

UHD Single-Master HDR-SDR Production

Shading and Grading Display Setup

UHD HDR-SDR Single-Master Live Production Method

This eBook will evolve as we document the complete workflow.

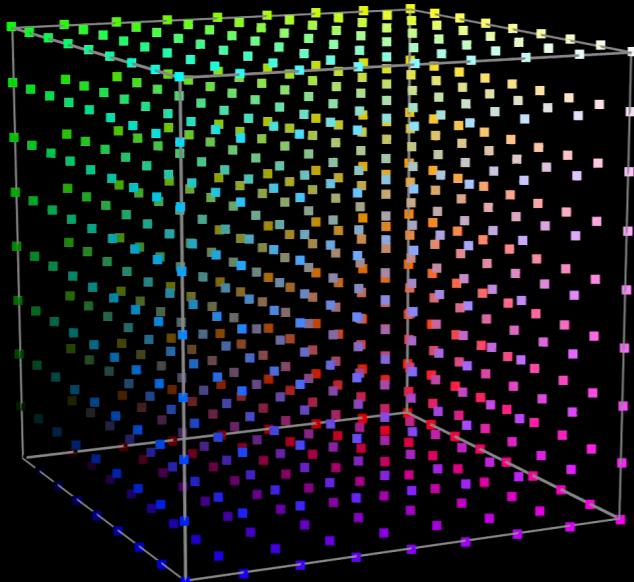
Lesson Two will review Shading/Grading.

It is provided as a reference for production teams.

Apple Book Store Link is here:

<http://books.apple.com/us/book/id6443508953>

Lesson 2



HDR-SDR Displays

ADJUSTMENTS FOR SHADING & GRADING

Live Broadcast Production

Adjustments

HLG and SDR Displays

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Optimal Gain-Staging
For Consumer Delivery
Of HDR and SDR

Display Adjustment Instructions

Side-by-Side HDR-SDR Shading

In the Single-Master production workflow, camera shading is performed in HLG BT.2100 using a native HLG reference display. We provide a “predictive” HLG-to-SDR conversion for shaders so that converted SDR simulates transmission for monitoring. The NBCU LUT3 for HDR to SDR conversion is designed to consistently maintain the original artistic intent when compressing highlights from HDR.

Native HLG cameras are shaded so that “Diffused White” is equal to 75% signal level. This is equal to 203cd/m^2 if an HLG displays peak white equals $1,000\text{cd/m}^2$. No contrast adjustments are necessary on $1,000\text{cd/m}^2$ HLG displays. Displays lower than $1,000\text{nits}$ require a contrast adjustment so that 75% graphic white



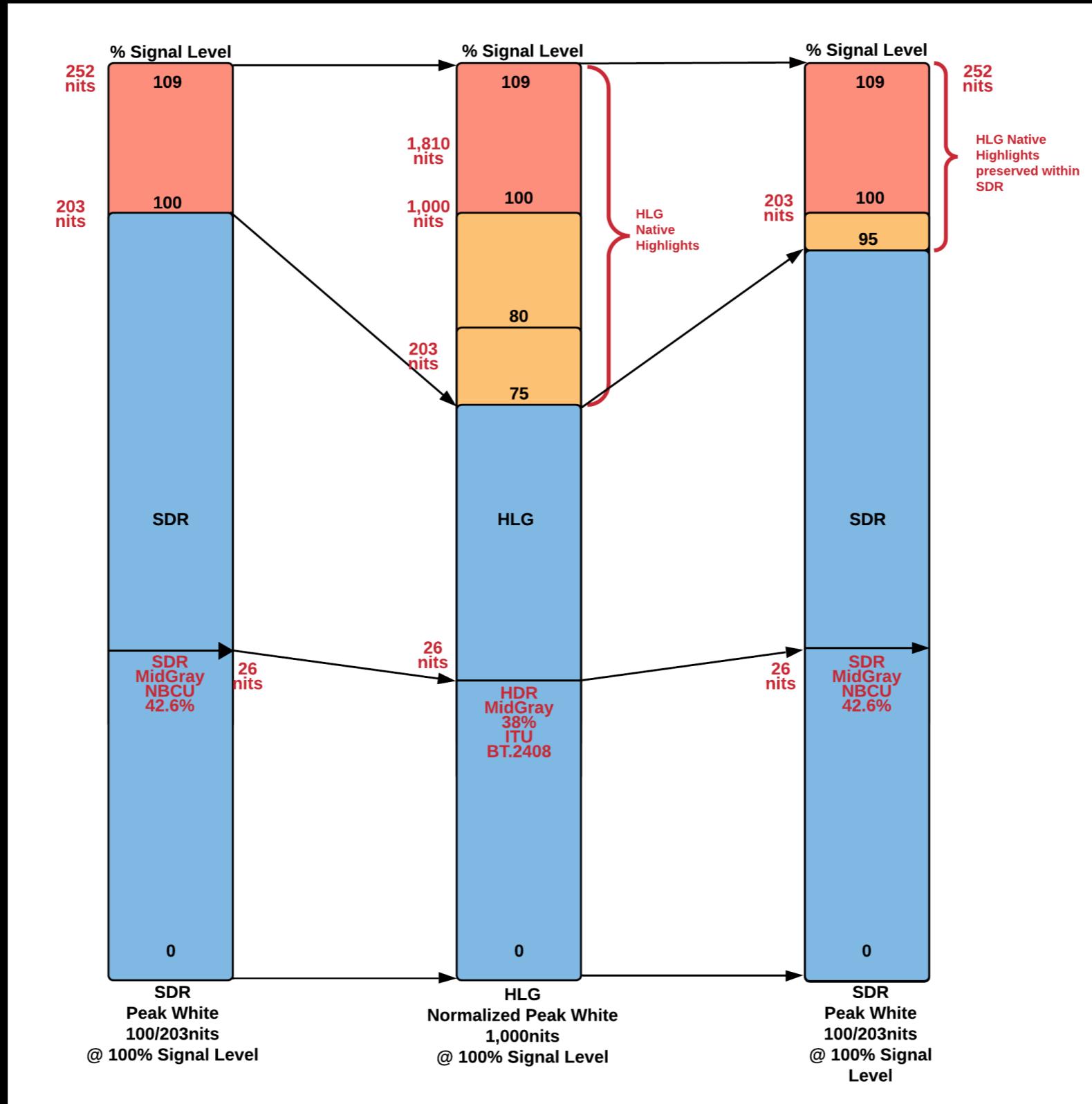
is equal to 203cd/m^2 . HLG is in-essence display-referred once adjusted.

The HLG camera signal is passed thru NBCU LUT3 (with what we call the “Predictive LUT”) to enable shaders to preview the camera’s appearance as it will be seen thru legacy SDR transmission. Generally this is fed by the router and can also be switched to the program output.

SDR camera signals are converted to HLG using NBCU LUT2.

NBCU LUT3 provides a “predictive” preview of the camera thru SDR transmission. SDR displays must be adjusted using the contrast control so a peak-white(100% signal level) equaling 203cd/m^2 .

A Unified Reference/Graphics White and MidGray



Monitoring HDR and SDR Side-by-Side With a Unified Reference Graphics White and MidGray

HLG REFERENCE DISPLAY

Peak White = 600-to-1000nits

REFERENCE WHITE CONTRAST ADJUSTMENT = 203 nits



SDR BT.1886 REFERENCE DISPLAY

Peak White = 203nits

CONTRAST ADJUSTMENT TO 203 nits

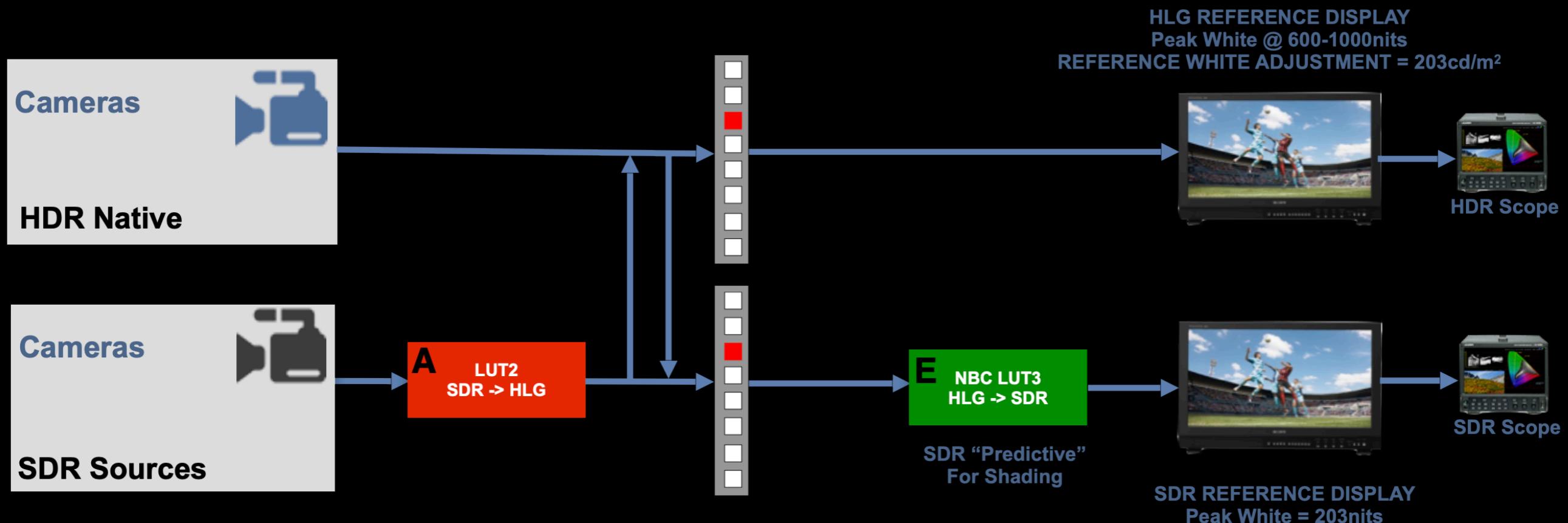


Set HLG Graphic/Reference White = SDR Graphics White

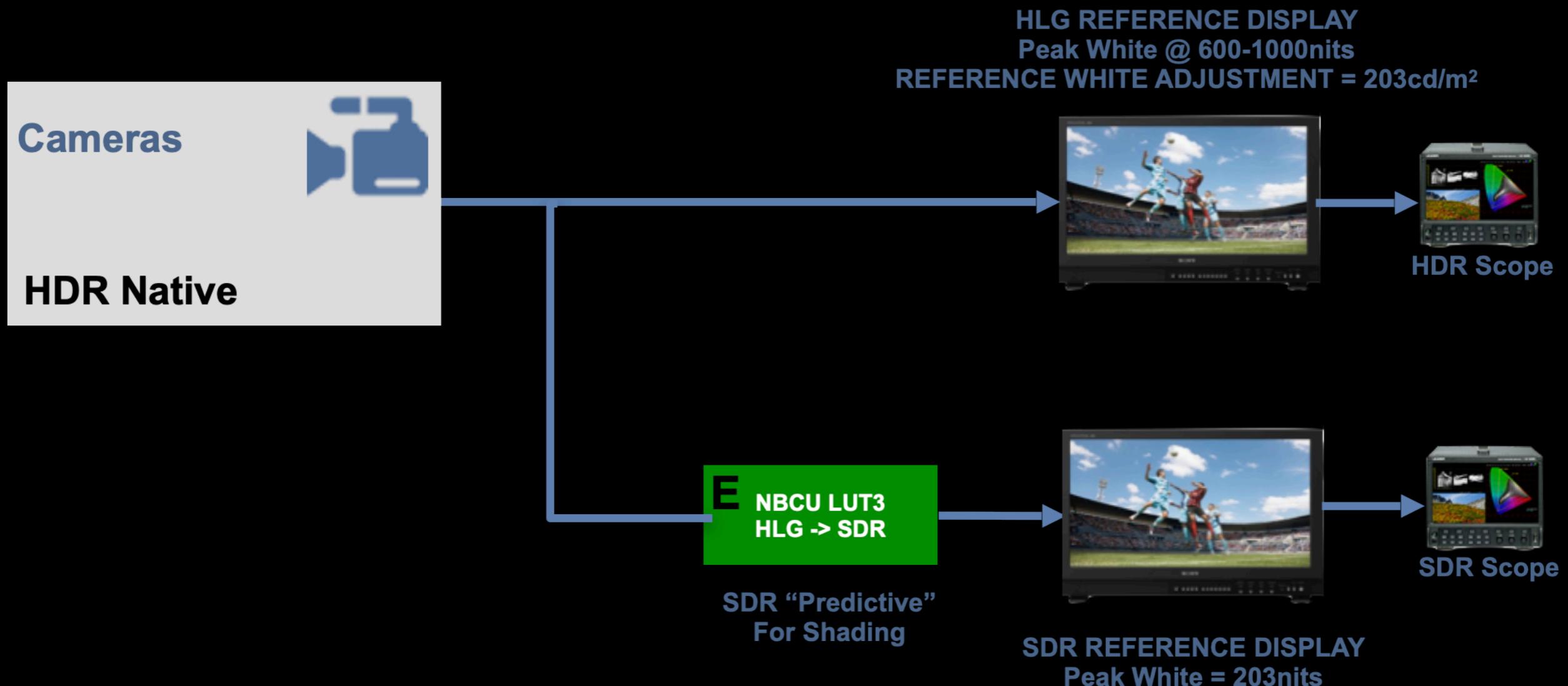
HLG @ 75%(203nits) = SDR @ 100%(203nits)

Setting a “unified reference white” luminance level between HLG and SDR displays allows comparisons of both images side-by-side and avoids eye adaption issues to the luminance differences in the main focal areas of the images (see display adjustments on the next page).

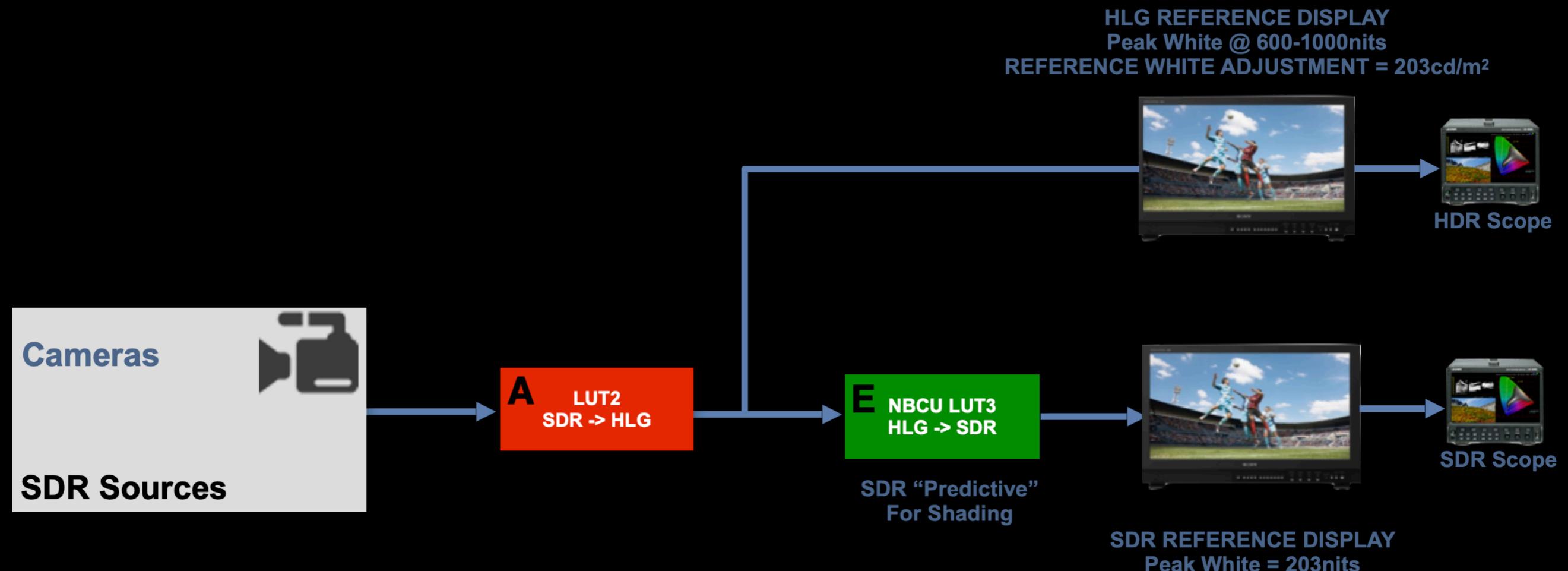
Shading HDR and SDR Cameras



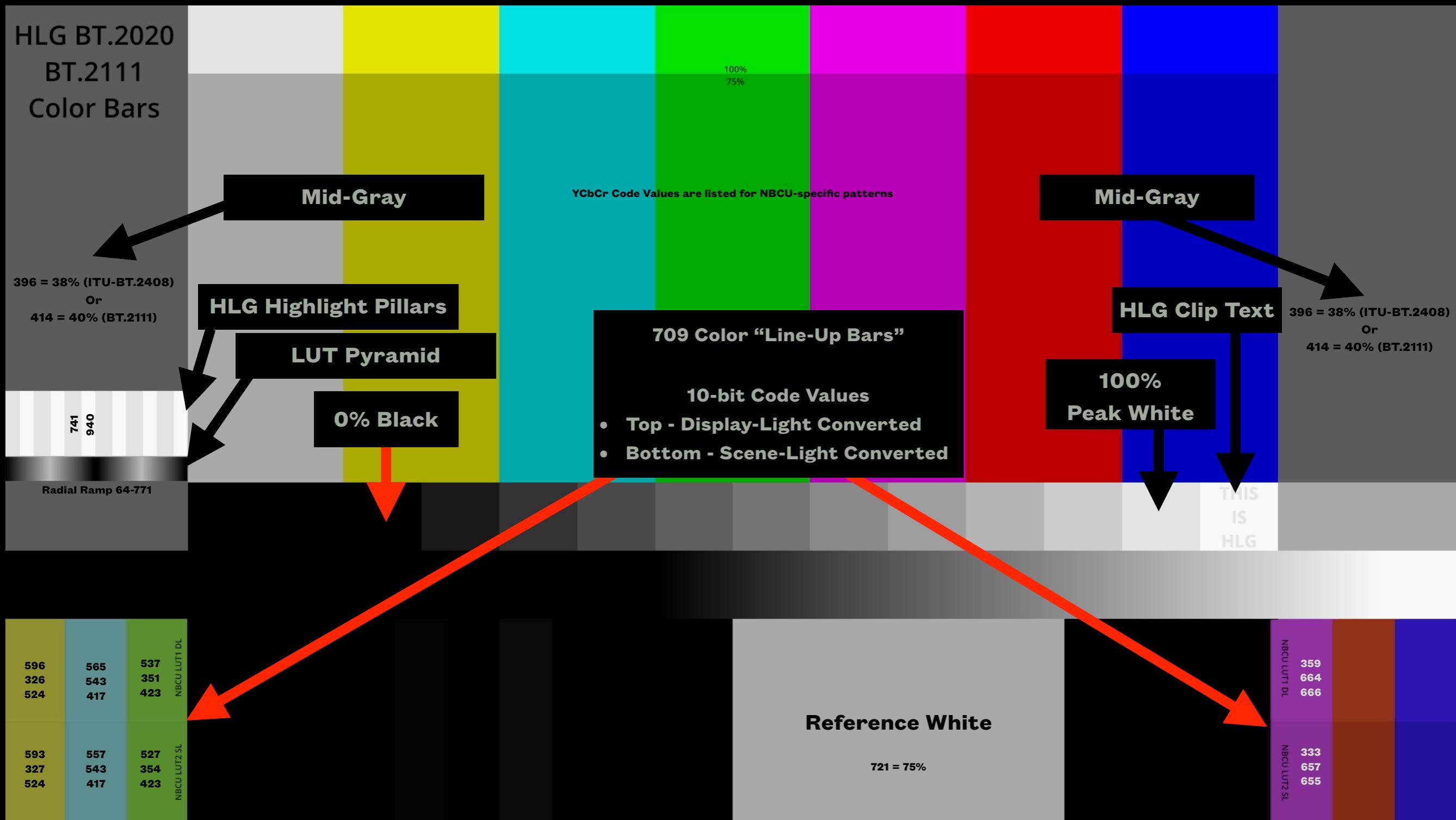
Shading HDR Cameras



Shading SDR Cameras

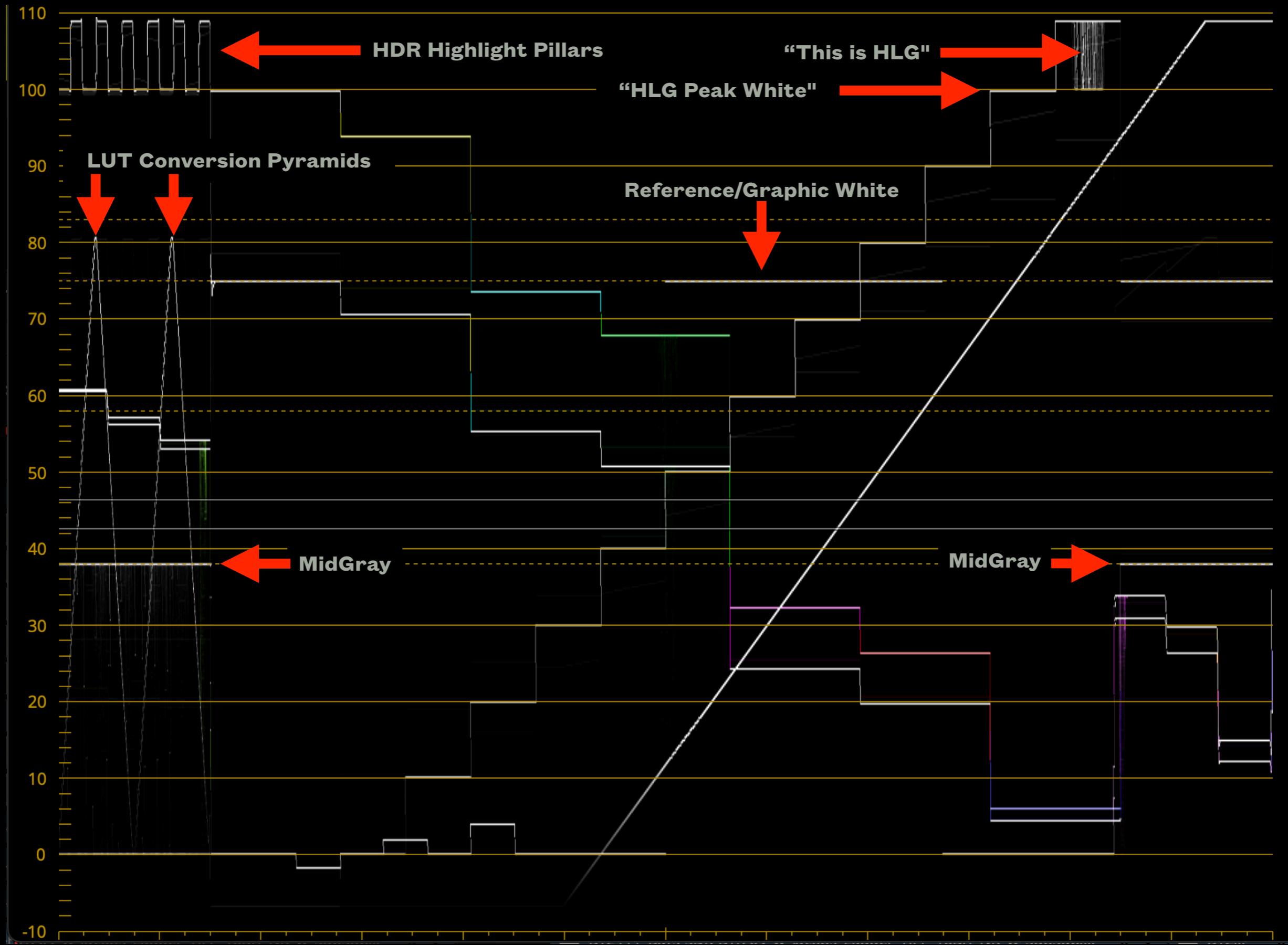


HLG BT.2111 (Fancy) Color Bars



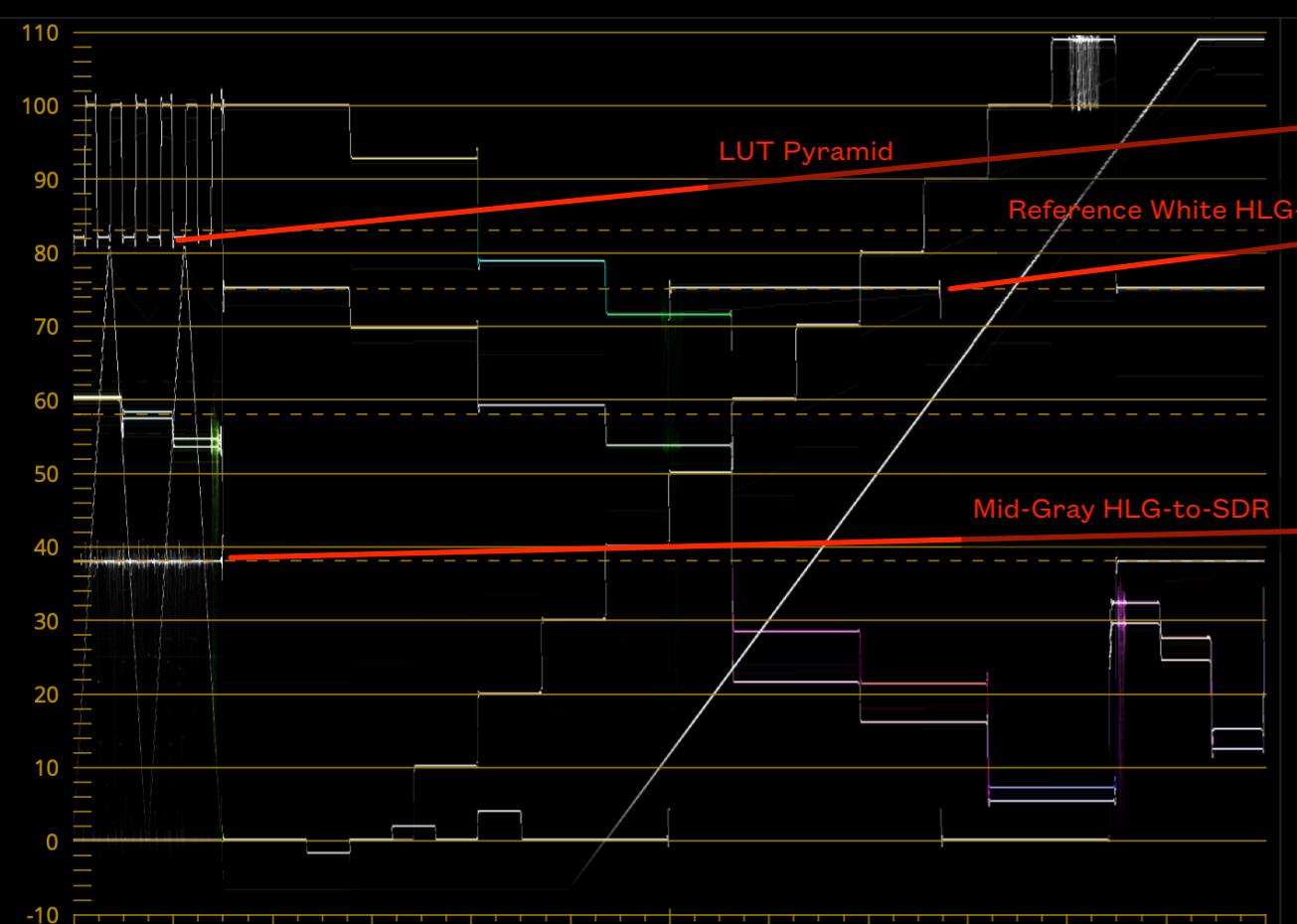
Since this HLG image is viewed in SDR-BT.709 it will not look quite correct

HLG Native BT.2111 (Fancy) Color Bars

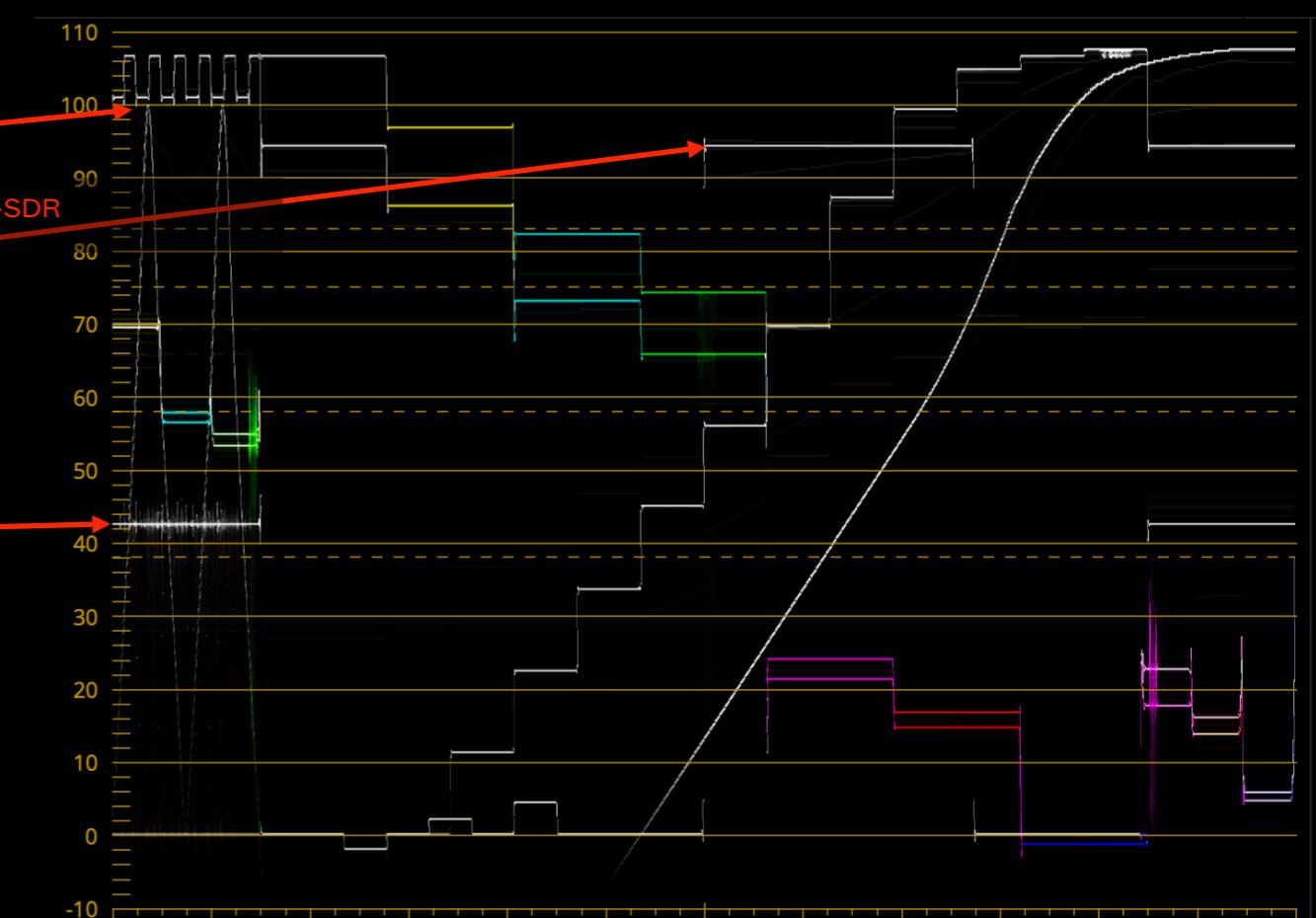


HLG to SDR Conversion: NBCU - LUT3

HLG Native Bars

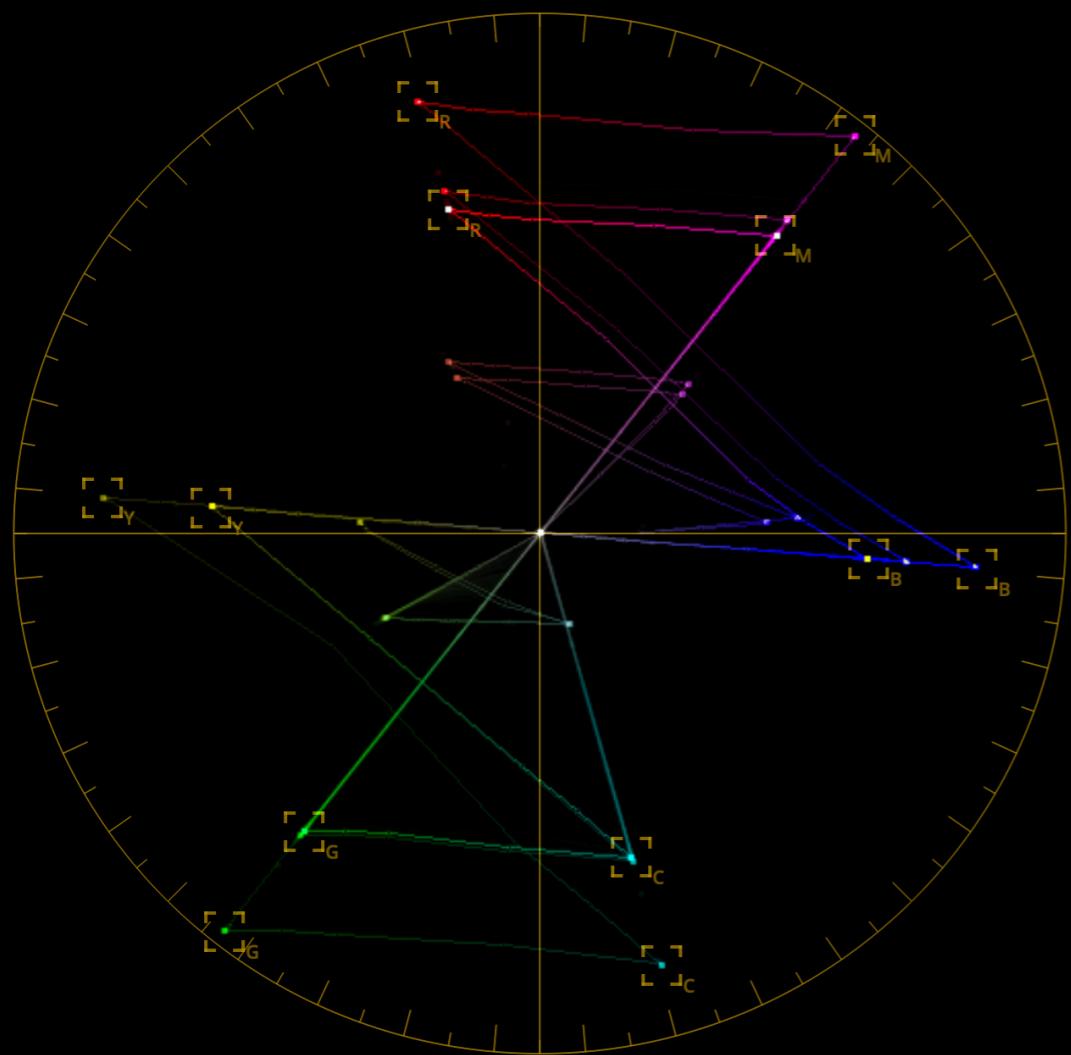


HLG-to-SDR (LUT3)

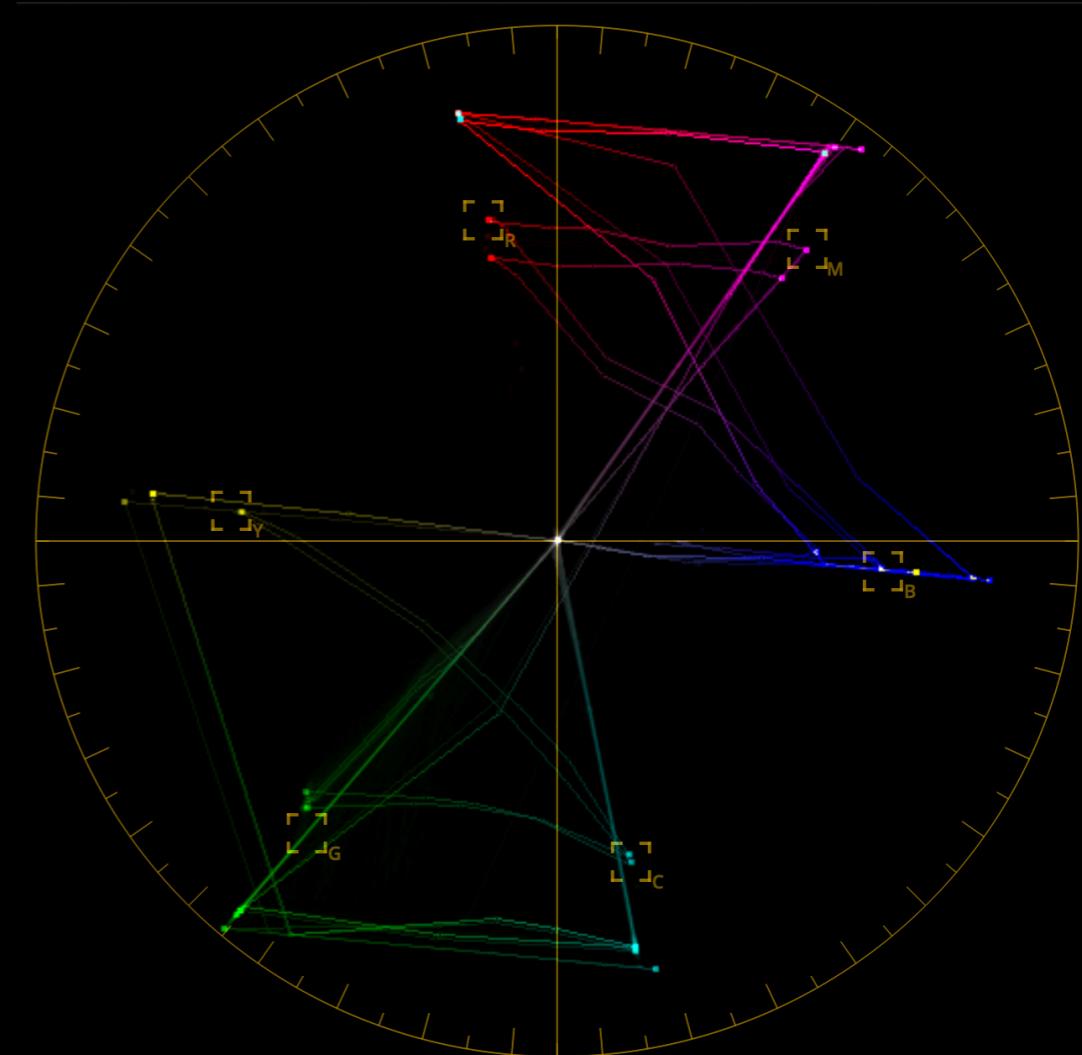


HLG to SDR Conversion: NBCU - LUT3

HLG 100/75%



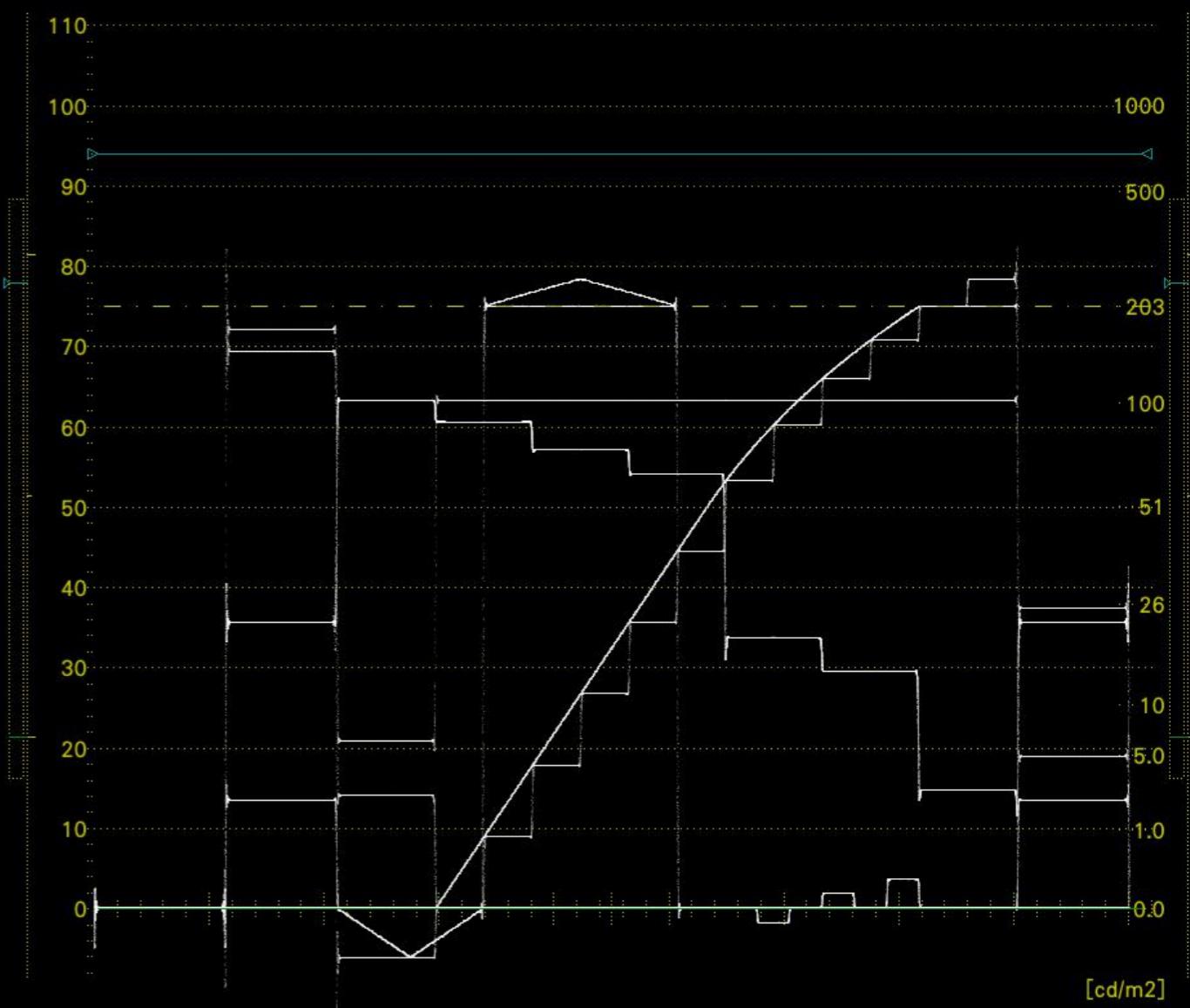
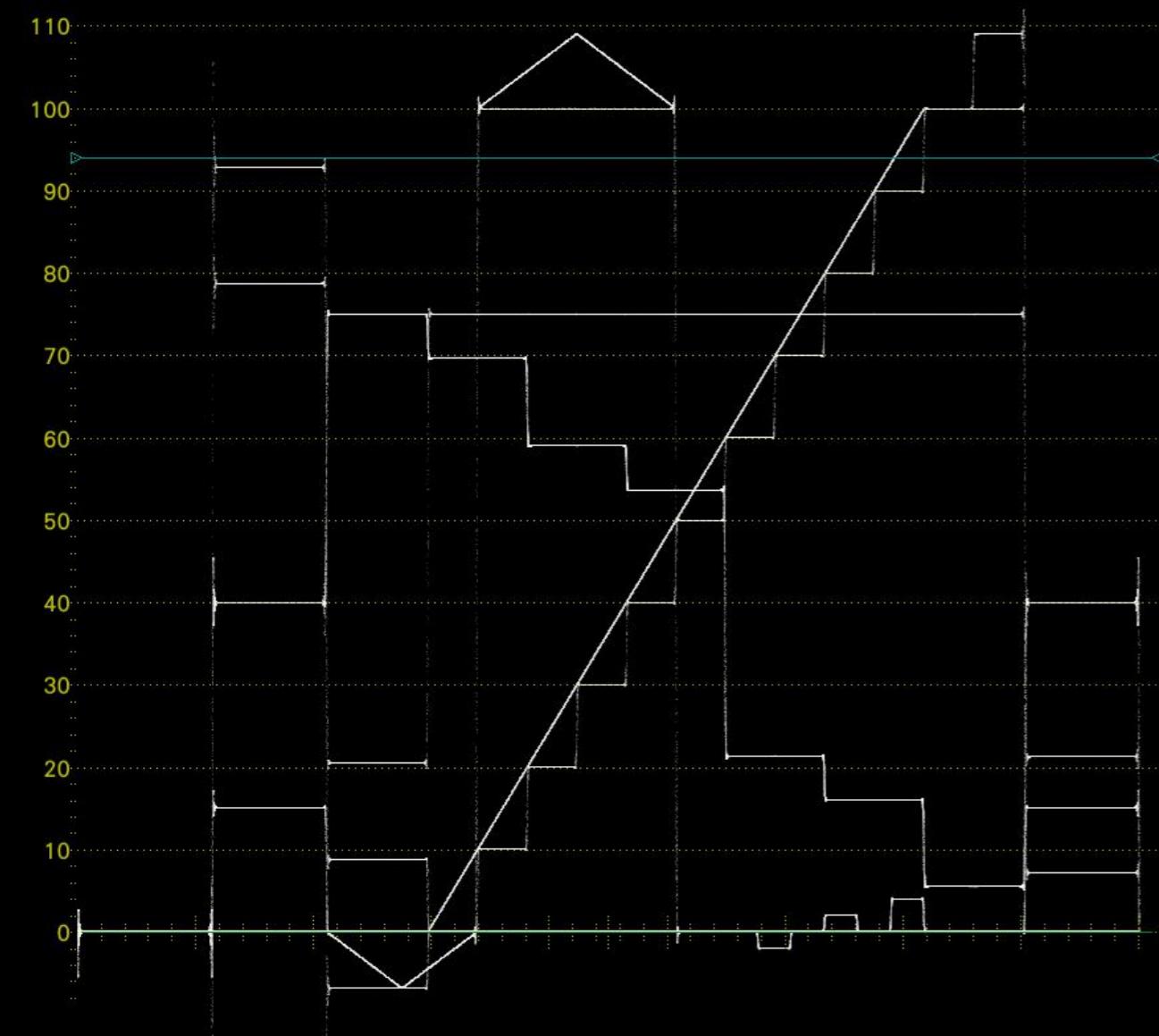
SDR 75%



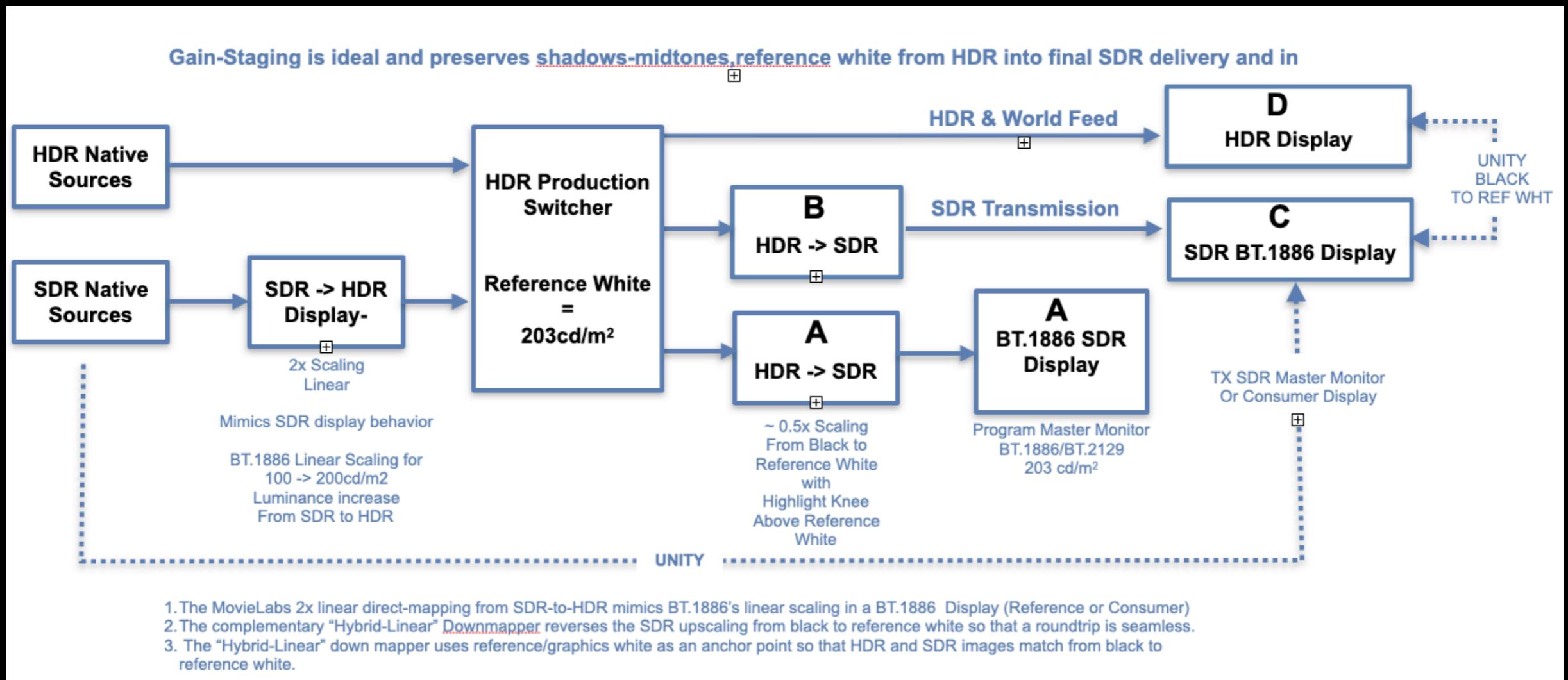
SDR to HLG Direct Upmapping- NBCU LUT1

SDR

Converted SDR-to-HLG



UHD Single-Master - Optimal Gain Staging



Optimal gain-staging starts with shading SDR at 203nits which is closer to what todays consumer displays use.

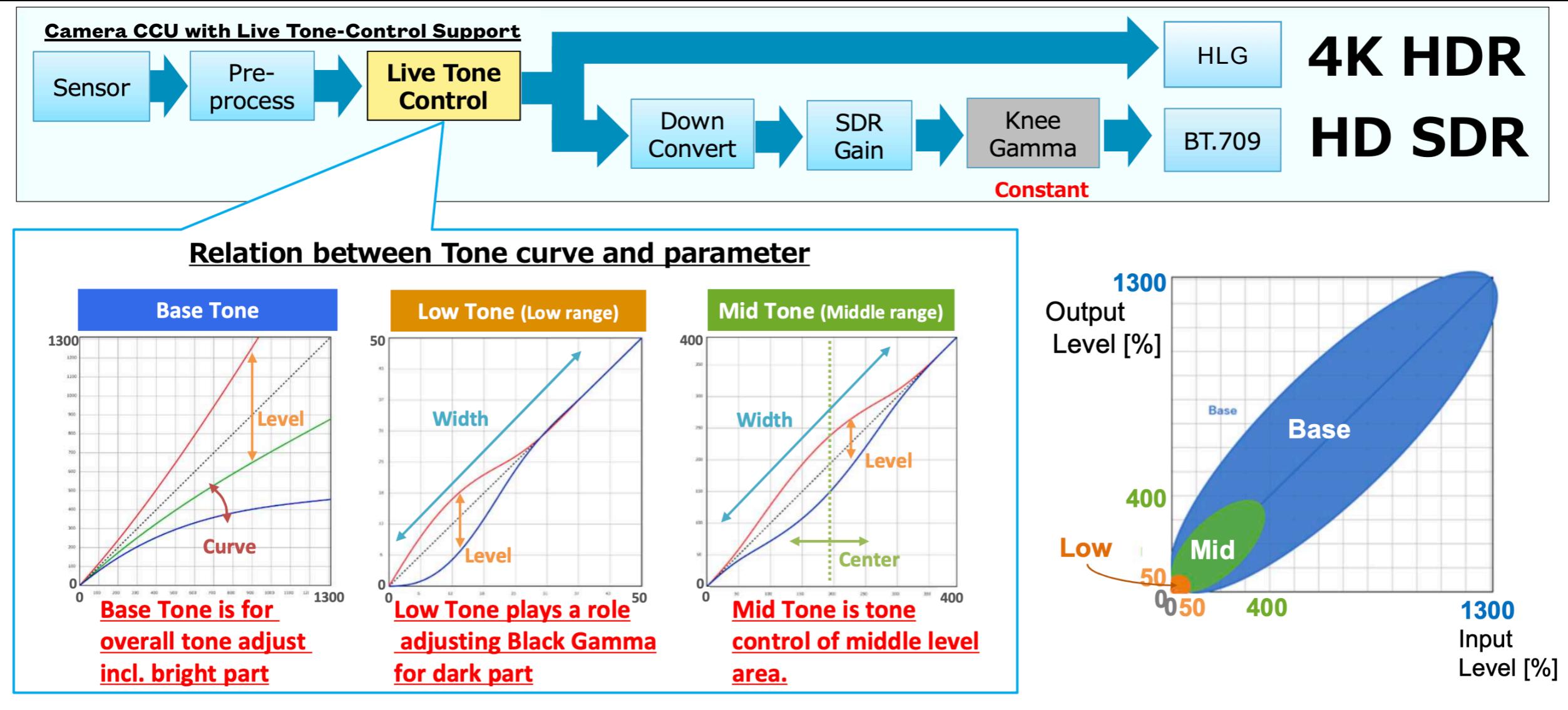
When the SDR shading display is set to 203nits, SDR peak-white is equal to HDR graphic white. This allows the two displays to be placed side-by-side.

SDR downmapping, applies a linear mapping so that the upmapping for a roundtrip is removed from HDR black to reference white. A knee is applied above HDR reference white so that some level of HDR highlights are preserved in SDR.

A consumer display typically rescales the video closer to 203nits providing optimal gain staging from source-to-consumer.

Sony HDR broadcast cameras: Live Tone-Controls

Sony Live Tone-Controls enable flexible tone setting in HDR Productions



SDR to HLG Display Contrast Adjustments

SDR / HDR REFERENCE DISPLAY CONTRAST ADJUSTMENT

9/23/22

*** Picture Adjustment: Make PRESETS that follow the HDR or SDR input selection ***

| | SDR | | | | HDR | | | | |
|-----------|----------------|--------------------|-------------------------|---------------------|-----------|----------------|--------------------|-------------------------|-------------------------|
| | CONTRAST VALUE | MAX CONTRAST VALUE | OUTPUT LUMINANCE (nits) | COLOR SPACE / GAMMA | | CONTRAST VALUE | MAX CONTRAST VALUE | OUTPUT LUMINANCE (nits) | COLOR SPACE / GAMMA |
| BVM-HX310 | 812 | 1000 | 203 | 709 / 2.4 | BVM-HX310 | 400 | 1000 | 1000 | BT.2020 / BT.2100 (HLG) |
| PVM-X2400 | 812 | 1000 | 203 | 709 / 2.4 | PVM-X2400 | 400 | 1000 | 1000 | BT.2020 / BT.2100 (HLG) |
| PVM-X1800 | 812 | 1000 | 203 | 709 / 2.4 | PVM-X1800 | 400 | 1000 | 1000 | BT.2020 / BT.2100 (HLG) |
| BVM-X300 | 812 | 1000 | 203 | 709 / 2.4 | BVM-X300 | 400 | 1000 | 1000 | BT.2020 / BT.2100 (HLG) |
| BVM-E171 | 2030 | 2500 | 203 | 709 / 2.4 | BVM-E171 | 1667 | 2500 | 1000 | BT.2020 / HLG 1.2 |
| PVM-A240 | 100 | tbd | 175 | 709 / 2.4 | PVM-A240 | 80 | 100 | 260 | BT.2020 / BT.2100 (HLG) |
| PVM-A170 | 100 | 250 | tbd | 709 / 2.4 | PVM-A170 | 85 | tbd | tbd | BT.2020 / BT.2100 (HLG) |
| LMD-A240 | 91 | 100 | tbd | 709 / 2.4 | LMD-A240 | 80 | 100 | tbd | BT.2020 / BT.2100 (HLG) |