Advanced LUT Auto-calibration with the Lumagen Pro

There are three types of auto-cal sessions you can run with the Lumagen Pro.

- <u>Rec. 2020 and HDR10</u>: Use this for calibration of UHD 4k sources
- <u>Rec. 2020 and SDR</u>: This is an alternative for UHD 4k sources for those users who prefer to not use HDR.
- <u>P3 and SDR</u>: This is another alternative for UHD 4k sources for those users who prefer to not use HDR.
- <u>Rec. 709 and SDR</u>: Use this for 2K HD broadcast and Blu-ray sources

TIPS

- If, for whatever reason, you need to run auto-cal more than once, then you should close ChromaPure and then restart before beginning a new auto-cal session.
- Do not enable Measurement Smoothing in ChromaPure.
- Do not enable Gamut Overlay in ChromaPure.
- If you are calibrating projector in HDR/2020 mode, then you must measure off of the screen.
- Be sure to always use the Filtering feature. For HDR set the grayscale filter to 65%. For SDR set the grayscale filter to 100%. The Color will be filtered automatically after the system measures your display gamut.
- Make sure that the Lumagen is connected to an active input before starting the calibration: Blu-ray/ broadcast HD for SDR HD or UHD disc for HDR2020 or SDR2020.
- The 709 calibrations and playback should be done using CMS0 and the HDR2020 and SDR2020 calibrations and playback should use CMS01.
- Many displays will automatically switch to the correct mode when detecting HDR and/or a 2020 signal. If not you may have to do this manually before you begin the calibration.

Rec. 2020 and HDR10

1. Begin playing UHD/HDR content, such as a UHD Blu-ray. UHD content will default to Lumagen CMS1 and SDR content will default to CMS0. It is good to keep these separate.

2. Open the Initial Setup module.

3. Setup the Lumagen Pro as a signal generator in ChromaPure. Select YCbCr422 – HDR2020 as the Color Space.

4. Select the appropriate test pattern size: Windows for plasma and OLED and Fields for Projectors and LCD/LED flat panels.

5. Select 100% Color Intensity.

6. Setup your meter.

7. In ChromaPure's Options module select Rec. 2020 as the Reference Gamut and HDR10 (or HDR 10 – Projector) as the Target Gamma.

8. Select an input with active HDR2020 material, i.e. a UHD disc.

9. Carefully set brightness using the Lumagen test pattern and the Lumagen's Black control. (Menu, Output, CMS, CMS<1>, Black) NOTE: This setting is likely different for HDR than SDR.
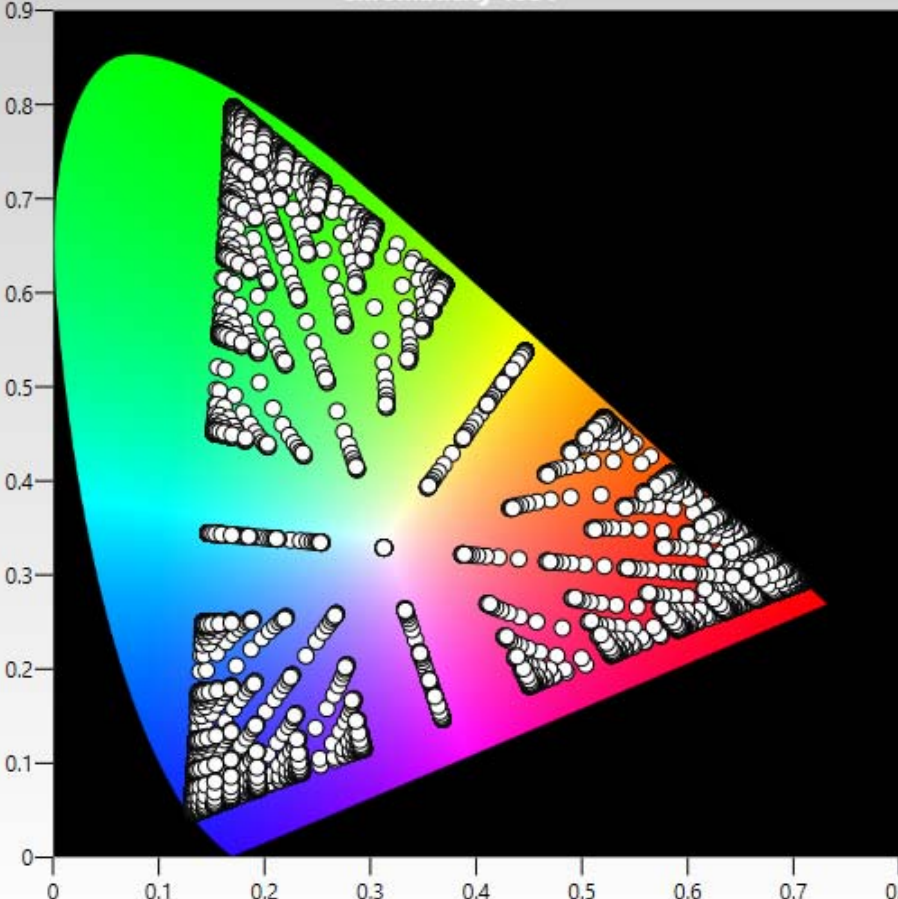
10. Open the Auto-cal module.
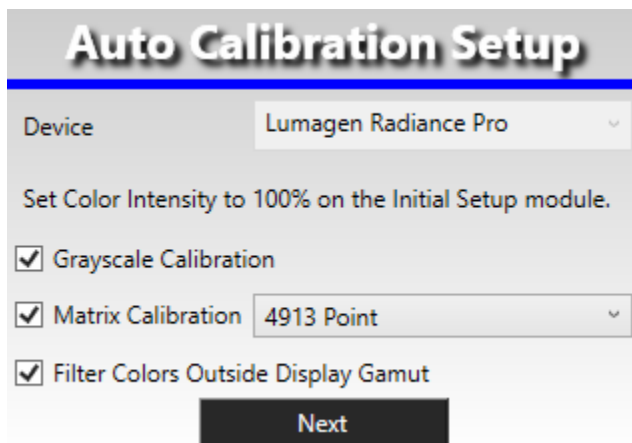
11. Select what you wish to calibrate: grayscale, color matrix (4913 colors recommended), or both. In most cases you will want to select both.

12. Select the **Filter Color outside the Gamut** option, and then click **Next**.

The **Gamut Filtering** window will appear.

13. Select a value for the intensity filter. A 65% setting is recommended, depending on your display's capabilities.

14. Click **Measure** to measure the display gamut.

15. Click **Apply Gamut and Intensity Filter**.

The ChromaPure Auto Calibration Process can not calibrate colors outside the display gamut. This module allows you to remove these off gamut colors from the calibration process.

1. Select Intensity Filter
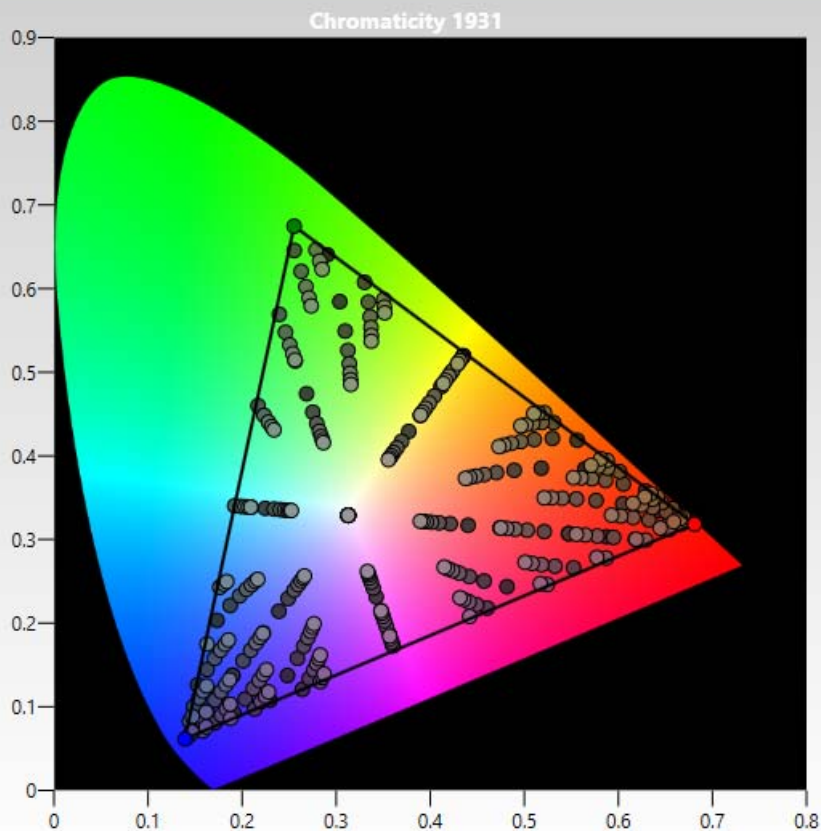
65%

2. Measure Display Gamut

Measure

Colors Inside Gamut   311

Colors Outside Gamut   0
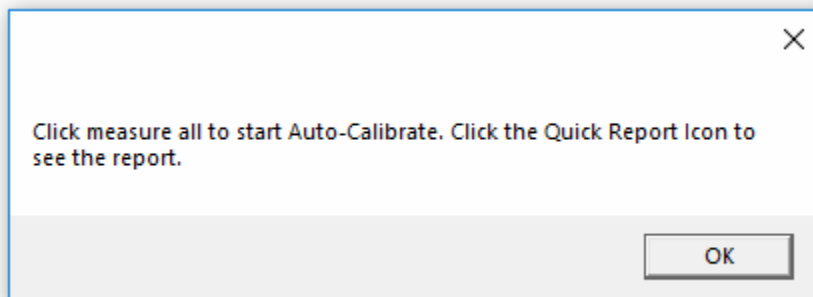
3. Apply Gamut and Intensity Filter

Apply Gamut and Intensity Filter

Next

Chromaticity 1931

16. Click **Next**.
    A window will appear with final instructions.

Click measure all to start Auto-Calibrate. Click the Quick Report Icon to see the report.

OK

17. Click **OK**.

18. Colors will populate on the left side.

19. Click **A** (Measure All) to measure and calibrate all of the colors in the series. (**NOTE:** The Red, Green, and Blue colors at the top of the list do not need to be measured. You can click M to measure White and then select the first grayscale color and click A to measure everything else.)

20. When the process has completed, you will be prompted to run a calibration report. You can also perform selected spot corrections (optional) by just selecting the desired color and then clicking **M** (Measure). ChromaPure will generate the selected test pattern and run the correction procedure on the color for a second time.

JVC Projector settings for HDR Calibration

By default, JVC projectors are not optimally configured for HDR. To get a good HDR calibration (manual or auto-cal) you need to manually input the following settings BEFORE starting the calibration.

ChromaPure Settings

- Gamma: HDR10 - Projector
- Gamut: Rec. 2020

Models DLA-X950R, X750R, X550R, X9000, X7000, X5000, XC7890R, XC6890R, XC5890R, RS600, RS500, RS400

General

- Iris: Manual, Fully open
- Picture Mode: Reference
- Lamp Power: High

Gamma

- Gamma setting: D
- Picture Tone: +12
- Dark Level: +5
- Bright Level: +4

Color (Models DLA-X950R,X750R,X9000,X7000,XC7890R,RS600,RS500)

- Picture Mode: Reference
- Color: +20
- Tint: -5
- Color Management: On
- Color Selection: Blue, Hue ： -15
- Color Selection: Yellow, Hue ： -3

Color (Models DLA-X550R,X5000,XC6890R,XC5890R,RS400)

- Color Profile: Cinema
- Color: +30
- Color Management: On
- Color Selection: Blue, Hue ： -15

Rec. 2020 and SDR

About Lumagen CMS memories

All Lumagen processors have multiple memories for independent CMS corrections. The Lumagen Pro will always default to CMS0 when it detects SDR source material. It will default to CMS01 when it detects HDR material. So, when doing 709/SDR or 2020/HDR calibrations, the Lumagen will automatically use CMS0 and CMS1, respectively. However, 2020/SDR is a hybrid between the previous two modes to which the Lumagen does NOT automatically assign a separate CMS, so the user has to do this manually.

First, copy the three calibration modes to separate CMSs for permanent storage.

- Copy any existing 709/SDR calibration from CMS0 to CMS2.

- Copy any existing 2020/HDR calibration from CMS1 to CMS3.

- When you have completed the 2020/SDR calibration, copy CMS0 to CMS4.

When you are ready for playback, ensure that the 709/SDR has been copied to CMS0 and that the 2020/HDR or 2020/SDR calibration has been copied to CMS01. (Since the Lumagen will see a 2020/HDR source, it will always default to CMS01 regardless if your playback mode is 2020/SDR or 2020/HDR.)

Copying a CMS

Using the Lumagen remote, Menu, Output, Copy <Enter>, Select *Type* (CMS) and *From* (Source CMS) and *To* (Target CMS), <Enter>, <Enter>.

Permanent Storage	CMS Memory		For Playback	CMS Memory
709/SDR	CMS2		709/SDR	CMS0
2020/HDR	CMS3		2020/HDR	CMS1
2020/SDR	CMS4		2020/SDR	CMS1

NOTE: Regardless of which CMSs you use for permanent storage, you will only use CMS0 or CMS1 for playback.

1. If you have not already done so, store your existing 709/SDR and 2020/HDR calibrations in available CMSs as described above.

2. Select the widest color gamut mode on your display. It might be 2020 or just called Wide. (For example, on the LG OLEDs Standard gamut is for SD DVD, Extended gamut is for Blu-ray and HD broadcast, and Wide gamut is for UHD. Wide is very close to DCi-P3.)

3. Setup the Lumagen Pro as a signal generator in ChromaPure.

4. In the **Colorspace** dropdown, select YCbCr422 – SDR2020.

5. Select 100% Color Intensity.

6. Initialize the colorimeter.

7. For SDR calibrations you can use full fields for projectors and windows for everything else.

8. Present to the Lumagen a 709/SDR signal, or you can use no active input at all—the Lumagen will still default to CMS0.

9. In the **Options** module select Rec. 2020 gamut and an SDR gamma of your choice. BT.1886 or 2.22. Higher gammas will work also, but they may crush shadow detail.

10. Carefully set Brightness using the Lumagen test pattern and the Lumagen Black control. (Menu, Output, CMS, CMS<1>, Black) NOTE: This setting is likely different for HDR and SDR.

11. Open ChromaPure's White Balance module and calibrate 100% white with the display's white balance controls. Do not use the Lumagen 100% grayscale control.

12. Open ChromaPure's Auto-cal module.

13. Select what you wish to wish to calibrate: grayscale, color matrix (4913 or 729 colors recommended), or both. In most cases you will want to select both.

14. Select the **Filter Color outside the Gamut** option, and then click **Next**.

15. The **Gamut Filtering** window will appear.

16. Set the Intensity Filter to 100%.

17. Click **Measure** to measure the display gamut.

    ChromaPure will take WRGB measurements and display the measured colors.

18. Click **Apply Gamut and Intensity Filter**.

    ChromaPure will eliminate any colors that fall outside of the display gamut.

19. Click **Next**.

    A window will appear with final instructions.

20. Click **OK**.

    Colors will populate on the left side.

21. Click **A** (Measure All) to measure and calibrate all of the colors in the series. (**NOTE:** The Red, Green, and Blue colors at the top of the list do not need to be measured again. You can click M to measure White and then select the first grayscale color and click A to measure everything else.)

22. When the process finishes, you will be prompted to run a calibration report. Please do so. You can also perform selected spot corrections (optional) by just selecting the desired color and then clicking **M** (Measure). ChromaPure will generate the selected test pattern and run the correction procedure on the color for a second time.

23. Copy the results of your 2020/SDR calibration to CMS4 for permanent storage.

24. Copy CMS4 to CMS01 for playback.

25. Begin playing HDR2020 content, such as a UHD Blu-ray. UHD content will default to CMS01.

NOTE: As described in step 4, you have set the Lumgen's Colorspace to SDR/2020. You need to change this to SDR709 when playing HD content or HDR2020 when playing HDR2020 content that you want to display in HDR.

P3 and SDR

The steps for using this option are exactly the same as Rec. 2020 and SDR described above with two changes:

- Select the SDRP3 colorspace when setting up the Lumagen Pro in ChromaPure.

- Select the DCi-P3 Reference Color Gamut in the ChromaPure Options module.

Rec. 709 and SDR

1. Setup the Lumagen Pro as a signal generator in ChromaPure.

2. Select YCbCr422 – 709 as the Color Space.

3. In ChromaPure's **Options** module select the Rec. 709 gamut and an SDR gamma of your choice. 2.22 or BT.1886 is recommended.

4. Present to the Lumagen a 709/SDR signal, or you can use no active input at all—the Lumagen will still default to CMS0.

5. Set Brightness and Contrast using the Lumagen test pattern.

6. Open the White Balance module in ChromaPure and manually calibrate 100% white using the display's own white balance controls. Do not use the Lumagen 100% white control.

7. Select the Color or Picture preset on your display that is closest to the Rec. 709 HD standard. You can use the Performance module to test the available Color presets. (For example, on the LG OLEDs the Extended gamut is closest to the Blu-ray and HD broadcast 709 standard.)

8. Open the Auto-cal module.

9. Select what you wish to calibrate: grayscale, color matrix, or both. In most cases you will want to select both.

10. Select the **Filter Color outside the Gamut** option, and then click **Next**.

    The **Gamut Filtering** window will appear.

11. Set the Intensity Filter to 100%.

12. Click **Measure** to measure the display gamut.

    ChromaPure will take WRGB measurements and display the measured colors.

13. Click **Apply Gamut and Intensity Filter**.

    ChromaPure will eliminate any colors that fall outside of the display gamut.

14. Click **Next**.

    A window will appear with final instructions.

15. Click **Next**.

16. Colors will populate on the left side.

17. Click **A** (Measure All) to measure and calibrate all of the colors in the series. (**NOTE:** The Red, Green, and Blue colors at the top of the list do not need to be measured again. You can click M to measure White and then select the first grayscale color and click A to measure everything else.)

18. When the process has completed, you will be prompted to run a calibration report. You can also perform selected spot corrections (optional) by just selecting the desired color and then clicking **M** (Measure). ChromaPure will generate the selected test pattern and run the correction procedure on the color for a second time.