

Color Science & Video Editing Notes

1 Colourspace Transforms

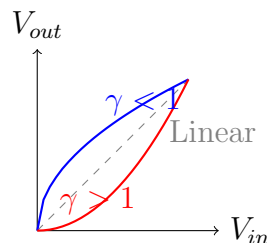
- **Definition:** A method to convert image or video data from one color space and gamma curve to another.
- **Steps in DaVinci Resolve:**
 1. Set **Input Color Space & Gamma** in CST (Color Space Transform) node to match the camera's format.
 2. Set **Output Color Space & Gamma** to:
 - DaVinci Wide Gamut
 - DaVinci Intermediate
 3. Perform editing and color grading in the wide gamut space.
 4. Add a CST Out Node to convert back to **Rec.709, Gamma 2.4** for delivery.
- **Notes:**
 - Clipping occurs when color values go outside the gamut.
 - Images may lose bright or saturated colors if not transformed correctly.

2 Key Concepts

2.1 Gamma

- Non-linear distribution of luminance values.
- Used for:
 - Gamma correction (to compensate for display response).
 - Monitor calibration.
- Equation:

$$V_{out} = A \cdot (V_{in})^\gamma$$



Gamma Curves: effect of different γ values

2.2 Dynamic Range

- Measured in **stops (f-stops)**.

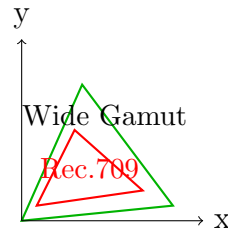
- 1 stop = doubling or halving of light.
- Formula:

$$f\text{-stop} \propto \frac{1}{\text{aperture}}$$

- More stops \Rightarrow more details in shadows and highlights.

2.3 Gamut

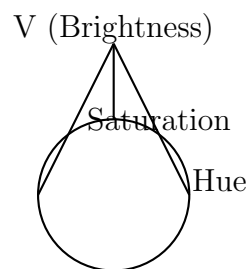
- Defines the complete range of colors that can be represented in a given color space.



Color Gamuts: Rec.709 vs. Wide Gamut (CIE xy diagram simplified)

3 Color Models

- **RGB**: Basis for most display devices.
- **CIE 1931 XYZ**: Mathematical standard for defining colors.
- **HSV (Hue, Saturation, Value)** and **HSL (Hue, Saturation, Lightness)**:
 - Hue: Type of color (red, green, etc.)
 - Saturation: Strength or intensity of color.
 - Value/Lightness: Brightness.



HSV Color Model (conceptual cone)

4 Video Production Hardware (Blackmagic Design)

- SDI Routers
- Cintel (Film scanner)
- Ultimatte (Compositing tool)
- ATEM Switchers
- Desktop solutions
- Streaming devices
- Disk Recorders
- Cameras
- RAW format

Note: These are not video editing software, but hardware tools used in production pipelines.

5 Extra Notes

- Colors outside gamut appear clipped or inaccurate.
- Rec.709 is the standard for HD broadcast.
- DaVinci Wide Gamut preserves more color detail for grading.
- Log profiles (C-Log, S-Log, V-Log) are used to capture wide dynamic range and require LUTs or CST for proper viewing.