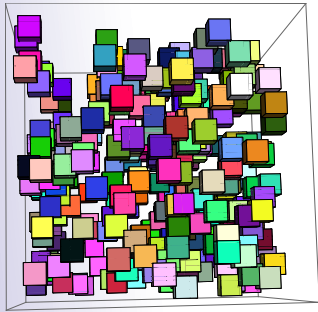


Announcing a workshop with Charles Poynton

Linear, log RGB, log neg, and Cineon printing density: What's in your DPX file?



Spring, 2010

I expect to present this workshop in New York City in the late spring.

July, 2010

I expect to present this workshop in Cape Town.

DI houses and VFX houses are faced with a proliferation of acquisition formats including log RGB ("quasilog," such as FilmStream, Panalog, and S-log), log neg (Cineon Printing Density), and "Rec. 709" in various forms (HyperGamma, Cine Gamma etc.). In addition, DI houses and VFX houses are presented with many formats described by DITs as "linear" but for which an 18% grey card does not approximate a signal code of 18 on a scale of 0 to 100! Any of these formats can appear in DPX files, but such files rarely contain sufficient metadata to identify the colour encoding.

In this 1-day workshop, organized by [\[TBD\]](#) and hosted at [\[TBD\]](#)'s screening room, [Charles Poynton](#) will introduce the perceptual and mathematical properties of linear-light, power function, and logarithmic encodings. He will detail the parameters of these coding schemes:

- Power function (gamma) encoded BT.709, sRGB, CineGamma, "FILM REC," and HyperGamma, including discussion of KNEE and SLOPE controls;
- Log *RGB* (quasilog/pseudolog) encodings: FilmStream (log₆₀), ARRI log F, Panalog, Sony-log (S-log), REDLOG, SI log₉₀;
- Log neg encodings: Cineon printing density (CPD/DPX), ARRI log C.

He will describe the trade-offs involved in choosing encodings suitable for D-cinema and HD projects; he'll review the bit depth requirements for digital imagery represented in various forms. He'll detail the 1D and 3D LUTs by which encodings are converted. He'll explain the origins of gamma values 1, 1.7, 1.8, 2.0, 2.2, 2.4, 2.6, 2.8, and 3, and explain where each is potentially appropriate at various stages of the DI pipeline.

Who Should Attend: The attendee should be very familiar with digital cinema acquisition, and should be quite comfortable with mathematics, including equations such as $y = mx + b$ and $T = 10^{-b} E^{-m}$. The workshop will be suitable for people in positions such as these:

- Visual effects supervisors, VFX/post-production/DI engineers
- CGI/VFX and digital cinema software developers
- Advanced-level Digital Imaging Technicians (DITs)
- Film scanner, film recorder, and colour grading system engineers

Registration: USD 450, including refreshments. Lunch will be provided; you will have a chance to socialize with your colleagues. Detailed handout notes – some of which form portions of Mr. Poynton's forthcoming book – will be provided. To enroll, e-mail charles@poynton.com, or telephone +1 416 535 7187. Please register early; seating is limited.

[Charles Poynton](#) specializes in the physics, mathematics, and engineering of digital colour imaging systems, including digital HDTV and digital cinema (D-cinema). He is the author of [Digital Video and HDTV Algorithms and Interfaces](#), and a Fellow of both the Society of Motion Picture and Television Engineers (SMPTE) and the BKSTS. He was the founding chairman of the SMPTE committee that developed the DPX standard.

**Linear, log RGB, log neg, and Cineon printing density:
What's in your DPX file?**

Introduction: Two views of imaging – the engineering view and the creative view; picture rendering and image state; establishing and preserving creative intent. Logarithms, exponentials, and power functions; the zone system; introduction to radiometry and photometry (lumens, lux, candelas, and $\text{cd}\cdot\text{m}^{-2}$ ["nit," nt]).

Visual perception: Perceptual uniformity; lightness terminology; contrast ratio and its measurement(s); Lightness (CIE L^*), colour appearance, viewing conditions; picture rendering and image state; colorimetric matching and appearance matching.

Linear-light: Additive reproduction; XYZ , RGB , and LMS tristimulus values; CIE $[x, y]$ chromaticity; gamut limitations; bit depths; code efficiency and its visual impact; OpenEXR; colour implications of "raw" workflows.

Gamma encoding: OECF and EOCF; studio reference displays (CRTs and emergent LCDs); emergent display standards; power function (BT.709) encoding and its variants (HyperGamma, FILM REC, Cine Gamma); gamma 1.0, 1.7, 1.8, 2.0, 2.2, 2.4, 2.6, 2.8, and 3 in video, HDTV, CGI, and film, 1-D LUTs; DCI $RGB^{1/2.6}$ and $XYZ^{1/2.6}$ encoding; studio-swing ("normal") and full-swing (extended/extreme); sRGB, treatment of the "linear segment."

Quasilog (log RGB) encoding: Dynamic range; highlight (specular) handling; noise near black and noise rectification; steps-per-stop; Panalog, FilmStream (\log_{60}), ARRI log F; Sony log, REDLOG, SI-log (\log_{90}).

Log neg (Cineon) coding: Sensitometry and film gamma (D -log E curves); optical density and Beer's Law; "Subtractive" reproduction, non-fixed primaries and unwanted absorptions; "Printer lights"; Cineon printing density (CPD); ARRI log C; colour grading and approval prior to film-out.

Camera characteristics: Saturation, dynamic range, exposure latitude, and ISO/EI ratings; noise; highlight handling; histograms and "exposing to the right" (ETTR); GAMMA, BLACK GAMMA, KNEE POINT, and KNEE SLOPE controls; on-set previsualization and look management; "look" files and ASC color decision lists (CDLs). Characteristics of real cameras: Sony F900/F950/F23, Thomson Viper FilmStream, ARRI D-21, Panavision Genesis, Sony F35, RED ONE, Phantom HD & 65, Silicon Imaging SI-2K, others.

The DI/post/CGI/VFX pipeline: DPX and Cineon files as containers; quasilog (log RGB); log-neg (CPD), and video/HD image data in DPX files; integration of CGI and visual effects; colour characterization and calibration; LUTs: 1-D and 3-D; "view" LUTs and "print" LUTs; introduction to ICC colour management and ICC profiles; DCI standards and the reference projector.