Video Exposure/Dynamic Range

IMA 753 •Doc 2

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GAMMA & EXPOSURE

3 Elements of EXPOSURE

Characteristic Curves for Popular Color Transparency Films
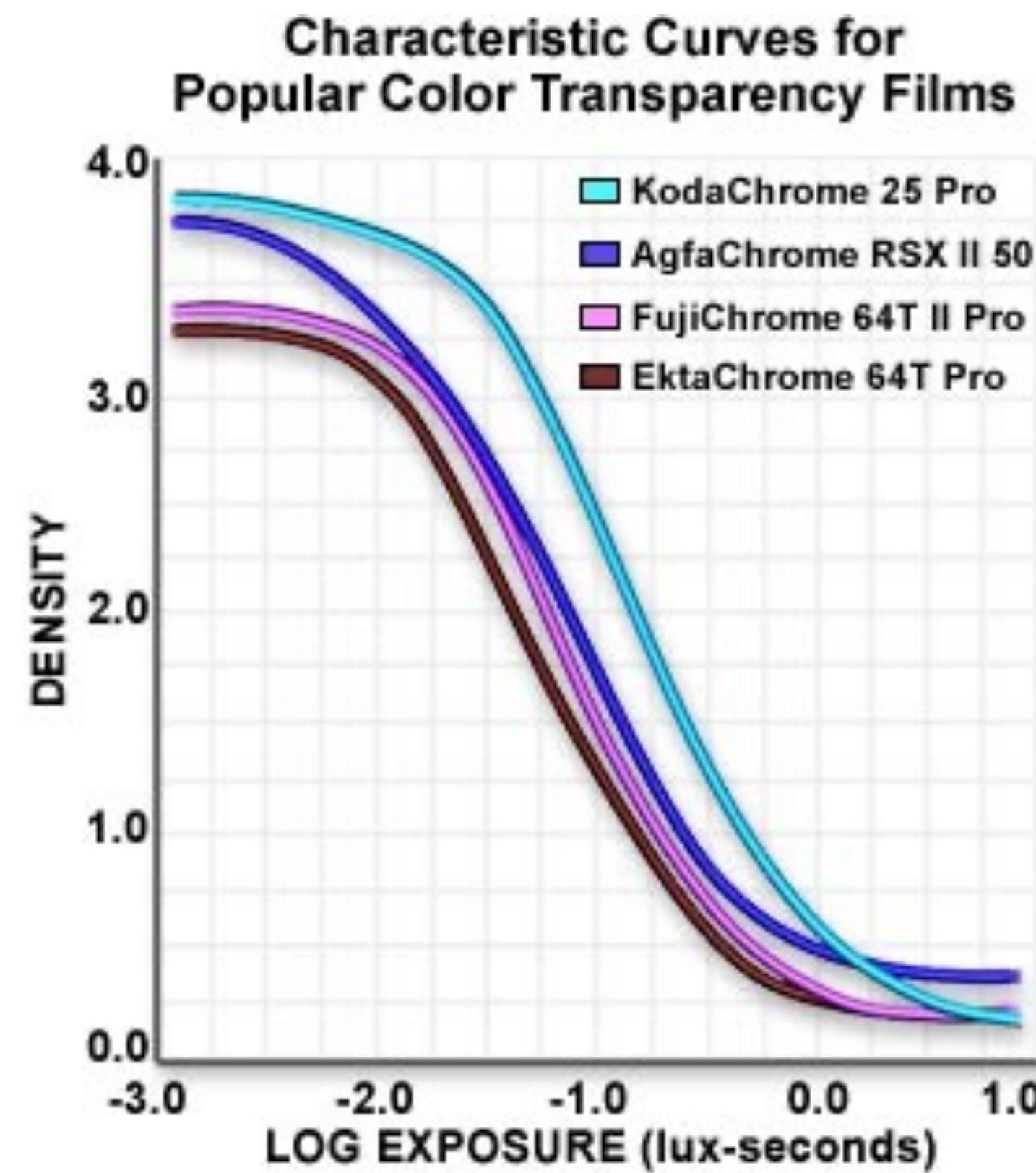
Figure 1

- Exposure is usually expressed as a 'gamma curve'.
- The x-axis shows density of the negative.
- The y-axis shows the amount of light/time logarithmically

Film Exposure

The ability of film to create an exposure and hence reproduce an image is qualified by several different dimensions.

One is the film's "speed" which is a measure of the sensitivity to light, measured in ISO numbers.

Another is the film's ability to handle a range from darks to lights. This measure is called the film's *latitude*.

A third is the film's *gamma*, or exposure curve. This is an indication of *how* a given film stock will reproduce any given light level. To the eye, this reads as more or less contrast in an image. Finally, there is the way that different film stocks, particularly from different manufacturers, handle color.

GAMMA & EXPOSURE
Latitude / Dynamic Range

- Latitude is the term for the number of *f*-stops between dark and light that a particular film stock can handle before going to complete black or total white.

- In video *dynamic range* deals with the same concept, which is an inherent technical aspect of the specific sensor being used.

- Various schemes have been developed to extend the dynamic range of

6

8

3

1

2

7

5

2

7

**Original Negative
Exposure Data**
Lens: 27 mm ZEISS Master Prime lens
FPS: 36
Filter: 85
Incident light levels:
   (HMI and ambient daylight:
   approx. 5400K):
   Key = T 2.8 (50 fc)
   Fill = T 1.8 (20 fc)

Stop notations listed on the
photo are reflected-light readings.

4

| 1 -.5 Stop | 2 -2.5 Stops | 3 -1.8 Stops | 4 -1 Stop | 5 +2 Stops | 6 +4 Stops | 7 +6 Stops | 8 +7 Stops |

Kodak 5203 Color Negative. ISO 50
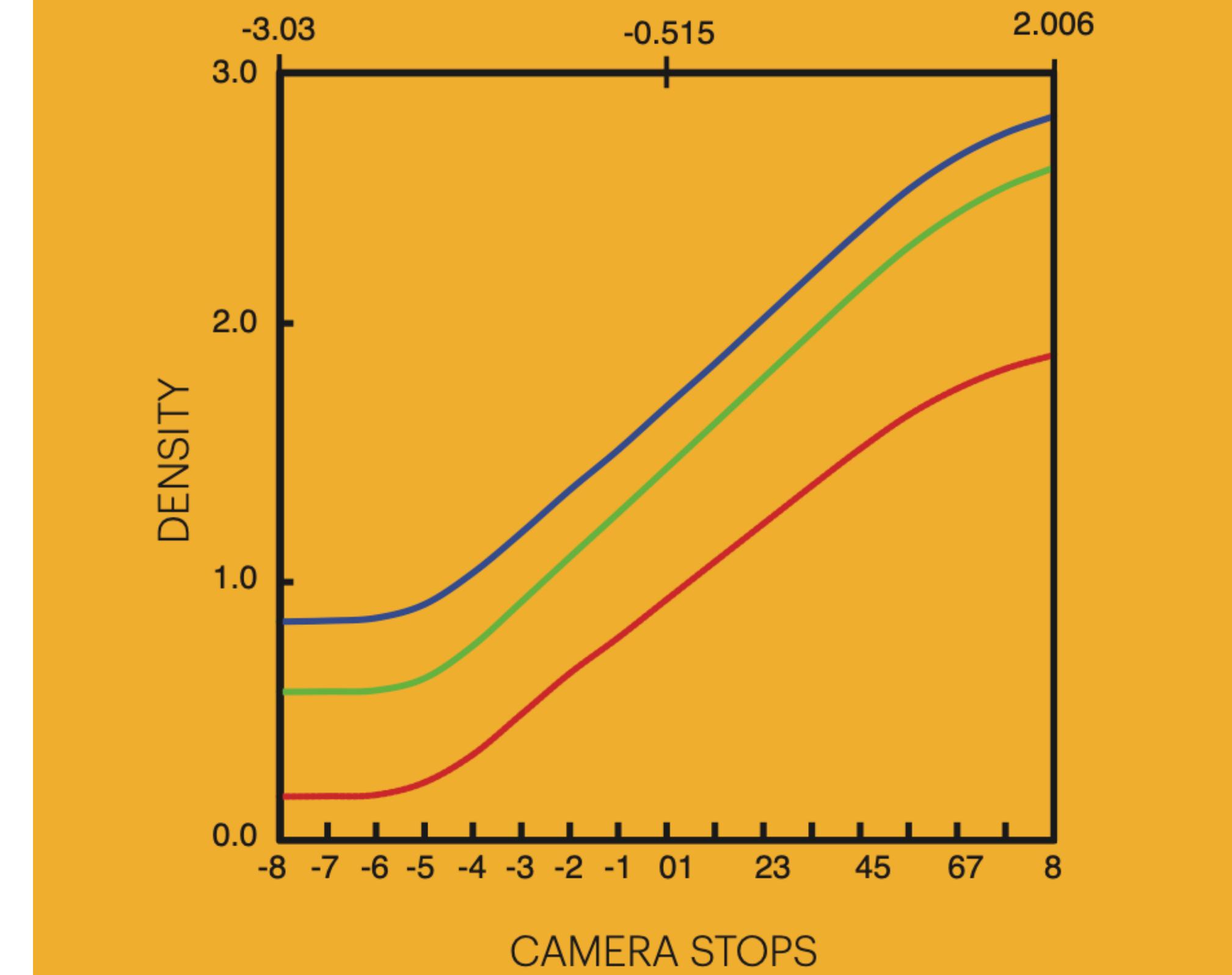
SENSITOMETRIC CURVES

"0" on the x-axis represents normal exposure of an 18-percent gray card in the red, green, and blue layers of this film. A white card is 2⅓ stops higher than normal exposure, and there are at least 3½ stops above that for capturing specular highlight detail. A 3-percent black card is 2⅔ stops below normal exposure. There are at least 2½ stops of latitude below that for capturing shadow detail.

WAVE FORM MONITOR

100 IRE units = WHITE

Zero IRE units = BLACK

Source: (no clips)   Lumetri Scopes ≡   Effect Controls   Audio Clip Mixer: Sequence 02

120 — 306
110 — 280
100 — 255
90 — 230
80 — 204
70 — 178
60 — 153
50 — 128
40 — 102
30 — 76
20 — 51
10 — 26
0 — 0
-10 — -26
-20 — -51

Rec. 709   Clamp Signal   8 Bit
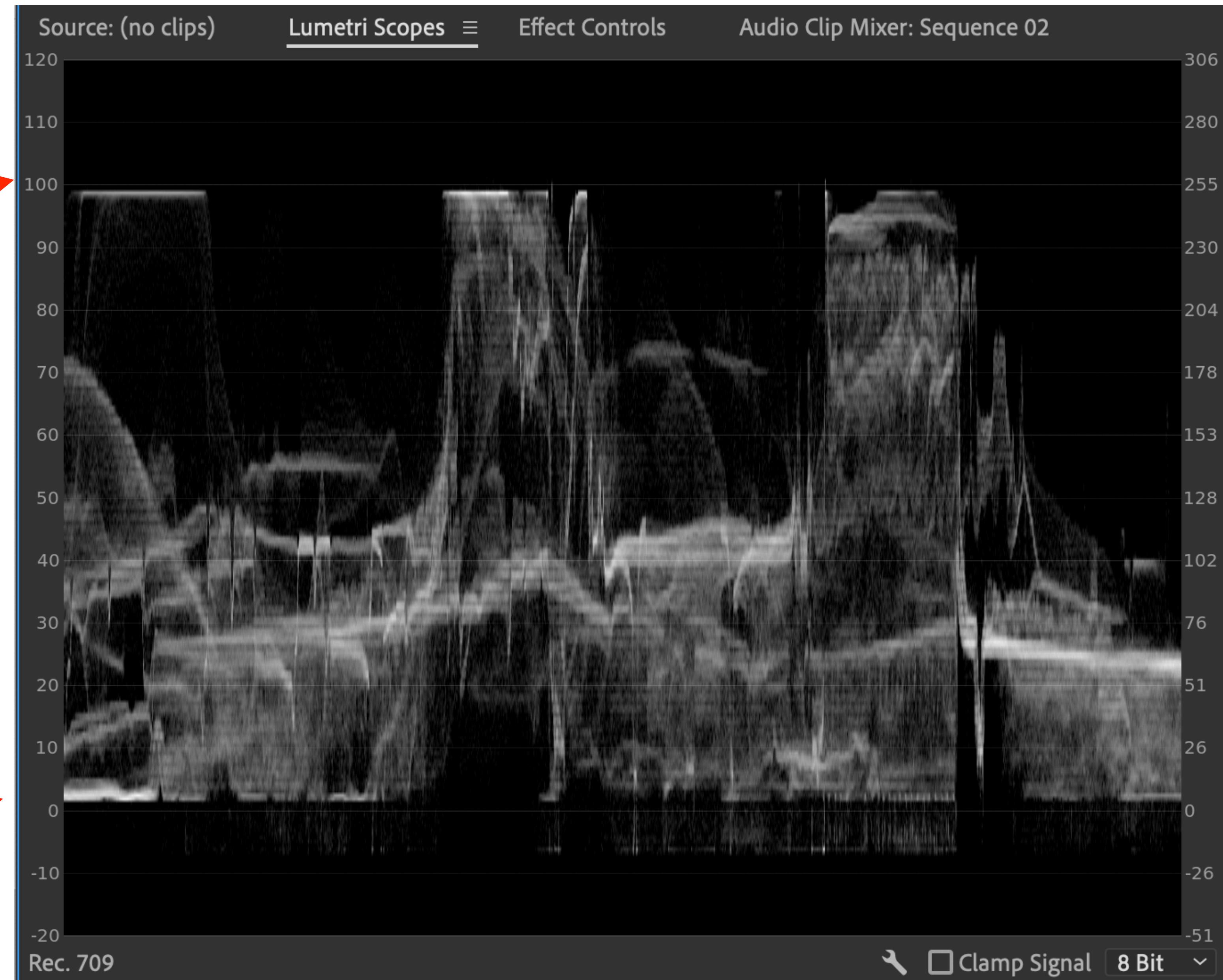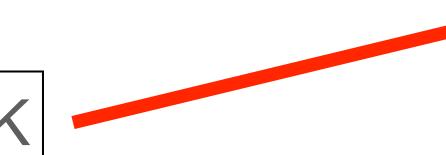
VECTORSCOPE

The video color signal shows HUE by which angle or direction the signal goes, Yellow to the left, Cyan below, etc.
and it shows SATURATION by how far out toward the edge the signal goes.
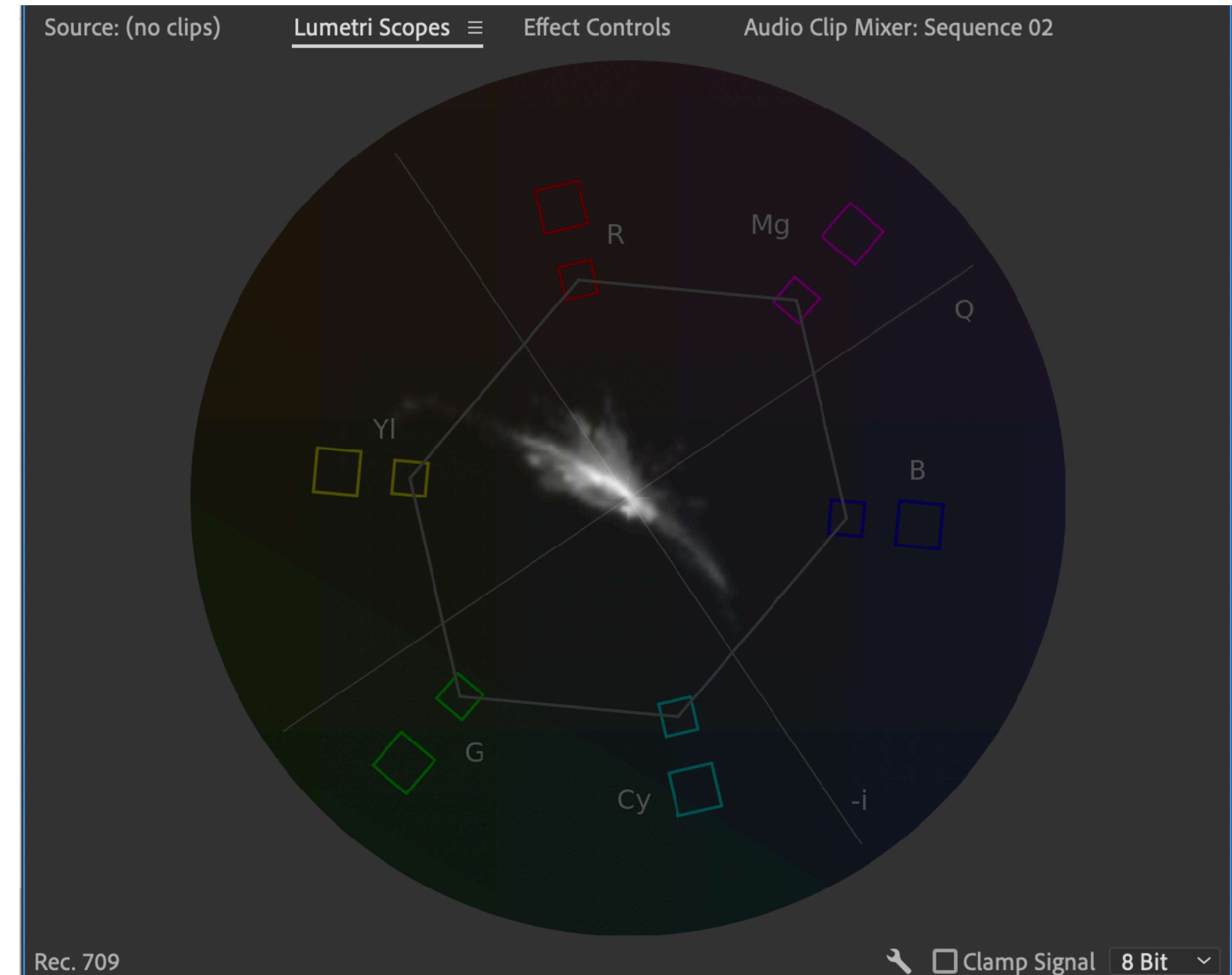
Rec. 709 is the standard color space for HD video.
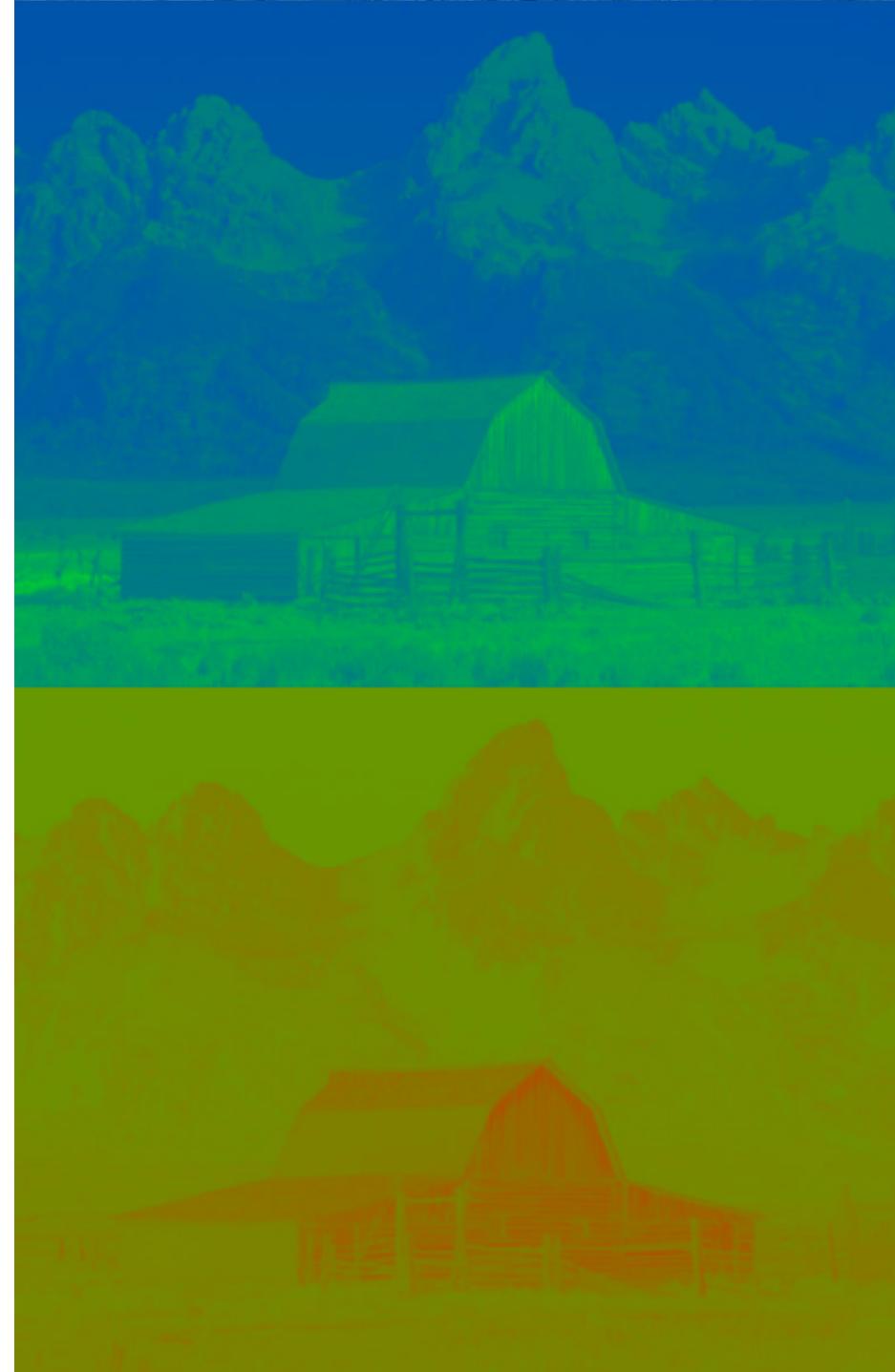
How do we read this information for color correction?

Gamma & Exposure

Manufacturers have developed two main routes to extending dynamic range.

Log gamma and HDR

Selecting Custom Picture Files

Select a custom picture file to apply its settings to your recordings or to edit, rename, protect, or transfer it. When [🎥 Camera Setup] ▶ [CP CINEMA Locked] is set to [On], the custom picture menu cannot be accessed and custom picture files cannot be used.

1 Press the CUSTOM PICTURE button.
- The custom picture menu appears. The currently selected file appears next to the SET icon or [Off] if no file is selected.
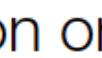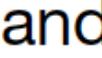
2 Select [SET CP Select File] and then press the joystick.

3 Select the location of the custom picture file and then press the joystick.
- Select [Camera] to apply a custom picture file saved in the camcorder or [SD A] or [SD B] to apply a custom picture file saved on the respective SD card.
- [SD A] and [SD B] will only appear if the SD card contains previously saved custom picture files.
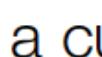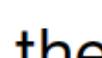
4 Select the desired file and then press the joystick.
- Select [Off] to record without applying any custom picture settings.
- To apply the file's settings, press the CUSTOM PICTURE button to exit the custom picture menu. An icon representing the selected custom picture file will appear on the left of the screen.
- To perform other operations on the file, continue with the following procedures.

Canon offers both a "Wide DR" (dynamic range) setting and a Canon Log Gamma setting
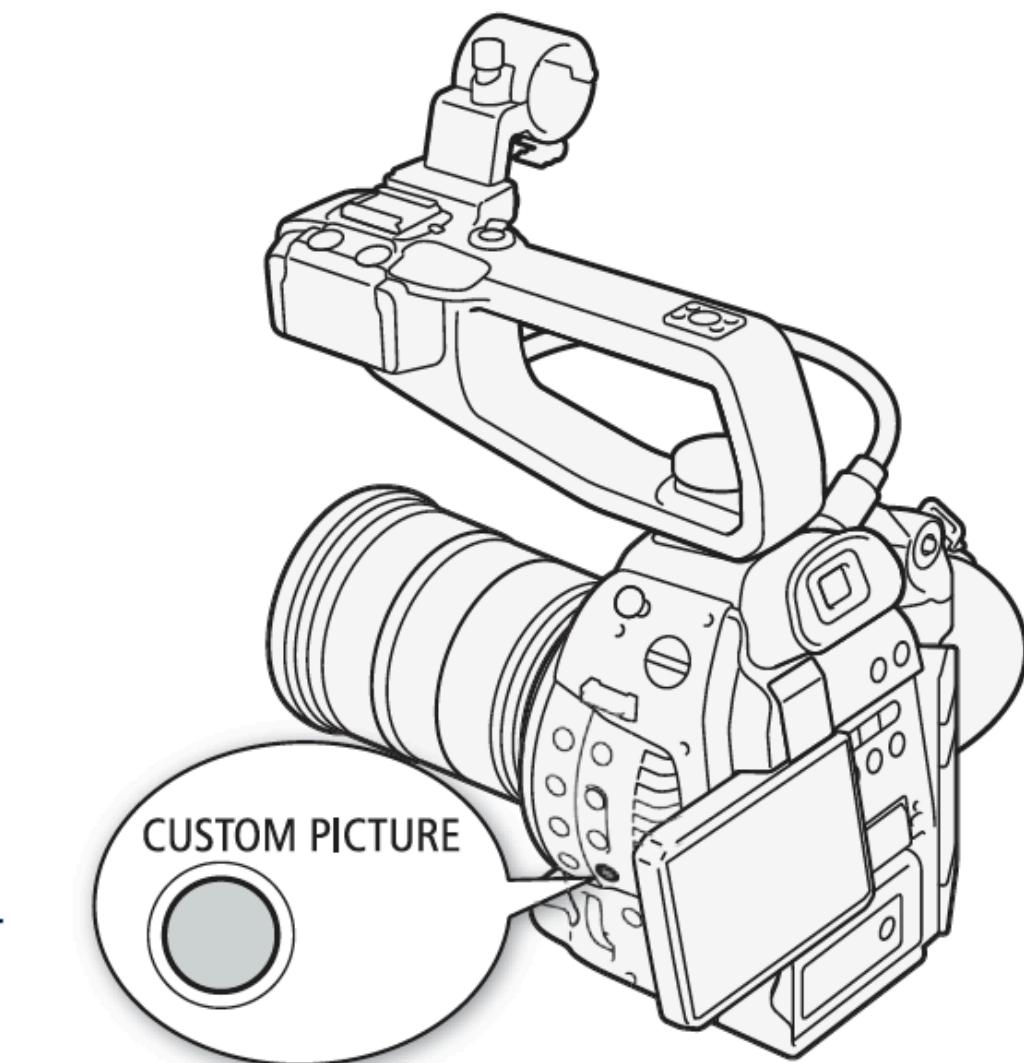
Preset Custom Picture Files

By default, the custom picture files in the camcorder in file slots [C7] to [C9] are protected. Remove the protection (📖 91) to edit the file. The following describes when to use the preset files.

[C7: EOS Std.]: Reproduces the image quality and look (high contrast, vibrant colors) of an EOS digital SLR camera with its picture style set to [Standard].

[C8: Wide DR]: Applies a gamma curve with a very wide dynamic range and an appropriate color matrix that nevertheless do not require post-production processing.

[C9: CINEMA]: Uses the Canon Log gamma and color matrix for an outstanding dynamic range and an image suitable for processing in post-production.

[Gamma]

The gamma curve changes the overall look of the image. Generally, this should be the same setting as [Select] under [Color Matrix]. (Default: [Normal 1]).

[Normal 1] to [Normal 4]: These settings are suitable for viewing the image on a TV monitor. Highlights in [Normal 2] are brighter than those of [Normal 1]. Dark tones in the lower part of the gamma curve for [Normal 3] (ITU-R BT.709 standard) and [Normal 4] are more pronounced than those of [Normal 2].

[Cine 1] or [Cine 2]: Use [Cine 1] for a gamma curve that results in a picture with a cinema-like feel and cinema-like tones. [Cine 2] has softer contrasts than does [Cine 1] but is also suitable for creating a cinema-like picture.

[EOS Std.]: This gamma curve approximates the look of an EOS digital SLR camera when the picture style is set to [Standard] (high contrast, vibrant colors).

[Wide DR]: Applies a gamma curve with a very wide dynamic range, optimized for playback on an HDTV.

[Canon Log]: Applies a logarithmic gamma curve for outstanding dynamic range. Requires image processing in post-production.
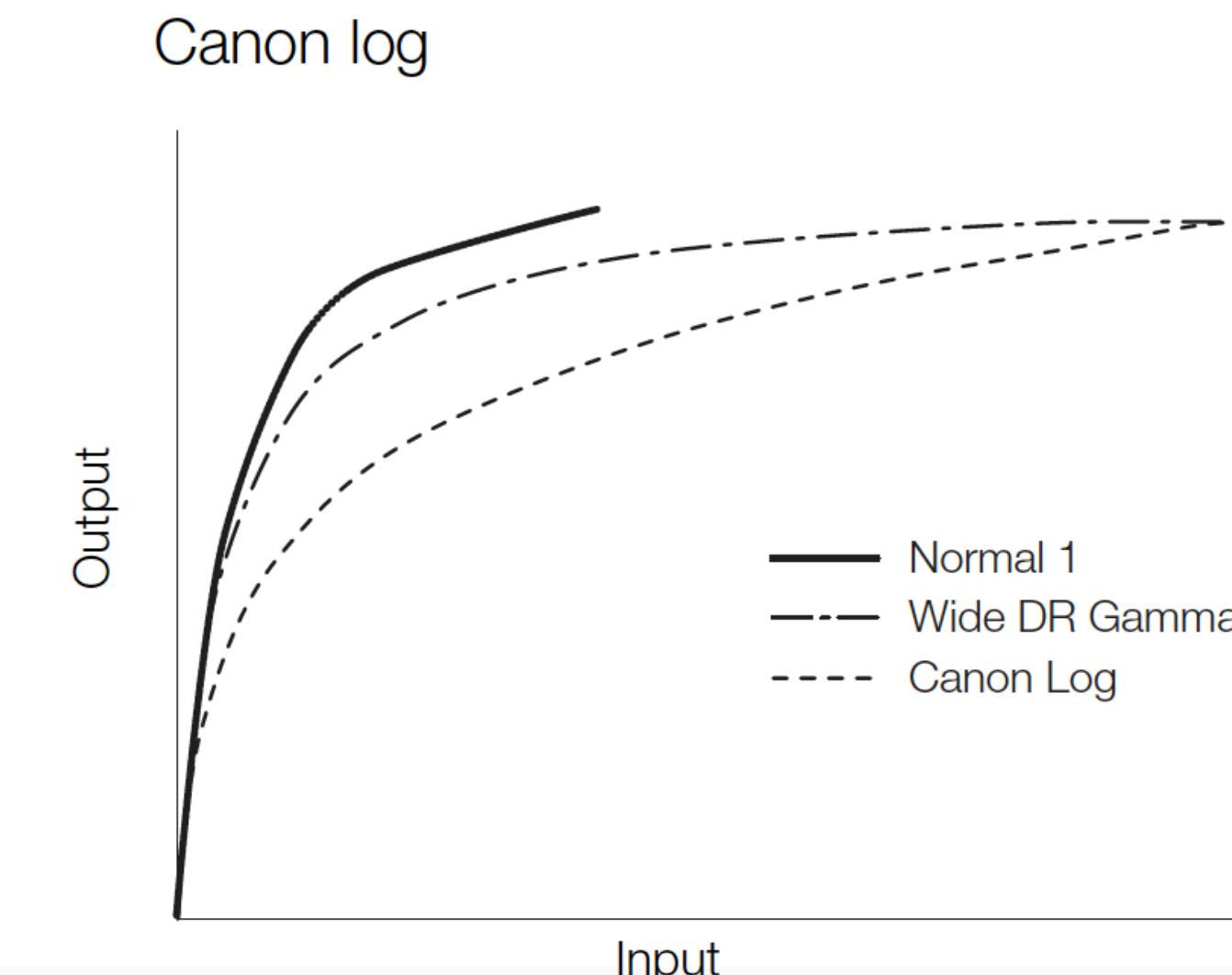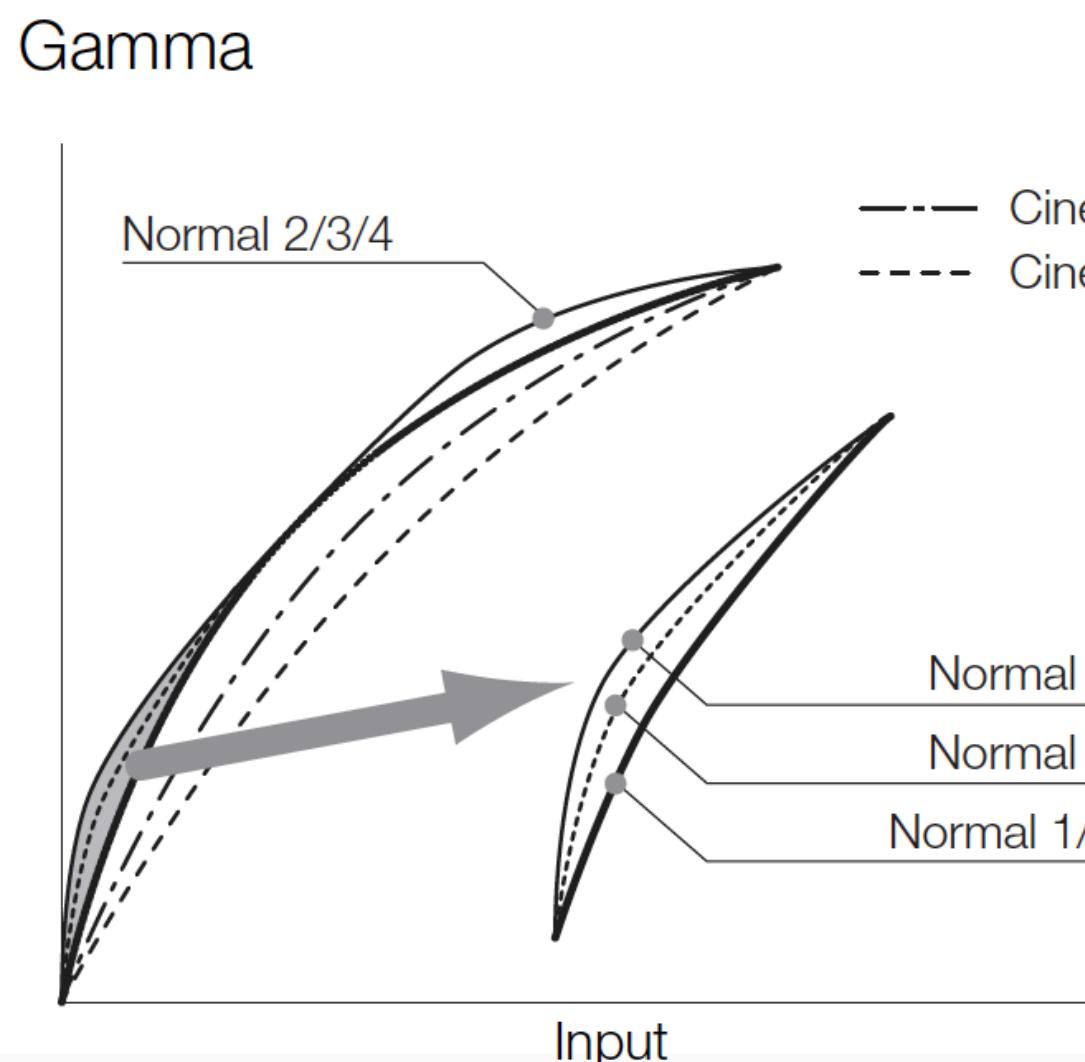
Shooting "log gamma" underexposes the image.
It also lowers the contrast (so the blacks are gray).
The end result is a dull looking image on screen,
hence "shooting flat."

In order to get a sense of the final result while
shooting you can set the VF to compensate.

Checking Clips Recorded with Canon Log Gamma (View Assistance)

When Canon Log gamma is used, the image displayed on the screen will appear darker than usual. You can use the view assistance function to display an image that approximates the one that would be obtained using a normal gamma setting. View assistance is only applied on the camcorder screen; it will not affect your recordings or the video signal output from the various terminals.

1 Open the [View Assist.] submenu.
  [▱ LCD/VF Setup] ❯ [View Assist.]

2 Select [On] and then press the joystick.
  • **V.Assist.** will appear on the lower left of the screen.

[▱ LCD/VF Setup]

[View Assist.]

[Off]

V5
V4
V3
V2
V1 01:39:20:04
A1 01:39:20:04
A2 01:39:20:04
A3 00;00;16;27
A4 01:39:20:04
A5

00:08:00:07   Fit   Full   00:35:09:15

/Volumes/Tules 2TB/TULES PROJECTS/TULES-FEBRUARY.prproj *

Learning   Assembly   Editing   Color   Effects   Audio   Captions and Graphics   Libraries   Marty Editing 2

Source: Tules Assembly 042822: Clip0022.MXF: 00:07:13:13   Lumetri Scopes ≡   Effect Controls   Audio Clip Mixer: Tules Assembly 042822

Program: Tules Assembly 042822

Lumetri Color ≡

Source - Clip0022.MXF   Tules Assembly 042822 - Clip0022.MXF

fx   Lumetri Color

Basic Correction ☑

Creative ☑

Look   SL CLEAN KODAK C HDR

Intensity   100.0

Adjustments
Faded Film   0.0
Sharpen   0.0
Vibrance   0.0
Saturation   100.0

Shadow Tint   Highlight Tint

Tint Balance   0.0

Curves ☑

Color Wheels & Match ☑

HSL Secondary ☑

Vignette ☑

Rec. 2100 HLG

Clamp Signal   10 Bit

V5
V4
V3
V2
V1 01:39:20:04
A1 01:39:20:04
A2 01:39:20:04
A3 00:00;16;27
A4 01:39:20:04
A5

00:08:00:07   Fit   Full   00:35:09:15

Info   Effects   Markers   History   Project: TULES-FEBRUARY ≡

TULES-FEBRUARY.prproj

29 items

Name ∧   Description   Log
ASSEMBLIES
Tules Seqs. June
Tules Seqs. October
ARCHIVAL
Audio 3_8.wav
Audio 3_9.wav
Audio 4_8.wav
BKLYN MUSEUM
BROOKLYN
CANON MEDIA
FREEZE FRAMES
MAPS
ML PHONE
Motion Graphics Template Medi
OTHER VIDEO
PAINTERS
PHOTOGRAPHERS

Tules Assembly 042822

00:08:00:07

C1   Subtitle

V5
V4
V3
V2
V1
A1
A2
A3   Audio 3
A4   Audio 4
A5
Mix   0.0