Panasonic

VARICAM

V-Log/V-Gamut

REFERENCE MANUAL

November 28, 2014

Revision history

Revision	Date	Explanation
Rev.1.0	November 28, 2014	First Edition

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1. Introduction

This document describes technical information on the log curve and gamut used in Panasonic's "Varicam" for utilization in recording and workflow composition.

V-Log has characteristics similar to a log curve of a scan from negative film and is highly compatible with conventional firm workflow. Light information collected via a lens is converted to electronic information by sensors. In other words, light information and electronic information have a proportional relation. Log curve characteristics show the relationship between the linear domain video signal and exposure measured in stops, and a change in each stop of exposure increases or decreases the signal by almost the same amount.

2. Curve Characteristics

Fig. 2.1 shows the characteristics of V-Log. This graph is defined as the x axis being exposure and the y axis being 10bit code values. Fig. 2.2 shows reflection and code assignment. Gray output code with reflection of 18% is defined as 433, black output code with reflection of 0% as 128, and white output code with reflection of 90% as 602. Varicam also supports 12bitV-Log output, and a value four times that of 10bit code is the output code with 12bit code.

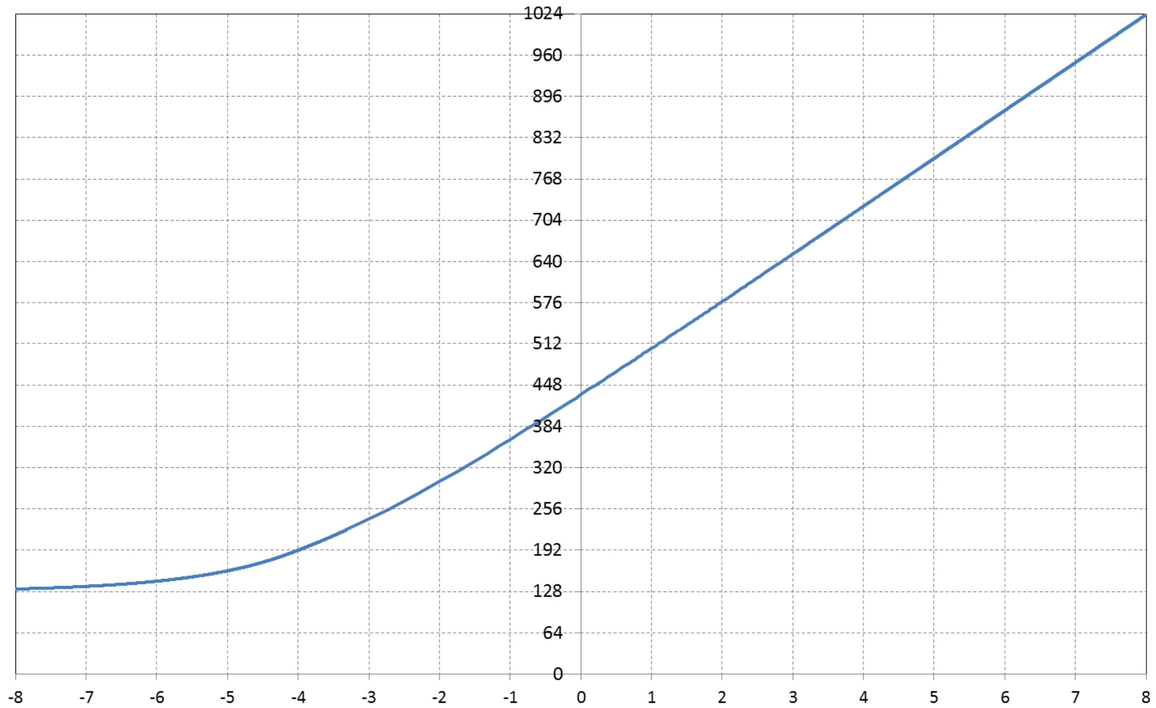

Fig.2.1 V-Log characteristics

Input reflection [%]	V-Log		
	IRE [%]	10bit Code Value	12bit Code Value
0	7.3	128	512
18	42	433	1732
90	61	602	2408

Fig.2.2 V-Log Code Value

3. V-Log Formula

3.1 Scene Linear Reflection to V-Log

The function for converting from linear signal to V-Log data is as follows. With linear reflection as “in” and V-Log data as “out”,

out = 5.6*in+0.125 (in < cut1)

out = c*$\log_{10}$(in+b)+d (in >= cut1)

cut1 = 0.01, b=0.00873, c=0.241514, d=0.598206

However, 0<=out<=1

3.2 V-Log to Scene Linear Reflection

The function for reverting compressed V-Log data to linear refection is as follows. With V-Log data as “in” and linear reflection as “out”,

out = (in - 0.125) / 5.6 (in < cut2)

out = pow(10.0, ((in - d) / c)) – b (in >= cut2)

cut2 = 0.181However, 0<=in<=1

3.3 V-Log 10bit code to Scene Linear Reflection

This shows an example of converting 10bit code value V-Log data to linear reflection using the above-mentioned inverse function. However, V-Log 10bit code value is IN10BIT.

in = IN10BIT/1023

out = (in - 0.125) / 5.6 (in < cut2)

out = pow(10.0, ((in - d) / c)) – b (in >= cut2)

4. Colorimetric Information

4.1 V-Gamut

Super35mm Sensors in the Varicam 35 achieve wide color gamut V-Gamut by optimizing the on-chip filter characteristics for splitting light into RGB. V-Gamut is therefore the optimum color space as a master archive, and video production with high color reproducibility is possible by converting to P3DCI color space and ITU-R BT.709 color space in post-processing. V-Gamut can also enable operation of subsequent stage color conversion in a common conversion matrix through chromatic adaptation processing.

The following is wide gamut RGB primary, and White point is defined in the D65 color space.

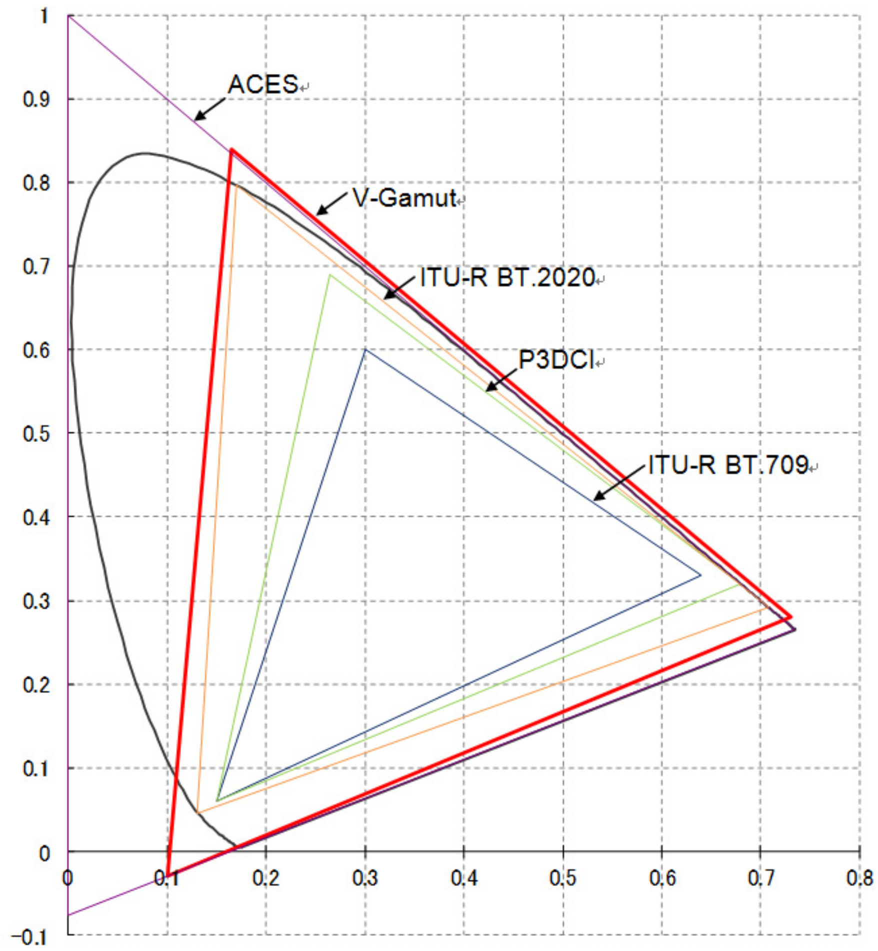

Fig.4.1 V-Gamut

	x	y
R	0.730	0.280
G	0.165	0.840
B	0.100	-0.030
White(D65)	0.3127	0.3290

Fig.4.2 V-Gamut RGB primary

4.2 Gamut Conversion Matrix

The V-Gamut RGB to CIE 1931 XYZ conversion matrix is shown below.

0.679644	0.152211	0.118600
0.260686	0.774894	-0.035580
-0.009310	-0.004612	1.102980

The CIE 1931 XYZ to V-Gamut RGB conversion matrix is shown below.

1.589012	-0.313204	-0.180965
-0.534053	1.396011	0.102458
0.011179	0.003194	0.905535

The V-Gamut RGB to ITU-R BT.709 RGB conversion matrix is shown below.

1.806576	-0.695697	-0.110879
-0.170090	1.305955	-0.135865
-0.025206	-0.154468	1.179674

The V-Gamut RGB to ACES RGB conversion matrix is defined as a matrix including chromatic adaptation and is shown below.

0.724383	0.166748	0.108497
0.021354	0.985138	-0.006319
-0.009234	-0.001043	1.010273

5. Appendix

Here, the clip level of Varicam 35 (model number AU-V35C1G/AU-VREC1G) and Varicam HS (model number AU-V23HS1G/AU-VREC1G) is expressed in 10bit code. Firmware version is shown individually.

Varicam 35 (Firmware version1.15 or higher)

ISO	Clipping Level 10bit code
800	911
1000	911
1250	911
1600	911
2000	911
2500	911
3200	911
4000	911
5000	911
6400	911
8000	911
10000	911
12800	911

Varicam HS (Firmware version1.15 or higher)

ISO	Clipping Level 10bit code
2500	896
3200	896
4000	896
5000	896
6400	896
8000	896
10000	896
12800	896