

360° video user guide



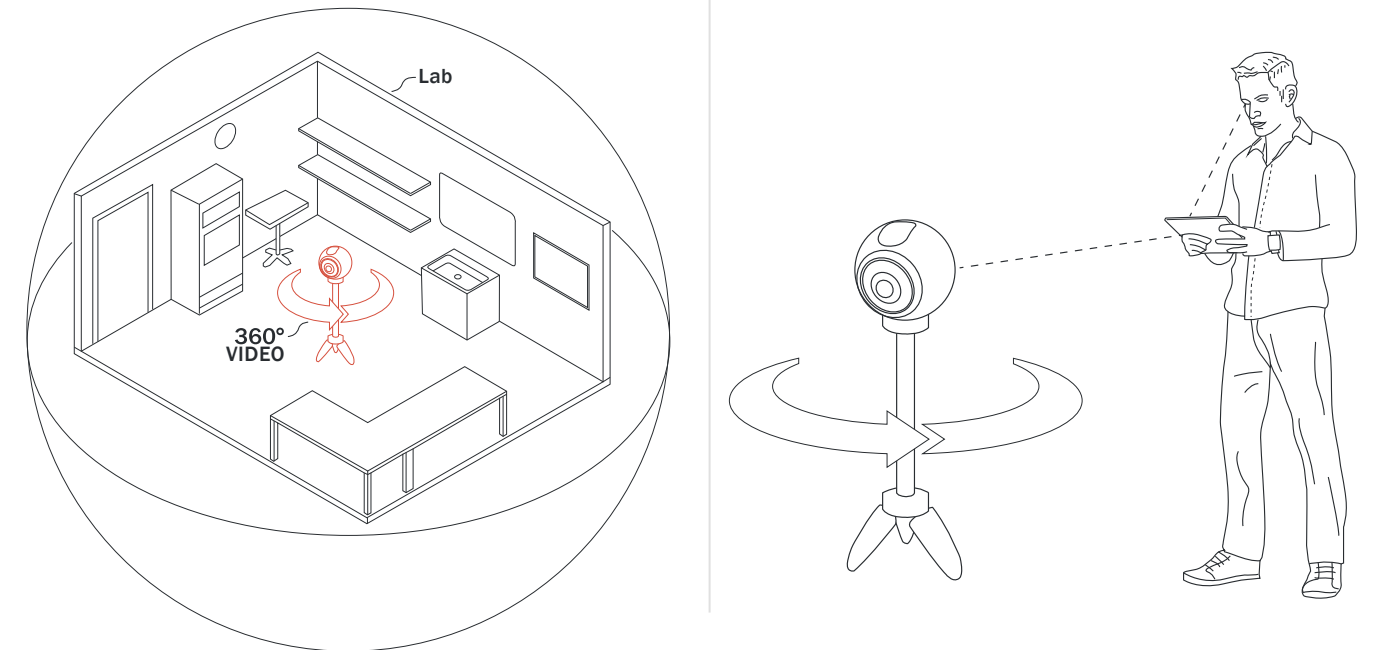
WHO IS THE INTENDED AUDIENCE OF THIS DOCUMENT?

This document provides basic information on producing 360° video using consumer-oriented equipment. It will discuss what is important to know when shooting 360 ° video, like camera position, etc. The document will also say something about post production such as editing and exporting.



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WHAT IS 360° VIDEO?

360° video is a new way to experience video. It puts the viewer in the center of the story with the opportunities and limitations that brings. In traditional video, we have the opportunity to put together sequences of images that tell a story that the audience immediately understands. In 360° video this is different, as the viewer is free to choose where to look in the 360° environment. This gives the video producer less control when it comes to directing the viewer's attention.

360° video itself is still just video, which means that it is not possible to change the viewers position in a 3D-space. It is a spherical projection of a 2D image, which gives the impression of a 360° field of view. It is only possible to pan around the video, and there is no interaction. This is perhaps the biggest limitation to 360° video. This limitation is especially noticeable when using a VR headset to watch the 360° video. The immersive experience of a VR headset, may give the viewer a stronger feeling of wanting to interact, which is not possible. 360° video in itself often works best when the viewer is a passive observer, but with an added layer of interactivity, the viewer can become an active participant.

360° video is recorded with a camera specially designed for this purpose. The camera usually consists of two or more wide-angle lenses pointing in different directions to capture everything happening around the camera.

The difference between 360° video, 360° 3D-video, 360° Virtual Tours, VR, AR and MR

It is important to distinguish between the different concepts that are closely related to 360° video. Here are a few examples:

360° VIDEO

A “spherical” video, which in practice means a large panoramic video where the viewer can pan around. The video is not interactive and has no depth in a 3D space. Most browsers support playback of 360° videos and the viewer can pan around by clicking and dragging. Alternatively, you can use a mobile phone and point it in the direction you want to look. The best experience of a 360° video is achieved by using a Virtual Reality (VR) headset.

360° 3D VIDEO

In 360° 3D video, the camera has at least two lenses side by side, to recreate the gap between the eyes. When watching 3D video, the viewer eyes sees two slightly offset images, which gives the impression of depth in the video. But if the viewer tries to lean forward, the illusion quickly fades, because there is no actual depth in the video. Only specific 3D screens or VR headsets can be used to reproduce this effect.

360° VIRTUAL TOUR

A 360° virtual tour is 360°-video taken a step further. A layer of interactivity is added to create a more immersive experience, where the user, by using a dedicated software (i.e. webbrowser), can point and click to explore 360° videos and still images. Examples of use is virtual tours of museums, real estate and so on.

VIRTUAL REALITY (VR)

In VR or virtual reality, computer technology is used to create a simulated environment. The most advanced VR is based on computer generated graphics, which gives the possibility to explore and interact with the virtual environment. Video games is taking fully advantage of this, and really creates an immersive experience.

AUGMENTED REALITY (AR)

AR lets the user see the reality with an layer of added information, for example when using the camera on a mobile phone.

MIXED REALITY (MR)

MR is a mixture of the real and virtual world, for example, to create new environments and visualizations, where physical and digital objects coexist and interact.

PREPARING TO RECORD

Before recording, there are a few things to think about and prepare for. The first question to ask is, “What is the purpose of this video?” Once you have figured this out, you should also think about whether this should be a 360° video, or whether the message and purpose are better achieved through the use of traditional video.

THE STORY

Stories and emotions are effective for learning. Dramaturgy and storytelling will make the film more interesting and give the viewer greater learning outcome.

RECORDING

The camera is a tool for learning how to see without a camera
- Dorothea Lange

Here are a few tips when it comes to recording, what kind of equipment is needed, what settings you should have on the camera, where to place the camera and a little about audio recording.

EQUIPMENT

This is the basic equipment you need:

- 360° video camera (In this user guide a Insta360 One R Twin is used)
- Camera battery
- Camera memory card (MicroSD)
- Tripod (preferably with a level)

Additional equipment, which is convenient:

- Mobile phone with app installed for monitoring
- External audio recorder
- Lavalier microphone
- Headset

Make sure all batteries are charged, memory cards are formatted and that everything is working properly.

CAMERA SETTINGS

Recommended camera settings (Insta360 One R Twin):

- Resolution: 5.7K
- Framerate: 30
- File format: h.265
- Shutter: 1/60 (1/50 if you notice any flickering when shooting, ie. from a computer screen, or fluorescent lighting)
- ISO: Adjusted to the room's lighting, but as low as possible.
- LOG: OFF - (Advanced users can select ON and apply LUT afterwards)

CAMERA POSITION

In order for the viewer to get the best possible experience of the content, it is important to place the camera in the right position. A 360-degree camera consists of several lenses, from which the video will be stitched together. In this process, objects, which are placed very close to the camera, might be distorted.

Here are some guidelines when it comes to camera position:

- Think about where you would be to observe the action, and use that position as a starting point.
- Position the camera so that one lens points the way the main action will take place. Try to avoid that important parts of the action take place at the sides of the camera (in-between lenses), in the so-called stitch line.
- Make sure the camera is at least one meter away from the nearest person/object/hand, etc.
- Make sure the camera is leveled. Use the Insta360 app to check that the camera is leveled all the way around.
- Use a tripod and place the camera at eye level. That is, approx. 170 cm/5.6 feet above the ground. If the action occurs while sitting, place the camera at a sitting eye level. If any of the action occurs both sitting and standing, place the camera at eye level where the main action takes place.
- Do not move camera while recording.
- Remember to get out of sight when recording; if you can see the camera, the camera sees you.

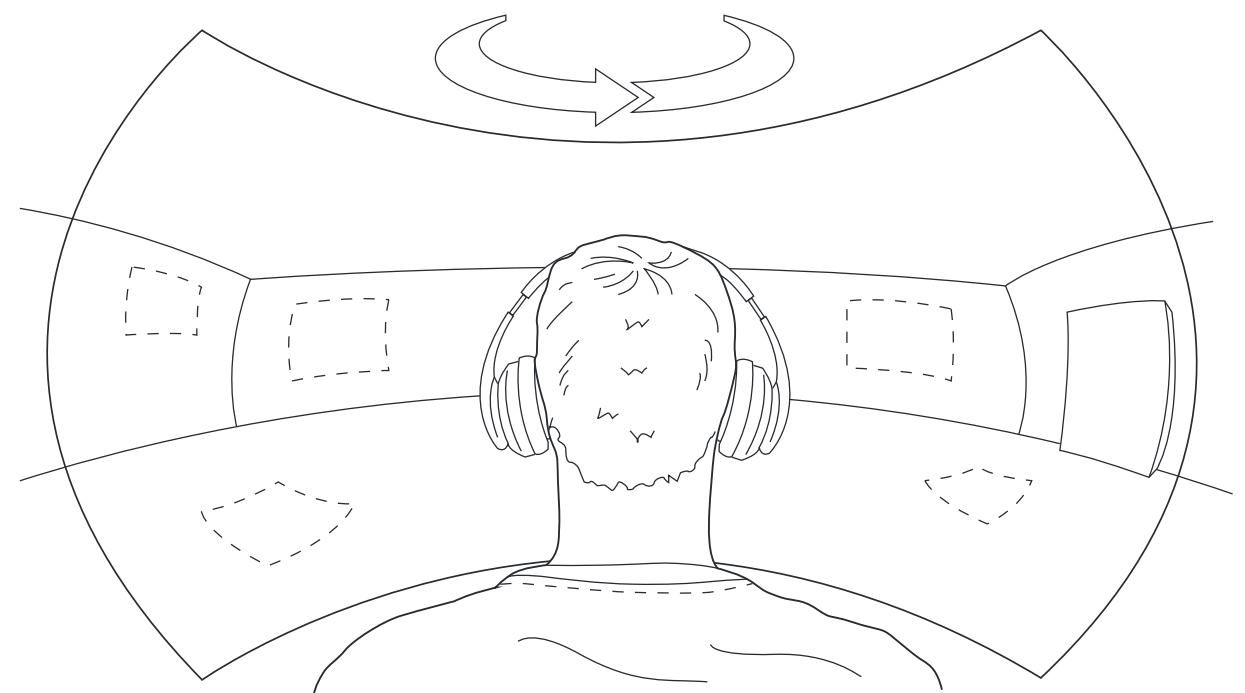
AUDIO

The audio quality from the camera's microphone is rarely very good, so an external microphone is needed to achieve high quality sound. Since the camera is filming in 360 degrees, it is difficult to hide microphones and audio technicians. Use of lavalier microphones is therefore recommended.

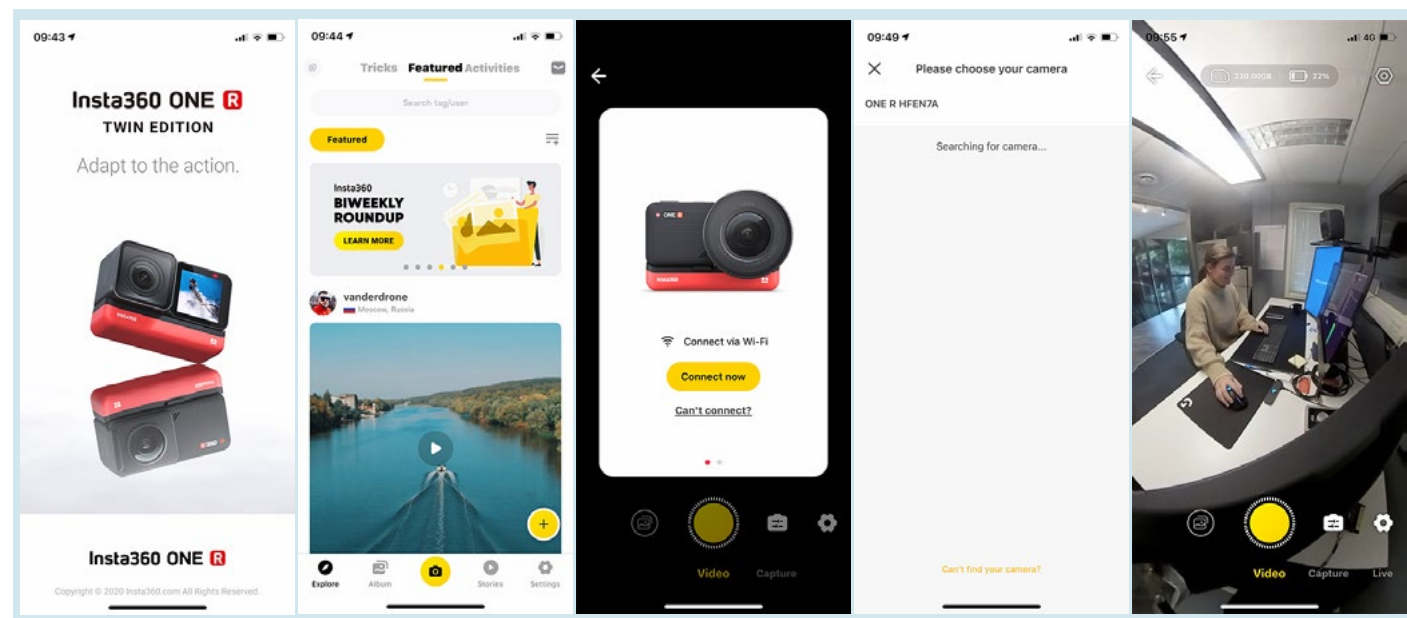
Small microphone receivers can be placed on top of the Insta360 One R Twin. Red Wireless GO is an example of this. A USB-C to 3.5mm jack adapter cable is needed. If you have multiple microphones, you have to use an external audio recorder.

Here are a few things to think about to improve sound quality when recording:

- Place the lavalier microphone approx. 15 cm from the mouth.
- Direct the microphone towards the mouth.
- Use a headset to monitor the sound.
- Hide all cables inside clothing, but make sure the microphone is not covered. If the microphone rubs against clothing, it will create noise.
- Remember to press record on both the camera equipment and the sound equipment.
- If you are using an external sound recorder, do a "sync-clap", where one of the participants clap their hand together when both the camera and the sound equipment is recording. This will make it easier to sync the clips in post-production.



INSTA360 ONE R APP FOR IOS AND ANDROID



With the Insta360 app, you can watch live feed from the camera, change settings and start recording with your mobile device. Here's a brief overview of the app. For more detailed information, see insta360's web site.

Turn on the camera and connect the Wi-Fi to the camera. Open the app and press the yellow camera button in the bottom centre. Select your camera from the list.

Now you'll get a live view from the camera. Touch and drag to look around. At the top of the screen you can see how much storage space is left on the memory card and also remaining battery time. You can also change settings, start recording, and view previous recordings. For more detailed information about the app, see [insta360.com/support](https://www.insta360.com/support).

POST PRODUCTION

I love editing. It's one of my favorite parts of filmmaking.
- *Steven Spielberg*

In the editing process, there are a few things to be aware of when editing 360 ° video. In traditional video you can use different cuts, cutting rhythm, etc. to tell the story in a good and effective way. 360° video does not offer the same opportunity. As a storyteller you have no control over where the viewer chooses to look. A cut in the video will potentially be disorienting and may drag the viewer out of the story and break the immersion. Therefore, it is recommended to have no or very few cuts in a 360° video.

TRANSFER RECORDED FILES TO HARD DRIVE

In order to import the video files, you need a memory card reader or a USB cable to connect the computer directly to the camera. Transfer and organize the video files in folders with date and name. Good naming conventions is key to finding your material at a later point.

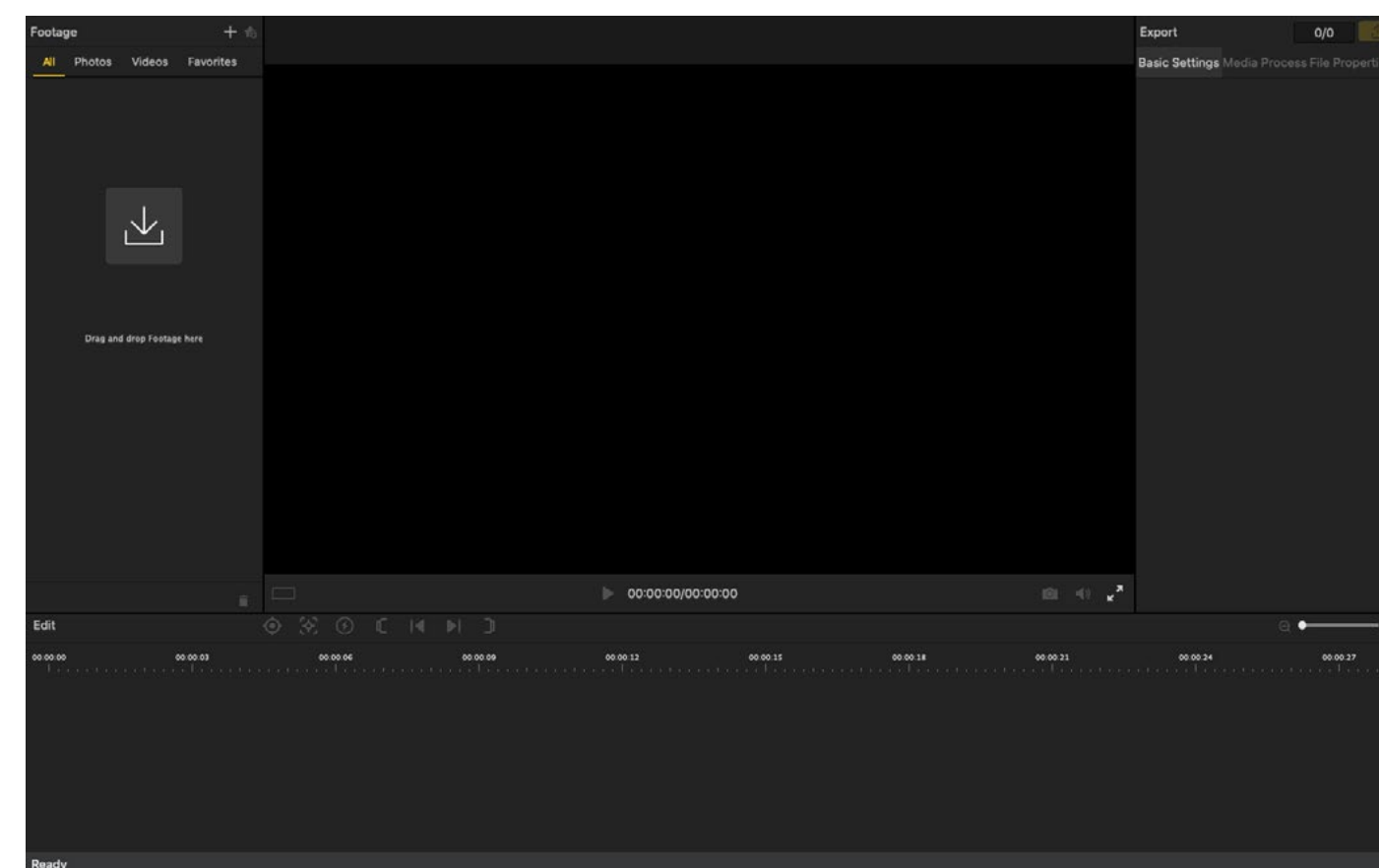
SOFTWARE

There is various software for editing 360° video material. This user guide will give more details about three of them: Insta360 Studio (Windows/Mac), Adobe Premiere Pro (Windows/Mac) and DaVince Resolve (Windows/Mac/Linux).

Download Insta360 Studio and plug-in for Adobe Premiere Pro, for free here:
<https://www.insta360.com/download>.

INSTA360 STUDIO 2020

Insta360 Studio 2020 is Insta360's own software to create and edit simple 360-videos. The software is very limited and is recommended only for simple edits and exports. If you have a need to add a graphic layer or adjust the horizon and so on, Adobe Premiere Pro or DaVince Resolve may be a better fit.



IMPORT FILES

Click on the icon to the left beneath “footage” to import video files, or drag and drop the video files directly in to the footage tab. A list of the imported files will now appear on the left side. Double click the file you want to edit, to open it in the timeline.

EDITING

The timeline is located at the bottom with the file you have chosen. You can drag the yellow handles to choose where the video clip should start and end.

SETTINGS

On the right side there is a couple of settings that may be adjusted.

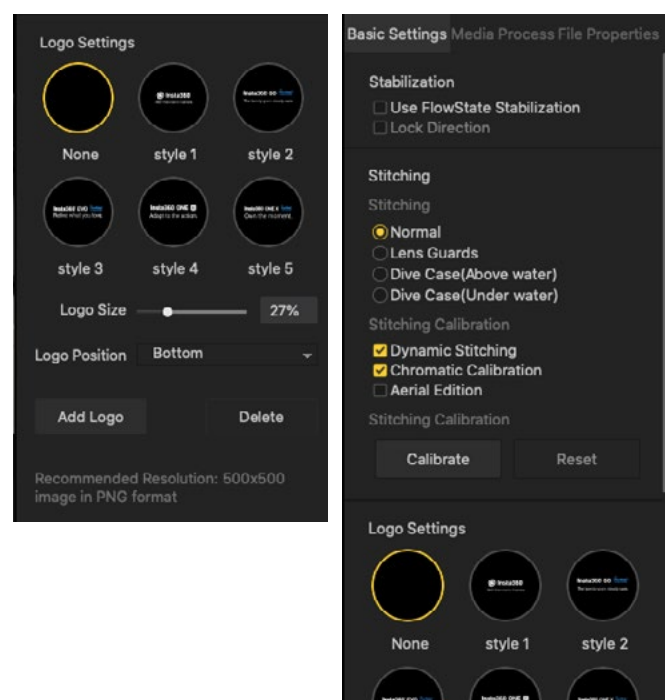
- Use Flowstate Stabilization – This should only be checked off if there was any camera movement in the shot. If the camera was on a tripod during shooting, this should not be checked.
- Stitching – Normal
- Stitching Optimization – should be checked off for Dynamic stitching and Chromaticcalibration
- True Audio – Off
- Play Rate – None

NADIR-LOGO

To hide the tripod at the bottom of the clip, you can add a logo to overlap the image. This is done by using the “Nadir Logo”. The logo should be 500x500 pixels and in a PNG-format.

EXPORT

It is important to choose the right settings when exporting. As a main rule, you should create three different versions of the edited movie. One compressed movie for publishing, one high quality file for archiving and one high quality file without graphics.



Press the yellow export-button. A list of choices will now appear. These are some recommended settings (you should fit these to your own needs):

Video for publishing

- Resolution: 5760x2880
- Bitrate: 60 mbps
- Encoding format: H264
- Export type: Video
- AI effects: None

Master in high quality:

Same as the other settings, except for bitrate.

- Bitrate: 200 mbps

Clean version:

This video should be without any graphical elements.

- Bitrate: 200 mbps

Good naming convention is again key.

For example:

YYYYMMDD – PROJECT NAME – MASTER H264/MASTER/MASTER CLEAN – AUTHOR

20201010 – 360 NURSING HOME - MASTER

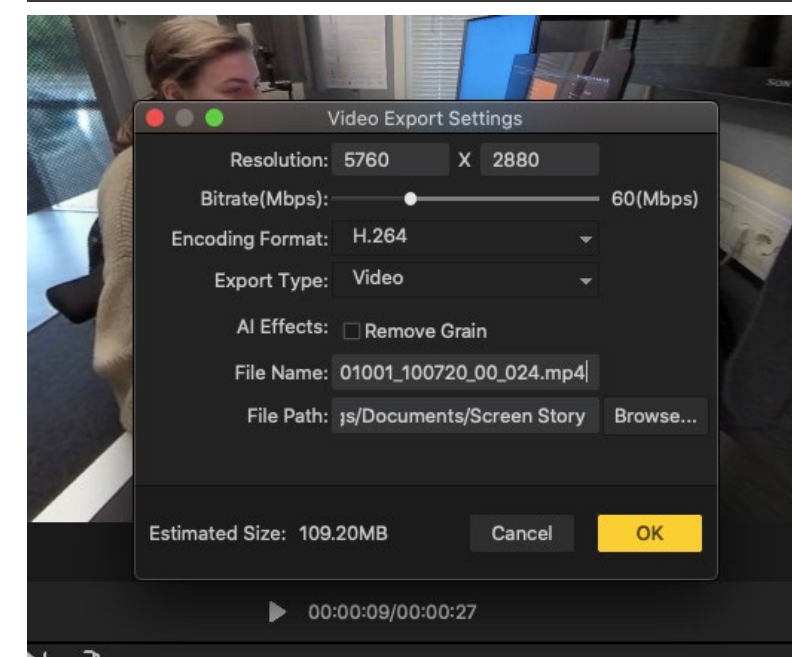
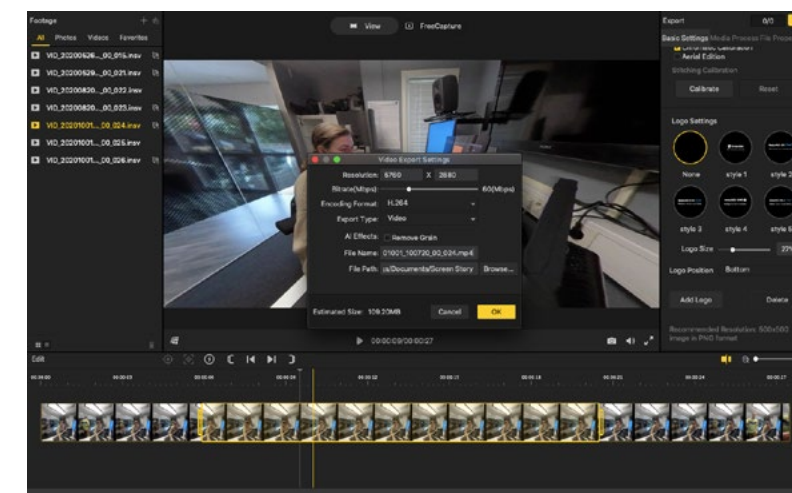
VIDEO TUTORIAL

For more information on the software see: [Insta360 Studio 2020](https://www.insta360.com/support/supportcourse?post_id=17067&locale=en-us)

REFRAMING

With the reframing tool, you can edit the starting viewpoint, so that the viewer doesn't have to start by finding where the action is. Follow this guide on how to do it:

https://www.insta360.com/support/supportcourse?post_id=17067&locale=en-us



ADOBE PREMIERE PRO

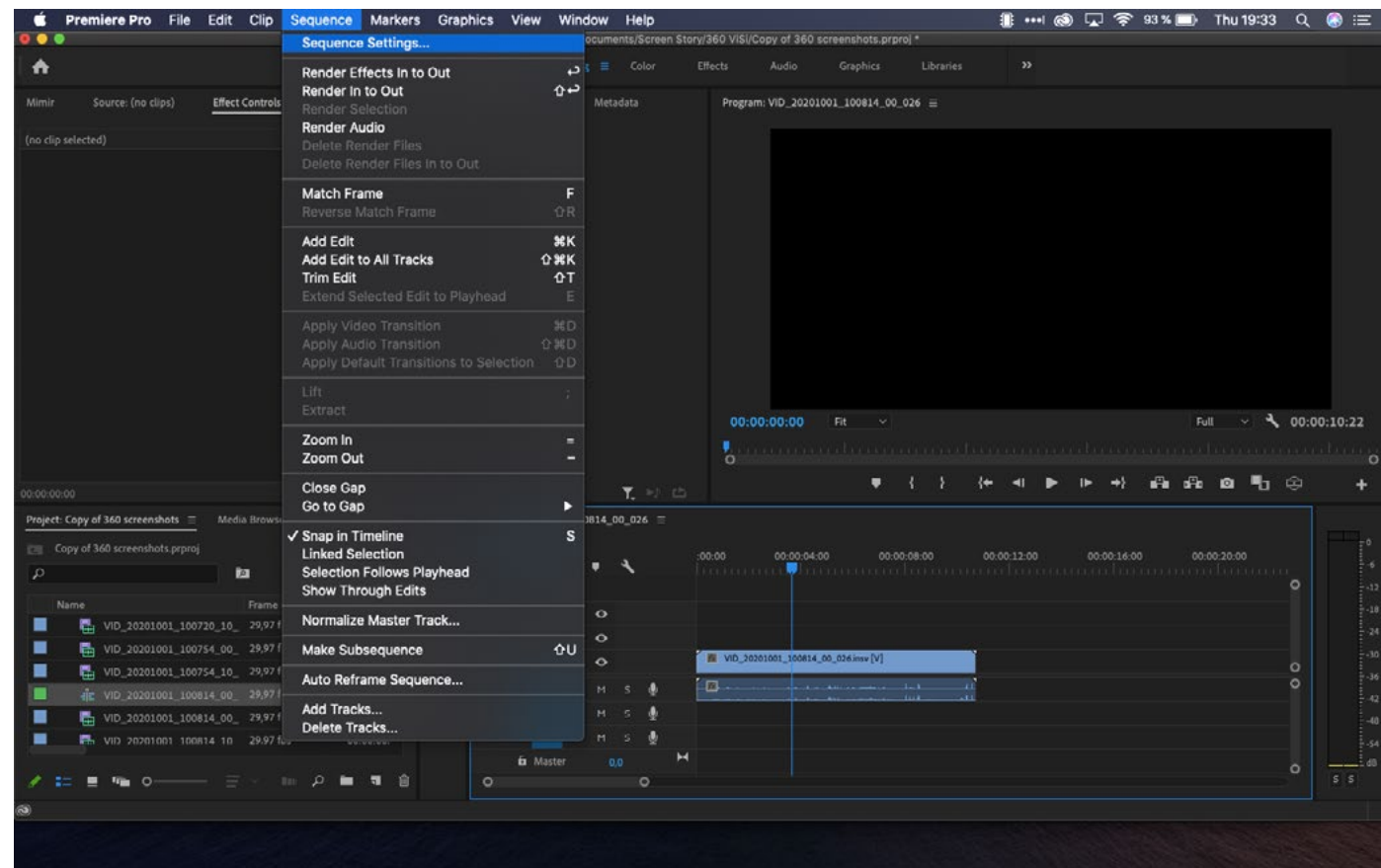
Working with 360-video in Premiere Pro is very similar to editing traditional video. You are still using regular “flat” video, which you can choose to view in 360 degrees by using built-in tools in Premiere Pro CC2017 and onwards. Premiere also has its own VR-filters for use with 360-video. Here you will get a short summary on how to edit 360-video in Premiere Pro.

For more information on Premiere Pro, visit Adobes pages:
<https://helpx.adobe.com/premiere-pro/kb/work-with-vr.html>

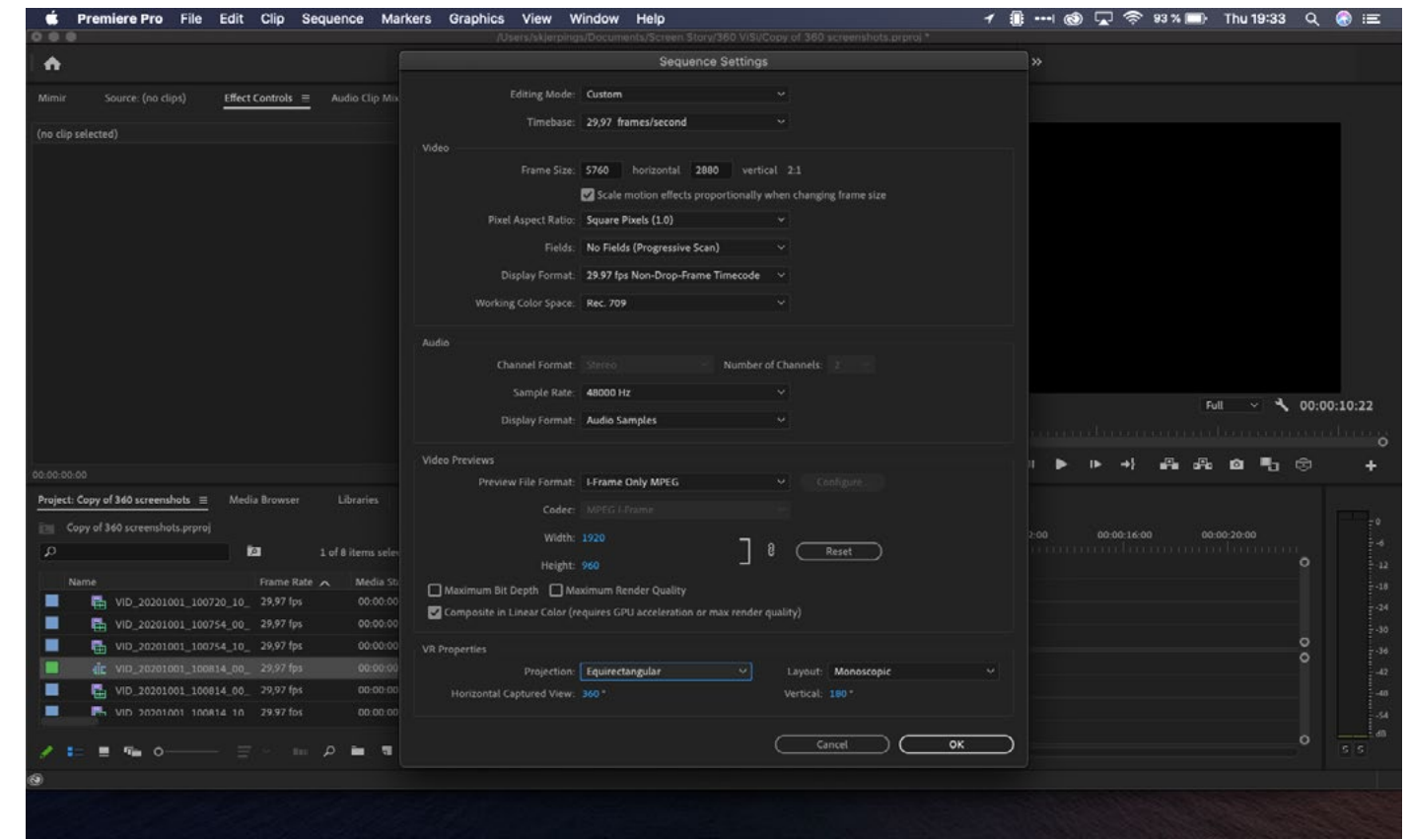
We expect you to have some background knowledge on Premiere Pro.

IMPORTING FILES AND SETTINGS

Importing files is done in the same way as always with Premiere, for example by using “Media browser”. When the video files are imported, create a new sequence and drag the video clip you want to edit, in to the sequence.

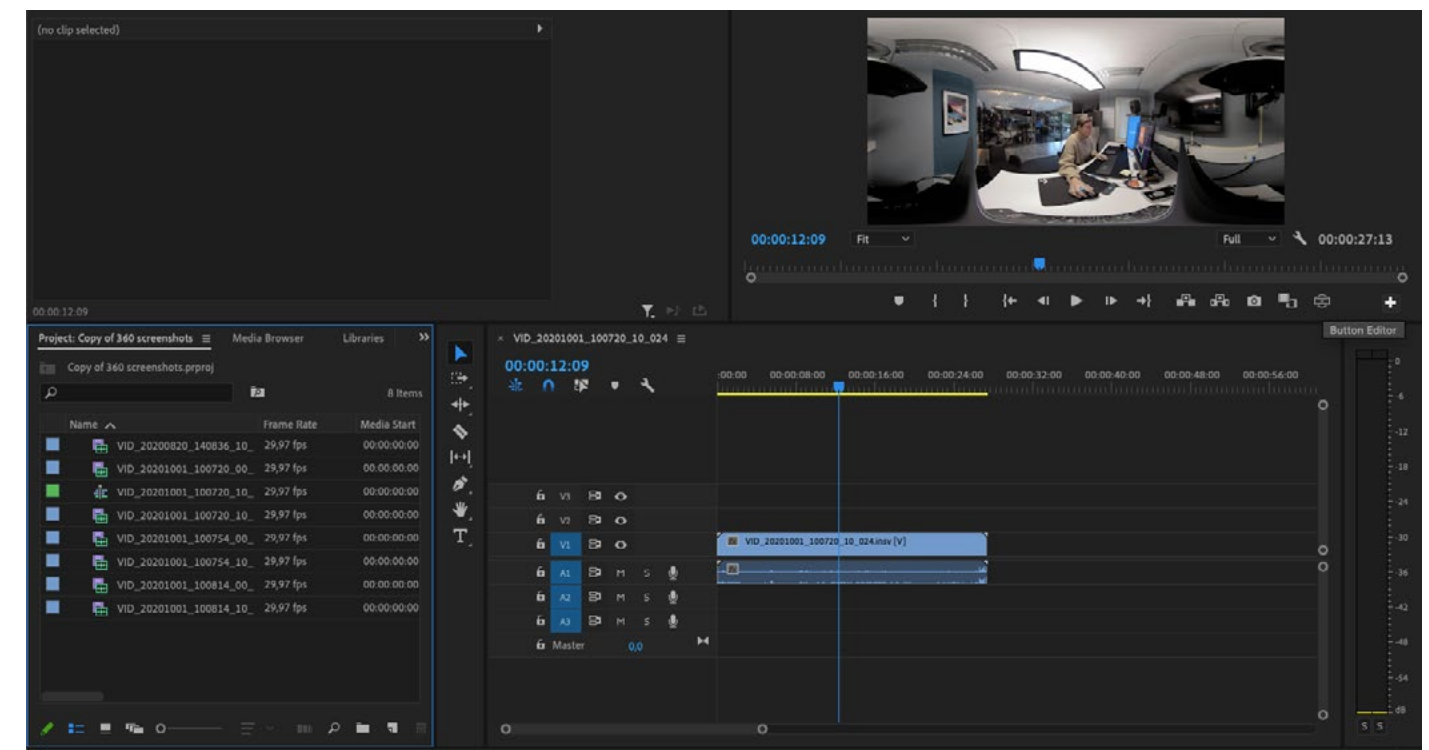


Premiere will ask if you want to use the settings from the file, choose “yes”. If it is not correct, you can manually change the settings by going to “Sequence settings”. At the bottom there is a section with “VR Properties”.

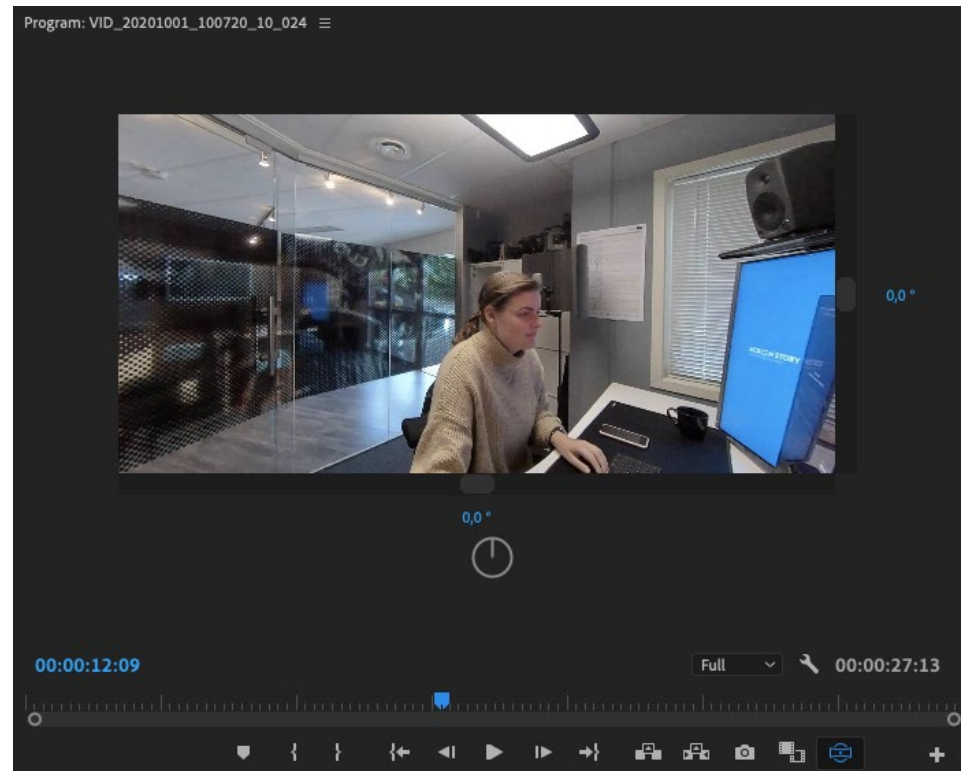


Here you can choose the kind of 360 video, and if it is “monoscopic” (2D) or “stereoscopic” (3D). As a rule of thumb, the settings will be “equirectangular” and “monoscopic”. Choose OK to confirm.

To view the video in VR, press the plus icon at the bottom of the player window. Add the button called “Toggle VR Video Display”.

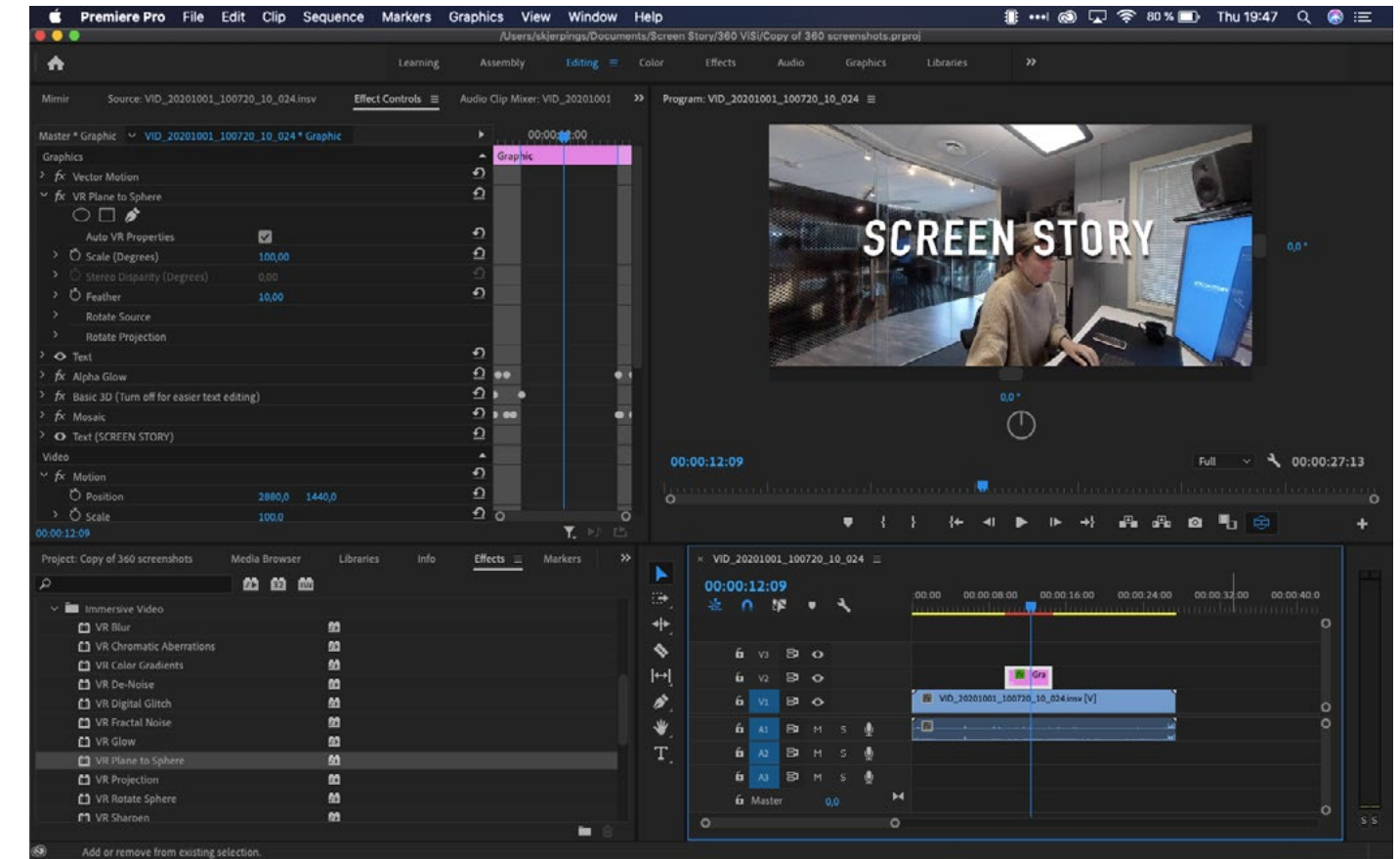
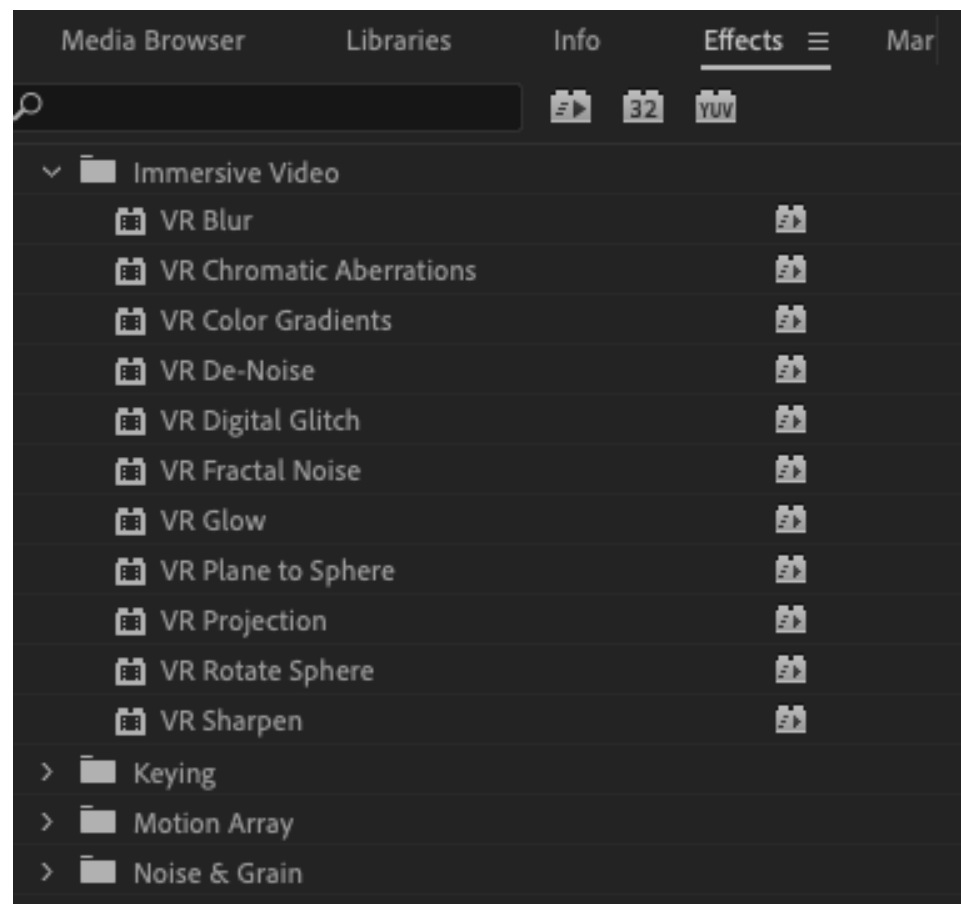


With this button you can choose to preview the video as it would in a final product.



EFFECTS

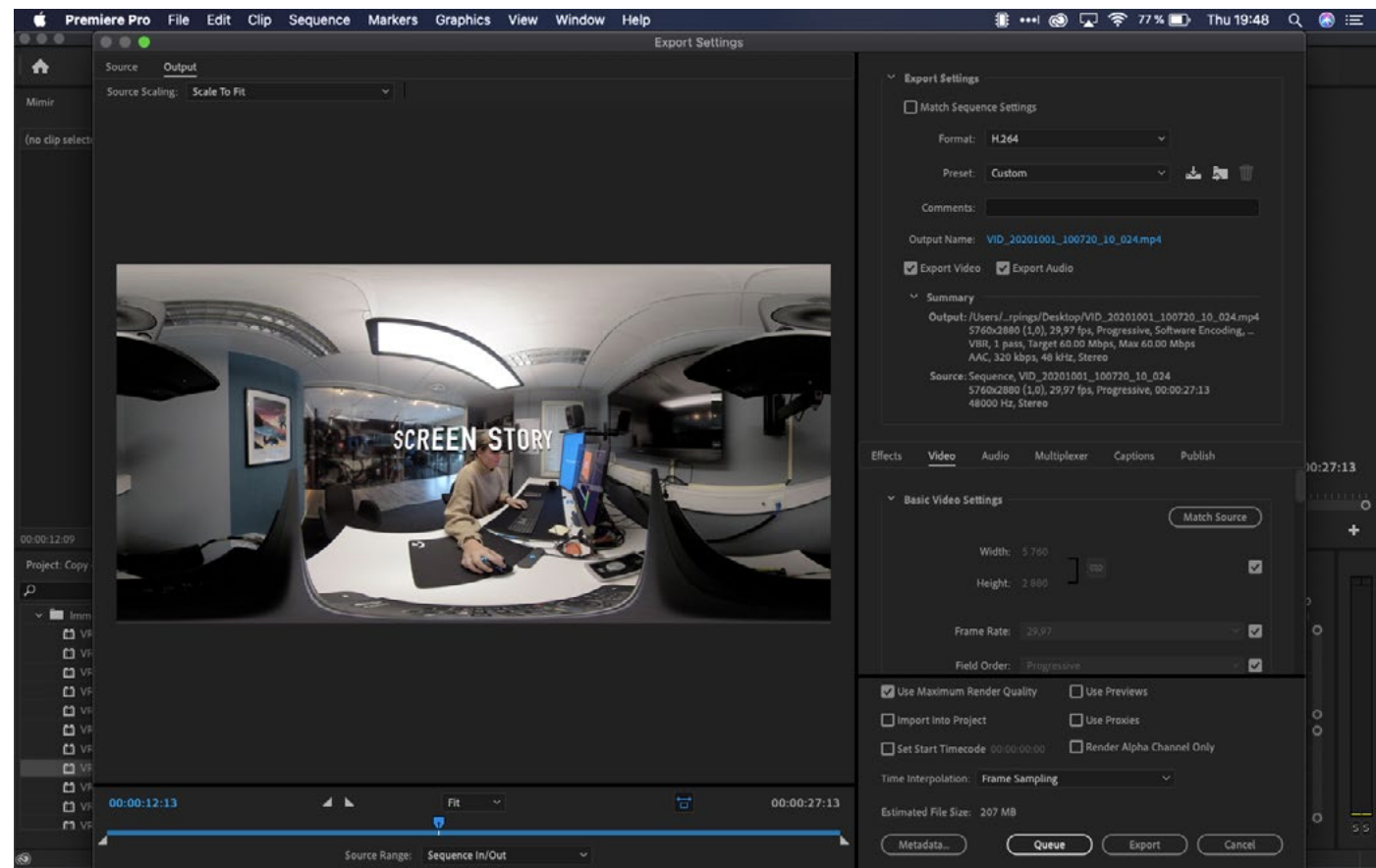
Premiere Pro has a couple of video effects, which you can add to your video. These are located under the effect panel in the folder "Immersive video".



GRAPHICS

To add 2D graphics such as text, still images or logos, import them and drag them to the timeline as you normally would. Then choose the effect "VR Plane to Sphere" to get it to show correctly.

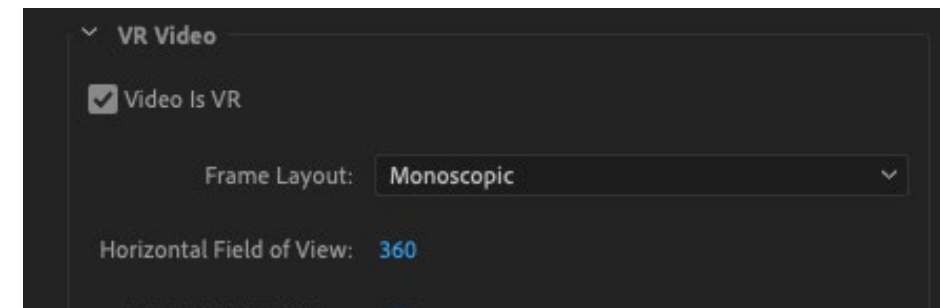
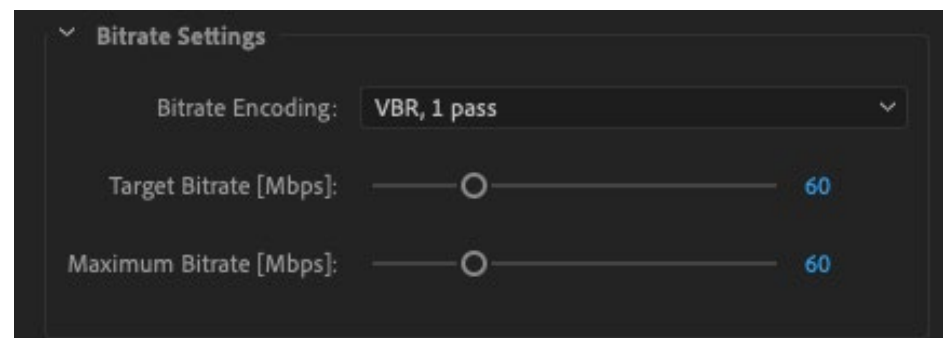




EXPORT

Here are some recommended settings when exporting 360-video using Premiere Pro

- Format: H264
- Under “Basic Video Settings” choose “Match Source”.
- **Bitrate Settings**
 - **Bitrate Encoding:** VBR 1 Pass
- **Target bitrate:** Choose anywhere between 40 to 60. The higher the bitrate, the better the quality, but this also results in larger files.



- **VR Video**
 - Check “Video is VR”.
 - **Frame layout:** Monoscopic

DAVINCI RESOLVE

DaVinci Resolve is a multiplatform video production kit, where you can do complicated 360° video editing with Fusion compositing tool in DaVinci Resolve’s free version. In the free version the maximum resolution is 3840x1920 pixels.

In DaVinci Resolve video editing is done in the editor timeline in the same way like in other editing programs. 360° effects are composed with Fusion on top of that. In this guide you will learn how to add text and images onto your 360° video.

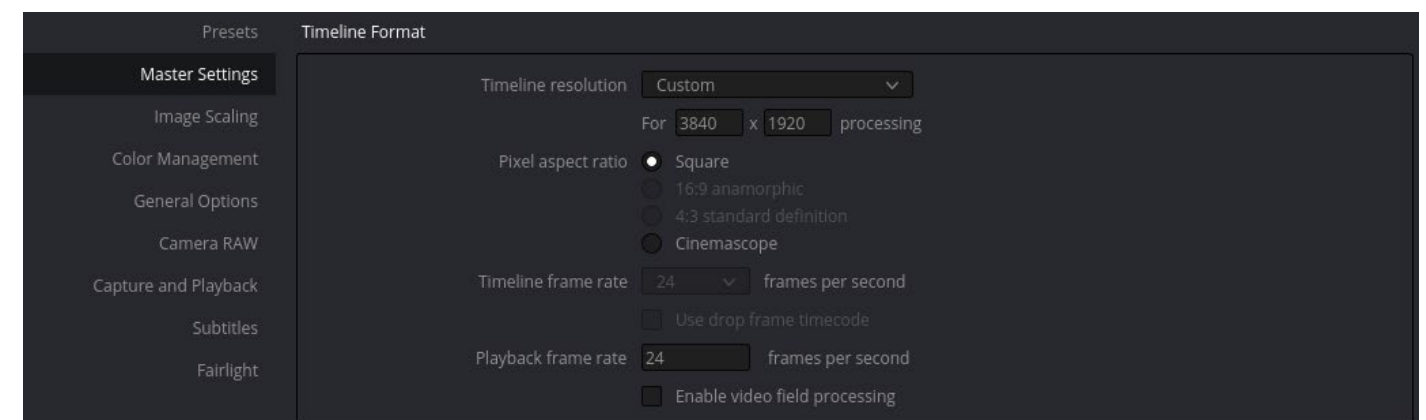
After exporting your edited video from Resolve, you need to inject metadata to your video file. The metadata is for video players to play your 360° video correctly. In this manual you will see one way to do that.

For more information how to use DaVinci Resolve, visit Resolve’s training page:

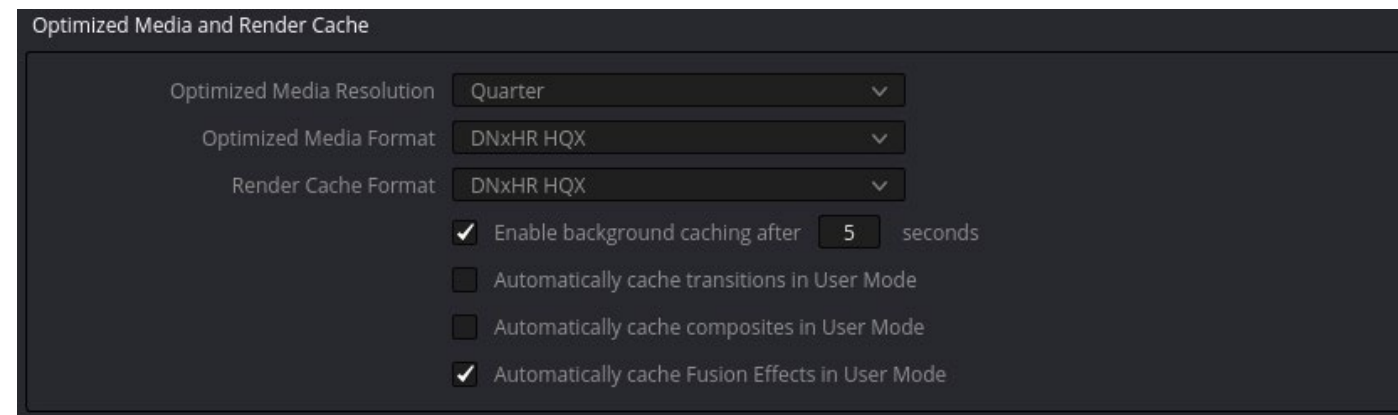
<https://www.blackmagicdesign.com/products/davinciresolve/training>

IMPORTING FILES AND SETTINGS

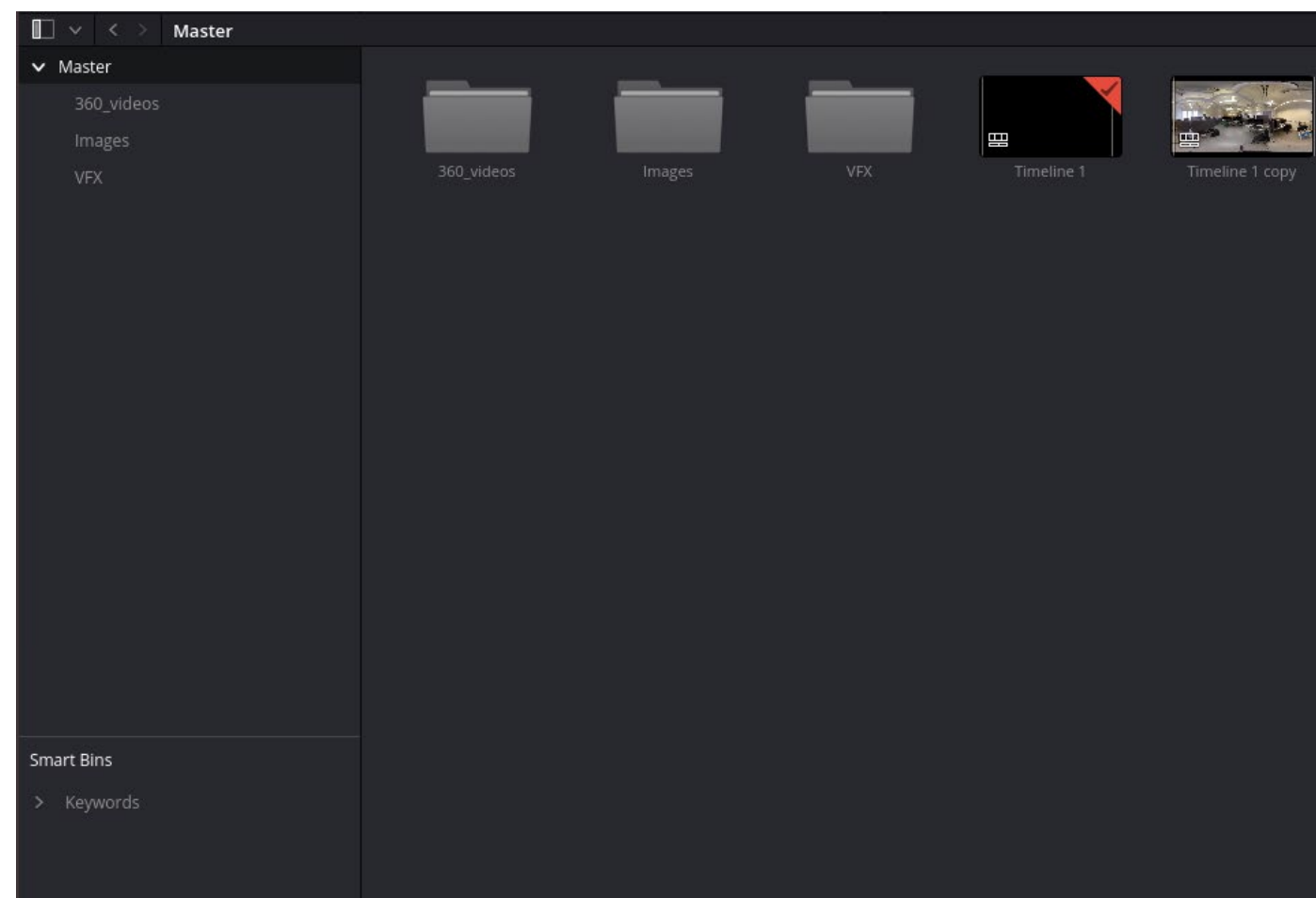
First you need to start new project. Then change resolution in “file/project settings” to 3820x1920, and match the frame rate to your video footage.



It might be good idea to reduce resolution to quarter in “optimized media and render cache” section for more fluent editing experience.

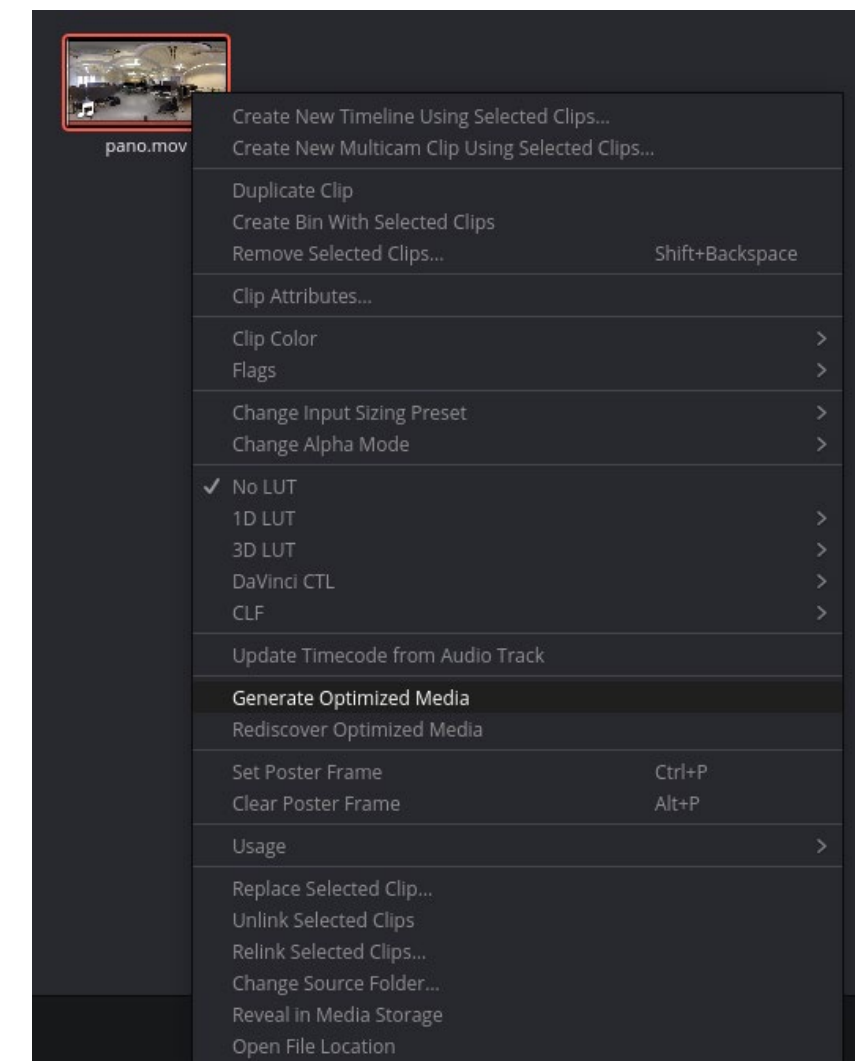
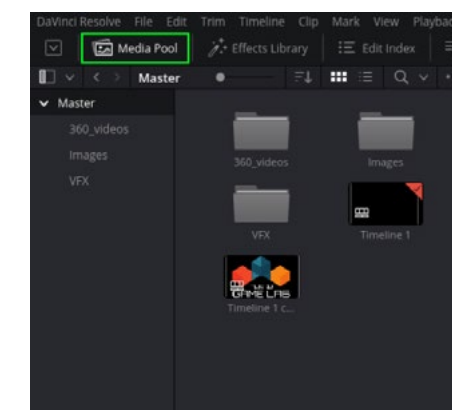


The easiest way to import files is to drag and drop them straight from your operation system file browser to the “Master” bin. You can create your own bins to keep your files organized.



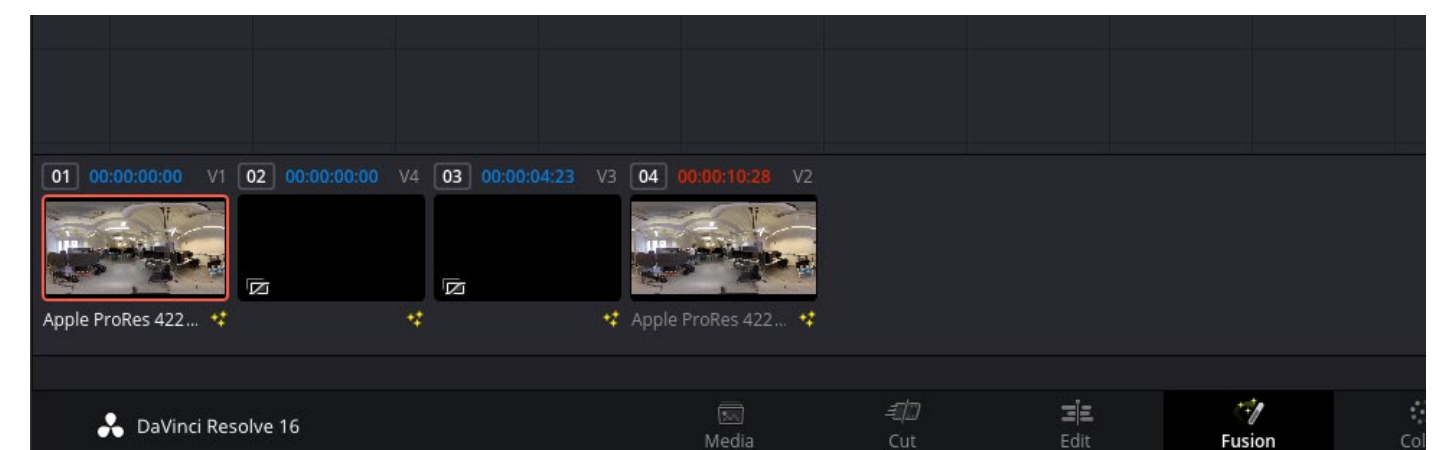
It's recommended to generate optimized versions of your video clips. Right click on your video clip and select “Generate Optimized Media”. This creates proxy versions from your video clip to make editing even more fluent.

In the “Edit” section you can drag and drop media files to editing tracks. If you don't see your media files, make sure that you have “Media Pool” activated in the top left corner.

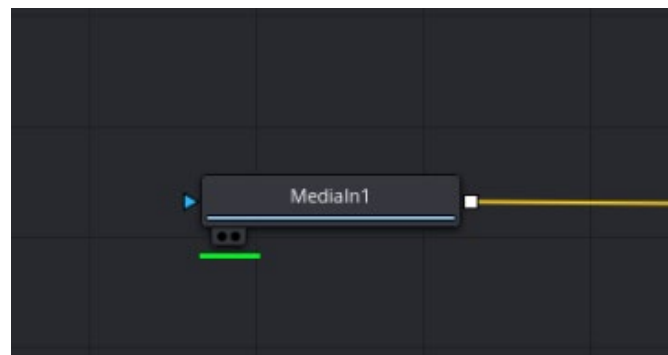


FUSION: VIEW 360

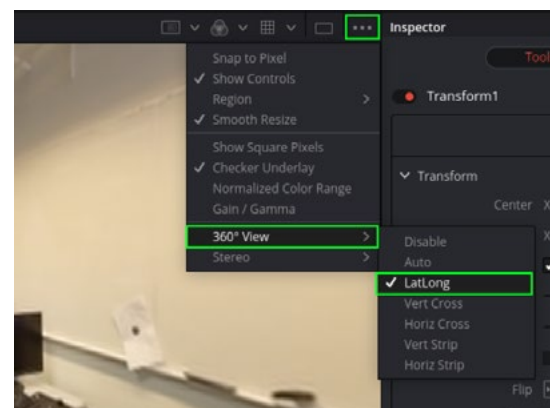
Go to the “Fusion” section and select your video clip from the bottom section. You should see every clip that is in use in the editors video layers. First you need to make sure that you have the clip that you want manipulate in “Editor”. If you still don't see clips in “Fusion”, you can toggle the “clips” button on the top bar.



You have two nodes: The “MediaIn” node that is connected to “MediaOut” node. When you hover your mouse over the node, little dots appear under the node. These dots shows the fusion views. Left dot is left view and right dot is right view. If you click the dot, it will toggle between black and white. White is “show” and black is “don’t show”. This way you can select which node’s output is showed in which view.

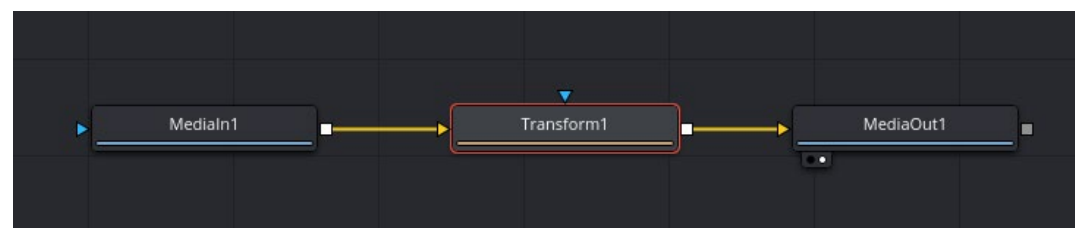
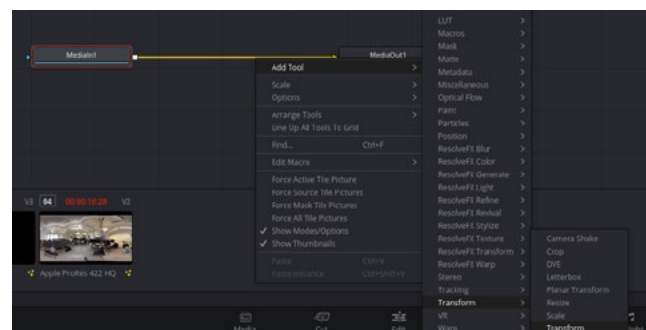


To view your footage in a 360 format, select preferred node and click the three dots in the viewing window at the top right corner. From the dropdown menu choose “360° View” and select “auto” or “LatLong”. After that you can rotate view by pressing shift on your keyboard and dragging with the right mouse button.



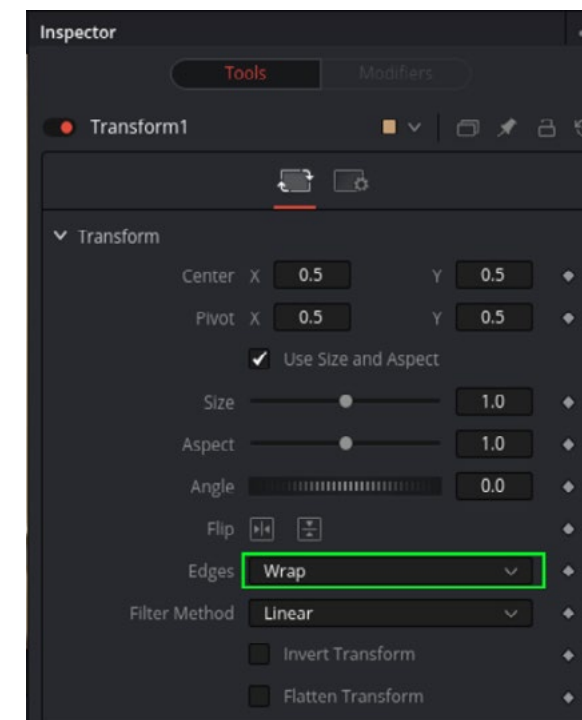
REFRAME OR ADJUST 360 VIDEO CENTER

In the “Fusion” section, select the video clip you want to reframe. Right click on the arrow between the “MediaIn” and “MediaOut” nodes. Select “Add Tool” → “Transform” → “Transform”.



Now the arrows should go from “MediaIn” to “Transform” and from there to “MediaOut”. If not, just drag and drop the arrows between nodes.

Select transform node and change “Edges” parameter to “Wrap” from inspector (on the right side of the Resolve window). This will make the video clip wrap around the image area when adjusting parameters. It should now be possible to adjust the center position by changing the transform node’s “Center X” parameter. It might be easier to adjust center point if you disable “360° View” option.

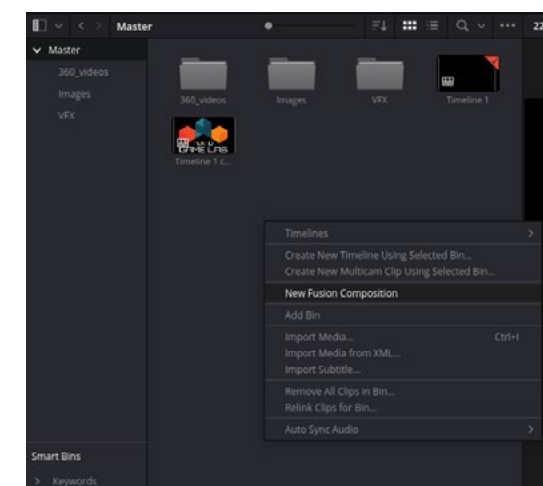


ADD TEXT

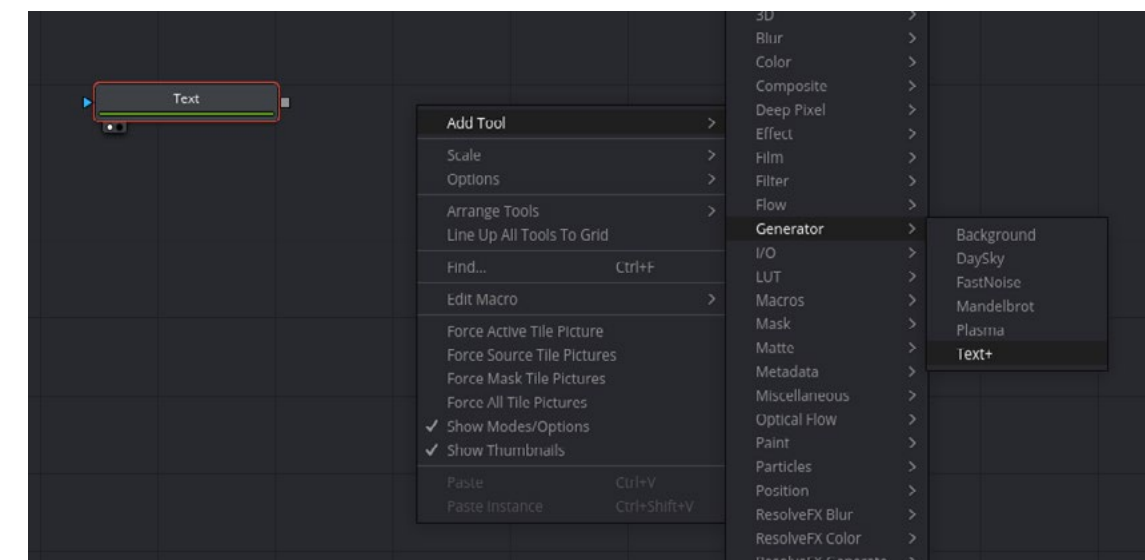
Create a new fusion composition in the “Edit” section by right clicking the “Master” bin and selecting “New Fusion Composition” from the dropdown menu. Drag and drop your newly created fusion composition to

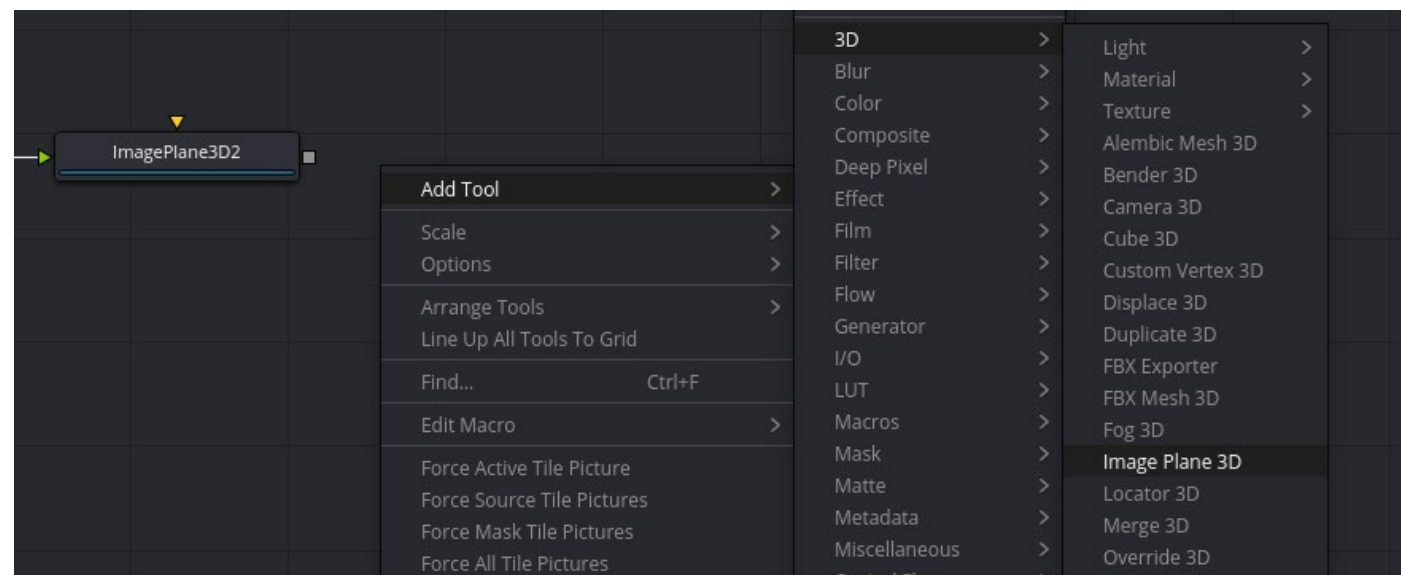
timeline.

Navigate to the “Fusion” section and select your fusion compose from the bottom section. For now, you will only have the “MediaOut” node in your fusion editor.

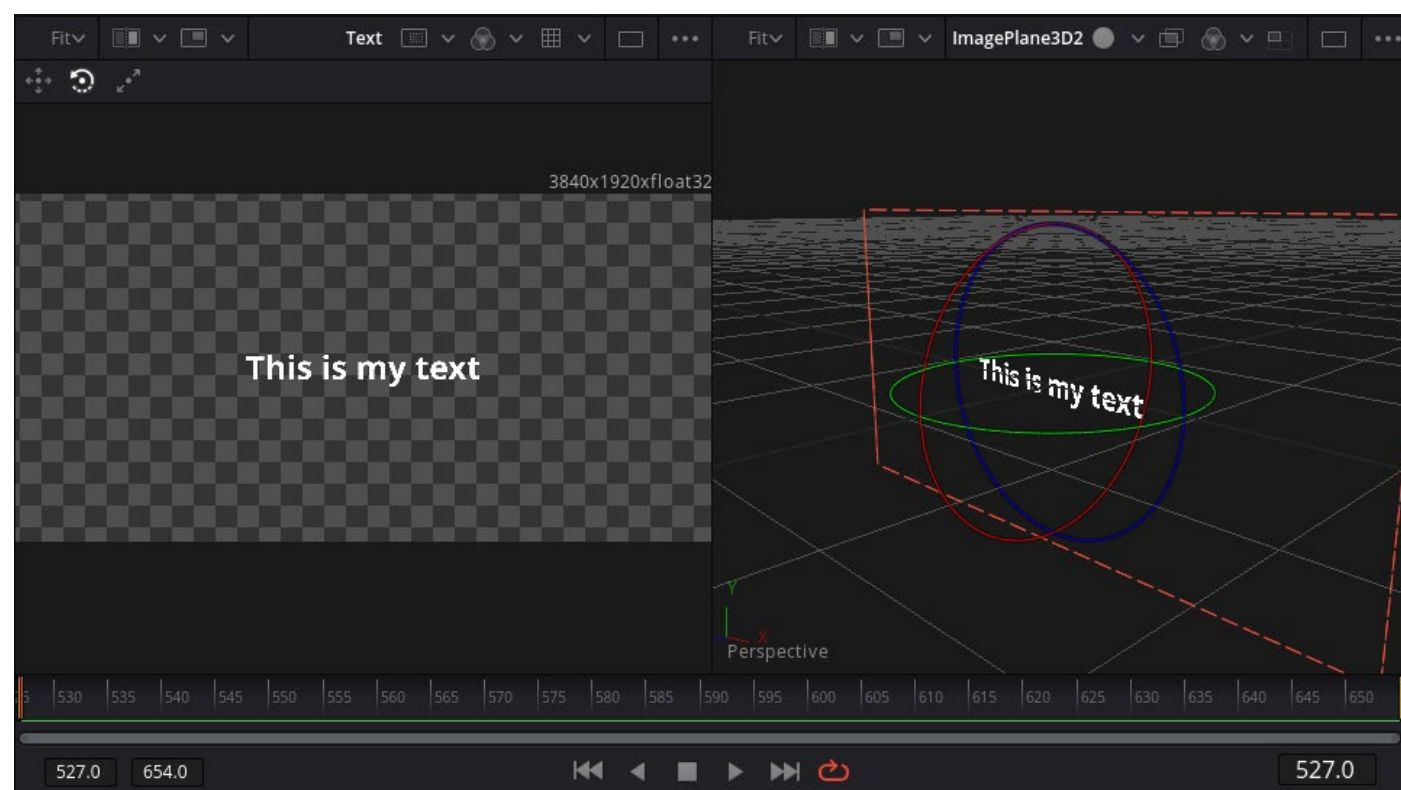


First we add a text node by right clicking and selecting “Add Tool” → “Generator” → “Text+”. Click the text node to show it in the left side view (black dot under the node). Make modifications to the text in the inspector. Don’t connect text node to “MediaOut” node yet. We need to make transformation in 3D space first.



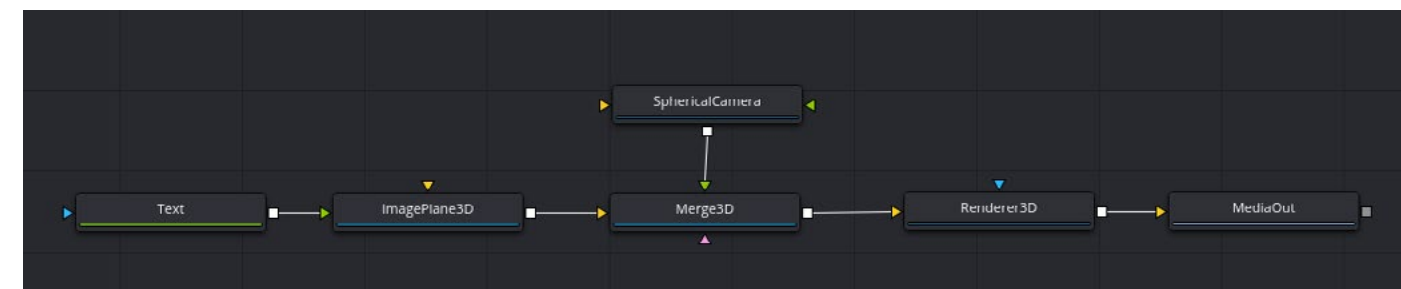


Create a plane to map our 2D text into 3D space. “Add Tool” → “3D” → “Image Plane 3D”. Connect the text node to the image plane node, by dragging the arrow from the text node’s grey square to the image plane node. You can adjust your text size from the text node or scale the image plane node. If you view image plane in viewer, you can see that the view is now in 3D mode.



Create a merge 3D node for collecting different 3D elements into one 3D scene. “Add Tool” → “3D” → “Merge 3D”. Connect the image plane node to the merge 3D node.

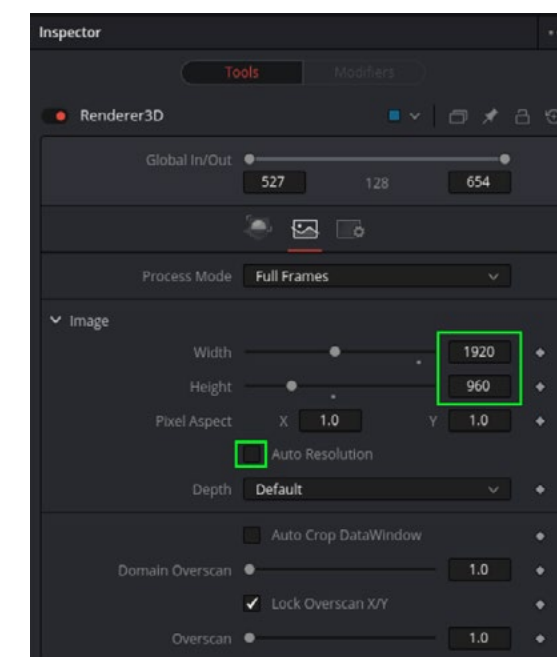
Now it’s time for the 360° magic to happen. Create a spherical camera “Add Tool” → “3D” → “Spherical Camera” and connect it to the merge 3D node. View the merge 3D node in the left side view. Now you have both the text plane and the spherical camera in same view and you can transform them separately in 3D space.



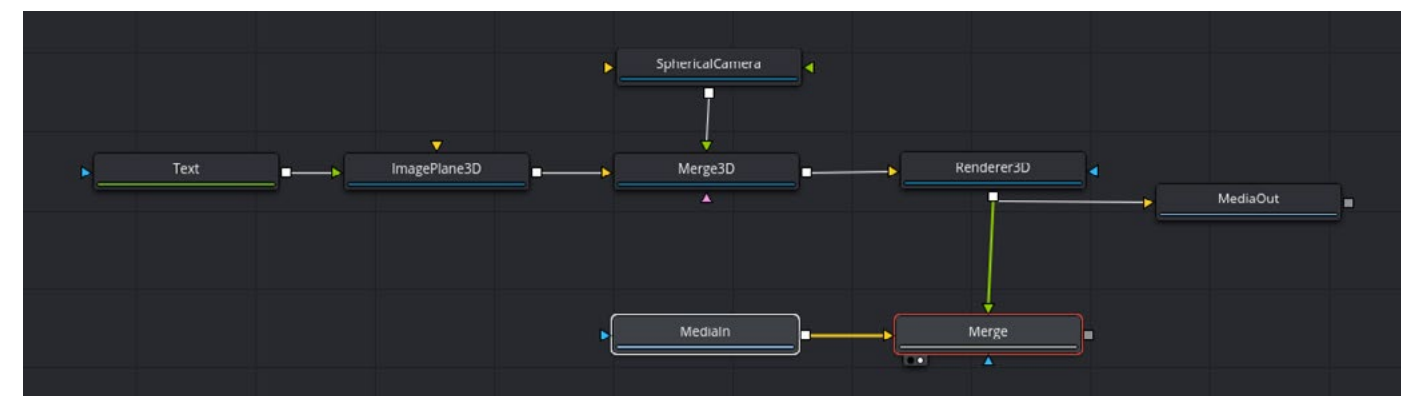
Next thing is to get back to the 2D plane from 3D space. This is done through render node “Add Tool” → “3D” → “Render 3D”.

Connect the 3D merge to the render node and choose the desired camera from inspector. In this case the only camera is a spherical camera. Render 3D node duplicates resolution.

To correct that, we need to half the resolution of the render node. In the inspector, click the “Image” tab, uncheck “auto resolution” and write your own resolution in “Width” to 1920 and “Height” to 960.



Finally, connect the render 3d node to the “MediaOut” node. After that you can edit your text in the “Editor” section.

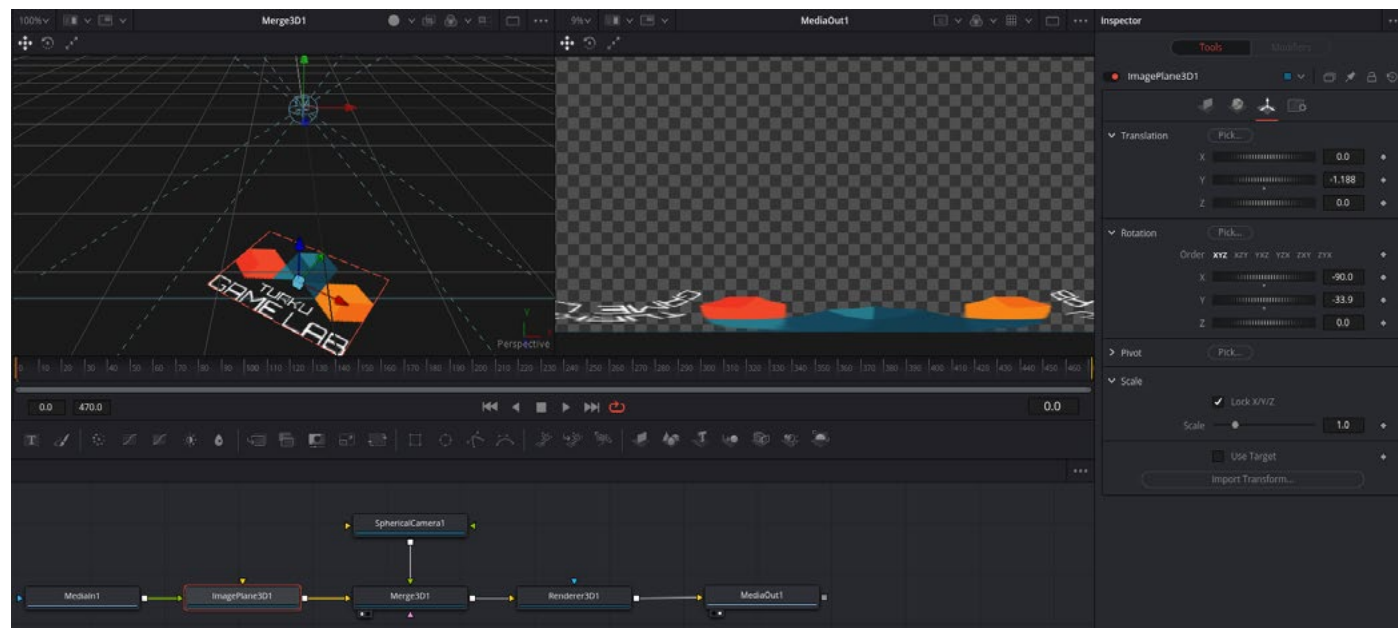
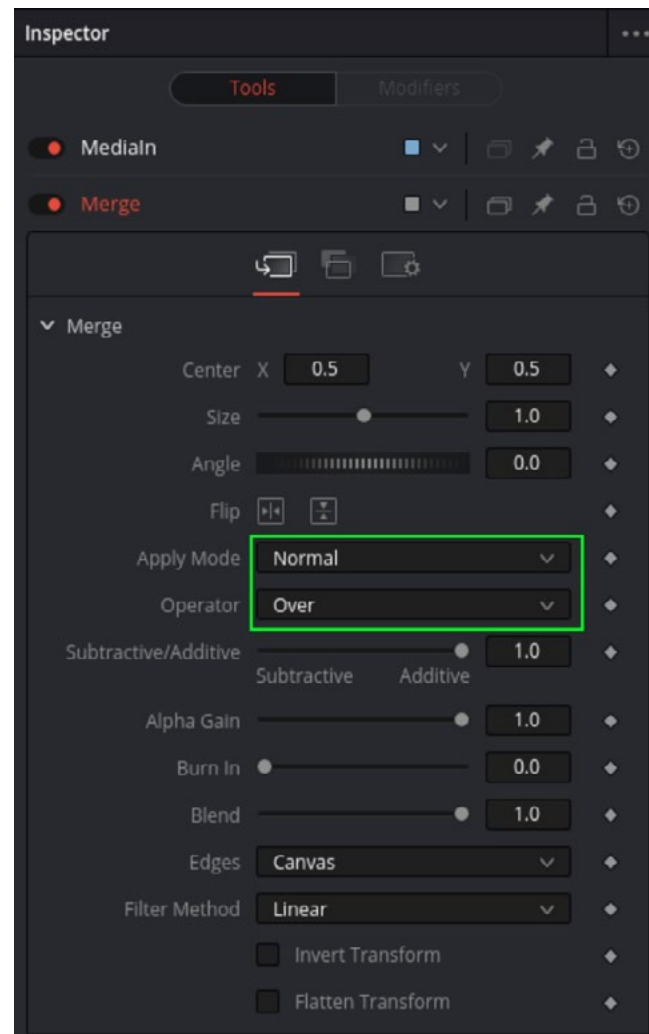


If you want to adjust your text with a video backdrop you need to make it happen in the “Fusion” section. Select text fusion composition. Drag and drop video clip to the node editor. Create a merge 2D

“Add Tool”→ “Composite”→ “Merge”.
Connect the video clip to the yellow socket (background) and render the 3D node to green socket (foreground).

Make sure that “Apply mode” is “Normal” and “Operator” is “Over”. Click the viewing dot to show your merge node in the viewer.

Change “View 360” to auto. Now you can move, scale and rotate your text with the “Merge3D” node to make new positions or create animated texts.



ADD IMAGE

Adding an image is the same workflow as adding text. In this instruction we will leave the out the details, and just give you the steps that you need to do. Transforming image in desired position, size and scale is done in the merge 3D node.

In the “Edit” section, create a new fusion composition, name it and drag it to the editor. Navigate to the “Fusion” section and select your newly created composition. Drag and drop your image from the media library to fusion node editor. Create “Image Plane 3D”, “Merge 3D”, “Spherical Camera” and “Render 3D” nodes. Connect image (“MediaIn”) to the image plane node and do that again to the merge 3D node. Connect spherical camera to merge 3D and merge 3D to Render 3D node. Lastly connect Render 3D to “MediaOut” and change render 3D node resolution to half (desired resolution 3820x1920 → render node resolution 1920x960). Then you can position the image in 3D space.

EXPORT

Navigate to the “Deliver” section. Select “Custom” preset. Name your video and select your target folder.

If you don’t see the folder you want to use when browsing, you need to add one in media storages. Navigate to preferences through the “DaVinci Resolve” dropdown menu. In preferences find the “Media Storage” and use the “add” button to add more folder structures to your options.

In “Video” options:

Format: MP4

Codec: H.264

Resolution: Custom (3840x1920)

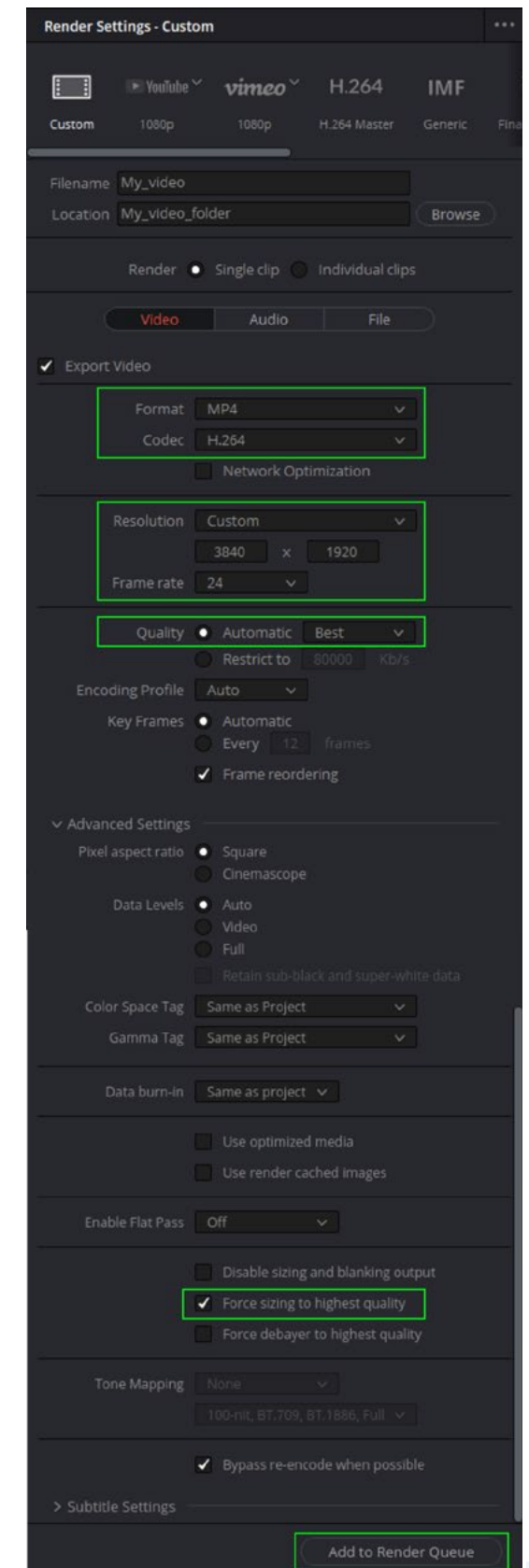
Framerate: Match the framerate of the composition

Quality: Choose the one that best suits yo purpose. Medium is a good starting point.

The better the quality, the larger the file size will be.

In the “Advanced settings”, toggle the “Force sizing to highest quality” ON. This ensures the scaling of the images is of good quality.

You can refine rendering range by sliding start and end points. Rendering range is displayed as a grey line just under the timeline in the editing section.





The last step is to render your edited video. Click “Add to Render Queue” to get your rendering in to the waiting list. You can add renders with different settings in the same queue. Click “Start Render” on the right side of your resolve window.

In Linux, there is no H.264 support directly in DaVinci Resolve. You can use the Quicktime format with the MPEG codec when rendering the video. Use quality option “Best” to get a high-quality video for further processing. After rendering, use another software to convert the video to H.264. Handbrake is a free and good alternative.

<https://handbrake.fr/>

INJECT METADATA

360° video files need to have correct metadata, so the video players play them correctly. DaVinci Resolve do not add metadata to video files. For that purpose, we use external application called “Spatial Media Metadata Injector”. On the github page you will find instructions how to “install” and use this program.

<https://github.com/google/spatial-media/releases>

It is a little python program with a GUI for Windows and Mac. After unpacking, start the program. Choose your video file with the “open” button. Toggle “My video is spherical (360)” ON and press “Inject metadata”.

With linux you need to use commandline (after downloading and unzipping the sourcecode).

```
python spatialmedia -i <input video> <output video>
```

LIVE STREAMING 360-VIDEO

360° video can also be used for real-time transmission. For example, video conferences where the video is based on 360° video. This allows for greater interaction between the participants as they can control the camera viewpoint in the room.

GDPR

To ensure the privacy of those involved in the video, everyone involved in the video has to fill out a document. The document consists of an agreement where the people involved agrees for the use of the video to be published through different channels.

