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Wide Gamut Intermediate

Blackmagicdesign

DaVinci Resolve 17

Leading the Creative Video Revolution

Contents

DaVinci Wide Gamut Intermediate

Revision History

Version	Date	Description
1.0	07/08/2020	Initial Release
1.0.1	11/09/2020	Fixed incorrect matrix values
1.1	31/07/2021	Fixed incorrect green x chromaticity coordinate value. Removed references to nominal nits levels.

Summary

DaVinci Wide Gamut Intermediate consists of two components:

1. **DaVinci Wide Gamut color space (DWG)**
   - DaVinci Wide Gamut is defined by its primary and white point CIE chromaticity coordinates.
   - It defines the width and shape of the associated gamut volume.

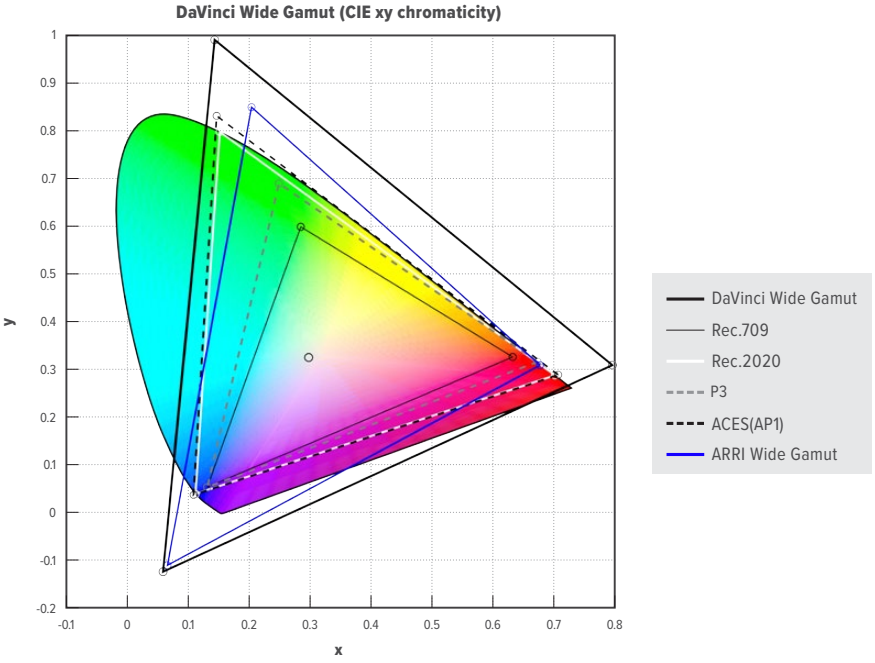
2. **DaVinci Intermediate OETF (DI)**
   - DaVinci Intermediate is a log-based transfer function, allowing the encoding of over 9 stops above mid-grey.
   - It defines the luminance distribution within the encoded gamut volume.

Together DWG and DaVinci Intermediate define the gamut volume and luminance distribution of the DaVinci Wide Gamut Intermediate space. Specifications for both are described below.

DaVinci Wide Gamut

DaVinci WG is designed to accommodate the vast majority of colors that can be captured using the latest modern cameras and capture devices.

It facilitates the storage and manipulation of *intermediate* image data in modern production pipelines, where imagery is sourced from a large variety of different sources and capture devices while outputs must be provided for both wide gamut (Rec.2020) or regular gamut (Rec.709) display devices.



DaVinci WG Primaries and White Point

DaVinci Wide Gamut is defined by the following CIE 1931 xy chromaticity coordinates:

	x	**y**
red	**0.8000**	**0.3130**
green	**0.1682**	**0.9877**
blue	**0.0790**	**-0.1155**
white	**0.3127**	**0.3290**

The matrices below convert linear DaVinci Wide Gamut RGB data to/from CIE 1931 XYZ:

DaVinci WG RGB -> XYZ matrix		
0.70062239	0.14877482	0.10105872
0.27411851	0.87363190	-0.14775041
-0.09896291	-0.13789533	1.32591599

XYZ -> DaVinci WG RGB matrix		
1.51667204	-0.28147805	-0.14696363
-0.46491710	1.25142378	0.17488461
0.06484905	0.10913934	0.76141462

DaVinci Intermediate (OETF)

DaVinci Intermediate encodes relative scene linear light and is defined by the parameters below.

Parameters

Parameter	Value
DI_A	0.0075
DI_B	7.0
DI_C	0.07329248
DI_M	10.44426855
DI_LIN_CUT	0.00262409
DI_LOG_CUT	0.02740668

Linear light values below **DI_LIN_CUT** are encoded linearly with a gradient of **DI_M**.

For a linear light value (`L`) and encoded value (`V`), and given the above parameters, DaVinci Intermediate is encoded / decoded using the following equations.

Forward OETF

```
V = (log2(L + DI_A) + DI_B)*DI_C        for L >      DI_LIN_CUT
V = L*DI_M                              for L < =    DI_LIN_CUT
```

Inverse OETF

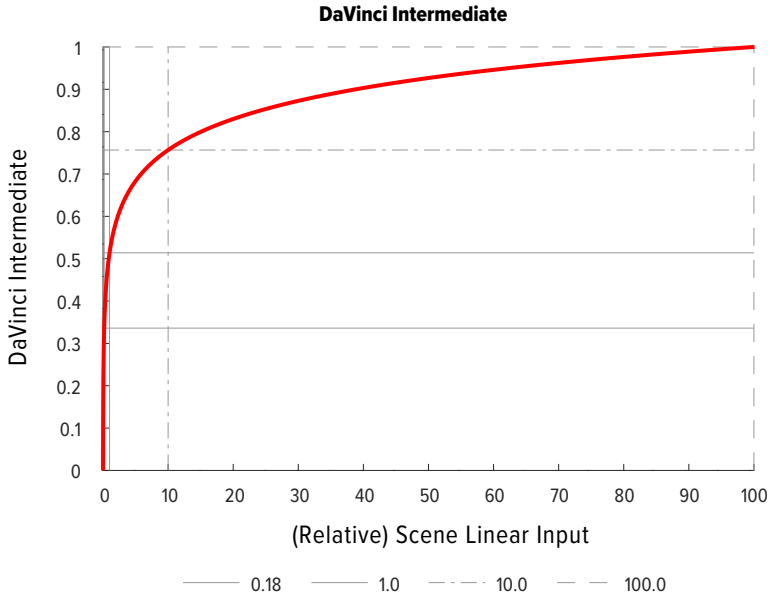
```
L = pow(2.0, (V / DI_C) - DI_B)-DI_A    for V>       DI_LOG_CUT
L = V/DI_M                              for V < =    DI_LOG_CUT
```

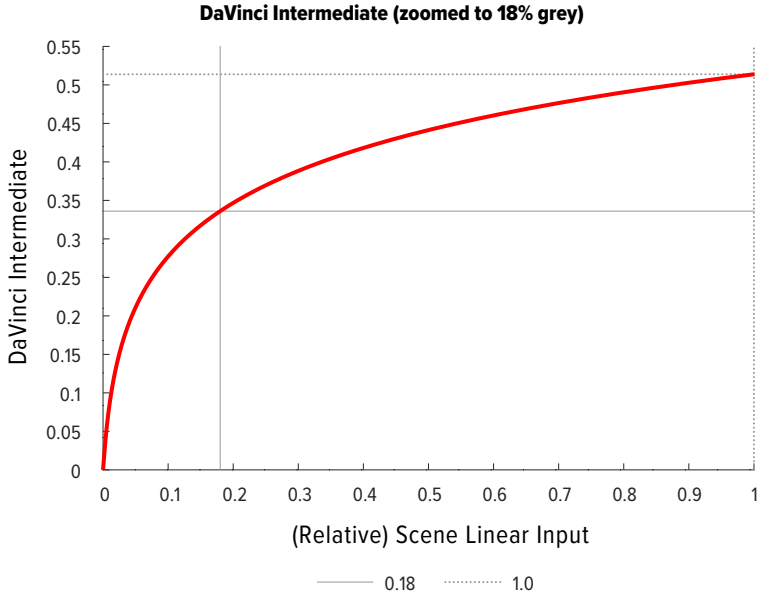
Mapping Values

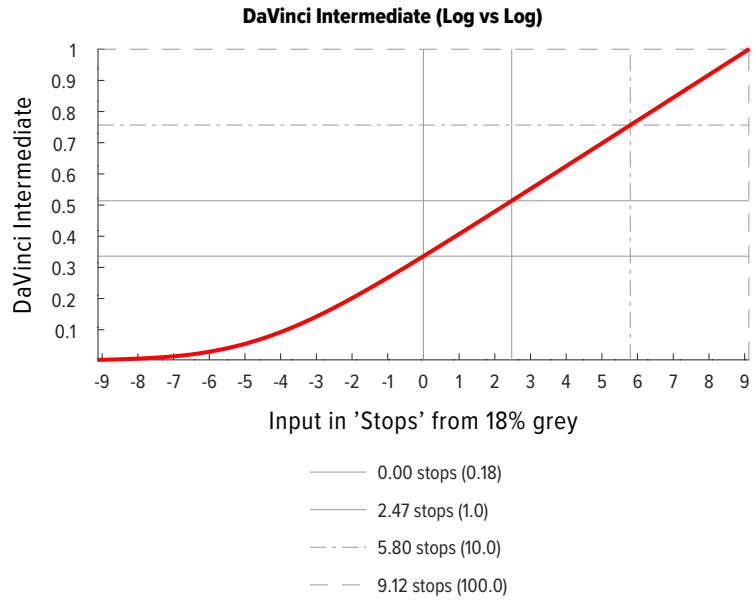
DaVinci Intermediate encodes > 9.1 stops above 18% grey.
Middle (18%) grey is mapped to 0.336043.

Input Nits	Input Value	DaVinci Intermediate Value
-1.0	-0.01	-0.104443
0.0	0.0	0.000000
18.0	0.18	0.336043
100.0	1.0	0.513837
1000.0	10.0	0.756599
4000.0	40.0	0.903125
10000.0	100.0	1.000000

Plots


DaVinci Intermediate
DaVinci Intermediate
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
40
50
60
70
80
90
100
(Relative) Scene Linear Input
0.18
1.0
10.0
100.0


DaVinci Intermediate (zoomed to 18% grey)
DaVinci Intermediate
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
(Relative) Scene Linear Input
0.18
1.0


DaVinci Intermediate (Log vs Log)
DaVinci Intermediate
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Input in 'Stops' from 18% grey
0.00 stops (0.18)
2.47 stops (1.0)
5.80 stops (10.0)
9.12 stops (100.0)