Streambox® Spectra™

HDR & Dolby Vision Workflow and Setup

⇐ Streambox Spectra Encoder ⇒
Streambox Media Player (iPad Pro, Apple TV 4K, macOS)
Streambox Chroma + and Halo Decoders
with Blackmagic Design DaVinci Resolve and UltraStudio

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Introduction

Streambox Encoders and Decoders allows editors and colorists the ability to share their work, in real-time, with other stakeholders near and far. With support for Dolby Vision, this collaboration is extended to a new level. Here we will introduce the implementation of Dolby Vision workflow using Blackmagic DaVinci Resolve as a source for streams from Streambox Spectra (software encoder), over IP, to Streambox Decoders and Media Players. We offer 2 workflows, **O**penFX and **B**lackmagic:

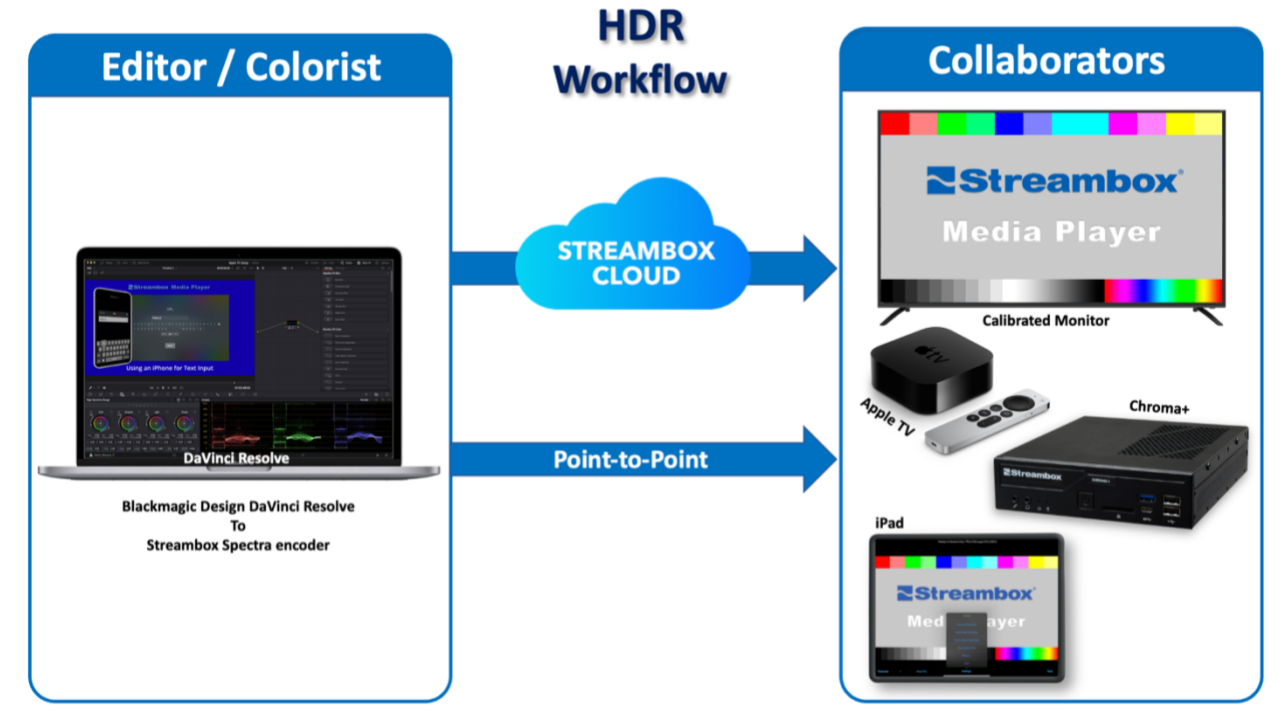
Revision 5b

OpenFX Workflow: Spectra Encoder only

HDR via OpenFX plugin

Advantages and Disadvantages: With OpenFX Workflow, the entire workstation can be in the cloud; DaVinci Resolve and Streambox Spectra can reside on AWS or other cloud platform. The limitation is that many elements of the video output from DaVinci Resolve do not actually originate from the timeline, e.g., Dolby Vision, Split screen, Timecode Burn-in, some OpenFX effects, audio, etc., and will not be available to the Spectra OpenFX plugin. Currently Dolby Vision Tone Mapping is only supported with Blackmagic Hardware (see Blackmagic Workflow below).

Cloud or On-premises setup



1. The editor or colorist sets up *Blackmagic DaVinci Resolve* to output to *the Spectra encoder*. The stream can then be transmitted over IP via the Streambox Cloud or directly, point-to-point, to a receiving decoder/player. The stream can be encrypted end-to-end without affecting latency. When properly configured, and with adequate bandwidth, most streams can be delivered within a second or less.

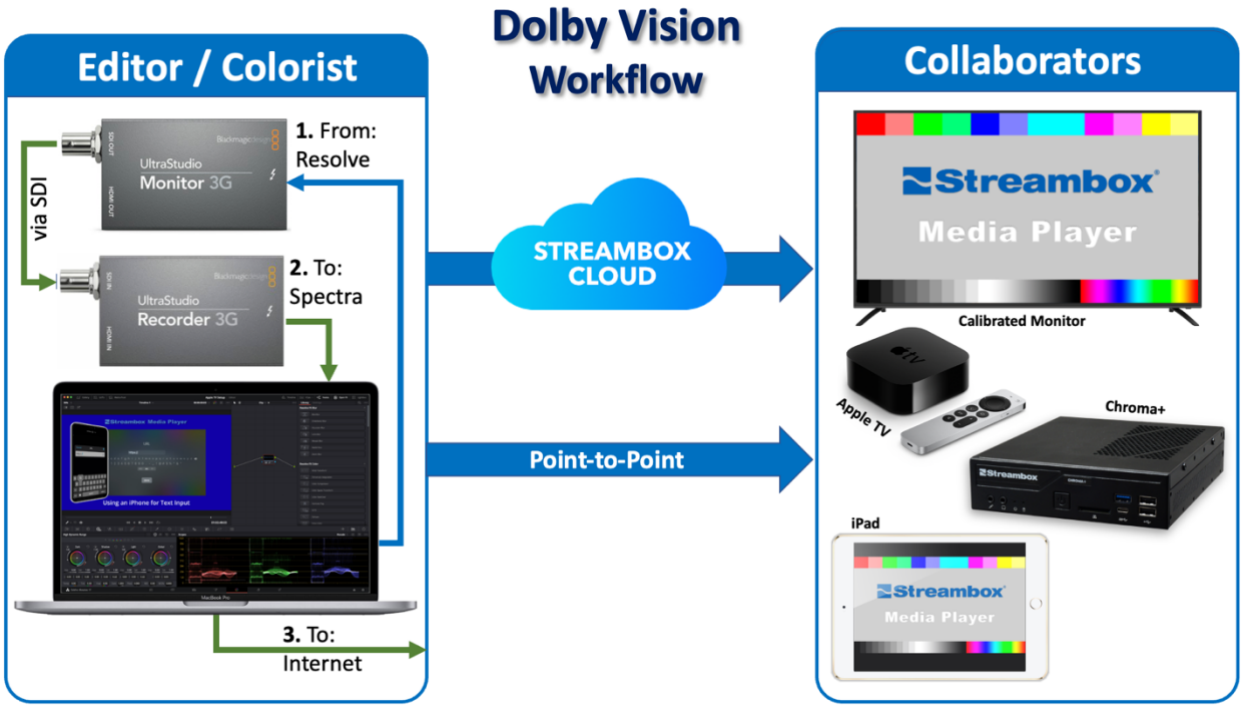
2. The viewer needs to use HDR enabled hardware – like Apple TV 4K (tvOS 14.6 or greater) or the Streambox Chroma+ (latest version, activation required) connected to a Monitor/TV that supports HDR. One can also use the latest generation iPad Pro (2021). The stream can be sent point-to-point using an IPv4 public address or via the Streambox Cloud using a SessionID to simultaneously share with up to 8 collaborators.

B Blackmagic Workflow: Spectra Encoder + Blackmagic UltraStudio

Dolby Vision and HDR via, UltraStudio Monitor/Recorder set, or full duplex 4K Mini

Advantages and Disadvantages: DaVinci Resolve will output all layers and effects, including the timeline, Dolby Vision tone mapping, Split screen, and 8 channels of audio, to their UltraStudio monitors. Streambox Spectra accepts input from UltraStudio recorders and can stream that to the internet. This allows Spectra to stream the full look and feel of the DaVinci Resolve output. The one limitation is that this requires addition hardware to be part of the workflow (which, currently, rules out cloud-only workflows on public networks like AWS and Azure).

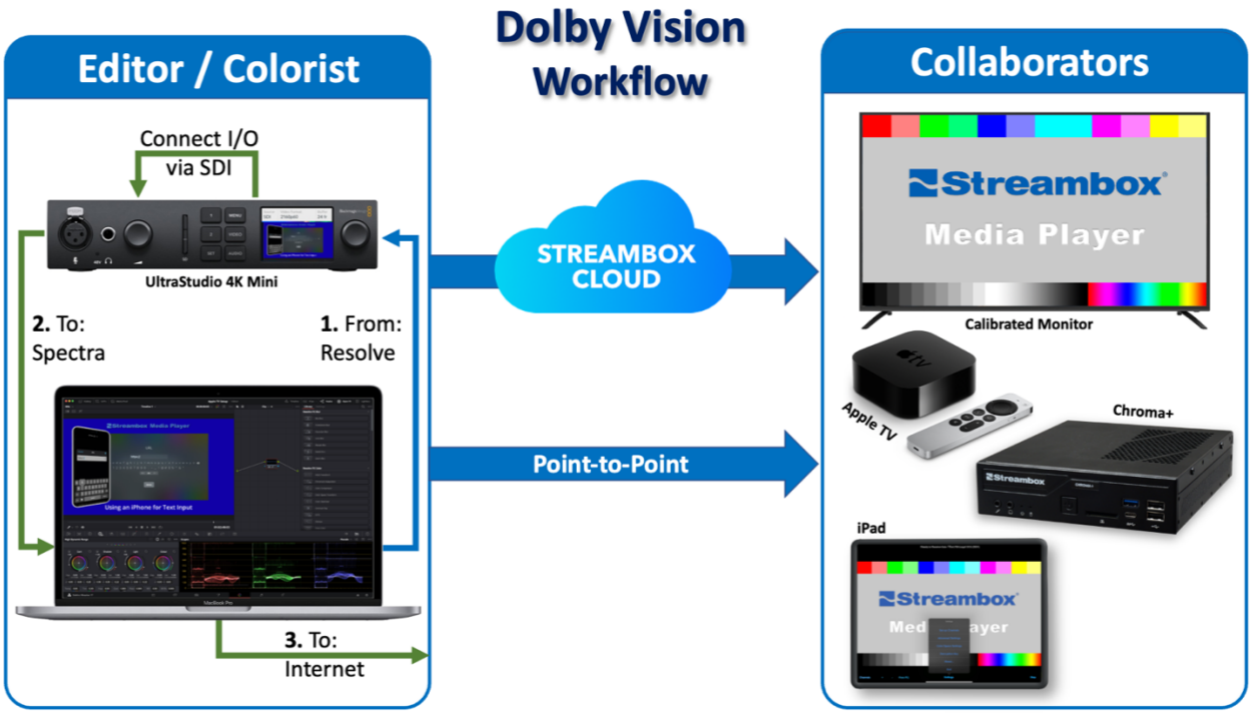
UltraStudio Monitor/Recorder setup



1. The editor or colorist sets up *Blackmagic DaVinci Resolve* to output to the UltraStudio Monitor (1), which is connected via SDI to the UltraStudio Recorder (2), back for the *Spectra* encoder to stream to the internet (3). The stream can then be transmitted over IP via the Streambox Cloud or directly, point-to-point, to a receiving decoder/player. The stream can be encrypted end-to-end without affecting latency. When properly configured, and with adequate bandwidth, most streams can be delivered within a second or less.

2. The viewer needs to use HDR enabled hardware – like Apple TV 4K (tvOS 14.6 or greater) or the Streambox Chroma+ (latest version, activation required) connected to a Monitor/TV that supports Dolby Vision. One can also use the latest generation iPad Pro (2021). The stream can be sent point-to-point using an IPv4 public address or via the Streambox Cloud using a Session ID to simultaneously share with up to 8 collaborators.

UltraStudio 4K Mini (full duplex)



1. The editor or colorist (1) sets up *Blackmagic DaVinci Resolve* to output to the UltraStudio 4K Mini, whose output and input is connected via SDI, (2) then back to *Spectra* (3) to be streamed to the internet (3). The stream can then be transmitted over IP via the Streambox Cloud or directly, point-to-point, to a receiving decoder/player. The stream can be encrypted end-to-end without affecting latency. When properly configured, and with adequate bandwidth, most streams can be delivered within a second or less.

2. The viewer needs to use HDR enabled hardware – like Apple TV 4K (tvOS 14.6 or greater) or the Streambox Chroma+ (latest version, activation required) connected to a Monitor/TV that supports Dolby Vision. One can also use the latest generation iPad Pro (2021). The stream can be sent point-to-point using an IPv4 public address or via the Streambox Cloud using a Session ID to simultaneously share with up to 8 collaborators.

The Components

1. Streambox Spectra software encoder and Streambox Decoders (including software Media Players) that support High Dynamic Range (HDR) and Dolby Vision (DV):

   Media Players – for **iPad Pro**, **macOS**, and **Apple TV 4K** (2nd Generation)
   Decoders – **Chroma** +, **Chroma** x, and **Halo**

2. Dolby Vision is an HDR (High Dynamic Range) dynamic metadata format with support for wide color gamuts (e.g., P3 D65 PQ and Rec.2020) that can support up to a 12-bit color depth and 10K nits[1] brightness.

3. Blackmagic DaVinci Resolve[2] is a video/color/graphics editor that supports Dolby Vision. DaVinci Resolve can stream the timeline display, via a Streambox Spectra OpenFX plug-in, to the Spectra software encoder which in turn streams over IP to Streambox Decoders and Media Players as illustrated below (see Overview).

4. For Blackmagic Workflow, you will need Blackmagic Design UltraStudio 4K Mini or Monitor 3G with Recorder 3G. Note: These are setup examples; other Blackmagic UltraStudio equipment can be used.

Streambox Spectra Setup

This setup is most ideal for color grading with focus on Dolby Vision support on Blackmagic DaVinci Resolve and Streambox Spectra. These instructions assume you are familiar with both DaVinci Resolve and Streambox products.

Note 1: When streaming Dolby Vision content via Streambox, setup in DaVinci Resolve supports both iCMU (internal - with pre-applied tone mapping - used when streaming to the iPad, macOS, Apple TV, Chroma +, Chroma X, and Halo) and eCMU (external - with metadata for endpoint tone mapping - used when streaming to Chroma+). By default, DaVinci Resolve output uses Internal CMU and should be used with a Spectra Encoder workflow.

Note 2: iCMU workflow is primary for Color Correction/Grading. Davinci Resolve produces video that is tone mapped using Dolby Vision imaging which allows for direct viewing on professional monitors. Therefore, with iCMU the video is already tone mapped and should not be further modified by the display device. To achieve this, Streambox provides 'Pure PQ'[3] mode for Apple devices and 'Absolute' mode for Dolby Vision TV's to mimic professional monitors.

Note 3: Currently, Dolby Vision tone mapping is supported with Blackmagic Hardware only, since Resolve applies tone-mapping after timeline.

[1] 10,000 cd/m^2
[2] All references in this document are for Blackmagic DaVinci Resolve 17 studio version.
[3] PQ (Perceptual Quantizer) format is a SMPTE ST 2084 standard. It is a gamma transformation.

Spectra (Encoder) Setup

O **For *OpenFX Workflow***, apply a Spectra OpenFX node to the timeline in DaVinci Resolve. For detailed instructions, refer to the "Spectra & DaVinci Resolve – OpenFX Workflow" section below. After that is done, you need to open Spectra and set it up for Dolby Vision. **Note**: You will need an activation code from Streambox for Avid (which includes DaVinci Resolve).

B **For *Blackmagic Workflow***, setup the UltraStudio hardware. For detailed instructions, refer to the "Blackmagic Hardware and DaVinci Resolve – Blackmagic Workflow" section below. After that is done, you need to open Spectra and set it up for Dolby Vision. **Note**: You will need an activation code from Streambox for Blackmagic.

O,B

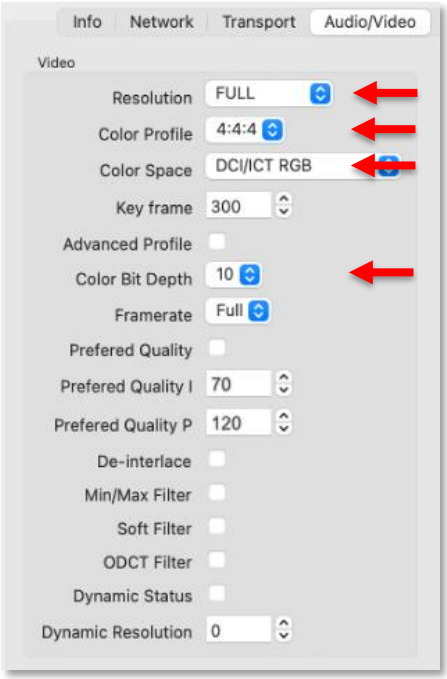
1. Set up a Session for streaming. On the Spectra Metadata Page, enter the Session DRM. The Session ID will need to be shared with stream recipients.
   Remember to 'Apply' changes.

2. On the Spectra Network page, make sure the Decoder IP is correct for the Session DRM (see 'live IP' dropdown if you are unsure). *Remember to 'Apply' changes if any are made*.

3. On the Spectra 'Audio/Video' tab you will want to set the following values:
   - Video Resolution: Full
   - Color Profile: 4:4:4[4]
   - Color Space: DCI/ICT RGB or Native RGB
   - Color Bit Depth: 10

   Remember to 'Apply Audio/Video Settings'

   Note: Once you have everything set up, you can save all the settings as a Preset on the Presets tab.



4. On the Spectra Source page, make sure the Capture Driver is set to:[5]
   'Spectra' for *OpenFX Workflow*
   'Blackmagic' for Blackmagic Workflow
   and the Capture Input is:
   'SDI' for Blackmagic Workflow
   Remember to Apply all changes.

5. On the Spectra System tab, make sure the Codec is ACT-L5 (bottom of page). If it is not, click the 'ACT-L5' option, then close and reopen Spectra.

[4] You can also use 4:2:2 with P3 D65 PQ color space (full or legal) where Spectra will convert PQ RGB into the appropriate component YCrCb signal.
[5] You must start Spectra after DaVinci Resolve is open (OpenFX Workflow) or after UltraStudio is connected (Blackmagic Workflow).

The Spectra Encoder is now ready to stream to a Session. To start the stream, from the 'Info' tab, click on the START Streaming button. But first we need to finish setting up the other components.

Streambox Media Players for Apple Devices

Streambox Media Players provides a 'Pure PQ' mode where Apple tone mapping is disabled and a 'Native PQ' mode where Apple tone mapping is enabled. The PQ mode can be toggled when in landscape orientation. You can also adjust the image brightness with the + and – buttons (and keyboard equivalents – see Media Player for Apple iPad® Pro section below).

Note: Pure PQ mode mimics the behavior found in professional monitors. When Pure PQ mode is used for HDR profiles, Streambox Media Player will maintain true signal brightness regardless of the iPad brightness settings. If current screen brightness settings are above or below signal levels, Pure PQ mode will "hard cut" to the nearest available levels.

Media Player for Apple iPad® Pro

Streambox Media Player for iPad and iOS provides support for Dolby Vision iCMU workflows/streams.

Note: Screen brightness (nits) varies by generation:
2021- iPad Pro Liquid Retina XDR (supports up to 1000 nits)
2019/2018 - Retina iPad Pro 12" (supports up to 600 nits)
*Streambox does not recommend older iPads for Dolby Vision color grading

1. From the 'Settings' menu, select 'Color Space Settings'.
   From that menu, select '(HDR) P3 D65 PQ Full'.

   Note: Select 'Full' unless 'Legal' range was used in Spectra, then select '(HDR) P3 D65 PQ Legal'.

The Pure PQ / Native PQ switch is available in the landscape orientation along with a + and – buttons to adjust screen brightness (see red arrow, image below).
You will want to select Pure PQ mode for iCMU streams to disable additional tone mapping.

2. You can setup up a Session to select from the Channels menu, or in portrait orientation, you can enter the Session ID directly and click ‘Go’.

Note 1: On iPads with keyboards
‘Space’ (or screen tap in landscape orientation) will Show/Hide bottom menu
‘P’ will toggle between Pure PQ and Native PQ modes
‘+’ will increase screen brightness by 1 step
‘↑’ will increase screen brightness by 10 steps
‘-‘ will decrease screen brightness by 1 step
‘↓’ will decrease screen brightness by 10 steps

Note 2: In landscape mode, tap the screen to show/hide color space and Pure PQ information (see top of screen in image above).

Media Player for Apple TV® 4K

Apple TV (2nd Generation) supports iCMU streams on TV's/monitors that support HDR. Streambox Media Player for Apple TV can be downloaded/installed from the Apple Store.

1. From the 'Settings' menu, select 'Color Space Settings'.
   From that menu, select '(HDR) P3 D65 PQ Full'.

   Note: Select 'Full' unless 'Legal' range was used in Spectra, then select '(HDR) P3 D65 PQ Legal'.

2. Setup up the Session to pull. From the main menu select 'Open Session' and enter the Session ID provided by the host (which matches the Session addressed in Spectra)

Note 1: Apple TV HDMI outputs/converts video to Rec.2020 for attached monitors. If you are streaming with an iCMU workflow, it is important that a Professional Monitor is set to Rec.2020 (BT.2100: Rec2020 +PQ). This does not apply to the Media Player which should be set to P3 D65 PQ.

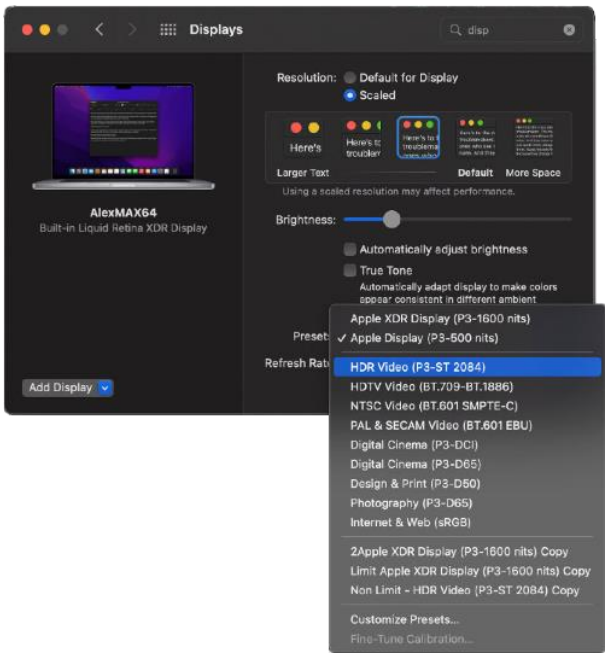
Note 2: It is advised that you review the Streambox Setup Guide for Media Player for Apple TV. Both Apple TV and the TV/monitor require some up-front setup for proper playback.

Note 3: Streambox Media Player for Apple TV does not apply tone mapping, but many HDR/Dolby Vision enabled televisions do. If you are streaming with iCMU workflow, it is important to ensure that tone mapping for the TV/monitor is disabled.

Media Player for macOS (MacBook Pro, XDR 2021+)

Streambox Media Player for macOS (1.2.6 or higher) provides support for Dolby Vision iCMU streams.

1. First, configure your MacBook display for Dolby Vision / HDR. Open the 'Displays' page from the 'System Preferences' dialog (see image on right), Select the 'HDR Video (P3-ST 2084)' reference profile.[6]



2. Now on Media Player, from the 'Settings' menu, select 'Color Space Settings'. From that menu, select '(HDR) P3 D65 PQ Full'.

   Note: Select 'Full' unless 'Legal' range was used in Spectra, then select '(HDR) P3 D65 PQ Legal'.

3. Setup up the Session to pull. In portrait orientation, you can enter the Session ID and click 'Go' (see red arrow, image on right).

4. The Pure PQ / Native PQ switch is available in the landscape orientation (as shown above in the iPad section) by resizing or maximizing the Media Players window.

Note 1: When HDR Video reference profile is selected, macOS disables brightness control. However, in 1600 and 500nits profiles, it is possible to adjust brightness with Mac Book Pro keyboard. Only brightness in the 100% to 75% range is supported. When brightness is below this value "increase brightness" message is displayed.

Note 2: You will want to select Pure PQ mode for iCMU streams. For macOS 12.1 and for HDR Video reference profile, both Pure PQ and Native PQ are identical. Other profiles will require Pure PQ mode.

Note 3: On MacBooks

- 'Space' will Show/Hide bottom menu
- 'P' will toggle between Pure PQ and Native PQ modes

[6] Used for 4K or ultra-high-definition video production workflows up to 1000 nits. This profile uses the wide color P3 primaries and the high-dynamic-range SMPTE ST-2084.

- Click on screen to show/hide color space and PQ status

Note 4: MacBooks (latest generation, 2021+) support stream tone mapped with Dolby Vision iCMU up to 1000 nits.

Note 5: MacBooks 2018-2021 can display up to 600 nits with Color LCD Profile and Pure PQ mode enabled and brightness set from 100% to 75%.

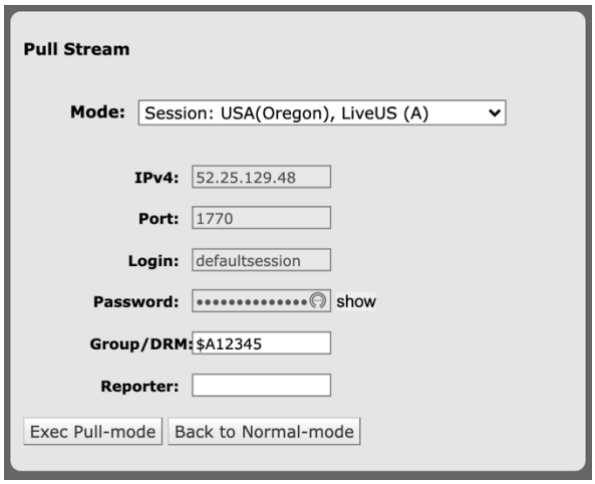
Streambox Hardware Decoder Setup

Decoder Network Setup

In this workflow we will review the Chroma+, Halo, and Chroma X, but any Chroma decoder will work nicely, and the setup is nearly identical.

First – On the 'Network' page, click the 'Back to Normal-mode' button to ensure that the decoder is in the Unicast (receive) mode. A confirmation message will appear - click 'OK'.

Second – While on the Network tab, you can setup the Session ID (see image on right). Select the Mode/Server for the Session (that is associated with the Session ID. In this example, the Session ID starts with $A, so from the Mode dropdown, you can see that it is associated with the 'Session; USA(Oregon)' server. Enter the Session ID in the Group field.



Network Page

Note 1: After everything else is setup (see below) you can click the 'Exec Pull-mode' button and within a minute the Session should start. The Session won't be seen on the decoder side until the stream is started in Spectra.

Note 2: Jump to the section below based on the Chroma decoder you are setting up.

Chroma+ Decoder

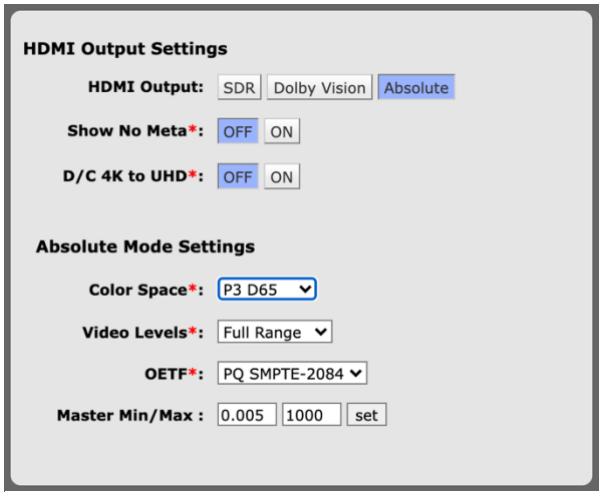
Streambox Chroma+ is a Chroma Decoder with HDMI output and support for Dolby Vision eCMU and iCMU for Dolby Vision enabled TV's. However, for color grading reviews, iCMU mode is most commonly used.

1. Turn to the ‘Output’ tab (see second image on right). The settings provided here are a good starting point for iCMU.

   Note: Set the Video Levels to Full Range unless Legal Range was used in Spectra.

2. On the Decoder’s System page, make sure the Codec is ACT-L5. If it is not, click the ‘ACT-L5’ button, then click the ‘OK’ button in the Restart dialog box.

Note: When connected, for example, to a Dolby Vision enabled consumer TV, Chroma + can receive either eCMU or iCMU streams. If receiving an iCMU stream (DaVinci Resolve default), make sure ‘HDMI Output’ is set to Absolute so there is no additional tone mapping applied. If receiving an eCMU stream, make sure ‘HDMI Output’ is set to Dolby Vision. When Dolby Vision is set, tone mapping metadata is passed through and applied by the displaying monitor.



Chroma+ Decoder

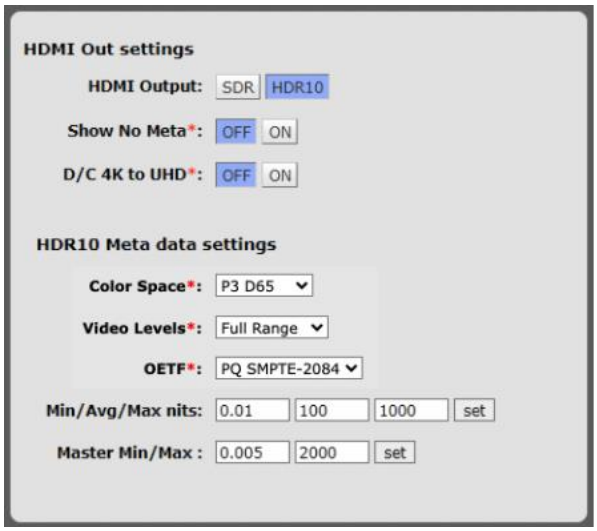
Halo Decoder

Streambox Halo is a Chroma Decoder with SDI output and support for Dolby Vision eCMU and iCMU.

1. Turn to the ‘Output’ tab (see image on right, next page). The settings provided here are a good starting point for iCMU.

   Note: Set the Video Levels to Full Range unless Legal Range was used in Spectra.

2. On the Decoder's System page, make sure the Codec is ACT-L5. If it is not, click the 'ACT-L5' button, then click the 'OK' button in the Restart dialog box.



Halo Decoder

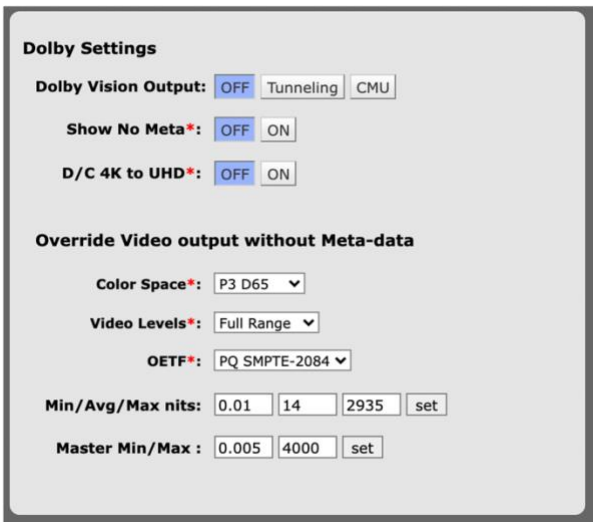
Chroma X Encoder/Decoder

Streambox Chroma X is a Chroma Encoder and Decoder with SDI input/output and support for Dolby Vision eCMU and iCMU.

1. Make sure Chroma X is in the Decoder mode. If not, go to the System tab and click the 'Switch to Decoder' button (it will restart in Decoder mode).

2. On the Decoder's System page, make sure the Codec is ACT-L5. If it is not, click the 'ACT-L5' button, then click the 'OK' button in the Restart dialog box.

3. Turn to the 'Output' tab (see image on right). The settings provided here are a good starting point for iCMU.



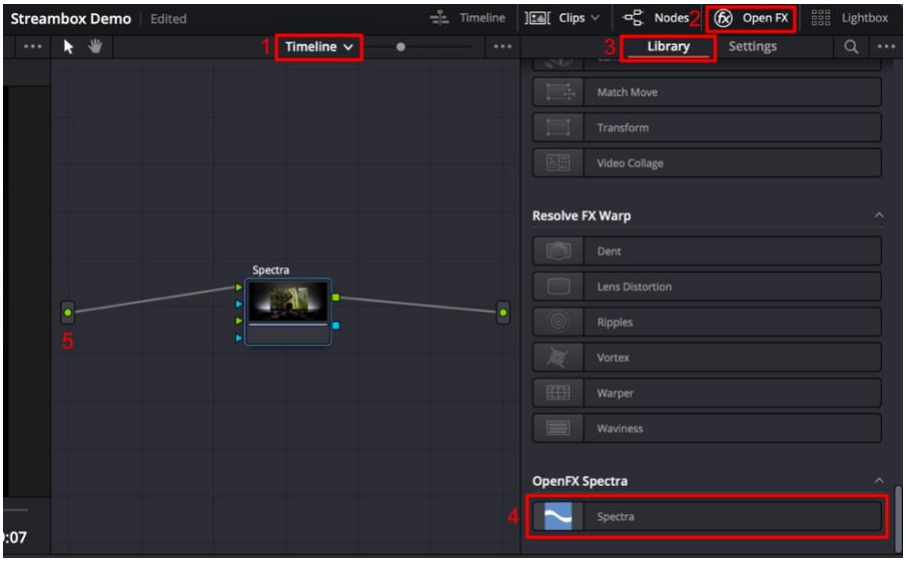
Chroma X

Note 1: Set the Video Levels to Full Range unless Legal Range was used in Spectra.

Note 2: For iCMU streams, ensure that 'Dolby Vision Output' is set to OFF, since tone mapping is already applied, and connected to a monitor where tone mapping is disabled (e.g., Sony X300).

Spectra & DaVinci Resolve – OpenFX Workflow

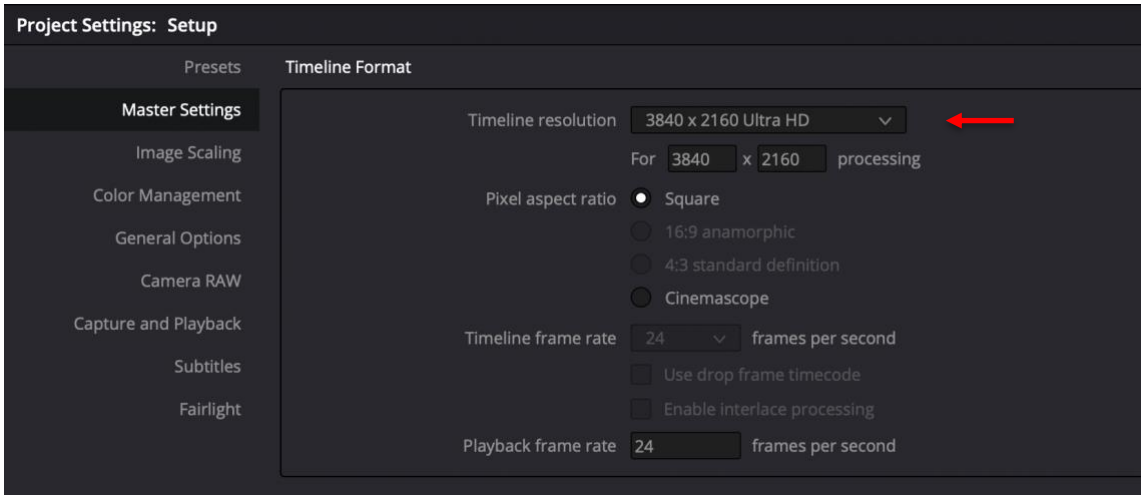
You must apply the Spectra node to the timeline: Under the 'Color' page **1**) Switch the focus to Timeline, **2**) Open the OpenFX panel, **3**) Select the Library list, **4**) find and drag the Spectra node into the node field, and **5**) Connect the Spectra node to timeline's in and out.



Note: The OpenFX plugin for DaVinci Resolve is part of the Avid Media Composer setup/activation and so requires the "SpectraAVID" license (If not activated, an error report will be displayed: "Spectra AVID license is missing").

Project Settings Setup

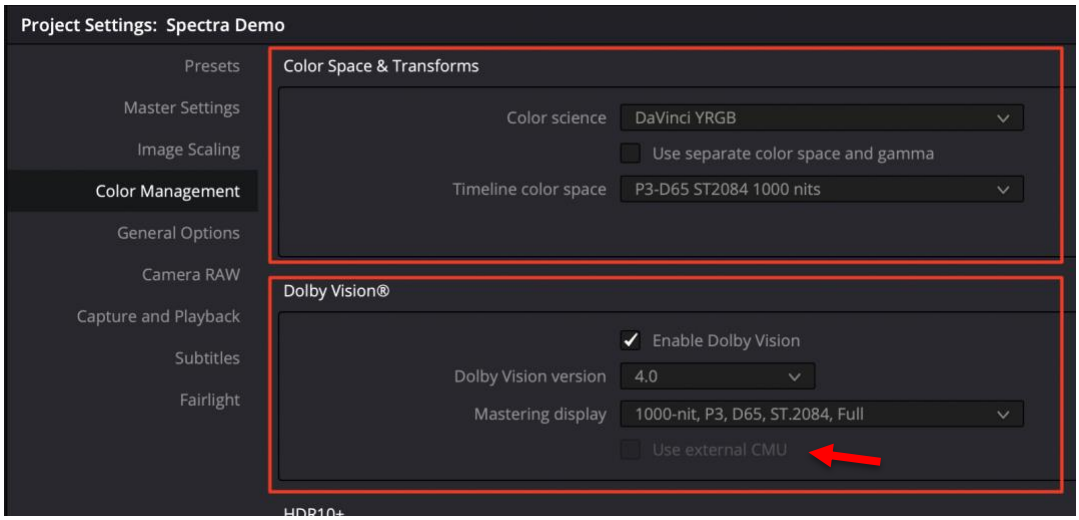
Spectra uses the timeline format, from the Project Settings page, as the output format (see image below). Set the 'Timeline resolution' to the appropriate resolution; Resolve will adjust the timeline scale accordingly.



Next, we need to select 'Color Management' on the 'Project Settings' page (see image below).

1. Under the ‘Color Space & Transforms’ section set the following:
   - Color science = ‘DaVinci YRGB’
   - Timeline color space = ‘P3-D65 ST2048 1000 nits’

2. Under the ‘Dolby Vision’ section set the following:
   - Check the ‘Enable Dolby Vision’ feature
   - Dolby Vision version = ‘4.0’ (for iCMU)
     Dolby Vision version = ‘2.9’ (for eCMU)
   - Mastering display = ‘1000-nit, P3, D65, ST.2084, Full’
   - Uncheck ‘Use external CMU’ to use Internal CMU to map Dolby Vision to HDR10 in Davinci Resolve for HDR streaming to iOS or Apple TV 4K (red arrow).



3. Save - click the Save button

Note 1: Once these changes have been made, you can do a simple scrub of the timeline to make sure Spectra is receiving a representative image.

Note 2: Refer to the Streambox Spectra Setup Guide for additional information on “Using ACES and other Color Space Standards” as they do apply to ‘DaVinci YRGB Color Managed’ used here.

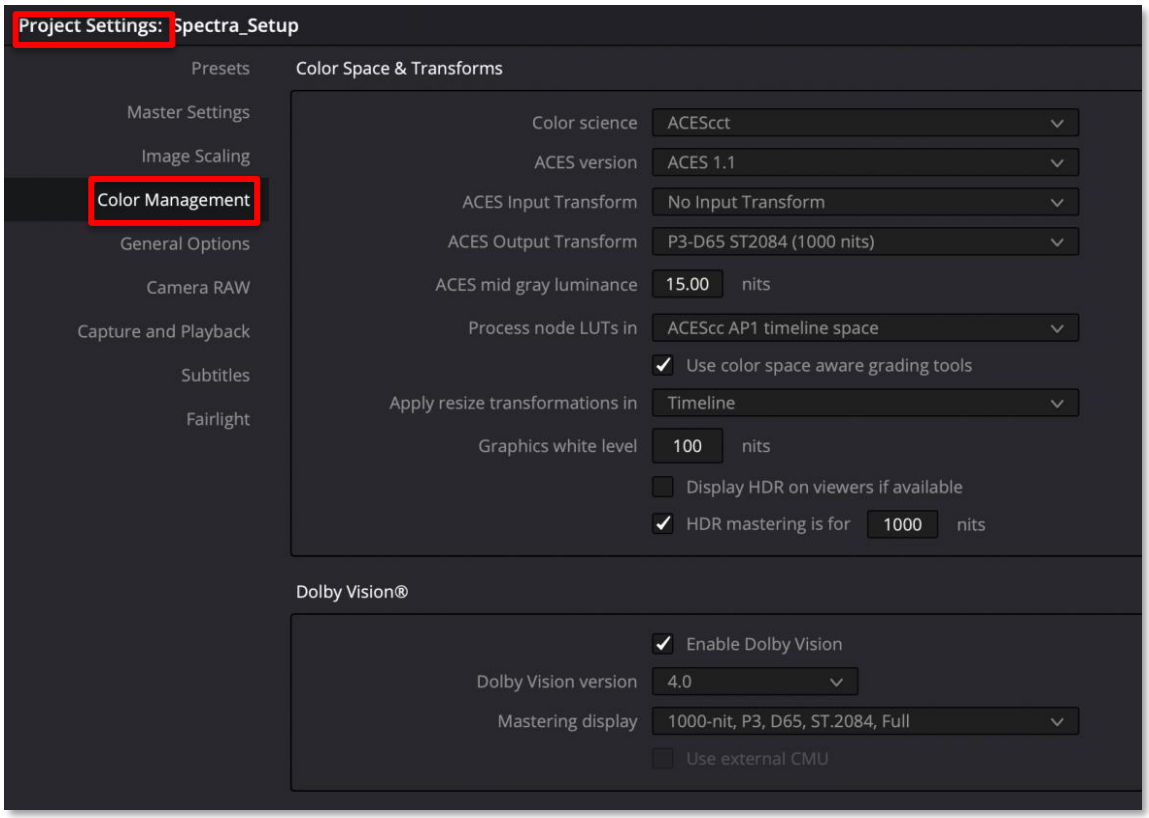
[Back to Spectra (Encoder) Setup]

O ACES Workflow with DaVinci Resolve & Spectra (OpenFX)

Here we use ACES as an example, but this applies to other standards used by Resolve, e.g., DaVinci Wide Gamut. The basic goal is to deliver P3-D65 (ST2084) to the Spectra OpenFX plugin while editing with an expanded gamut like ACES.

Using ACES: Academy Color Encoding System (ACES) is a standard developed under the auspices of the Academy of Motion Picture Arts and Sciences organization. To properly deploy ACES with Spectra requires a few extra steps.

1. Setup the 'Color Management' tab of the Project Settings page.
   Either ACEScc or ACEScct color science will work. ACEScct is generally recommended for Dolby Vision workflow. Setup for 1000nits:
   - We recommend using the latest ACES version
   - ACES Input Transform should match the source file format. So, if the source files are in a specific camera format, choose that. If the files have already been transformed into ACES, choose that. In most cases, files are delivered in a standard or raw format and 'No Input Transform' should be selected.
   - ACES Output Transform should match the capabilities of your video display. For our purposes here, to stream HDR video, we recommend 'P3-D65 ST2084 (1000nits)'.
   - ACES mid gray luminance should be set to 15.00nits.
   - Under Dolby Vision, make sure 'Enable Dolby Vision' is checked and that 'Mastering display' matches ACES Output Transform.



Note: The 'ACES Output Transform' is applied to Blackmagic hardware output to a local grading monitor, and *not* used by the Spectra OpenFX plugin. However, 'ACES Output Transform' will be applied if Spectra is connected to Resolve via SDI hardware (see Spectra & DaVinci Resolve – Blackmagic Workflow).

2. This applies to OpenFX Workflow (via OpenFX Plugin). On the Color page, switch focus to Timeline (as described above) and add 3 Corrector nodes. Note: if you already have a Spectra node, delete that one first.

    a. Connect Node 01 to input and Node 03 to output. Now connect Node 01 to Node 02, and Node 02 to Node 03 (as shown in the image below).

    b. To the middle node (02), add Spectra from the OpenFX list (see below).

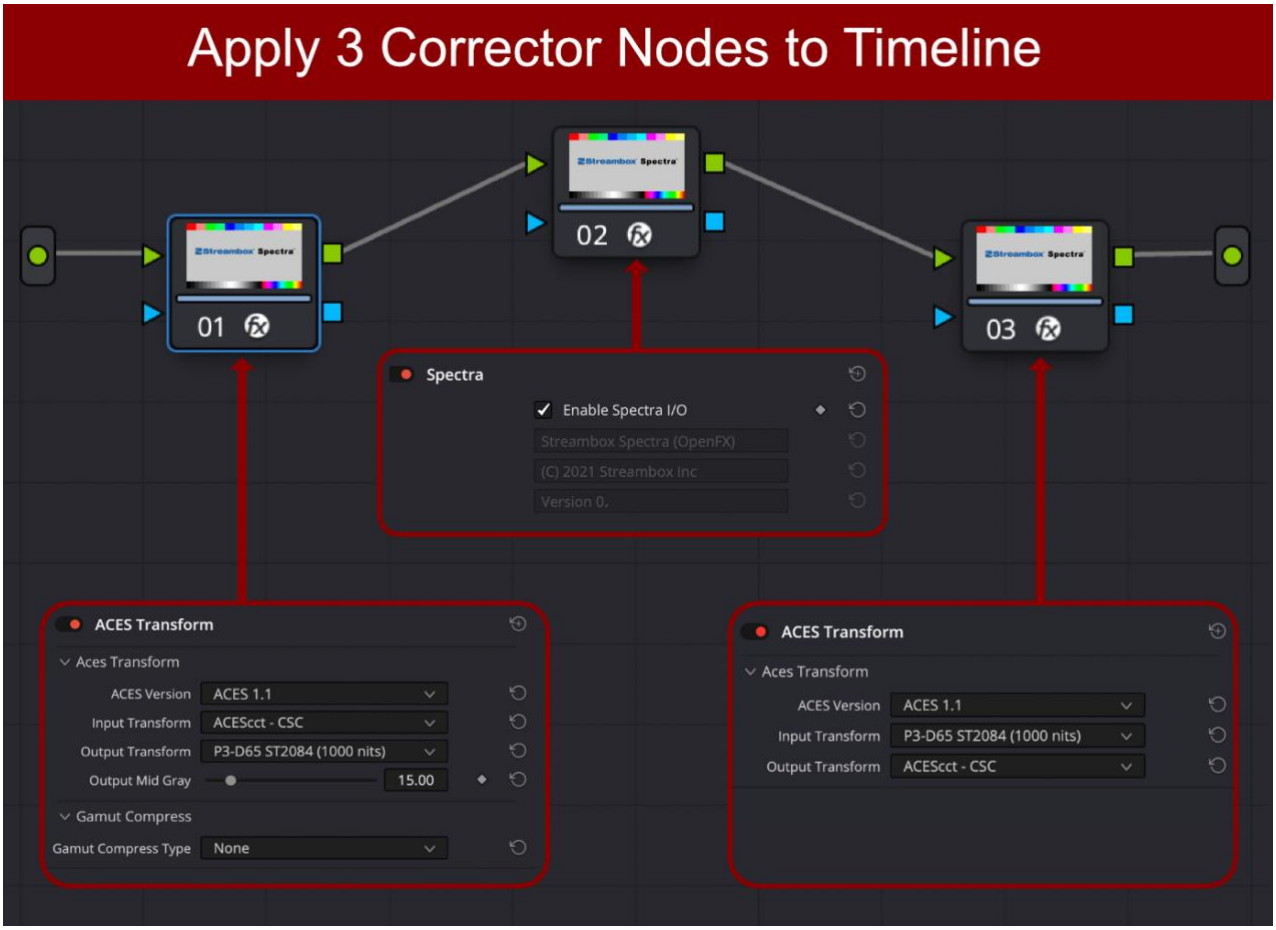
    c. To the first node (01), add 'ACES Transform' from the OpenFX list
    - Set the ACES Version to match the Color Management settings from the Project Settings page (e.g., ACES 1.1)
    - Set Input Transform to match your Color Management settings from the Project Settings page (e.g., ACEScct)
    - Set Output Transform to match Dolby Vision workflow: P3-D65 ST2084(1000nits)

    d. To the third node (03), add 'ACES Transform' from OpenFX list
    - Set the ACES Version to match the first node (01), e.g., ACES 1.1
    - Set Input Transform to match Output Transform of first node (01): P3-D65 ST2084(1000nits)
    - Set Output Transform to match Input Transform of first node (01), e.g., ACEScct

3. Once these changes have been made, you can do a simple scrub of the timeline to make sure Spectra is receiving a representative image.

Note 1: If you add additional corrective nodes, they should be placed before the Spectra node.

Note 2: When using ACES and Dolby Vision, it is important that all equipment supports Dolby Vision and attention must be paid to all settings that can affect media output. Netflix has published helpful information about using the ACES color science with DaVinci Resolve.


Apply 3 Corrector Nodes to Timeline
01
02
03
Spectra
Enable Spectra I/O
Streambox Spectra (OpenFX)
(C) 2021 Streambox Inc
Version 0,
ACES Transform
Aces Transform
ACES Version
ACES 1.1
Input Transform
ACEScct - CSC
Output Transform
P3-D65 ST2084 (1000 nits)
Output Mid Gray
15.00
Gamut Compress
Gamut Compress Type
None
ACES Transform
Aces Transform
ACES Version
ACES 1.1
Input Transform
P3-D65 ST2084 (1000 nits)
Output Transform
ACEScct - CSC

B Spectra & DaVinci Resolve – Blackmagic Workflow

Setup the UltraStudio Monitor/Recorder or 4K Mini as shown in the overview pictures (Pages 3 and 4).

Note 1: For UltraStudio 4K, start Spectra first and make sure Capture Drive is set to Blackmagic in source tab. Note if you start Resolve before Spectra, resolve will capture both input and output, and you will need to quit Resolve for Spectra to use Ultrastudio 4K. In Source Tab Make , make sure Blackmagic UltraStudio 4K is selected

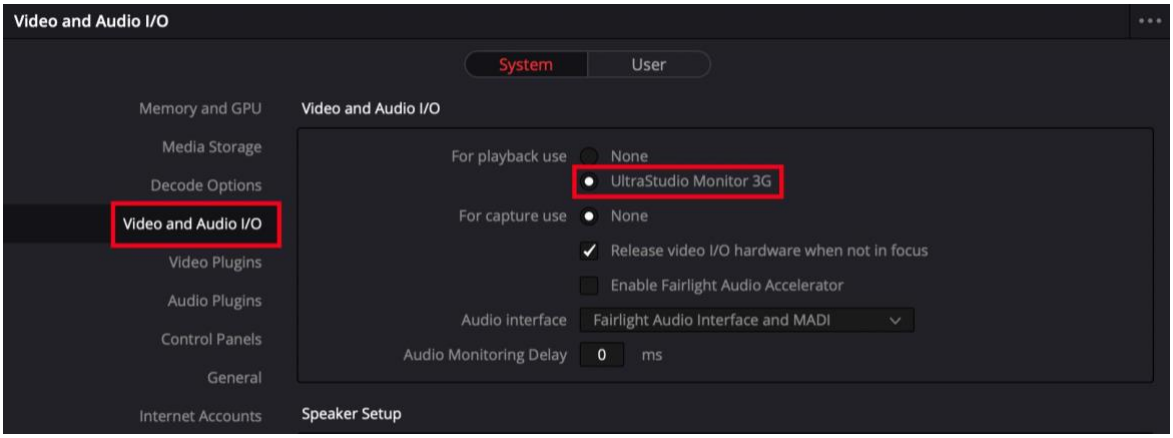
Note 2: For the UltraStudio 3G, connect the Monitor SDI out to the Recorder SDI in, to pass Resolve's output to Spectra's input.

Note 4: For the UltraStudio 4K Mini setup, connect SDI out to SDI in, to pass Resolve's output to Spectra's input. If it is a 4K, 4:4:4 project, you might need to connect the second pair of SDI I/O for dual link.

Note 5: Streambox Spectra can run on the same device as DaVinci Resolve or you can use two separate devices (the use of a second machine is not generally required with newer MacOS equipment).

B Setting up DaVinci Resolve

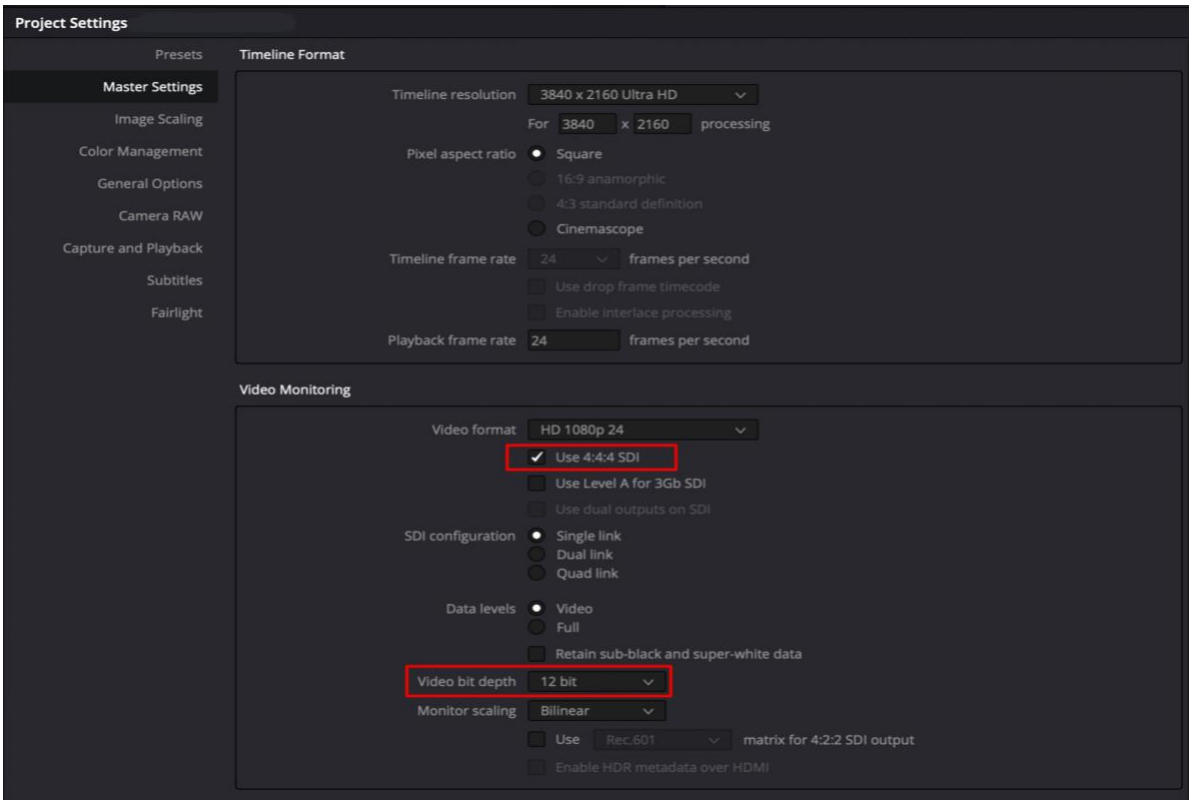
Basically, you need to tell DaVinci Resolve where to send the output. In this case, it is the UltraStudio equipment (either **UltraStudio Monitor 3G** or **UltraStudio 4K Mini**). Open the



'Preferences…' page and select the 'Video and Audio I/O' tab. Make sure that the UltraStudio equipment is first plugged in and then selected here. All other settings on this page have no impact on our mission here.

Next, we need to open the 'Project Settings' page (Shift + 9).

4. If you are streaming with Dolby Vision metadata (to Chroma+), you need to set Video Monitoring to 'Use 4:4:4 SDI' and 12-bit for 'Video bit depth.'



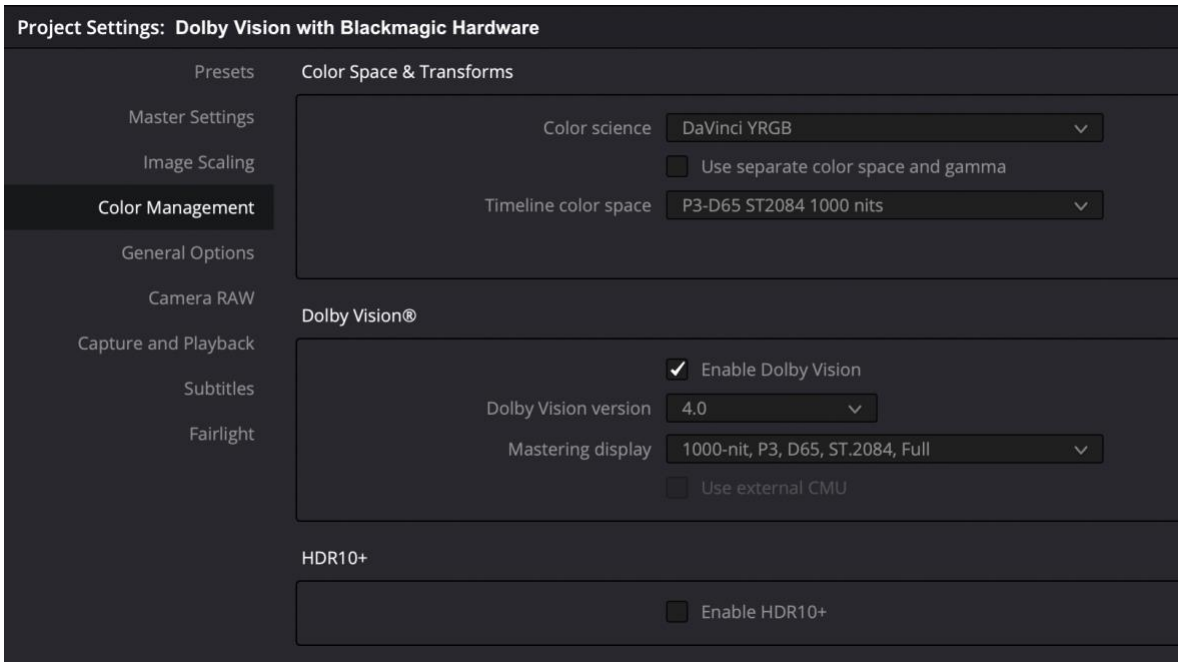
Next we need to select ‘Color Management’ on the ‘Project Settings’ page (see image below).

5. Under the ‘Color Space & Transforms’ section set the following:
    - Color science = ‘DaVinci YRGB’
    - Timeline color space = ‘P3-D65 ST2084 1000 nits’

6. Under the ‘Dolby Vision’ section set the following:
    - Check the ‘Enable Dolby Vision’ feature
    - Dolby Vision version (latest version) = ‘4.0’
    - Mastering display = ‘1000-nit, P3, D65, ST.2084, Full’
    - **Uncheck** ‘Use external CMU’ (default) to use Internal CMU for embedded tone mapping for most colorist work.

      Note: For External CMU, you need a Dolby Vision use license, and you will need to stream to a Chroma+ decoder (see Chroma+ setup above). Chroma+ will then output Dolby Vision metadata over HDMI to a Dolby Vision enabled TV (monitor). Otherwise, leave this unchecked (e.g., for streaming to Apple TV and/or iPads). Also, leave unchecked if you are streaming to multiple collaborators with varying types of Streambox decoders.

7. Save - click the Save button

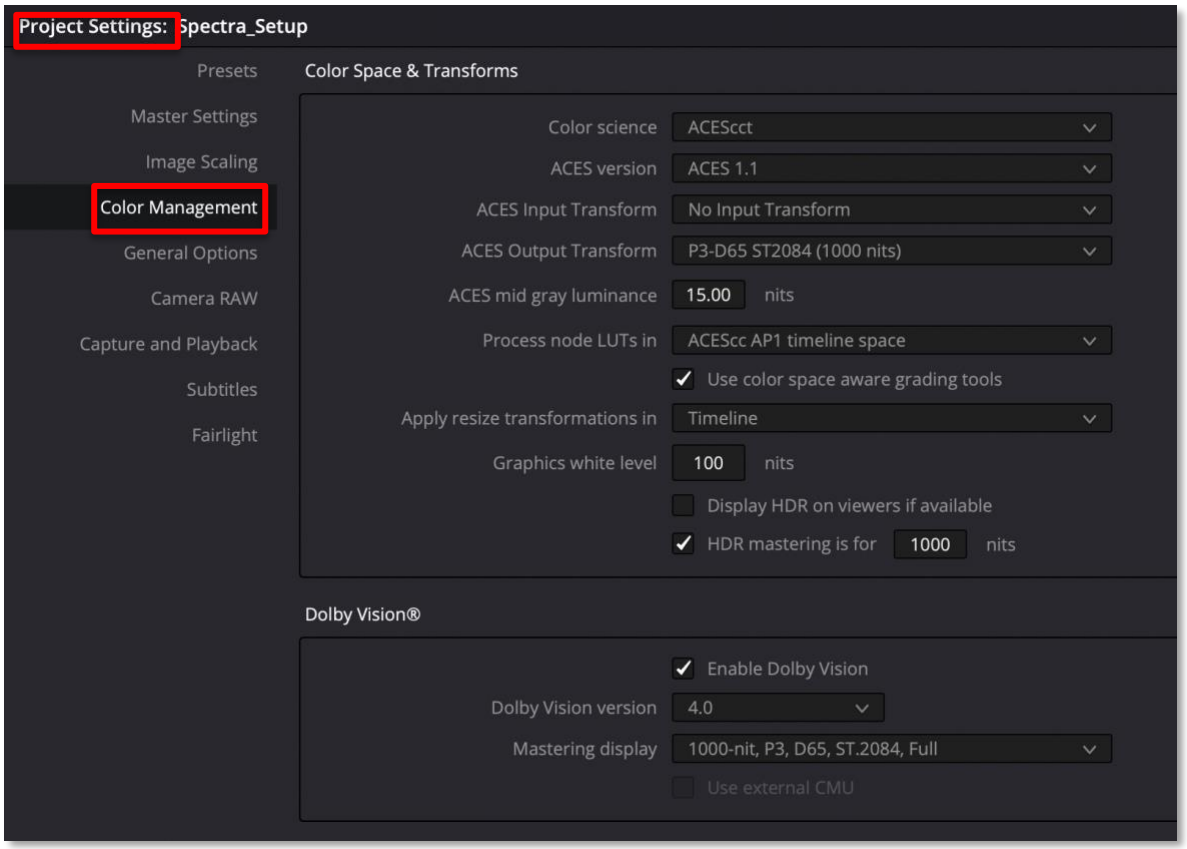


B ACES Workflow with DaVinci Resolve & Spectra (Blackmagic)

Here we use ACES as an example, but this applies to other standards used by Resolve, e.g., DaVinci Wide Gamut. The basic goal is to deliver P3-D65 (ST2084) the UltraStudio device while editing with an expanded gamut like ACES.

Using ACES: Academy Color Encoding System (ACES) is a standard developed under the auspices of the Academy of Motion Picture Arts and Sciences organization. To properly deploy ACES with Spectra requires a few extra steps.

4. Setup the 'Color Management' tab of the Project Settings page.
   Either ACEScc or ACEScct color science will work. ACEScct is generally recommended for Dolby Vision workflow. Setup for 1000nits:
   - We recommend using the latest ACES version
   - ACES Input Transform should match the source file format. So, if the source files are in a specific camera format, choose that. If the files have already been transformed into ACES, choose that. In most cases, files are delivered in a standard or raw format and 'No Input Transform' should be selected.
   - ACES Output Transform should match the capabilities of your video display. For our purposes here, to stream HDR video, we recommend 'P3-D65 ST2084 (1000nits)'.
   - ACES mid gray luminance should be set to 15.00nits.
   - Under Dolby Vision, make sure 'Enable Dolby Vision' is checked and that 'Mastering display' matches ACES Output Transform.


Project Settings: Spectra_Setup
Presets
Master Settings
Image Scaling
Color Management
General Options
Camera RAW
Capture and Playback
Subtitles
Fairlight
Color Space & Transforms
Color science
ACEScct
ACES version
ACES 1.1
ACES Input Transform
No Input Transform
ACES Output Transform
P3-D65 ST2084 (1000 nits)
ACES mid gray luminance
15.00
nits
Process node LUTs in
ACEScc AP1 timeline space
Use color space aware grading tools
Apply resize transformations in
Timeline
Graphics white level
100
nits
Display HDR on viewers if available
HDR mastering is for
1000
nits
Dolby Vision®
Enable Dolby Vision
Dolby Vision version
4.0
Mastering display
1000-nit, P3, D65, ST.2084, Full
Use external CMU

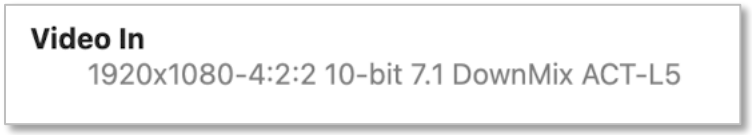
O,B Troubleshooting (OpenFX & Blackmagic)

[O] Background scrolling in Spectra: If Render Cache (in Playback Menu) is set to Smart you may see the image in Spectra scroll by as background rending takes place (during play or scrubbing). If this becomes an issue, you can set the Render Cache to User and then only render the cache when needed. Furthermore, you can set the Render Cache properties under the Manager Settings tab of the Project Settings dialog (from File menu).

[O] OpenFX failure: If the Spectra OpenFX plugin initially fails, you may have to delete the OFXPluginCache.xml file. This file is in the ~/Library/Application Support/Blackmagic Design/DaVinci Resolve folder.
From the Go menu of the Finder, select 'Go to Folder…' and enter the path above.

[O,B] Note 1: Resolve defaults to 10-bit output so Spectra must be set to ACT-L5 (System page) and 10-bit color depth on (Video/Audio page) for correct resolution to be displayed.

[O,B] Note 2: You can confirm correct settings by streaming to a Media Player (directly or via the Streambox Cloud) and reviewing the 'Video In' readout (see image below). The example below shows that the video resolution is 1920x1080 (or HD), the chroma subsampling is 4:2:2, the color depth is 10-bit, there are 8 audio channels (that were downmixed to 2, stereo), and the codec is ACT-L5.



Conclusion

If all the above setup is implemented, and the Encoder is set to stream, you should now be streaming the DaVinci Resolve timeline from Spectra to a Streambox decoder.

If this is not the case, please go through the steps one more time. If that fails, please contact Support.

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