

Technical Summary for S-Gamut3.Cine/S-Log3 and S-Gamut3/S-Log3

Introduction

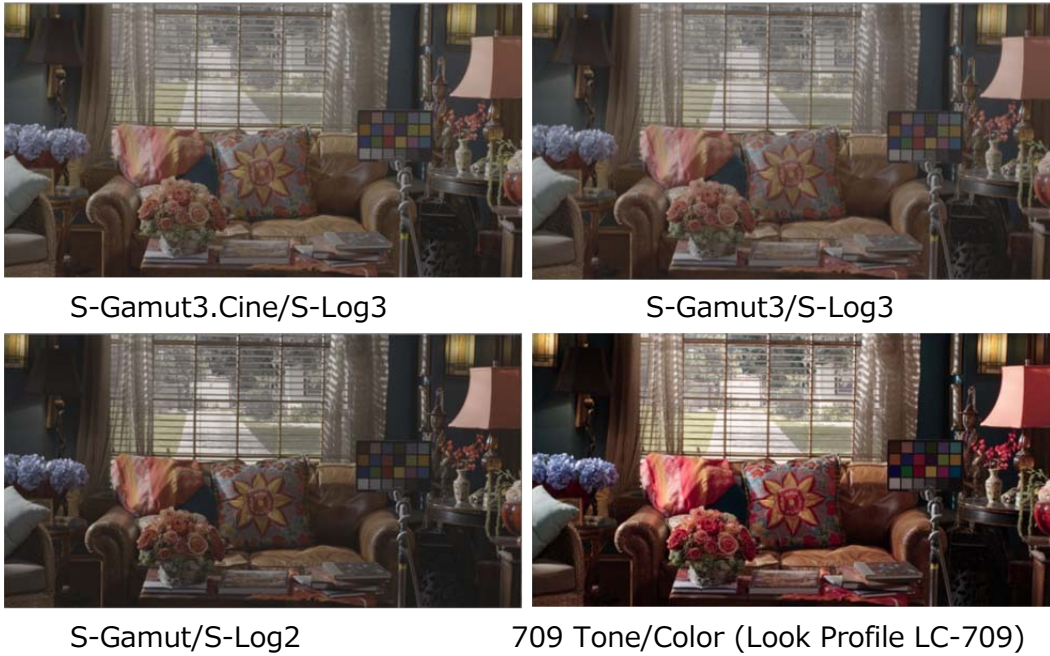
F65, F55 and F5 will add two new color grading spaces, “S-Gamut3.Cine/S-Log3” and “S-Gamut3/S-Log3”. This document provides a technical summary of the new color grading space for people who are familiar with Log Base Grading.

“S-Gamut3.Cine/S-Log3” is designed for more like pure log workflow. Color space is similar to negative film scan which is used for TV production, film out and digital cinema. Color reproduction is designed slightly wider than DCI-P3 to provide ample room of grading. Tone curve is more like pure log encoding characteristics preserving more tonal gradations in the blacks, and has good compatibility with Cineon workflow.

“S-Gamut3/S-Log3” is very close to camera native color, and is very good for archiving as a digital camera negative, as 8/10/12bit code value. Color space of S-Gamut3 is kept the same area of original S-Gamut, though color reproduction inside S-Gamut3 is more accurate than S-Gamut.

Color space setting of “S-Gamut3.Cine/S-Log3” and “S-Gamut3/S-Log3” will be recorded XAVC, HDCAM SR and MPEG50 in the F55 and F5 cameras, and with HDCAM SR in the F65 camera. These color spaces are not applied to 16bit RAW linear recording, in this case only the color space metadata is saved. Both color spaces can be applied to RAW data during the De-Bayer process.

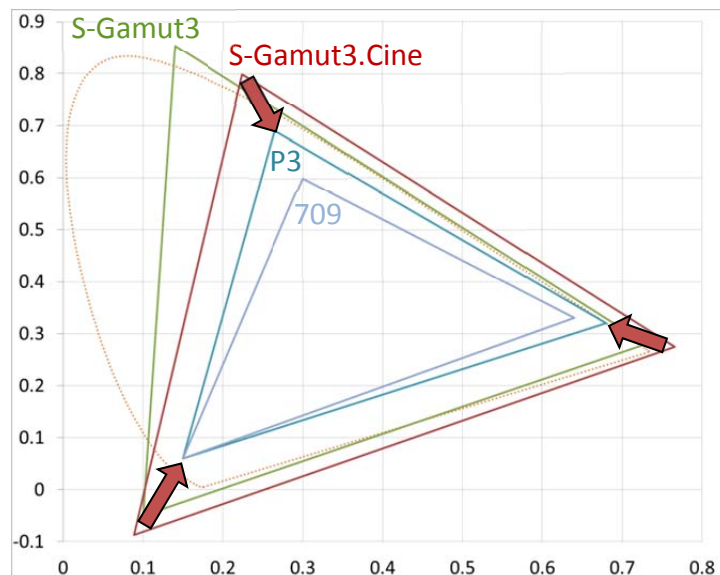
S-Gamut/S-Log2 selection is still available in the camera and workflow tools to maintain backward compatibility. S-Gamut and S-Log2 are not combined to new S-Log3, S-Gamut3.Cine and S-Gamut3 to simplify user interface.



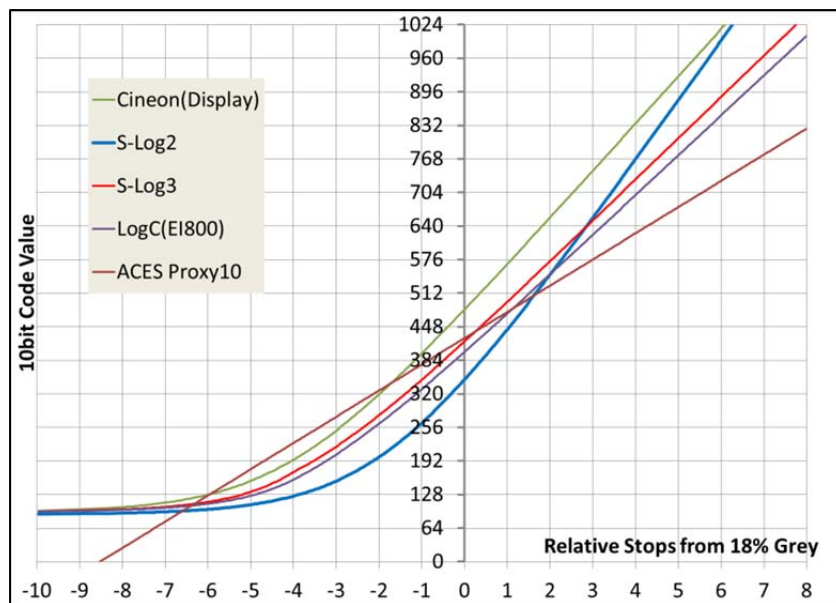
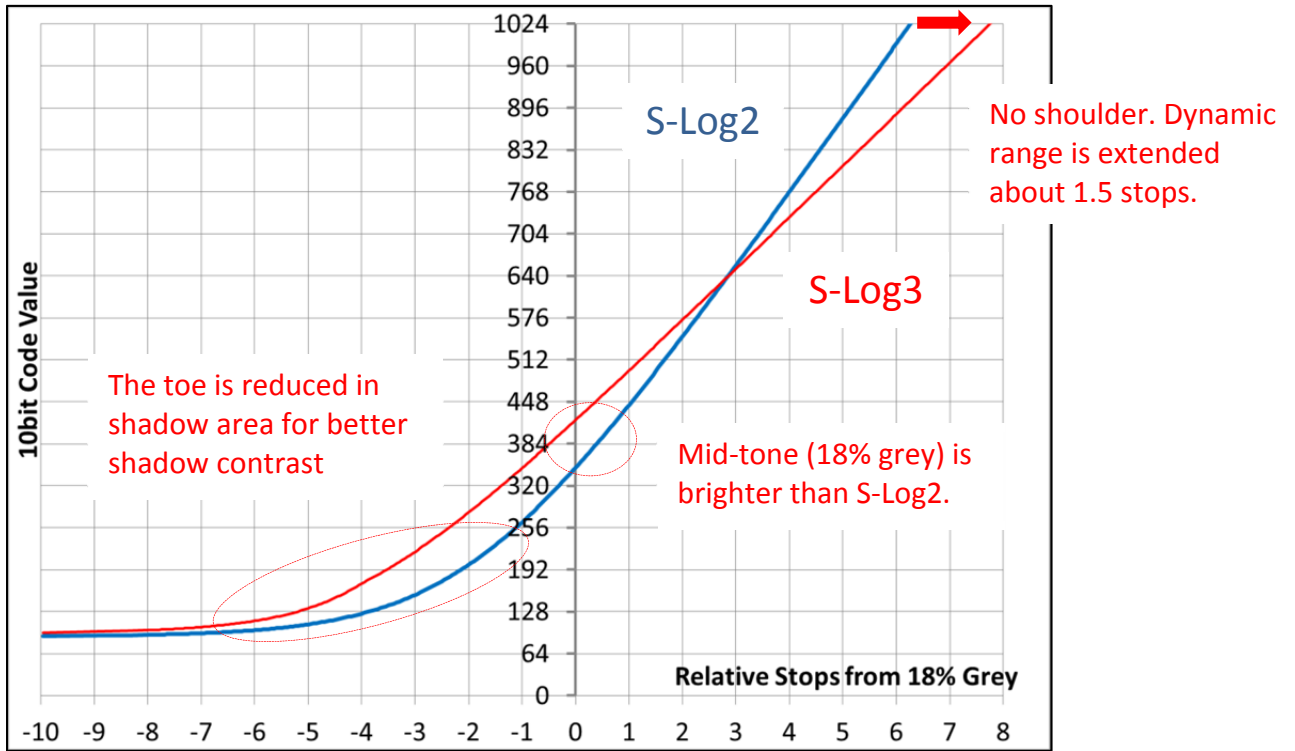
S-Gamut3.Cine/S-Log3

S-Gamut3.Cine is similar to negative film scan which was used for TV production, film out digital cinema. Color reproduction is designed slightly wider than DCI-P3 to provide ample room for grading. Thus manual grading for P3 becomes easier. S-Gamut3.Cine is more convenient to grade than S-Gamut3 and S-Gamut as camera digital negative.

If you would like to apply print film emulation, please increase saturation to about 1.4. Sony also provides .cube files (Look Profile) to convert 709 video color space.



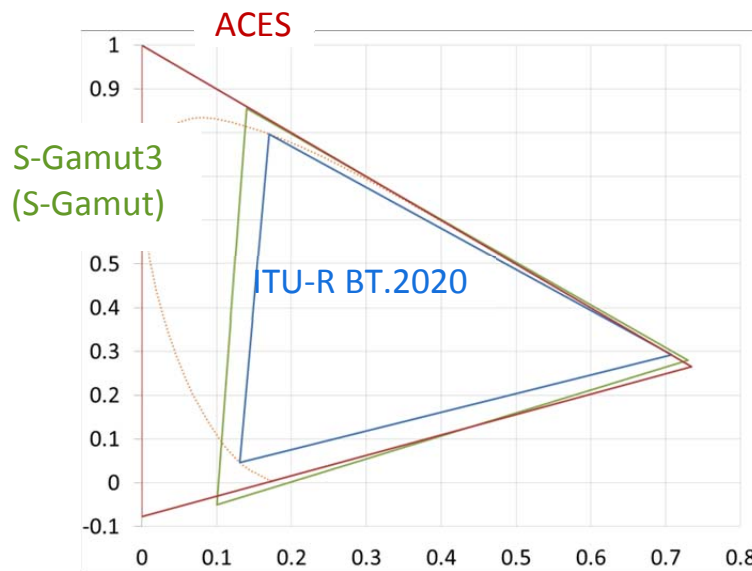
S-Log3 is based on Cineon Digital Negative revised in 2007. S-Log3 tone curve has no shoulder and is reduced the toe (non-linear curve in shadow area). It is more like a pure log encoding than S-Log2 to provide better log based grading (See chart below). Mid-tone value; 18% grey is brighter than S-Log2. S-Log3 has 1.5 stops wider dynamic range than S-Log2, covering the full EI range. It is not necessary to change the conversion formula for each EI setting.



S-Log3 Comparison with other Log curve

S-Gamut3/S-Log3

S-Gamut3 is almost camera native color space, and wider than S-Gamut3.Cine. So this space is best for ACES, ITU-R BT.2020 and camera data archiving use. The color primaries (edge of color space triangle) of S-Gamut3 are the same as conventional S-Gamut. Current S-Gamut needs color temperature setting to select color conversion matrix. But S-Gamut3 is optimized to combine these color conversion matrix. The conversion matrix does not depend on color temperature any more. The ACES IDT for S-Gamut3 becomes simpler than S-Gamut.



ITU-R BT.2020 is color space of UHDTV (Ultra-high definition television).

Launch schedule

F55/F5

S-Gamut3.Cine/S-Log3 has been implemented from V3.0 in January 2014.

S-Gamut3/S-Log3 will be implemented around in spring 2014.

These setting are placed at System - Base Setting page.



F65

S-Gamut3.Cine/S-Log3 and S-Gamut3/S-Log3 will be implemented in spring 2014.

RAW Viewer

S-Gamut3.Cine/S-Log3 and S-Gamut3/S-Log3 has been implemented from V2.1 in January/2014.

FAQ

Q1. Are S-Log3, S-Gamut3.Cine and S-Gamut3 successors to the current S-Log2 and S-Gamut?

A1. No. We will provide options for a while. Camera and Software tools do not eliminate current S-Log2 and S-Gamut. To reduce complexity of user interface, S-Log3 is always combined with the new S-Gamut3.Cine or S-Gamut3 in the camera menu.

Q2. How about supporting status of other tool vendors and post production?

A2. We communicate regularly with each stakeholder. We will update the schedule when we get information for implementation.

Q3. Will Sony provide 3D-LUT for 709 color space?

A3. Yes. We will provide 3D LUT (Look Profiles) for S-Gamut3.Cine/S-Log3 like current S-Gamut/S-Log2 Look Profiles. We will let you know soon.

<http://community.sony.com/t5/F5-F55/NEW-3D-LUT-s-for-F55-and-F65/m-p/135617#U135617>

Q4. Is S-Log3 Full (Extended) range or Legal range?

A4. S-Log3 is recorded as Full range in XAVC, MPEG and HDCAM SR File. Camera SDI output is also Full range every time. There is no option to select Legal range to prevent miss operation. Full (Extended) range: Data range is used from 0 to 1023 (from -7IRE to 109IRE) to utilize full 10bit code value. SDI treat valid data from 4 to 1019, but definition of Full (Extended) does not change between file and SDI.

Legal range: Data range is scaled and limited from 64 to 940 (from 0IRE to 100IRE) in 10bit code value.

Q5. Which is the best selection to use ACES workflow?

A5. We recommend using S-Gamut3/S-Log3 for ACES as recording of 10bit MXF. S-Gamut3.Cine is narrower than S-Gamut3 and good for DCI-P3 grading.

Q6. Which color space and log are used for RAW recording?

A6. RAW is sensor native data and RAW does not apply any color space nor log curve. RAW is always recorded by 16bit Scene linear. S-Log3 is designed to utilize 8/10/12bit code value to reserve wide dynamic range effectively for 444 or 422 recording.

Appendix

S-Log3 Formula

Scene Linear Reflection to S-Log3

If $in \geq 0.01125000$

$$out = (420.0 + \log_{10}((in + 0.01) / (0.18 + 0.01)) * 261.5) / 1023.0$$

else

$$out = (in * (171.2102946929 - 95.0) / 0.01125000 + 95.0) / 1023.0$$

in = reflection

$$reflection = IRE * 0.9$$

out 0.0 - 1.0

if you need 10bit code for "out".

$$10bit\ code = Round(out * 1023.0)$$

S-Log3 to Scene Linear Reflection

If $in \geq 171.2102946929 / 1023.0$

$$out = (10.0 ^ ((in * 1023.0 - 420.0) / 261.5)) * (0.18 + 0.01) - 0.01$$

else

$$out = (in * 1023.0 - 95.0) * 0.01125000 / (171.2102946929 - 95.0)$$

in 0.0 - 1.0

out = reflection

$$reflection = IRE * 0.9$$

if you use 10bit code for "in"

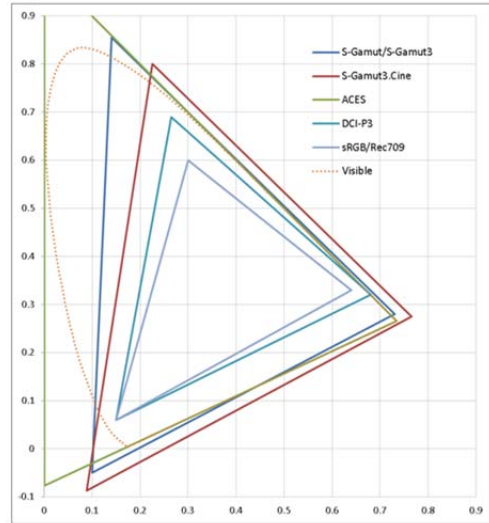
$$in = S-Log3\ 10bit\ Code / 1023.0$$

S-Log3 10bit code values (18%, 90%)

Input reflection	0% Black (IRE0%)		18% Grey (IRE20%)		90% White (IRE100%)	
	IRE	CV	IRE	CV	IRE	CV
S-Log3	3.5%	95	41%	420	61%	598
S-Log2	3.0%	90	32%	347	59%	582
S-Log	3.0%	90	38%	394	65%	636

Color Primaries and conversion matrix

		x	y
S-Gamut3.Cine	Red Primary	0.76600	0.27500
	Green Primary	0.22500	0.80000
	Blue Primary	0.08900	-0.08700
	White(D65)	0.31270	0.32900
S-Gamut/ S-Gamut3	Red Primary	0.73000	0.28000
	Green Primary	0.14000	0.85500
	Blue Primary	0.10000	-0.05000
	White(D65)	0.31270	0.32900
DCI-P3	Red Primary	0.68000	0.32000
	Green Primary	0.26500	0.69000
	Blue Primary	0.15000	0.06000
	White(DCI)	0.31400	0.35100
sRGB/Rec709	Red Primary	0.64000	0.33000
	Green Primary	0.30000	0.60000
	Blue Primary	0.15000	0.06000
	White(D65)	0.31270	0.32900
ACES-Gamut	Red Primary	0.73470	0.26530
	Green Primary	0.00000	1.00000
	Blue Primary	0.00010	-0.07700
	White(Approx.D60)	0.32168	0.33767



Reference

- <http://en.wikipedia.org/wiki/SRGB>
- http://www.digitalpreservation.gov/partners/ampas/high/IIF_Overview_August_2010.pdf