WHITE PAPER ON REDWIDEGAMUTRGB AND LOG3G10

This document is designed for technical users and post-production houses that intend to perform their own color math using RED's standardized color space and gamma curve.

REDWIDEGAMUTRGB

REDWideGamutRGB (RWG) is a camera color space designed to encompass all colors a RED camera can generate without clipping. Essentially RWG is a standardized CameraRGB color space.

PRIMARIES AND WHITE POINT

red primary	0.780308,	0.304253
green primary	0.121595,	1.493994
blue primary	0.095612,	-0.084589
white point (D65)	0.3127,	0.3290

MATRICES TO AND FROM XYZ

REDWideGamutRGB to XYZ =

0.735275,	0.068609,	0.146571,
0.286694,	0.842979,	-0.129673,
-0.079681,	-0.347343,	1.516081

XYZ to REDWideGamutRGB =

1.412807,	-0.177523,	-0.151771,
-0.486203,	1.290697,	0.157401,
-0.037139,	0.286376,	0.687680

MATRICES TO AND FROM ACES (AP0)

REDWideGamutRGB to ACES AP0 =

0.785043,	0.083844,	0.131118,
0.023172,	1.087892,	-0.111055,
-0.073769,	-0.314639,	1.388537

ACES AP0 to REDWideGamutRGB =

1.265561,	-0.135228,	-0.130321,
-0.020568,	0.943172,	0.077377,
0.062575,	0.206536,	0.730792

MATRICES TO AND FROM REC709

REDWideGamutRGB to REC709 =

1.981880,	-0.900388,	-0.081540,
-0.178143,	1.500467,	-0.322325,
-0.101811,	-0.535343,	1.637304

REC709 to REDWideGamutRGB =

0.541973,	0.360148,	0.097891,
0.076993,	0.767969,	0.155019,
0.058875,	0.273495,	0.667533

MATRICES TO AND FROM REC2020

REDWideGamutRGB to REC2020 =

1.180431,	-0.094040,	-0.086391,
-0.028017,	1.311442,	-0.283425,
-0.074360,	-0.362078,	1.436437

REC2020 to REDWideGamutRGB =

0.853263,	0.079695,	0.067042,
0.029375,	0.809195,	0.161430,
0.051575,	0.208097,	0.740329

LOG3G10

Log3G10 is a log curve designed to encode camera data in RWG color space for subsequent grading and transformation to HDR, SDR or other log encodings.

Log3G10 is named for its key properties. The 3G represents the mapping of 18% mid grey to 1/3, and the 10 represents the extent of the log curve encoding a linear light value up to 10 stops above mid grey (0.18 * 2^10 = 184.32) before the curve reaches an output value of 1.0.

GRAPHS

The full curve shows the Log3G10 curve encodes a linear light value of 10 stops above mid grey (184.32) to 1.0.
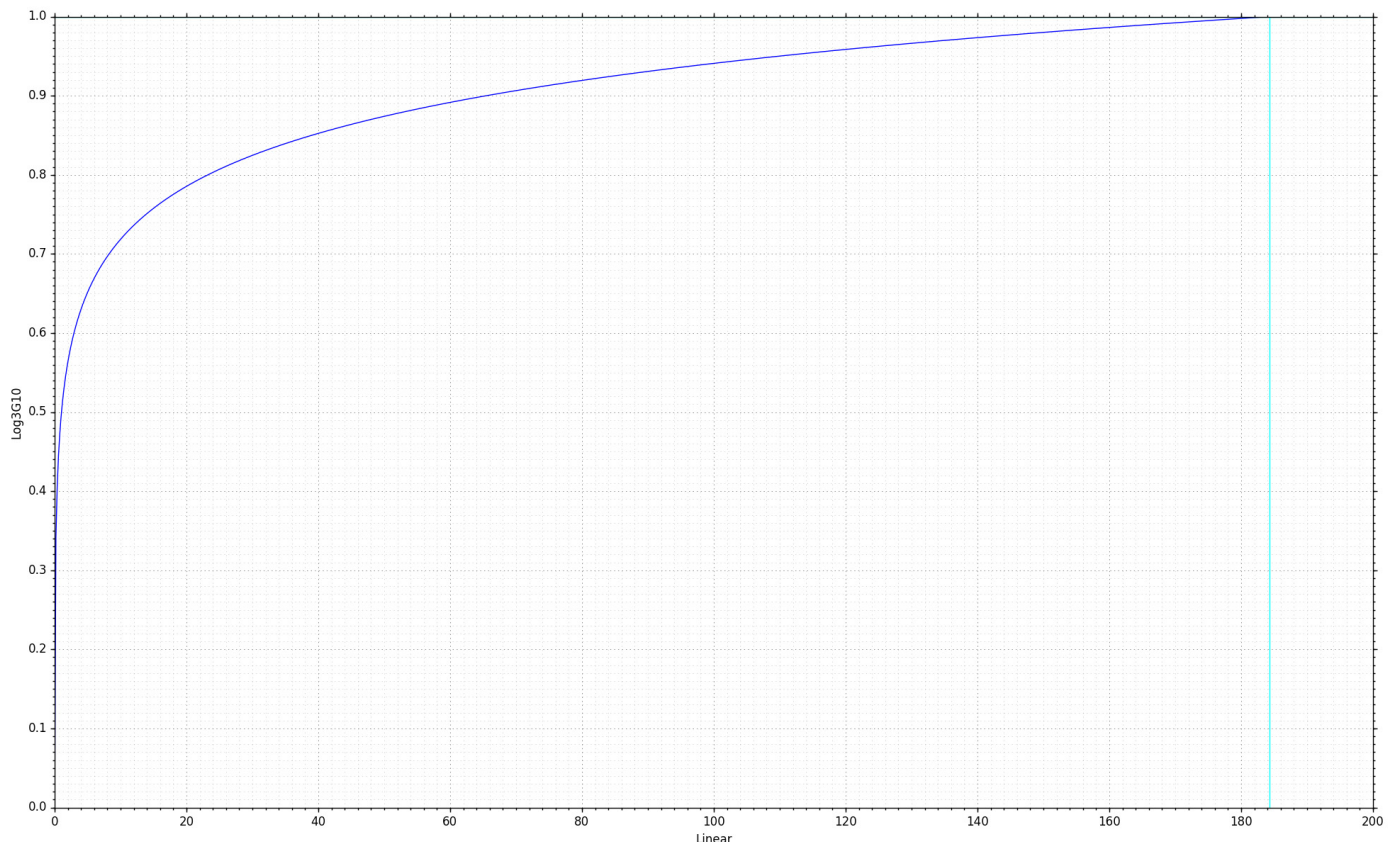

Figure 1.

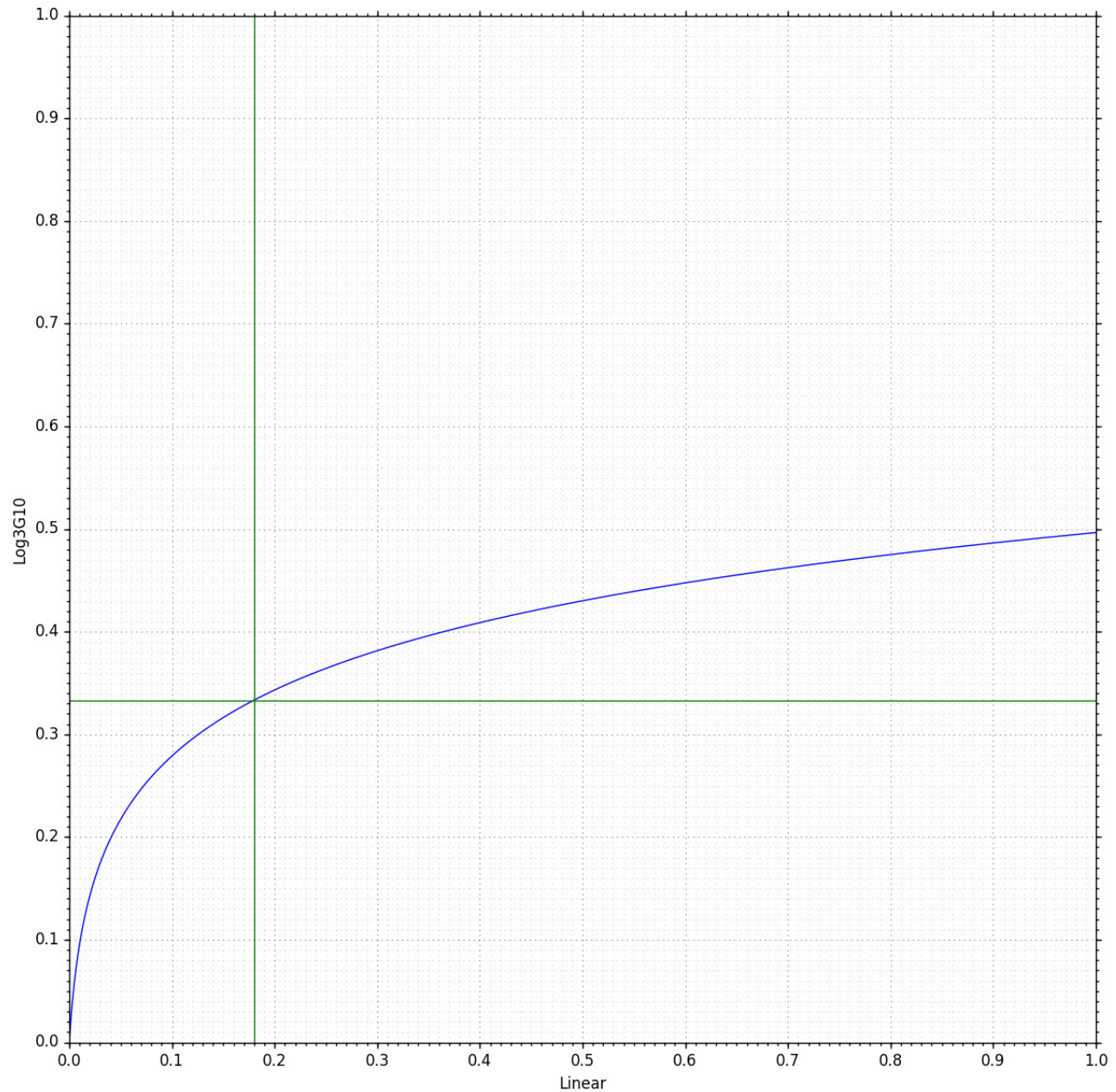The Log3G10 curve zoomed into the origin shows 18% mid grey gets encoded as 1/3.

Figure 2.

EQUATIONS

Log3G10 is defined by two parameters "a" and "b", and an offset "c".

a = 0.224282
b = 155.975327
c = 0.01

To extend a linear section for values lower than -0.01, the gradient at zero is:

g = 15.1927

To encode a linear light float value (i.e. 18% mid grey is represented as 0.18) use:

```
float log3G10Inverse(float x)
{
      const float a = 0.224282f;
      const float b = 155.975327f;
      const float c = 0.01f;
      const float g = 15.1927f;

      if (x < 0.0f) {
            return (x/g)-c;
      }
      const float output = (powf(10.0f,x/a)-1.0f) / b;
      return output - c;

}

float log3G10(float x)
{
      const float a = 0.224282f;
      const float b = 155.975327f;
      const float c = 0.01f;
      const float g = 15.1927f;

      x = x + c;

      if (x < 0.0f) {
            return x*g;
      }

      const float output = a*log10f((x*b)+1.0f);
      return output;

}
```

LOG3G10 MAPPING VALUES

INPUT VALUE	LOG3G10 ENCODED VALUE
-0.010000	0.000000
0.000000	0.091551
0.180000	0.333333
1.000000	0.493449
184.322	1.000000