

# 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.

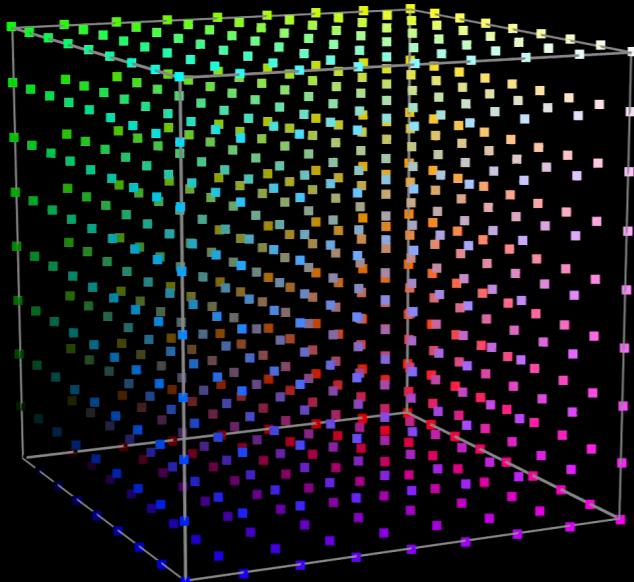
Lesson Two will review Shading/Grading.

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

- 

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<sup>2</sup> if an HLG displays peak white equals 1,000cd/m<sup>2</sup>. No contrast adjustments are necessary on 1,000cd/m<sup>2</sup> HLG displays. Displays lower than 1,000nits require a contrast adjustment so that 75% graphic white



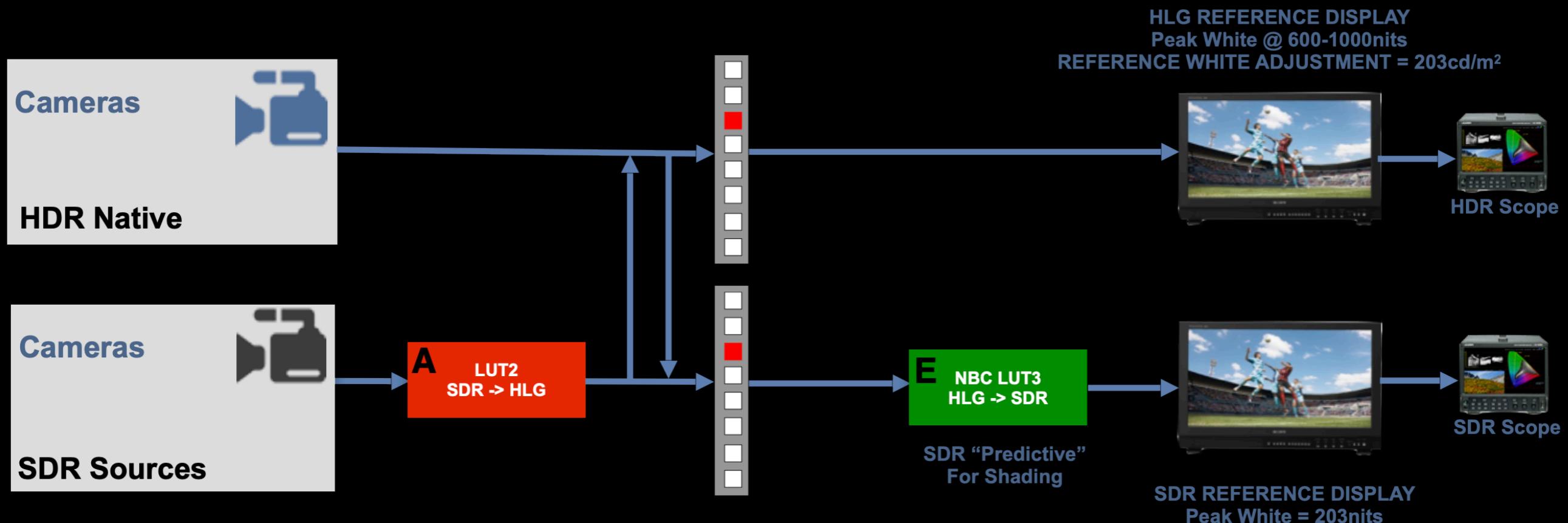
is equal to 203cd/m<sup>2</sup>. HLG is in-essence display-referred once adjusted.

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.

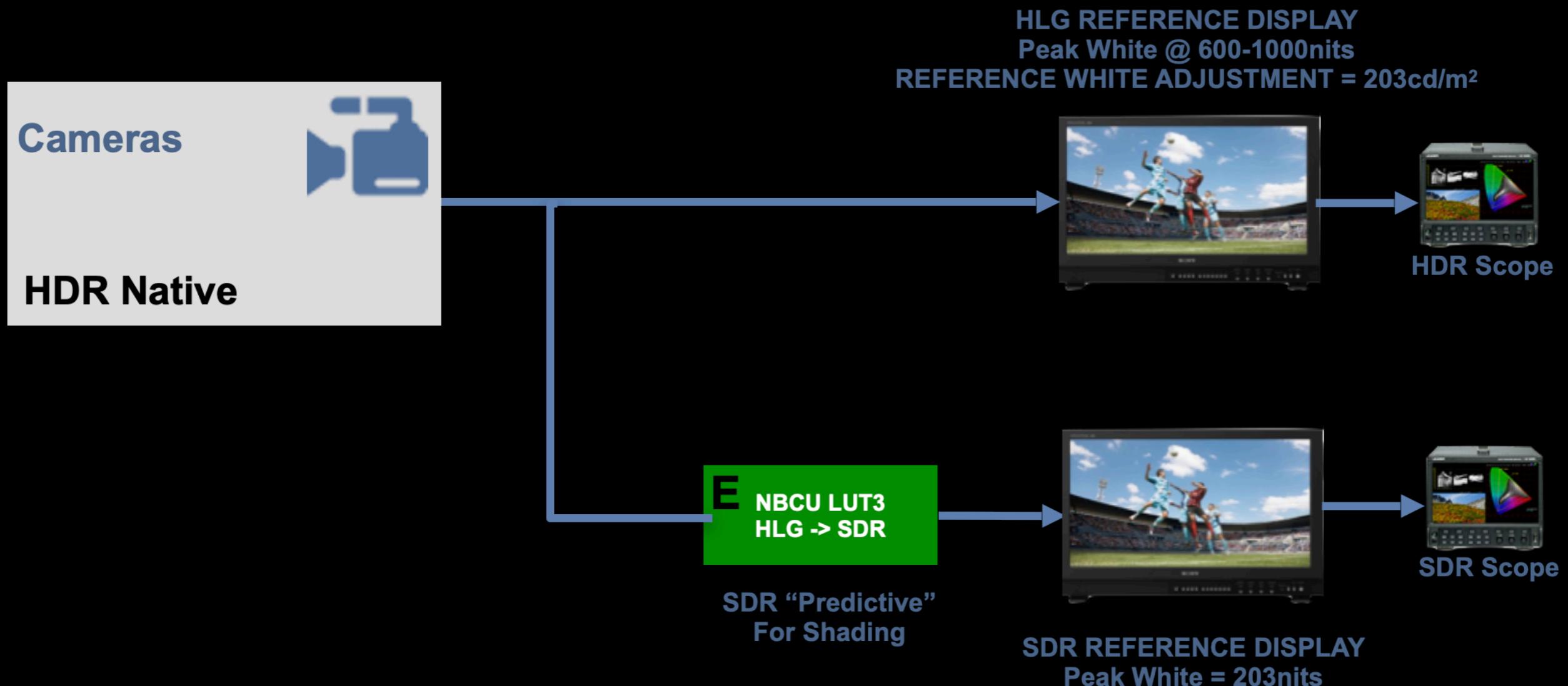
SDR camera signals are converted to HLG using NBCU LUT2.

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<sup>2</sup>.

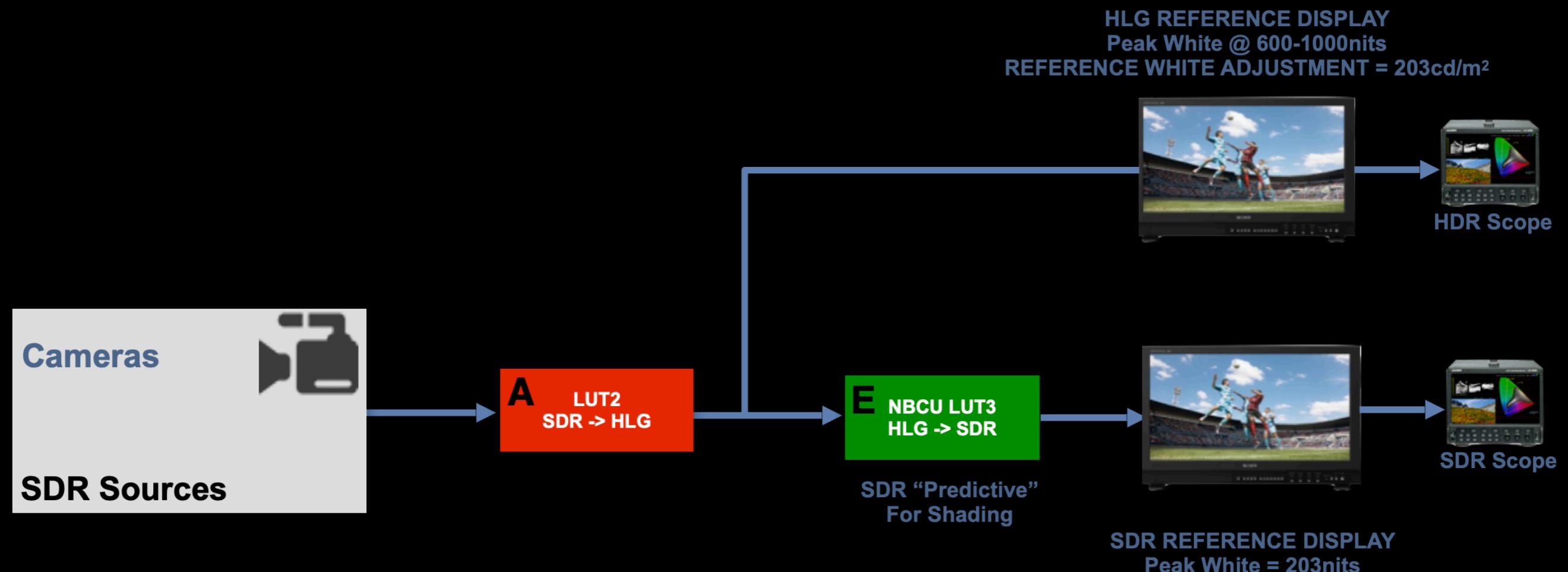
# Shading HDR and SDR Cameras



# Shading HDR Cameras



# Shading SDR Cameras



# Shading HDR and SDR Side-by-Side

**HLG REFERENCE DISPLAY**  
Peak White @ 600-1000nits  
**REFERENCE WHITE ADJUSTMENT = 203cd/m<sup>2</sup>**



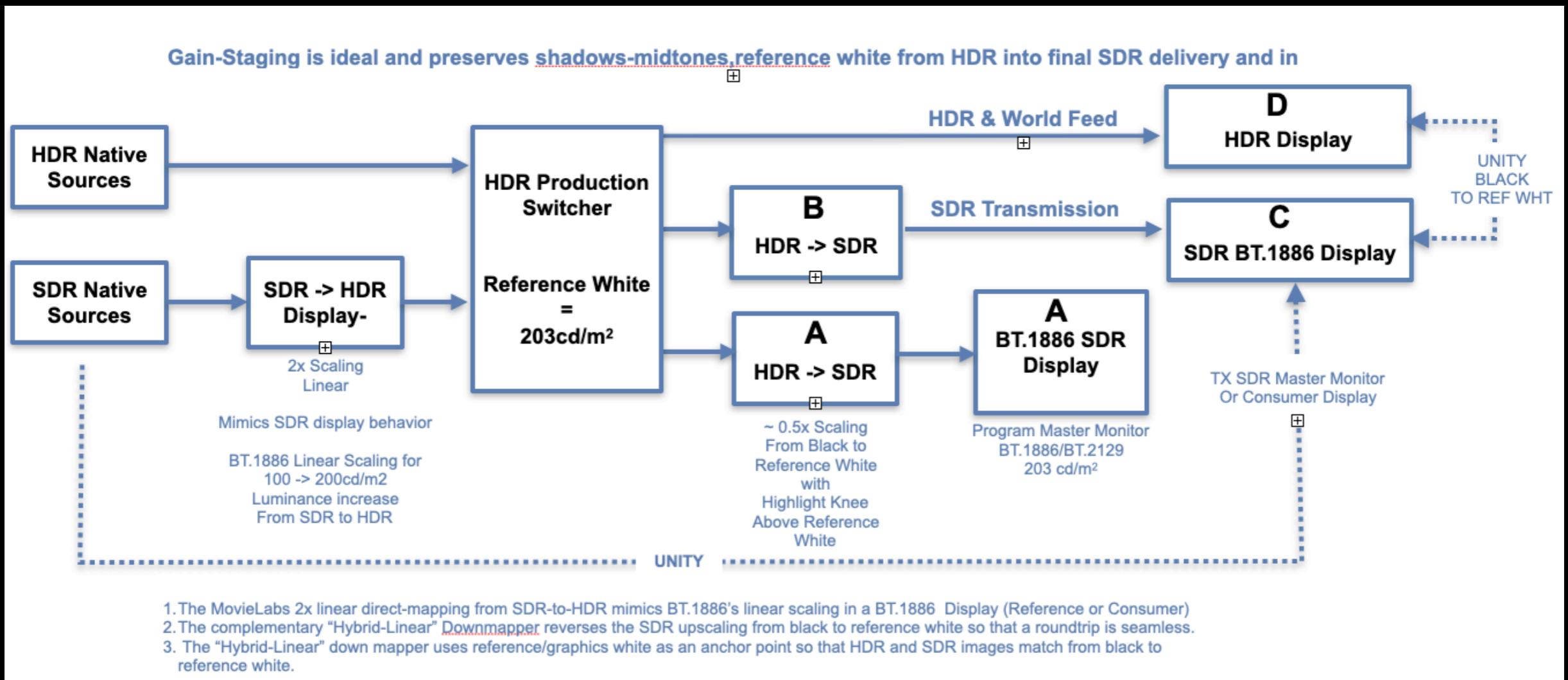
**SDR BT.1886 REFERENCE DISPLAY**  
Peak White = 203nits



HDR Graphic/Reference White = SDR Graphics White

5% SDR left for compressed highlights from SDR @ nominal video level  
9% SDR above nominal level remain for additional compressed highlight preservation  
Original BT.2020 Colors are preserved within part of BT.709 color space  
Remaining colors use BT.709 colors primaries

# 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.

# 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)