

SMPTE Technology Series Webcast



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New criteria to measure HDR image quality

Pierre (Pete) Routhier, Eng., M.Eng.

Media Production Architect

Canadian Broadcasting Corporation

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pierre.routhier@digitaltroublemaker.com



How do we measure Dynamic Range?



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- The difference between the **largest** and **smallest** values a certain phenomenon can assume



- It is often used in the context of signals, like sound and light
- For light, it is typically expressed as a ratio (displays) or a **base-2 logarithmic function** (cameras)

What does that mean ?



Example - Display

- Brightest illumination level the display can achieve: 1000 nit
- Darkest level the display can achieve: 1 nit
- Contrast ratio = 1000:1

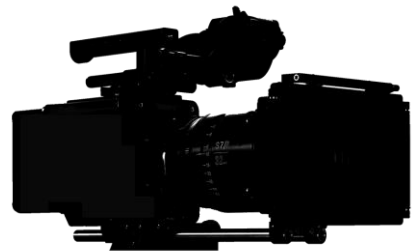


Example - Camera



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- Brightest highlight that can be captured is 20 000 times brighter than the darkest detail
- Contrast ratio = 20 000:1
- Dynamic range = $\log_2 20\,000 = 14.3$ stops



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Are we missing something?



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Dynamic Range = **crude** measure of image quality in HDR



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There's more to a High Dynamic Range image than a ... High Dynamic Range



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- Latitude
- Richness
- Resolution
- Composition



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Latitude (Dynamic Range)



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The ratio from the brightest highlight to the darkest visible element

High Latitude



Low Latitude



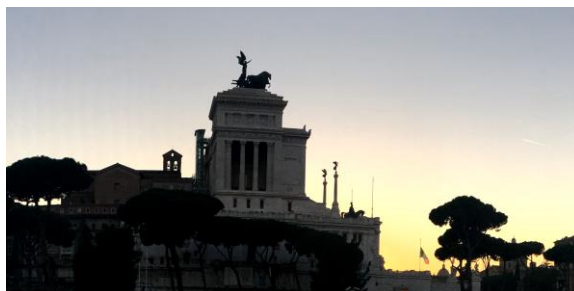
Richness

The distribution of pixels between the brightest highlight and the darkest visible element

High Richness



Low Richness



Resolution

The presence of detail across the image (absence of clipping, noise, banding)

High Resolution



Low Resolution



Composition



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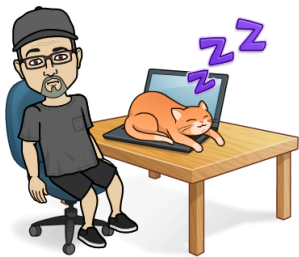
Light bringing focus to the subject of interest in the shot



How do we measure those ?



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► What Are the “Killer Apps” for HDR? Analysis of SDR Assets to Predict the Potential of HDR

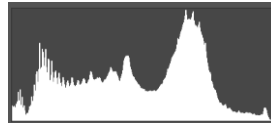


QC Tools



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- Histogrammatic Analysis



- EV Analysis



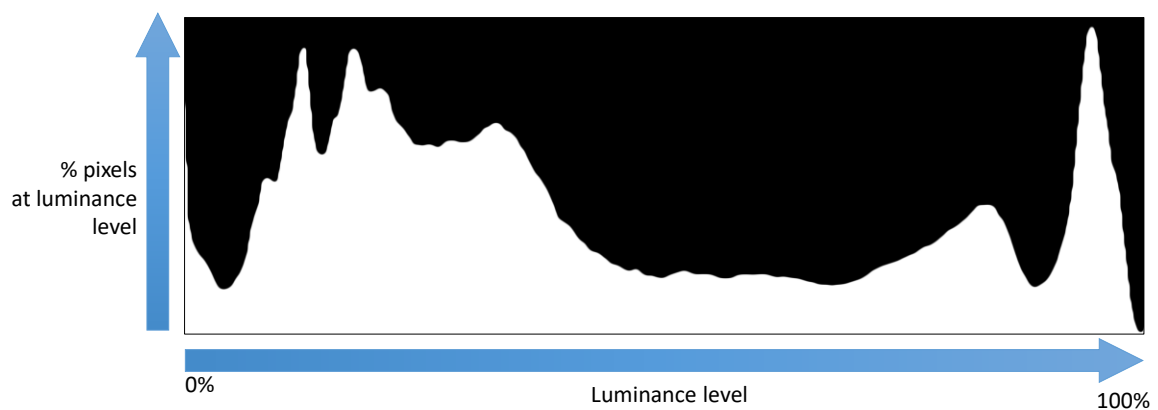
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Luminance Histogram



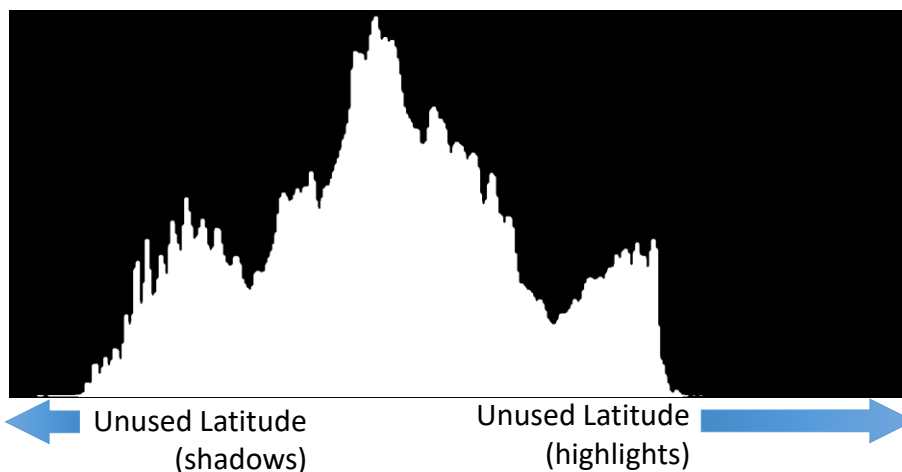
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Narrow Distribution – Poor Latitude



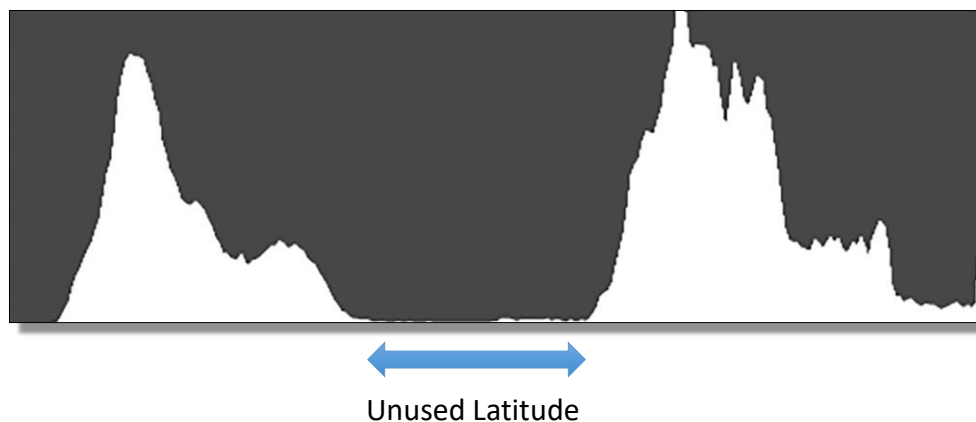
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Split Distribution – Poor Richness



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Clipped Distribution – Poor Resolution



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▲ Dark noise

Clipped highlights ▲

How about Composition?



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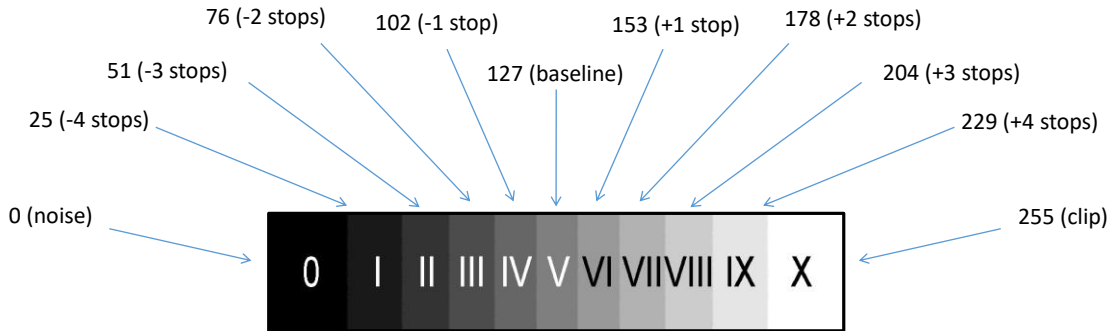
- EV Analysis



Exposure Vs. REC709 Code Values: ≈10 stops over 8 bits



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Exposure: The Ansel Adams Zone System (10 stops)



25
-4.0



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184
+2.25

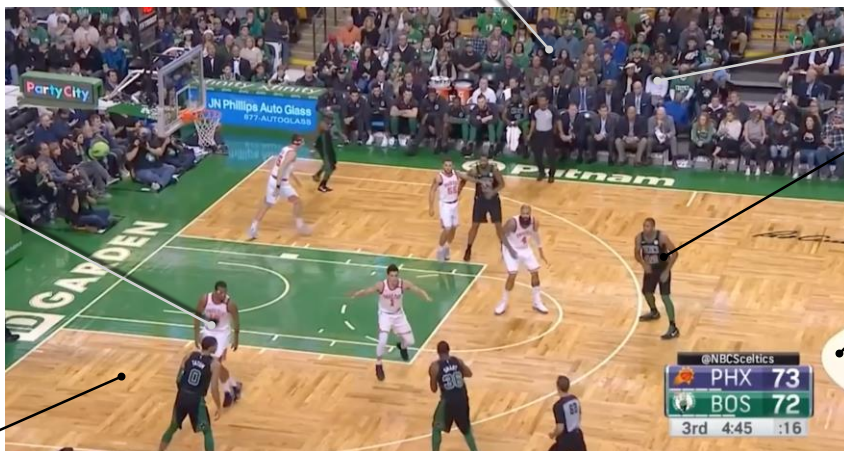
26
-4.0

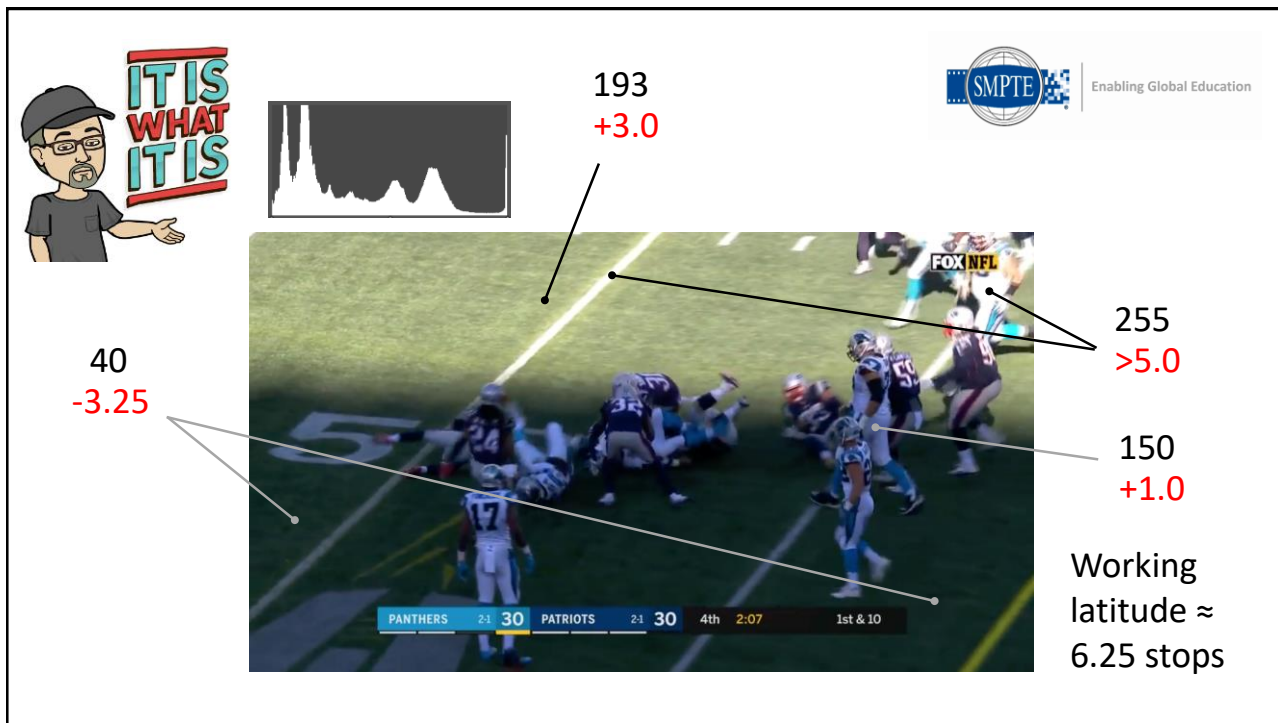
249
+4.75

Working
latitude ≈
8.75 stops

215
+3.5

176
+2.0





We are dealing with MOTION pictures,
however... so:



- Not every frame needs or even should have maximum HDR effect
- Concept of *Light Scripting*

Conclusions



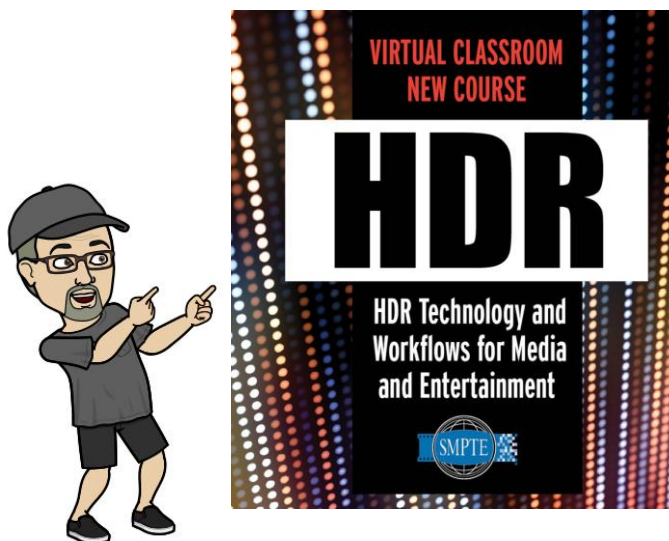
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- 4 key attributes: Latitude, Richness, Resolution, Composition
- There are tools and methodologies to help you develop a critical eye
- HDR needs to be part of lighting and set design in order to take full advantage of the technology

Want to explore further ?



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Q & A

hi



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