus position
- Manual focus limits
- Automated focus settings
- Manual focus infinity mode
- Zoom position
- Zoom limits
- Auto zoom settings
- Distortion correction
- Hardware noise reduction
- Hardware sharpness
- Hot pixel correction
- Stabilization settings
- GPU noise reduction and GPU sharpness presets
- Presetting GPU gamma curve
- Reverse tonemapping
- Presetting more GPU filters and controls
- Flashlight
- HDR adjustment
- Viewfinder desqueezing
- Video desqueezing
- Type of desqueezing
- Cropping video

- [Grid](#)
- [Adjusting the DOF adapter](#)

This approach is due to the fact that in 99% of cases the secondary sensors are a pathetic semblance of the main sensor. And very often the secondary sensors cannot do even 50% of what the main sensor can do. Consequently, it is impossible to save many settings for all sensors at once.

1.6.1.2. Problems with access to secondary sensors

As of today, it is known that the manufacturer Samsung does not grant access rights to the telelens. There is no hope, and as such there is no hope for 8K from the telelens either.
The manufacturer OnePlus on devices with version 11 of the Android OS does not give access to all of the secondary sensors. According to the latest information, the app must be put on some kind of app whitelist with access to secondary cameras. mcpro24fps is not on that list, and it is not yet known how to get on it.
There have also been noticed problems with the Huawei manufacturer, which may be hiding telelenses.
There are plenty of secondary cameras that carry auxiliary (non-serious) functions. Given that the mcpro24fps app relies on manual control, albeit minimally, some sensors can be discarded due to their complete uselessness or inoperability. All cameras that could be accessed without obvious "duct tapes" are available in the app and work. If there is no camera or it does not work, there is very little chance that a miracle will happen.

1.6.2. Flash Button

If the sensor allows flash on in flashlight mode, you will see this button in your quick access box. The setting is saved automatically for each sensor separately. If you exit the application with the flashlight on, the next time you start the application the flashlight will be on again.

1.6.3. Fast Lock Orientation Button

Duplicates the functionality of the menu item [1.3.2.4.1. Screen orientation](#)

1.7. Indication Area

1.7.1. Battery indicator

Indicator showing the remaining charge. Refreshed once every two minutes. It is not possible to turn on or off separately this indicator.

1.7.2. Available Space Indicator

Indicator that shows the remaining available space. It is updated every two minutes. As for available space, the application does not let you fill the last gigabyte. The remaining space is displayed with this limit in mind.

1.7.3. Audio Level Indicator

Green color of the indicator means that at this moment the sound is recorded at normal level. The yellow color of the indicator shows that the sound is approaching the -3dB limit. Red indicates that the sound level is at the overdrive level, above -3dB. The sound level indicator can be turned on in menu 1.3.2.1.19. Audio level indicator, there you can read a more detailed description of its location.

1.7.4. Histogram

The histogram consists of two parts. One part is the histogram itself. The second is the false color diagram. The diagram shows the ratio of the false color brightnesses to the histogram brightnesses, to make it easier to navigate through the false color colors.
A single tap on the histogram changes the histogram type (luminance, RGB).

1.7.5. Scene Temperature Indicator

Displays the scene temperature in the frame. Calculated by averaging the pixels. Note that the indicator does not display the selected settings; it works like a thermometer, measuring the scene temperature.
You can read more about the temperature indicator in section 1.3.2.1.8. Temperature of scene (before the viewfinder LUT).

1.7.6. "LUT" Indicator

This indicator turns on when the on-screen LUT is in use. A single tap this indicator disables or enables the on-screen LUT. If the LUT is on, the indicator glows red; if the LUT is off, the indicator glows gray. If the on-screen LUT is disabled in the settings or cannot be applied, the indicator is not displayed.
You can read more about the on-screen LUT in section 1.3.2.1.2 On-screen LUT (if possible).

1.7.7. Target Frame Rate Indicator

Displayed when a target frame rate other than frame rate is selected in the video settings. You can read more about target rate in section [1.3.3.3.2. Target framerate (no audio in MP4)](#).

1.7.8. The "R" Indicator

Indicates that recording is currently in progress. When the recording is stopped it turns off.

1.7.9. "Bluetooth" Indicator

Appears when the application is using Bluetooth connection with a device.

1.8. Window with Basic Settings Information

This window displays the information which was selected in the settings in section

2. Technical Features of the Application

2.1. Memory Buffer

For smoother video recording at high bitrates when the storage can become a bottleneck, the application has implemented temporary storage of frames in the main memory of the device. When the buffer is full the information is transferred to the MP4 container. Using the buffer allows you to trim files more accurately when recording with division into files.
Attention! Using the buffer creates a pause when you stop recording. All the time until the record button turns gray again, the buffer transfers the information to the MP4 container. If a memory card is used for recording, the pause time can increase several times.

2.2. Working with the GPU

The main feature of the GPU, in addition to the fact that it increases the load on the device many times, is that it is impossible to process 10 bits through the GPU.

2.3. 10 Bits

10 bits for third-party applications are available on these devices:
Asus Snapdragon 855/865/888
Samsung Snapdragon 855/865/888, Exynos starting from S10e with OneUI 2.5 and above
Sony Snapdragon 855/888
LG starting with V35
Nokia 9 PV
OnePlus 7 Android 11, OnePlus 8 and up
Oppo Find X2 (not confirmed)
Xiaomi Snapdragon 855/865/888, Snapdragon 845 only Android 9 (several models)

In the application mcpro24fps almost every device availability of 10 bits is enabled only after the tests of the device to support 10 bits. The reason for this - the manufacturers' statements about 10-bit support in the technical information of the device, but the actual absence of it.

2.4. 60 Frames per Second

Many users who have seen the ability to record at 60 fps in their native apps have suddenly decided that their devices can stably shoot in this mode in any conditions, at any settings.
As of today there is no Android device on which this mode was officially open for third-party apps and would work without any problems.
A couple of examples to better understand the problem.
The LG G7 can shoot at 60 fps only when hardware sharpening is activated. Even if you ignore the fact that 60 fps is not available to third-party apps and is implemented through "duct tapes", the device shoots at 57-58 fps when hardware sharpness is disabled.
Sony Xperia 1 (5) - the first device from Sony, which appeared conditionally official 60 fps. But they only work in auto exposure mode and very conventionally, according to the mood.
The Samsung S20/S21 on Snapdragon processors have no official 60 fps, and the 60 fps mode (enabled through "duct tapes") forces the device to reboot. Things are much better on Samsung Exynos devices. There the device not only does not reboot, but the mode itself is pretty workable.
Xiaomi Redmi Note 8 Pro does not allow to run 60 fps. And one of the reasons for this, it seems to us, is the MediaTek processor.

Often users refer to native apps or gcam. For such users we have section [2.6. The native application (stock) has...](#)

2.5. Saving Settings

For the present day, almost all settings are automatically saved. Given that secondary sensors are often very different from the primary sensor in terms of capabilities, the app saves many of the settings related to image or sensor control separately for each sensor.
There is currently no mechanism in the app that allows you to save a specific set of settings to a preset. There are modes and settings whose operation would have to be reworked before the implementation of saving a common preset. We know very well that this would be convenient, but "Rome was not built in a day".

2.6. The Native Application (Stock) has...

We are often asked questions that start with "Why doesn't it work..." and end with "It is available in the native app, so the device can!"
The most frequent is "Why doesn't digital stabilization work on Xiaomi?"
We will try to compare writing an app for Android devices with driving a car.

Imagine you are a driver (developer).
You have a car (phone) of the brand N.
It is evening. It is dark. To get to your destination (to record a video), you need the headlights on (digital stabilization).
You like a normal person try to use the standard switch, of course (according to the Camera2 API documentation), and the headlights don't work. The trip doesn't turn out to be the most pleasant.
The next day you go to an authorized service (open the native application) and ask the service worker (examine the code) how to turn on the headlights. The service worker opens the dashboard, under which there are many keyholes, takes out of his wide pants some obscure key, inserts it into one of the wells, turns it and the headlights turn on.
You are of course shocked, but the hope that you can be given this key still lingers. But there is no way! The employee clearly hints that you will not receive any key and that your headlights will work only if you hire the employee to be your driver (use the native application).
And well, if you have seen the key and the well to which it fits. You get angry, but you go around town looking for the same key (you look in the hidden corners of the native app). You find it with some door burglar who makes these keys himself (you understand the code, how it works and where to apply the key). Joyfully you go to the car, insert the key, turn it and watch the mirrors fold as you turn on the headlights. It turns out that the mirrors with headlights can work only if you find a separate key for the mirrors.

That's how on many devices work:
60 frames per second
120/240 frames per second
8K
Digital stabilization
10 bit
Manual focus
And there's definitely more.

GCam modmakers are endlessly busy running around town looking for the right keys to activate certain features. Often their search is limited to a small number of specific vehicles. And let's be honest, they don't care about that turning on your headlights will fold your mirrors.

We are happy when we can find the right keys. But more often the result is the opposite, or we are not satisfied with folding mirrors.

So, if something works in hands of authorized service worker, but not in hands of driver, the reason may be that the service worker doesn't want to share the right key. And in general, thinks that the only driver of your car should be him. And before you resent the inaccessibility of the function, it makes sense to make sure that the car manufacturer has made all the switches (Camera2 API settings) where they should be located, and that they work the way they should work (according to the Camera2 API documentation).

2.7. The Best Mobile Video Recorder

Usually in such cases we say: "The best is the device, that you have in your pocket." But users are not satisfied with this answer.

The honest answer is less positive than the one above. And it sounds like "There is no such thing as the best, if we're talking about Android devices." Every Android device has some set of problems that one user will be willing to put up with, but which may be completely rejected by another.

The most basic problem with all Android devices is that manufacturers praise their smartphones in the context of native apps only. When a manufacturer says a new device will have 60/120/240 fps mode, they are talking exclusively about their native camera app. When the manufacturer says that the new device will have 10-bit recording support, they are talking exclusively about their native camera app. When a manufacturer talks about a special HDR mode that captures a huge dynamic range, rest assured they are talking exclusively about their native camera app. Android device manufacturers are not interested in what their device can do with third-party apps. They don't think about letting third-party developers create powerful tools that work correctly on their devices.

Samsung and Huawei tried to give third-party developers access to unique features through their own API. As a result, Samsung abandoned that idea in favor of the standard Camera2 API, but abandoned it in a way that deprived third-party developers of even fairly standard features. Huawei decided to create its own API after the problems with the sanctions. But that didn't work either. The problem with this approach is that using the API data, you can't do anything better than native app. And combining both the Camera2 API and the API from the manufacturer is difficult, double work.

What does the perfect mobile video device look like?
1. All three camera sensors have the same capabilities. If 60 fps is available, it is available on all sensors. White balance calibration is the same on all sensors. And so on.
2. All basic frequencies 24, 25, 30, 48, 50, 60, 100, 120, 200, 240 fps are available. And all frequencies work steadily.
3. Manual WB works without any problems.
4. Autofocus and manual focus work without problems. Have the same range of travel without any "duct tape".
5. No problems with auto exposure and manual exposure. Have the same range for both ISO and shutter speed, without any "duct tape". It is important that the exposure does not differ between 8 and 10-bit modes.
6. HDR mode is available to turn on without any "duct tape".
7. All the camera sensor settings documented in the Camera2 API are available and work. At least if they are available, they work.
8. All codec settings documented in the Android API are available and work.
9. Good cooling.
10. 10-bit recording in 4:2:2 would be a huge advantage.

2.7.1. Samsung.

Does not allow access to the telephoto lens module on any of its devices. So 8K is not available for third-party apps, the telephoto lens module is responsible for this.
Tone curve (gamma curves) may not work on younger models.
Problems with hardware noise reduction in 10-bit mode. There are a lot of complaints.
There are problems with electronic stabilization, does not work.

2.7.1.1. Exynos.

Problem with the number of tone curve points on all devices starting with the S6. We have only 32 points available to us, which makes the logarithmic curves work ugly. We have to adjust the density of tone curve points.
On the S20 and S21, the exposure of the frame changes when the exposure is locked. Correcting this problem with "duct tape" leads to the fact that zoom stops working.

2.7.1.2. Snapdragon

The problem with 60 fps mode. On S20 and S21 devices this mode makes the device to reboot.

2.7.2. OnePlus

On all devices of this manufacturer there are problems with frame rates 24 and 25 fps, does not work. On all devices of this manufacturer there are problems with electronic stabilization, it does not work. On the OnePlus 7 and 8 with Android 11, access to the secondary modules have been closed. Only the primary rear and front-facing are available. Also on Android 11 appeared pobblems with 48, 50, 60 fps, on some devices there was only one working frecuency - 30 fps. On some devices, not very modern and modern mid-range, there are problems with automatic focus, exposure and white balance working at the same time with the manual mode of any of these functions. For example, selecting manual focus and auto exposure at the same time can stop automatic exposure from working. Or selecting manual exposure can stop the auto focus from working. There is no cure for this, it is a feature of the camera's libraries.

2.7.3. Xiaomi

On all devices of this manufacturer there is a problem with electronic stabilization, it does not work. Where optical stabilization is available, the problem can also be observed. On devices on the MediaTek processor there may be a problem with the tone curve (gamma curves). 60 fps is available mainly only on flagman devices.

2.7.4. Redmi

All the problems of the manufacturer Xiaomi. In addition, on some devices working with the tone curve (gamma curves) can be observed greens in the shadows. 60k/s has been available since the Note 9 Pro. There were previously some individual devices with 60k/s, but these are rather exceptions to the rule.

2.7.5. Huawei.

All devices (except last) of this manufacturer have problems with frame rates of 24 and 25 fps, does not work. On all devices with RYYB sensors there are problems with manual white balance, it does not work. Manual white balance affects the operation of the gamuts.
On individual devices you can observe the problem of the tone curve not working (gamma curves).
On a large number of devices, hardware sharpness and optical stabilization cannot be turned off.

2.7.6. Sony

On devices before Xperia 1, 24 and 25 fps are not available, working only in manual exposure mode. 60 fps has only been available since the Xperia 1 II. On the Xperia 1, 60 fps only worked in 1080p auto exposure mode.
On the Xperia 1 II and above, turning on 60 fps and above in resolutions above 1080p causes the zoom to break, it stops working.
Almost all of this manufacturer's devices get very warm when recording. At some point, the heating reaches a critical level, and frames start dropping out in large quantities. The exception may be Xperia Pro, there the manufacturer has worked on cooling system.

2.7.7. Google

60 fps on the latest models are activated only when using the GPU. Before the release of Android 11 on devices of the Pixel 4 and 5 family there were problems with the tone curve (gamma curves), it did not work.

2.7.8. LG

One of the most "duct tapes" manufacturers. A lot of functions available in mcpro24fps are implemented by workarounds. Thankfully their implementation, unlike other manufacturers, is not so difficult.
On some devices, not very modern and modern middle segment, there are problems with automatic focus, exposition and white balance working at the same time with the manual mode of any of these functions. For example, selecting manual focus and auto exposure at the same time can stop automatic exposure from working. Or selecting manual exposure can stop the auto focus from working. There is no cure for this, it is a feature of the camera's libraries.
Turning off hardware sharpness drops the 60 fps to 57-58 fps.
There are problems with electronic stabilization, it does not work.

2.8. Zooming in on the Focus Subject with a Double Tap

This function is only available in manual focus mode and is activated by double-tapping the subject in focus. This function is designed to bring the subject into focus instantly by magnifying the viewfinder image four times (2x zoom). The image quality of the zoomed-in part of the viewfinder depends on the resolution of the viewfinder. If you want higher quality, you have the option of using the appropriate viewfinder resolution setting.

The function keeps track of where you double tap. And it zooms in exactly to that location. For this reason, viewfinder magnification was chosen to implement this function, rather than the quality zoom on the sensor. Zooming in on the sensor on most devices is only possible in the middle, and does not give the advantage of zooming in to any point on the viewfinder image. When this function is activated, the stroke of the manual focus ring is doubled, i.e., the orange working area becomes twice as large. In this state, the black focus position indicator may extend beyond the screen.

This function may conflict with the setting of hiding individual interface blocks, because hiding interface blocks is done by touching.

2.9. 4:2:2

Dream big, bro!

This subsampling is not currently available on Android devices.

2.10. Recording in RAW format

Keep up the good work! Do not stop!
Theoretically it is possible, but it is estimated that the medium will not be able to hold that much data. This sounds more like a science experiment, so it is unlikely to be implemented in mcpro24fps.

2.11. Support for External Stabilizers

Support for external stabilizers is currently on hold. Each manufacturer hide communication protocols from third-party applications. This why, implementation of support has proven to be a complex and time-consuming task for preparation and planning.

It is possible to activate start/stop recording, if the stabilizer presses its button and imitates pressing the volume buttons. To do this, select the appropriate value in paragraph 1.3.2.2.6. Volume buttons.

Afterword

That's all!

Now we are sure that you, as the user, will be able to use the full potential of the mcpro24fps application!

In spite the fact, that a lot has been written about the nuances, difficulties and limitations associated with the features of the Android OS and the behavior of device developers, we don't want to lose the main thing:

First of all, the art of filmmaking is about the talent, perseverance, passion and desire of the author to speak out. It`s about everything that flows straight from the heart of the creator to the viewer, prompts him to empathize with what is happening on the screen.

Let mcpro24fps become a reliable and versatile tool for your creative achievements and victories in the world of mobile cinema!

Best regards, mcpro24fps team.

P.S.

If you are reading these lines, then you are definitely one of those people who on the way to your goal goes to the end. This means that creative victories are just around the corner! Well, we certainly did not spend so much time in vain to write this detailed manual.

If you like the app and what we do - support us with five stars and write a short review! This will definitely inspire us to develop this project further.

If you mark your videos with the hashtag #mcpro24fps, then we will definitely find them on the net and we will be glad at your success. And maybe we will post them in a special playlist on our YouTube channel.

If you need any help or want to share your thoughts, write us at info@mcpro24fps.com, in Telegram chat or on Facebook Page.