

UHD Single-Master HDR-SDR Production

Reading Video Scopes: Professional Reference

UHD HDR-SDR Single-Master Live Production Method

This eBook will evolve as we document the complete workflow.

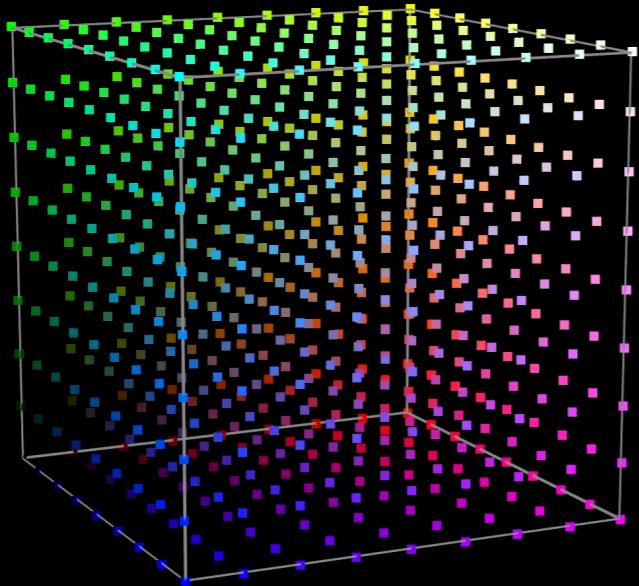
Lesson One will review reading video scopes.

It is provided as a reference for production teams.

Apple Book Store Link is here:

<https://books.apple.com/us/book/id6443385525>

Lesson 1



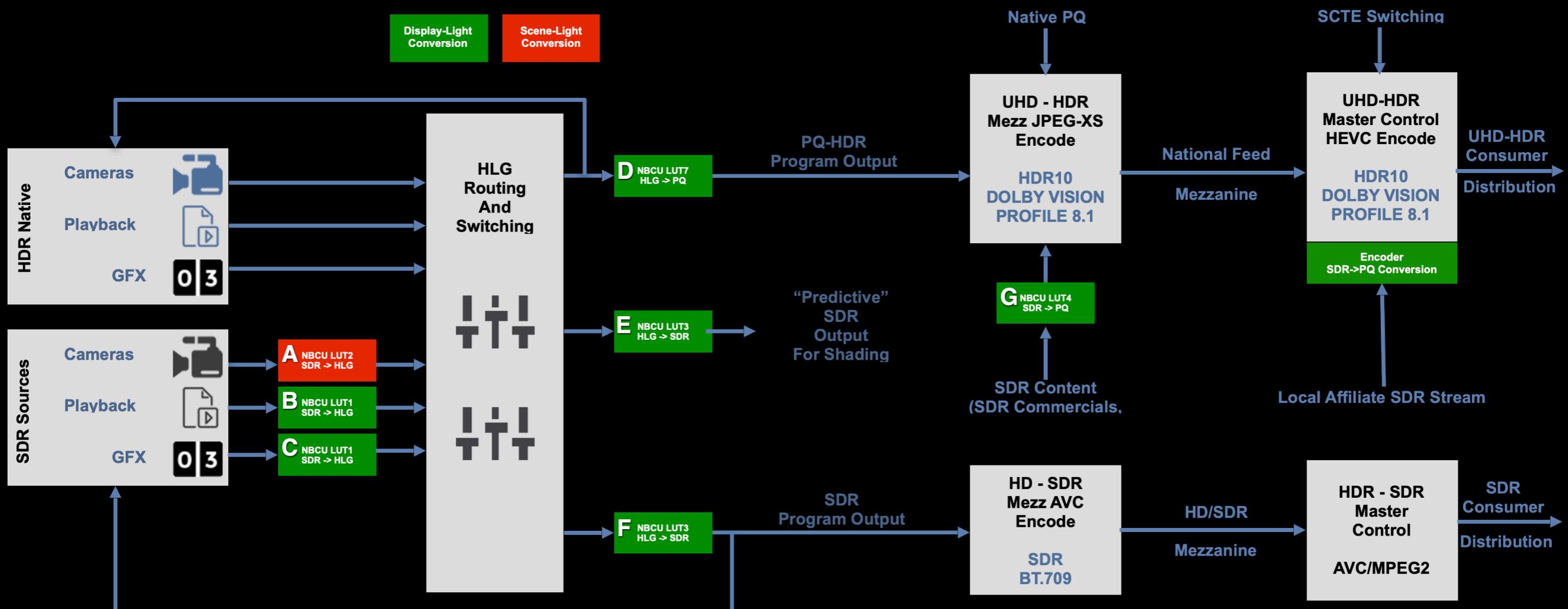
Video Scopes **HLG AND SDR REFERENCE FOR PROFESSIONALS**

What do the waveform and vector scopes look like before and after conversion in HLG, PQ and SDR
Using NBCUniversal LUTs 1 & 3

UHD Single-Master HDR-Signal Path

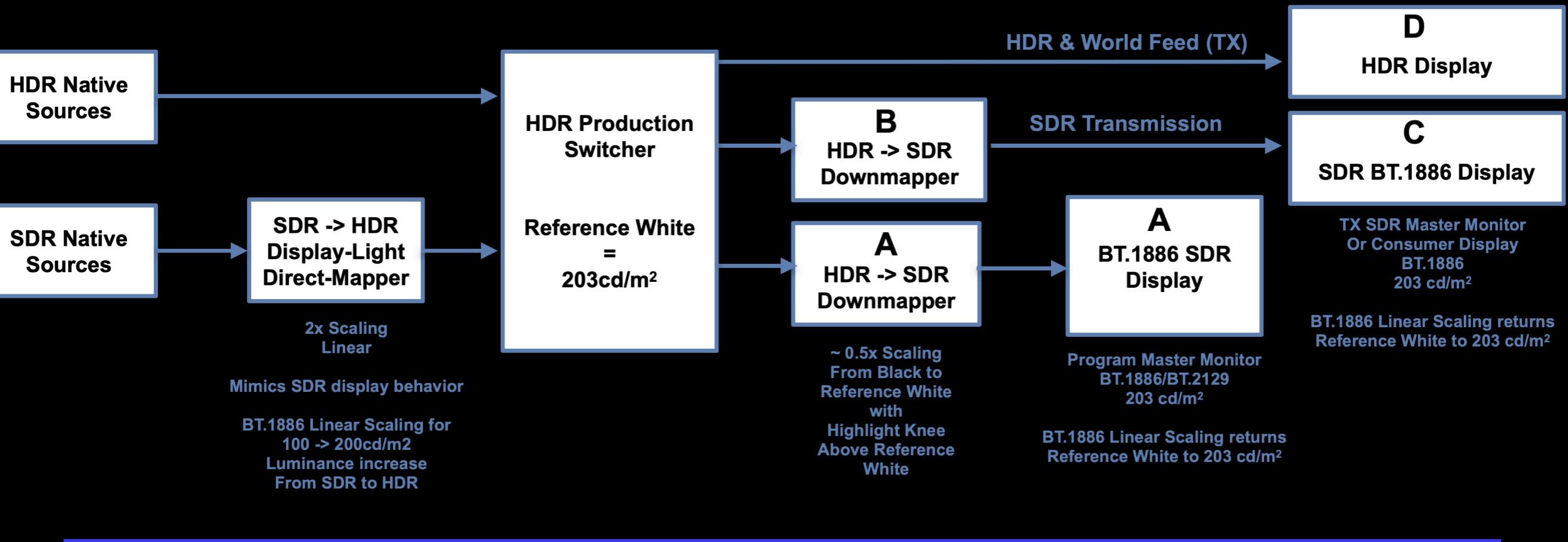
Live Production HLG

Transmission PQ/HDR10/DolbyVision



UHD Single-Master - Optimal Gain Staging

Gain-Staging is ideal and preserves shadows-midtones,reference white from HDR into final SDR delivery and in roundtrip



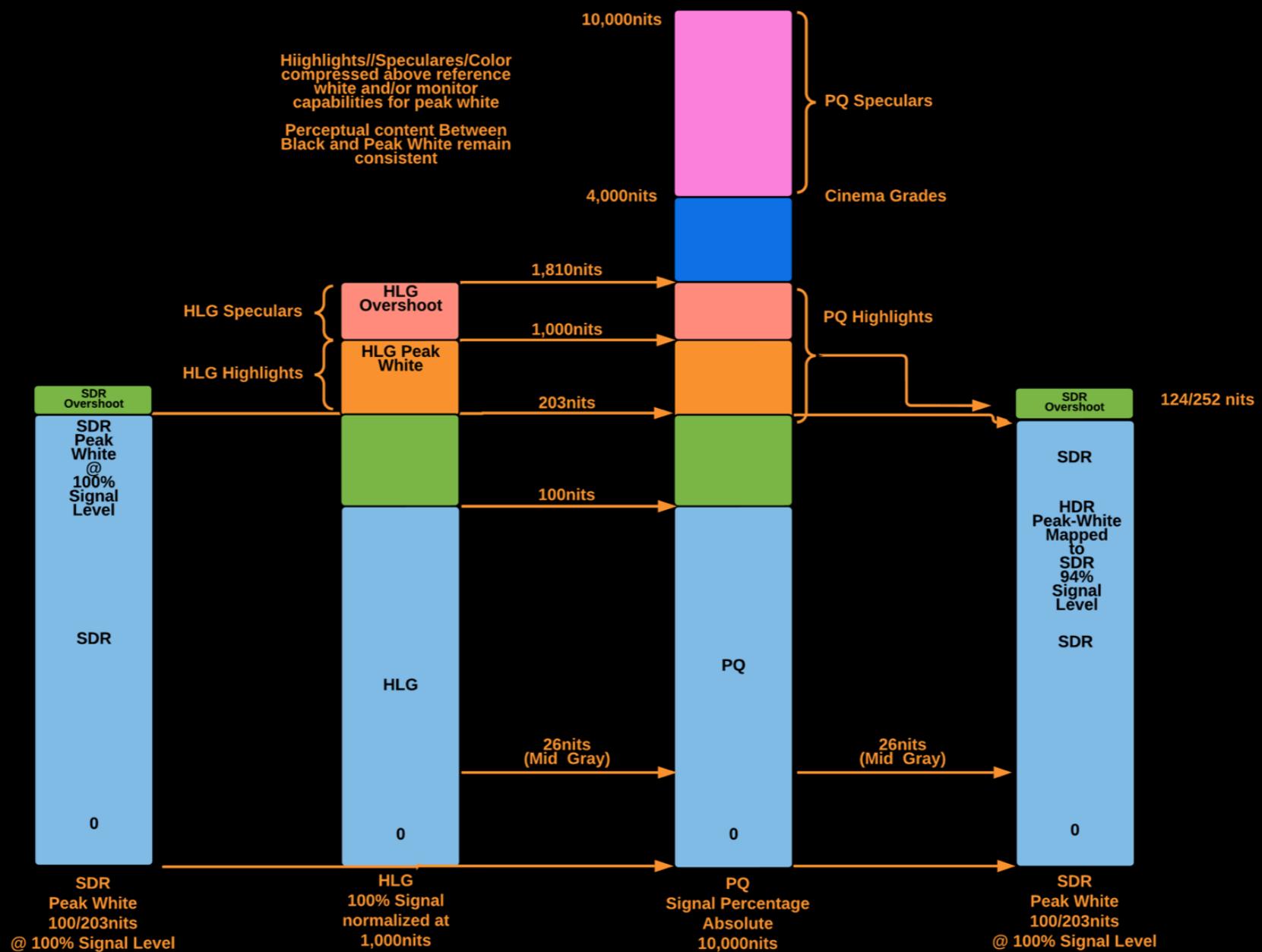
Optimal gain-staging starts with shading SDR at 203nits which is closer to what todays consumer displays use.

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.

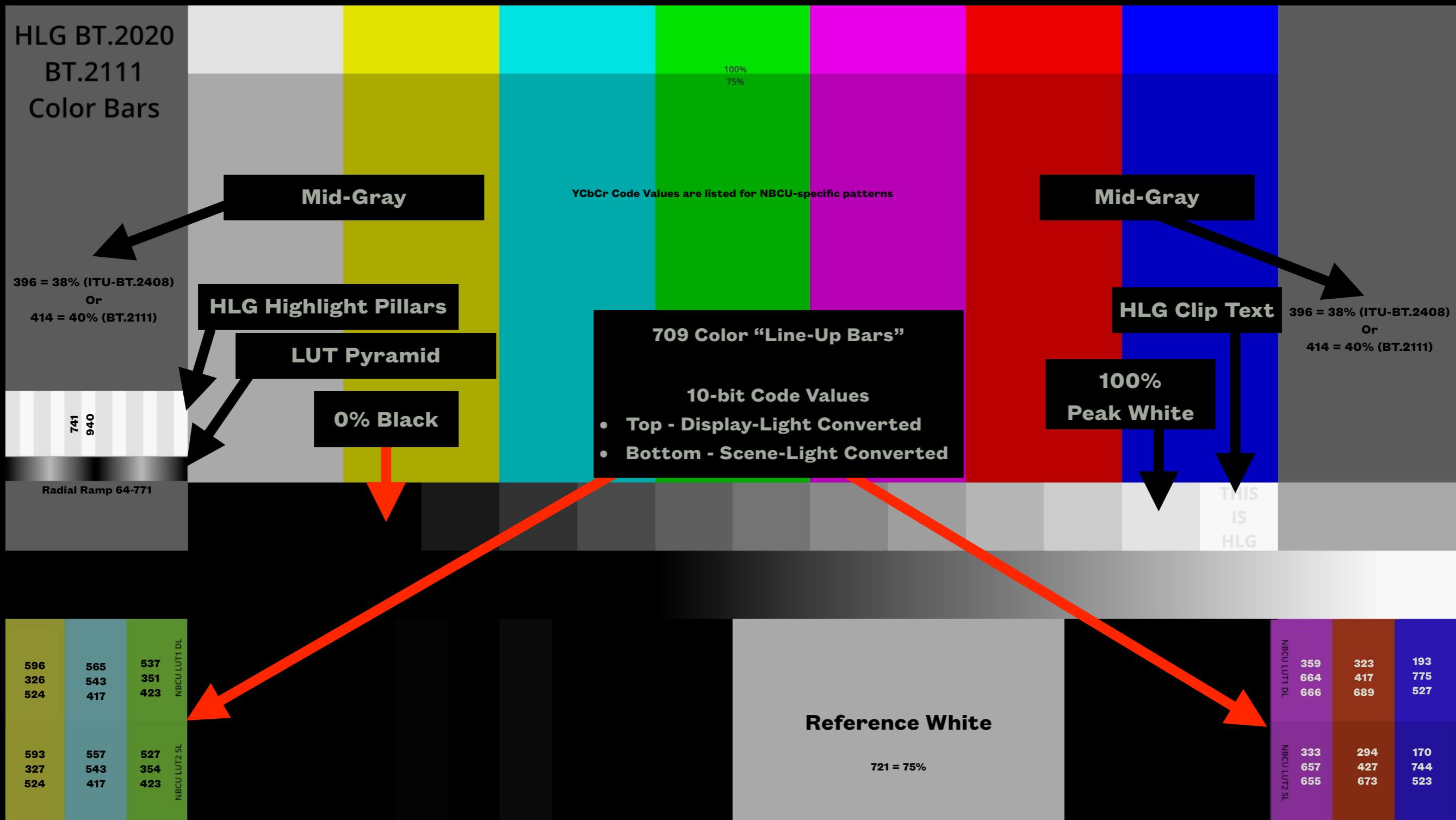
SDR downmapping, applies a linear mapping so that the upmapping for a roundtrip is removed from HDR black to reference white. A knee is applied above HDR reference white so that some level of HDR highlights are preserved in SDR.

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

Unified Graphic/Reference White

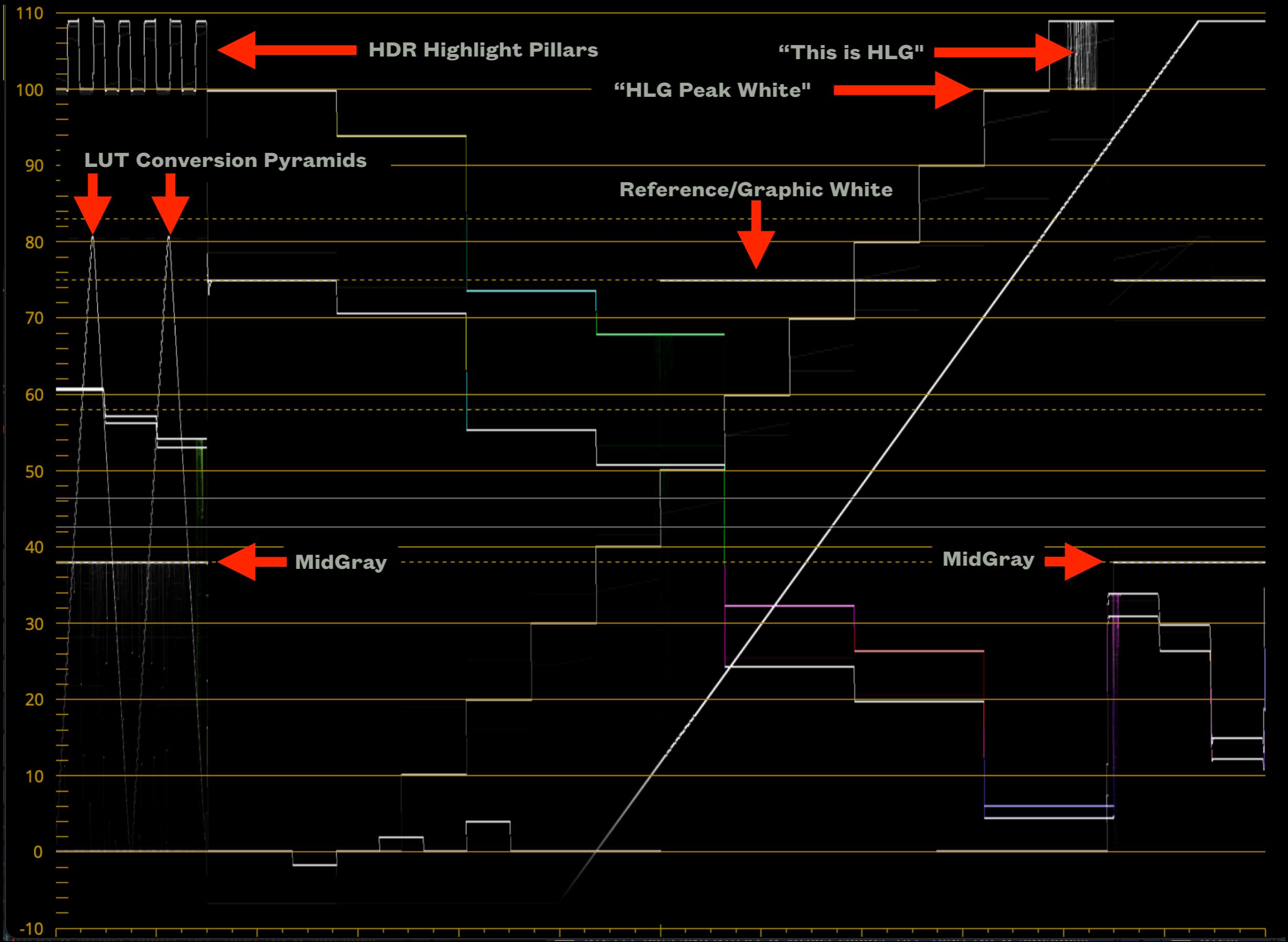


HLG BT.2111 (Fancy) Color Bars

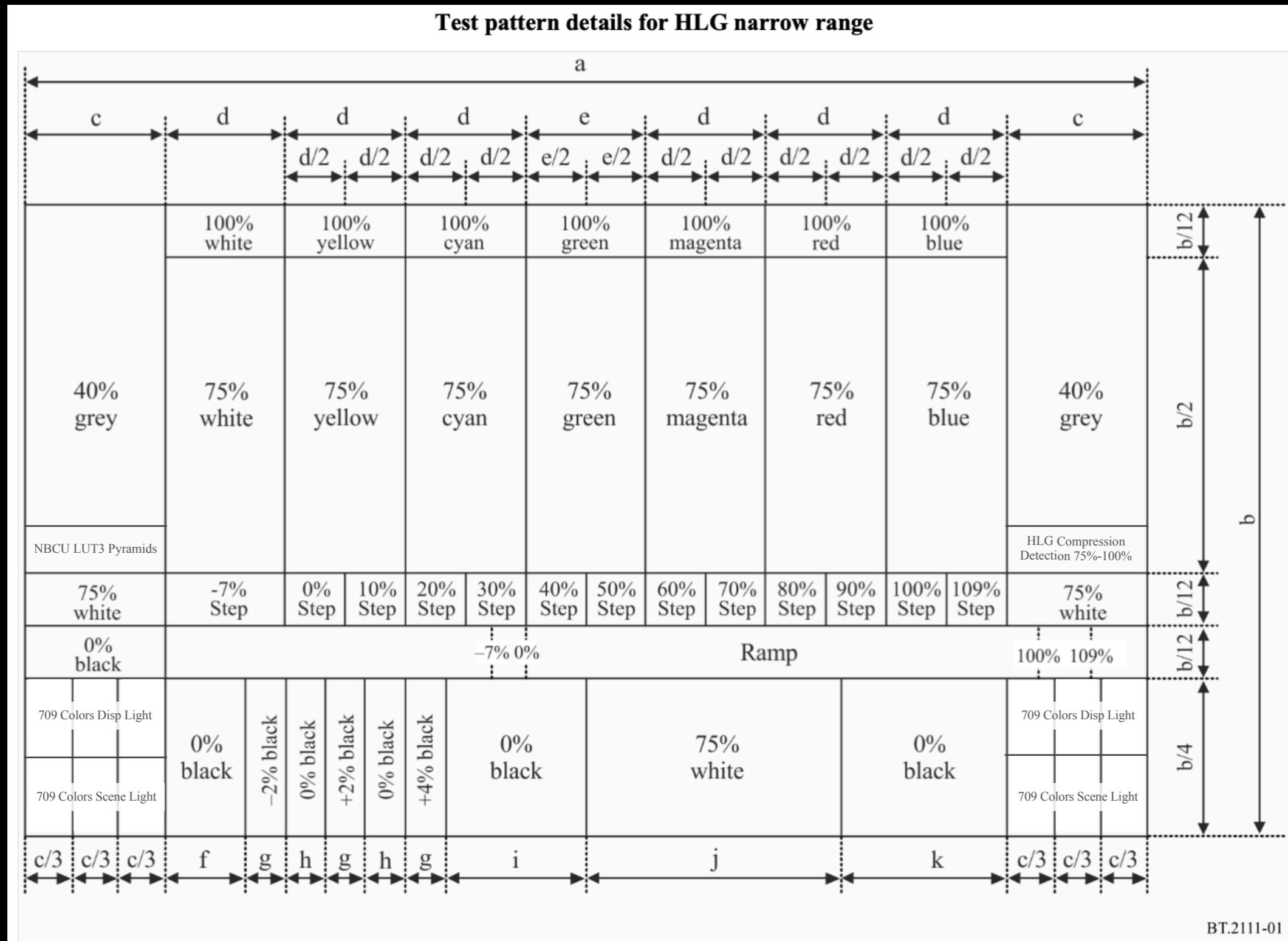


Since this HLG image is viewed in SDR-BT.709 it will not look quite correct

HLG BT.2111 (Fancy) Color Bars



HLG BT.2100 Color Bars (Fancy)



SDR BT.709 Color Bars



Added: SDR grayscale ladder, linear ramp and patterns closer to BT.2111 color bars

SDR to HLG Direct Upmapping- NBCU LUT1

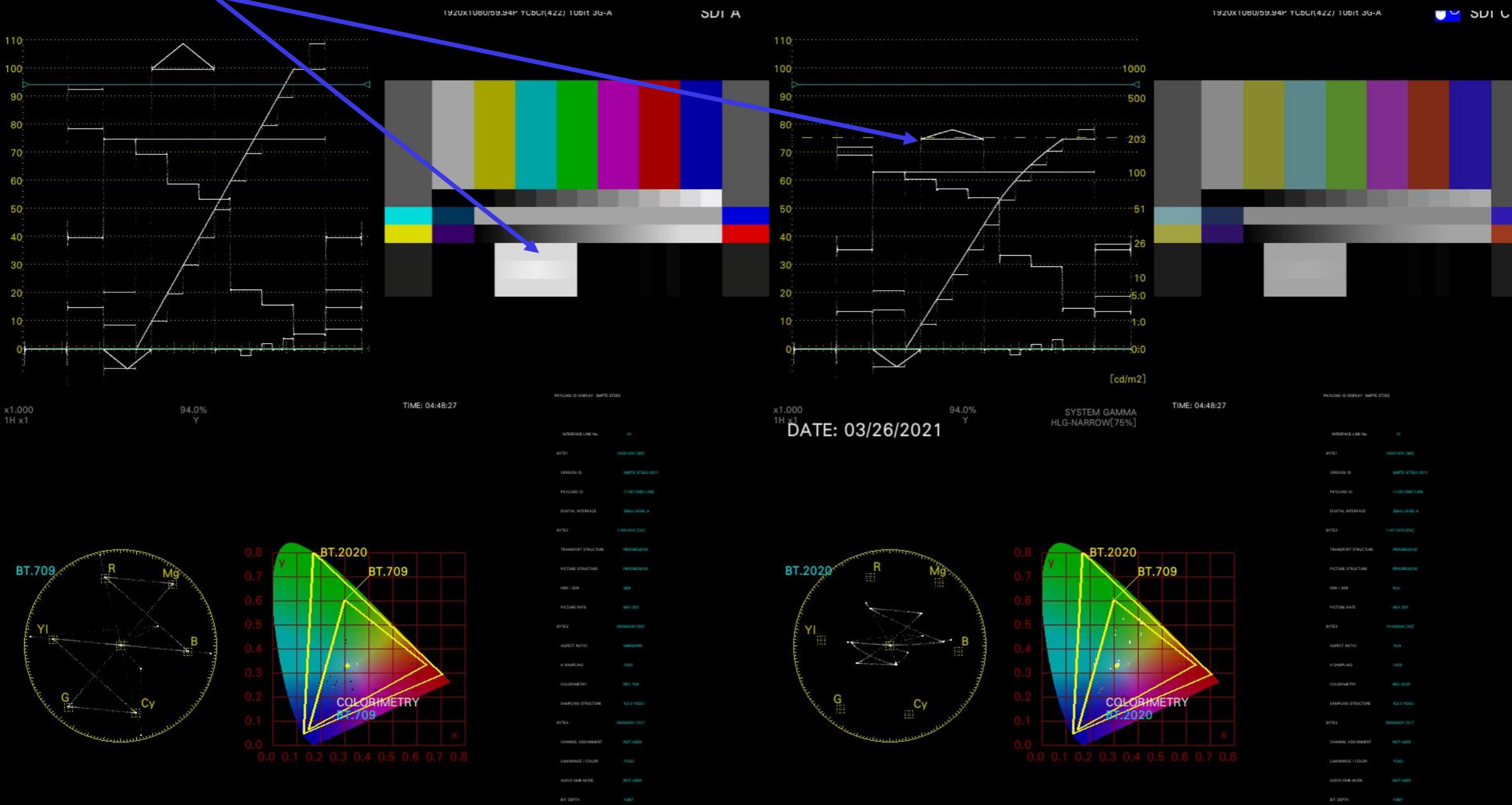
Conversion SDR to HLG

SDR Peak White (100% Signal Level)

to

HLG Graphic White (75%=203nits)

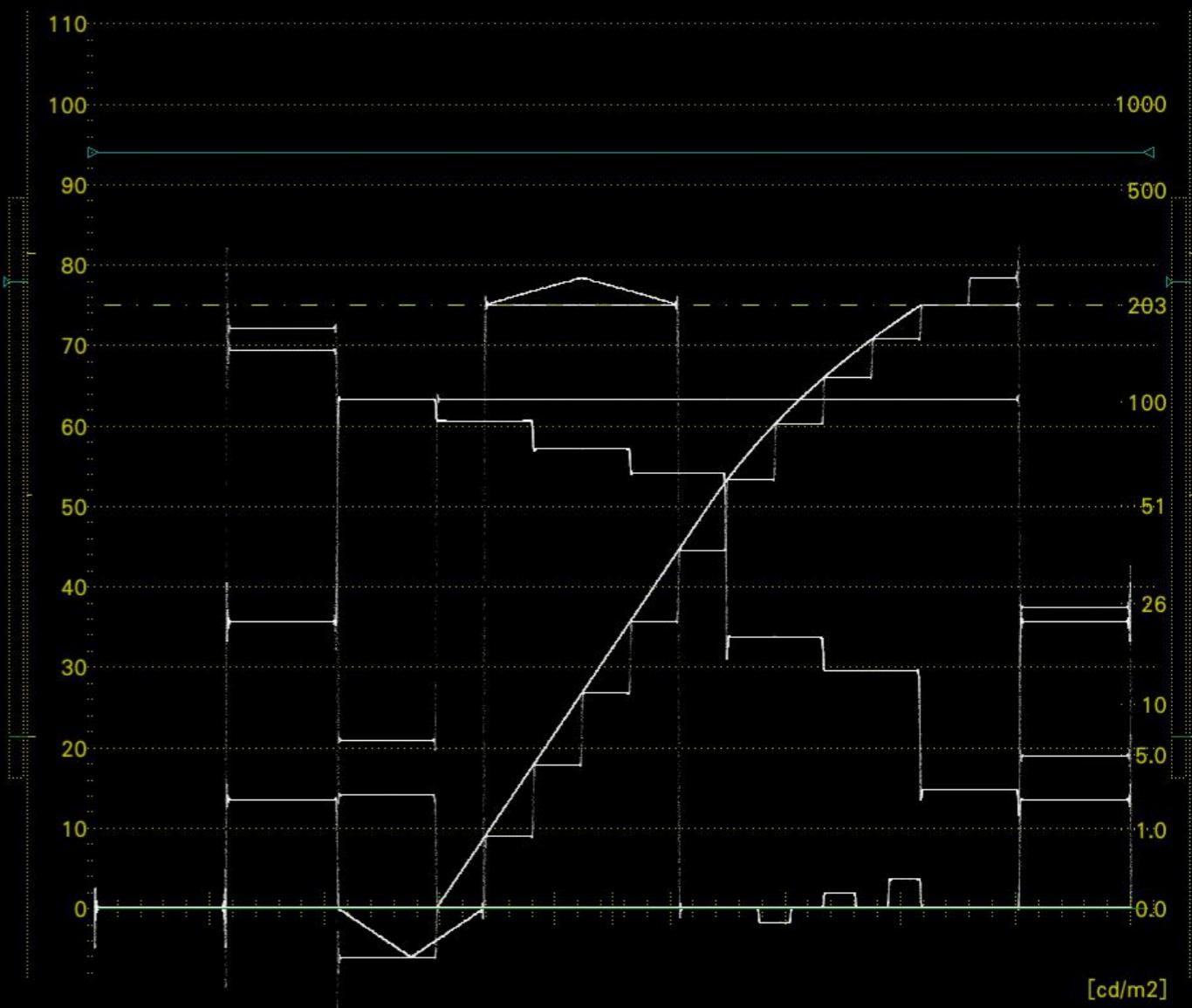
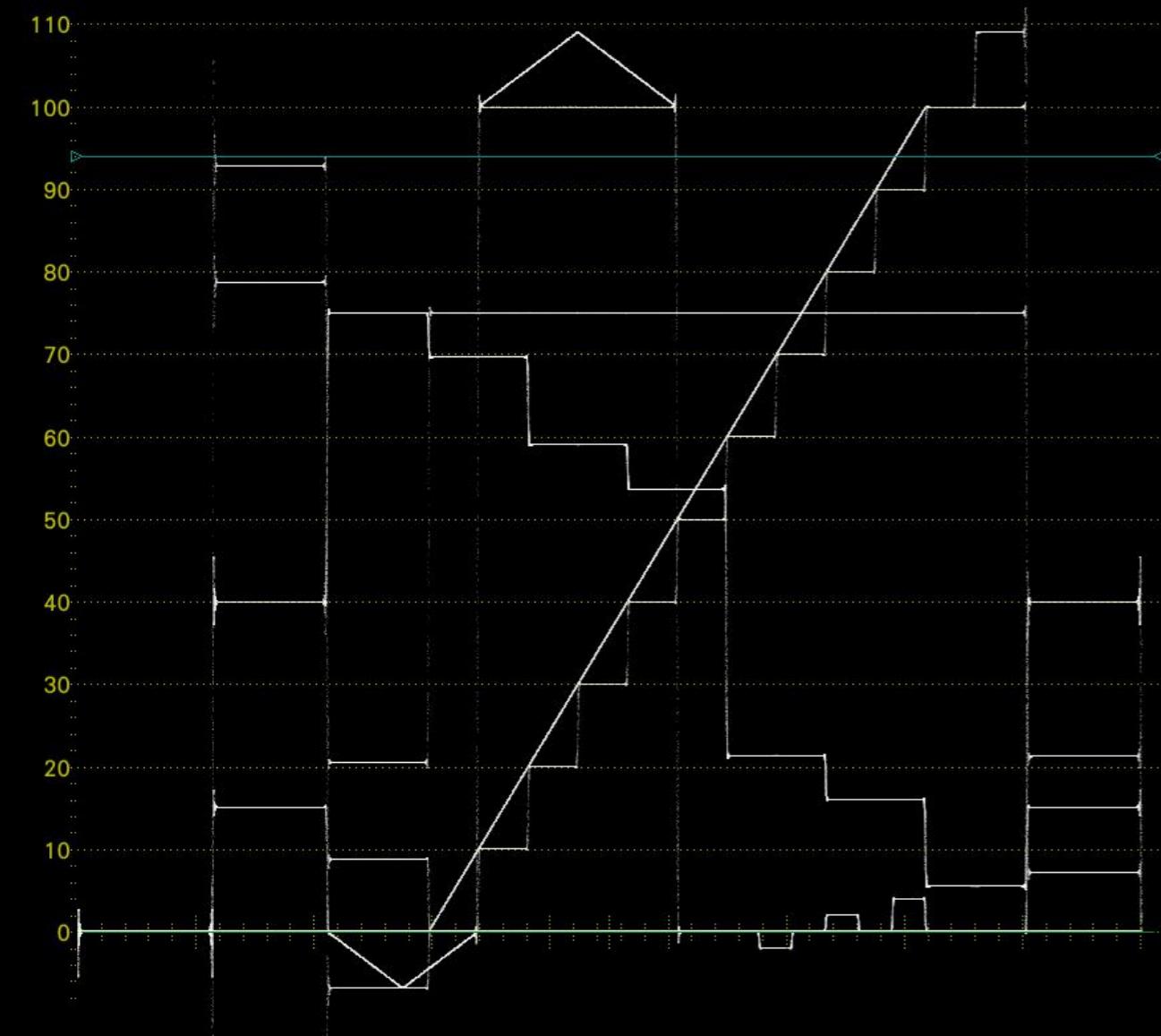
HLG Normalized @ 1,000nit peak @ 100%



SDR to HLG Direct Upmapping- NBCU LUT1

SDR

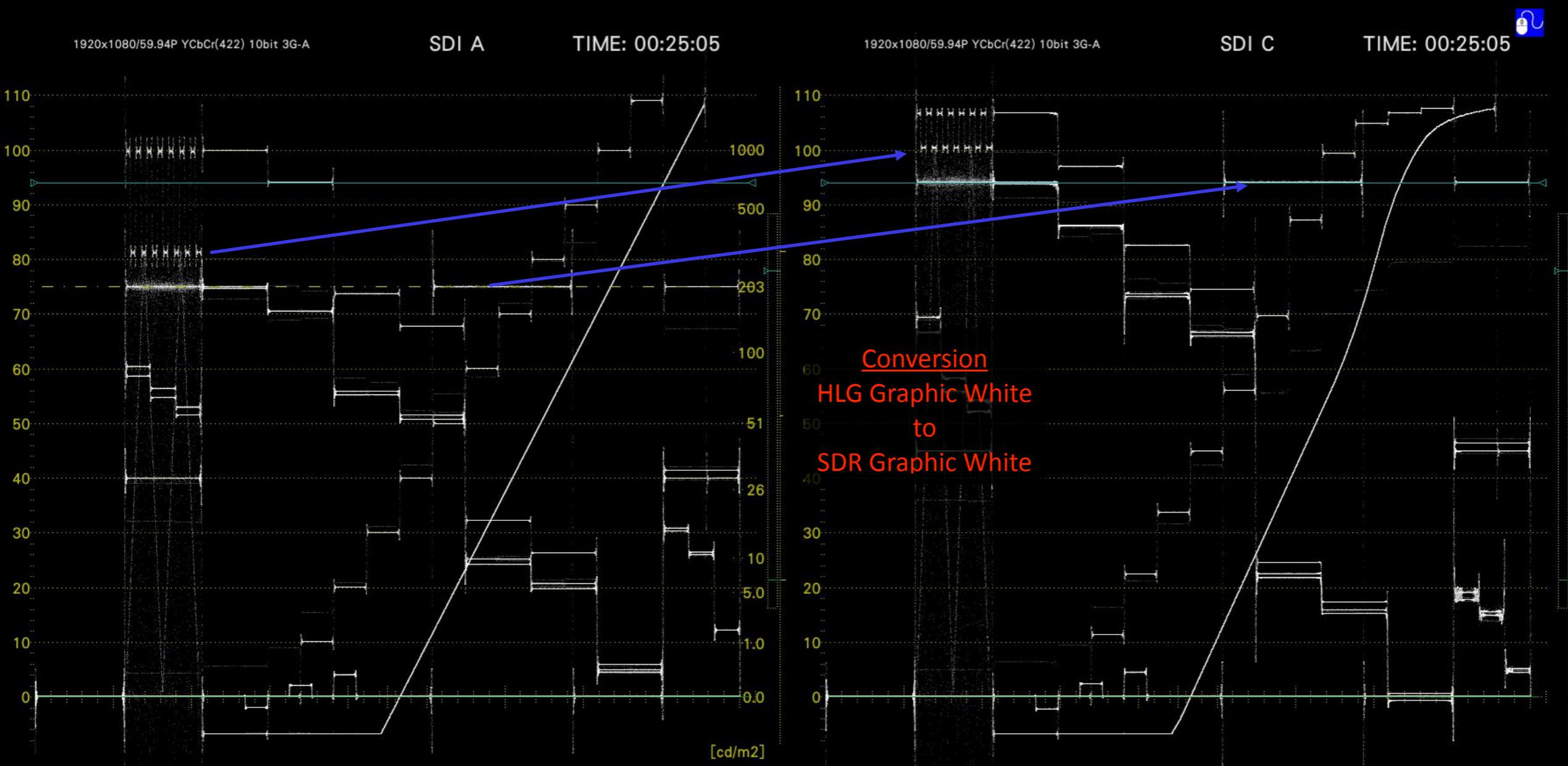
Converted HLG



HLG to SDR Conversion: NCU - LUT3

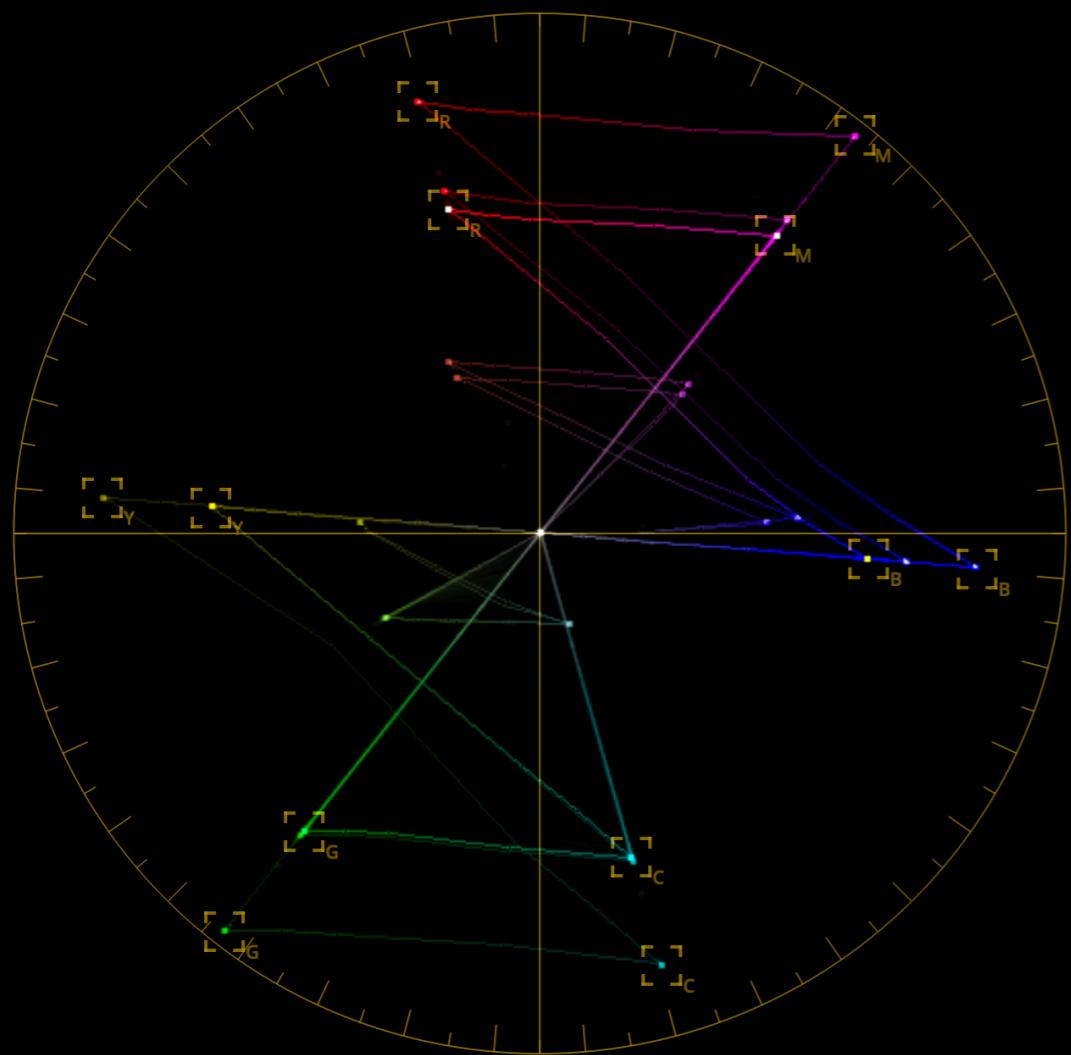
HLG Native Bars

SDR

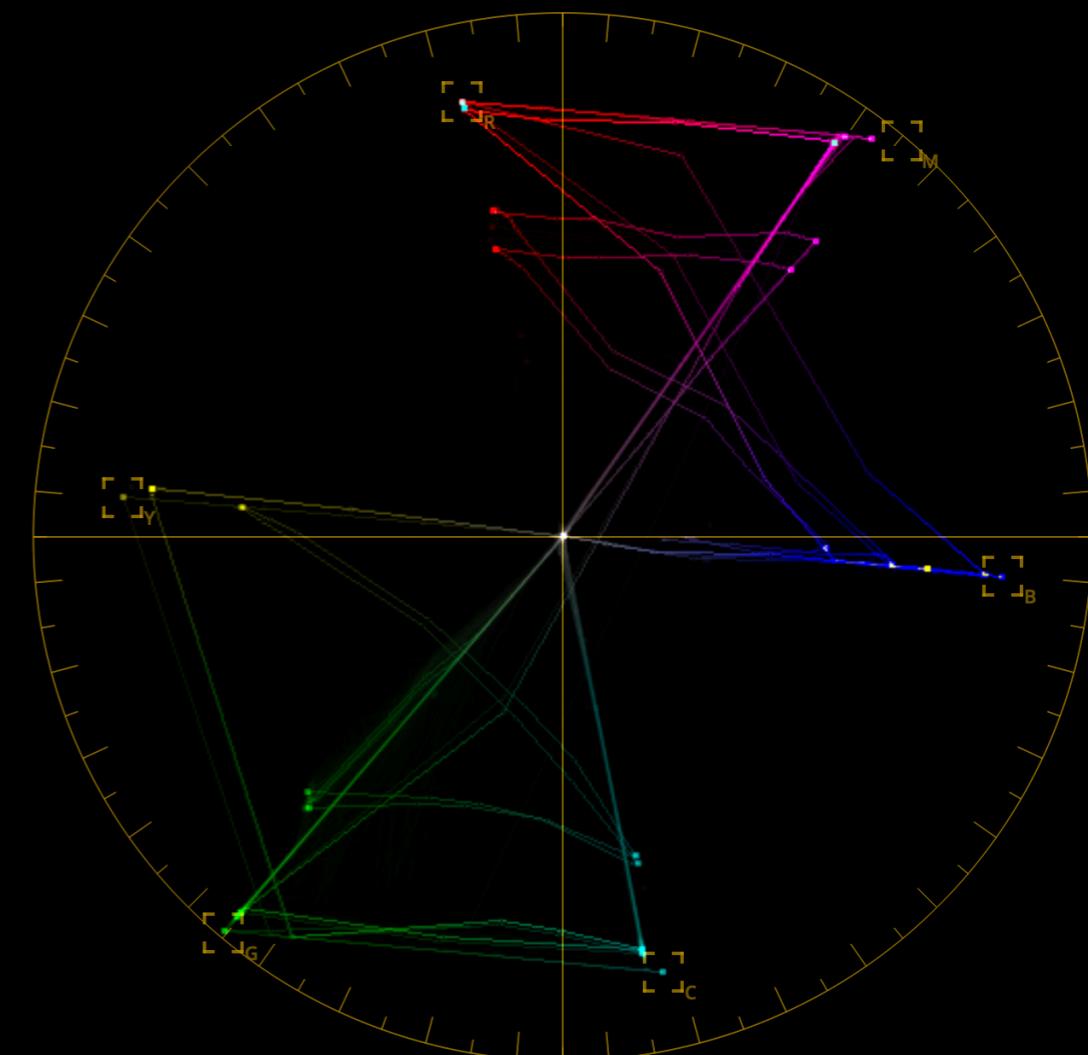


HLG to SDR Conversion: NBCU - LUT3

HLG 100/75%

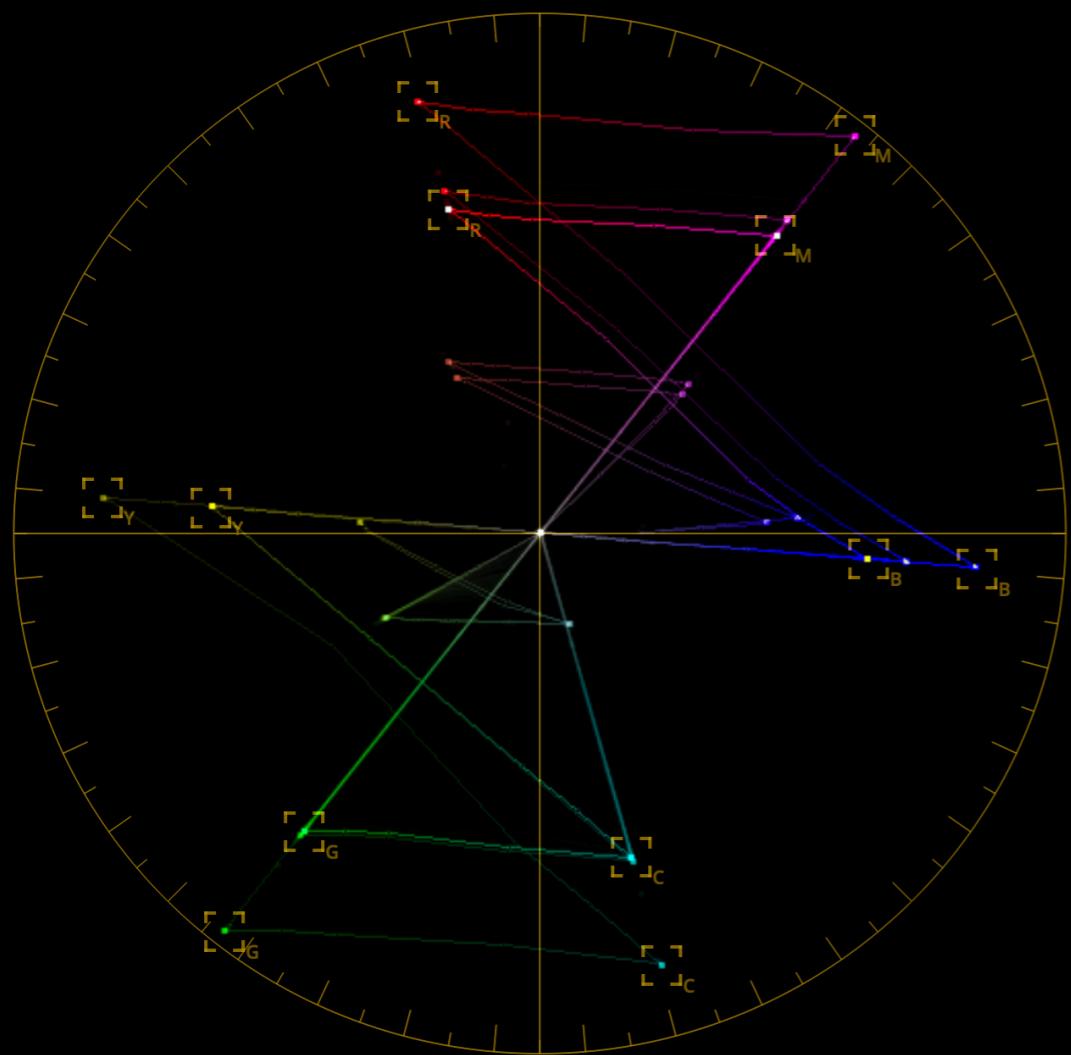


SDR 100%

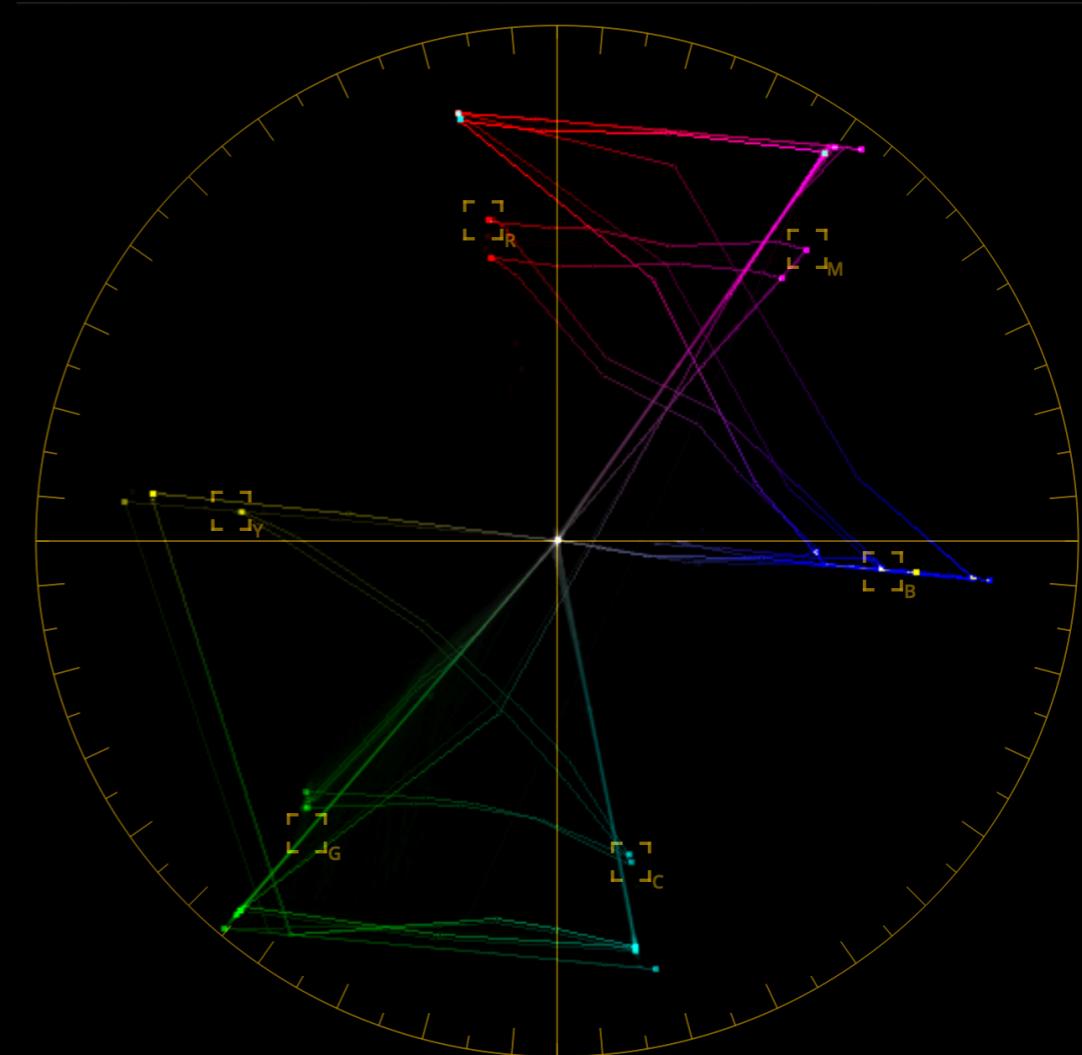


HLG to SDR Conversion: NBCU - LUT3

HLG 100/75%



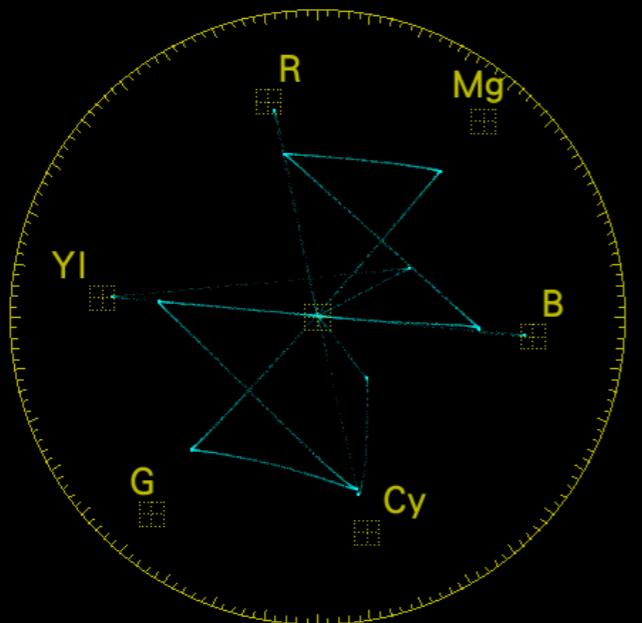
SDR 75%



Roundtripped SDR -> HLG -> SDR

1920x1080/50I YCbCr(422) 10bit HD

COLORIMETRY
BT.709



GAIN x1.000

COMPONENT

STATUS					
	Signal	Format	Freq.	Cable	Embedded Audio
A CH	DETECT	1920x1080/50I HD	-8.1ppm	< 10m	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

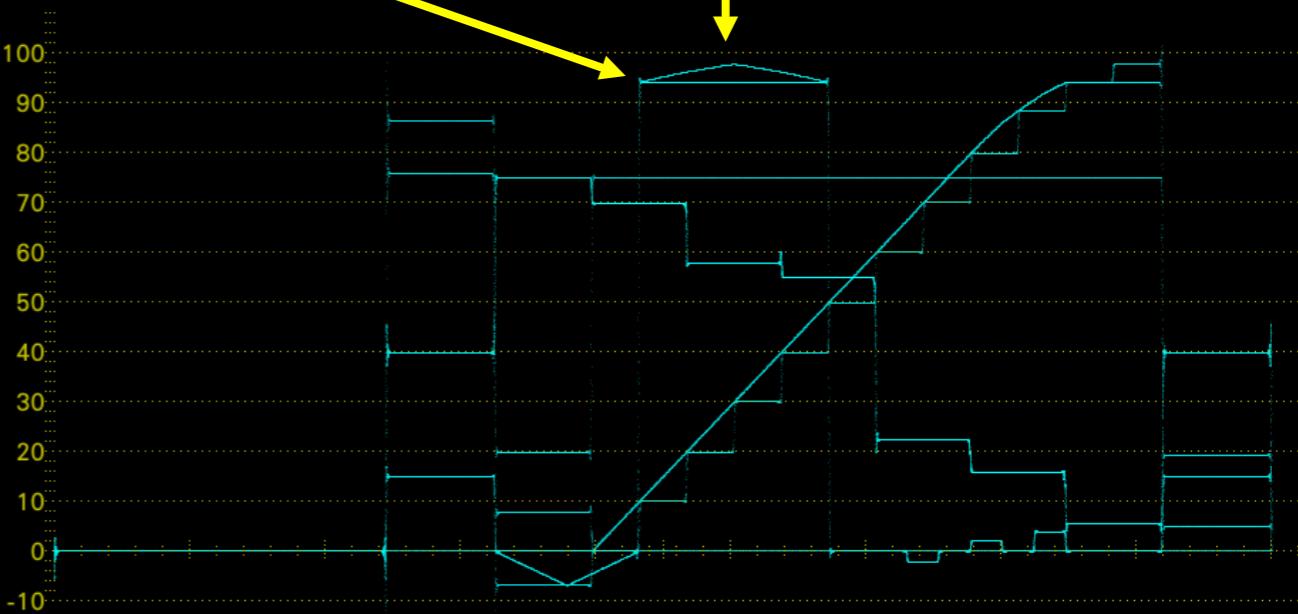
ERROR			
SDI	A CH	ANC	A CH
CRC	1	Check Sum	0
TRS Position	1	Parity	0
TRS Code	1		
Illegal Code	1		
Line Number	1		
Embedded Audio	A CH	Video Quality	A CH
BCH	0	Freeze	
Parity	0	Black	
DBN	0	Gamut	
Inhibit	0	Cmp. Gamut	
Audio Sample	1	Level Y	
		Level C	

SinceReset 01:14:51

Roundtripped
SDI A

Roundtripped
Tent

TIME: 08:06:18



GAIN x1.000
SWEEP 1H x1



Roundtripped SDR -> HLG -> SDR

There is a slight reduction in level during a round trip which reserves a range for HDR down mapped highlights

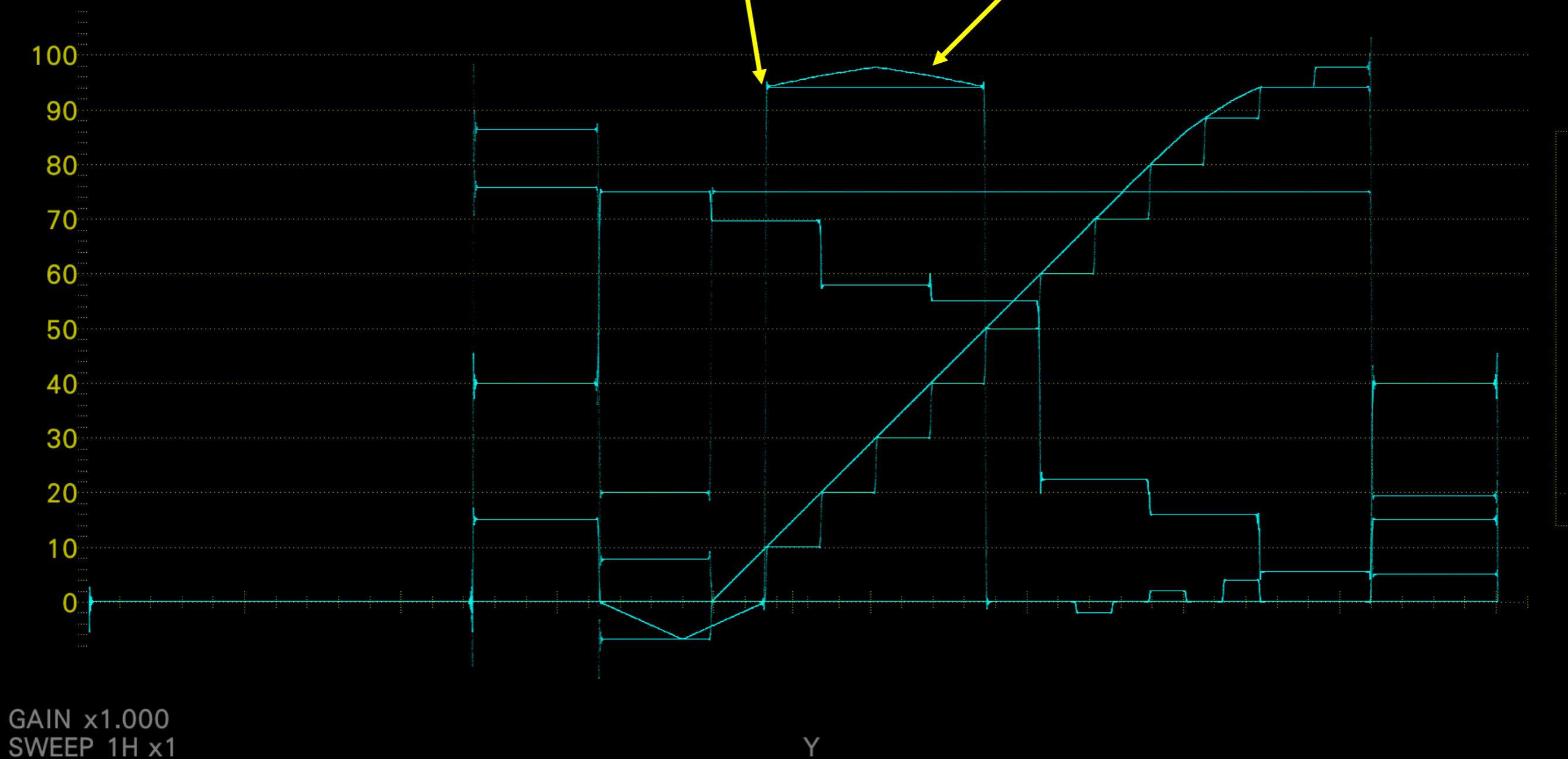
1920x1080/50I YCbCr(422) 10bit HD

Roundtripped
Graphics White 95%

SDI A

Roundtripped
Tent (check clipping)

TIME: 08:06:49

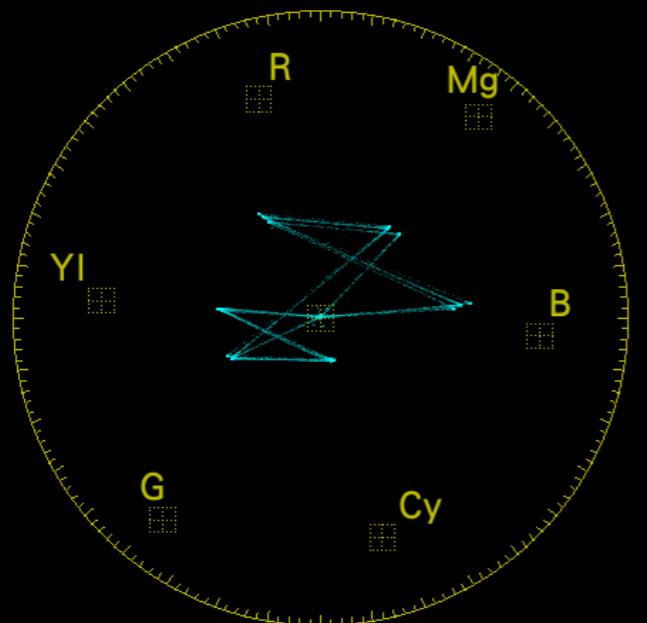


Roundtripped HLG -> SDR -> HLG

AVOID DOING THIS !!! REFER TO ORIGINAL HLG SOURCE

1920x1080/50P YCbCr(422) 10bit 3G-A

COLORIMETRY
BT.2020



GAIN x1.000

COMPONENT

STATUS					
	Signal	Format	Freq.	Cable	Embedded Audio
A CH	DETECT	1920x1080/50P 3G-A	-8.1ppm	< 10m	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

ERROR		
SDI	A CH	ANC
CRC	1	Check Sum
TRS Position	1	Parity
TRS Code	1	
Illegal Code	1	
Line Number	1	
Embedded Audio	A CH	Video Quality
BCH	0	Freeze
Parity	0	Black
DBN	0	Gamut
Inhibit	0	Cmp. Gamut
Audio Sample	1	Level Y
		Level C

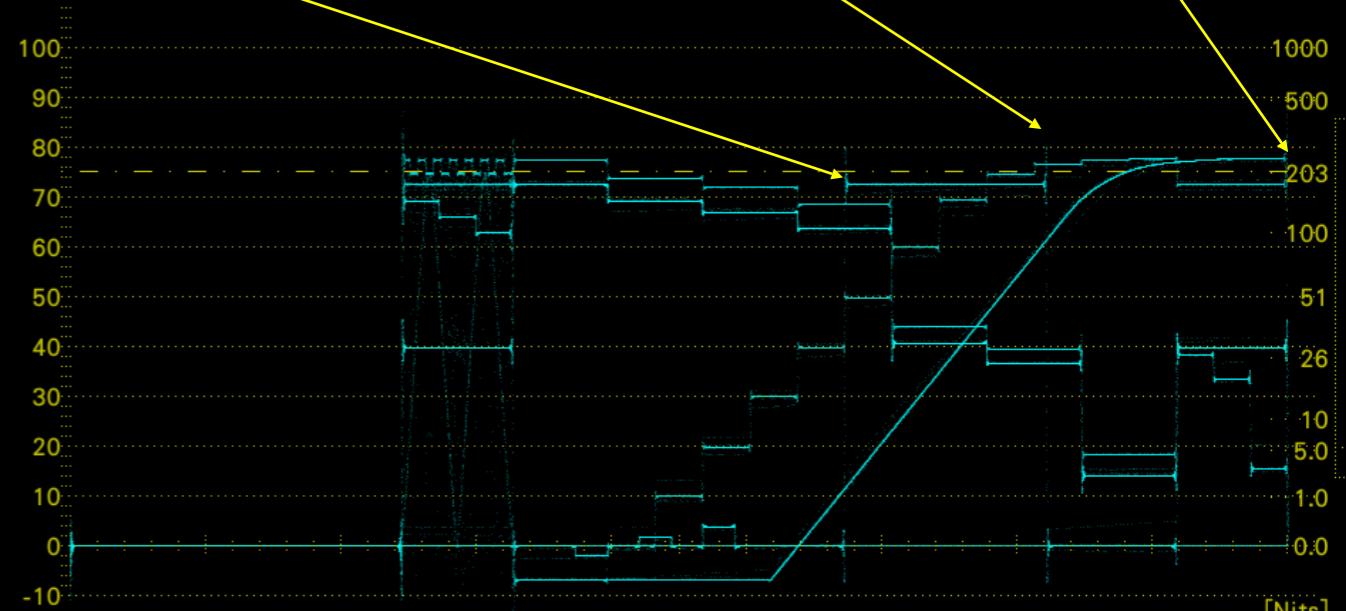
Roundtripped
Graphics White

SDI A

Roundtripped
Highlights

Nits

TIME: 08:07:49



GAIN x1.000
SWEEP 1H x1

SYSTEM GAMMA
HLG-NARROW[75%]



Roundtripped HLG → SDR → HLG

AVOID DOING THIS !!! REFER TO ORIGINAL HLG SOURCE