Hybrid Log-Gamma HDR

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BBC | Research & Development

Just like conventional TV, HLG is "**scene-referred**"

- Similar to BT.601, BT.709, Slog3, PanaLog etc.,
- The HLG signal describes the **relative** light in the scene
- The camera OETF (opto-electronic transfer function) has primacy

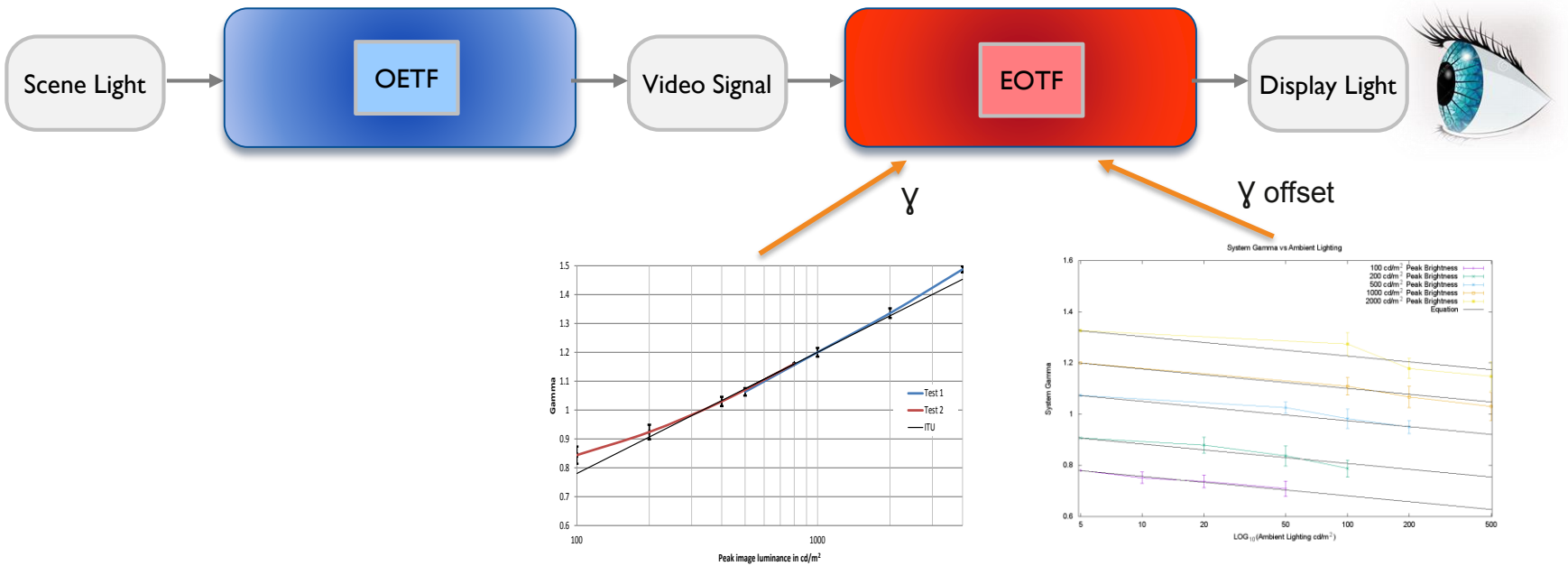
PQ (ST.2084) is "display-referred"

- Just like the DCI standards,
- The signal describes the **absolute** light output from the mastering display
- The display EOTF (electro-optical transfer function) has primacy

As HLG signal describes the scene, no need for mastering display metadata

- Allows use of conventional TV circuits, routers, switchers and codecs
- Even simple metadata prevents, mixes, DVE and complicates graphics

Display EOTF changes to ensure consistent pictures as eye adapts



Display peak luminance
(ITU-R BT.2100)

Display surround luminance
(ITU-R BT.2390)

A single HLG grade for all environments and displays

Recommend
600 to 1000 cd/m^2 “grading”

Code Values 64 - 940

HPA “Planet Earth II” projection

e.g. 400 cd/m^2 home theatre

Code Values 64 – 940

e.g. 1000 cd/m^2 evening viewing

Code Values 64 - 940

e.g. 2000 cd/m^2 daytime viewing

Code Values 64 - 940

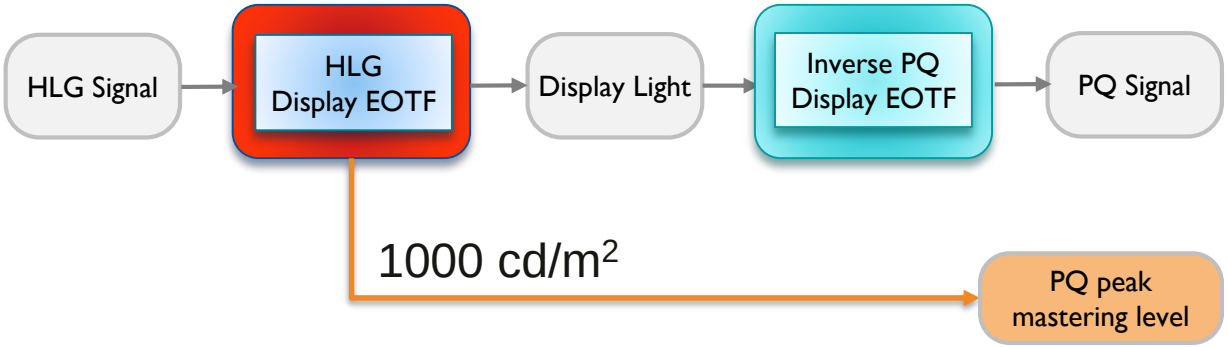
e.g. 4000 cd/m^2 signage display

Code Values 64 - 940

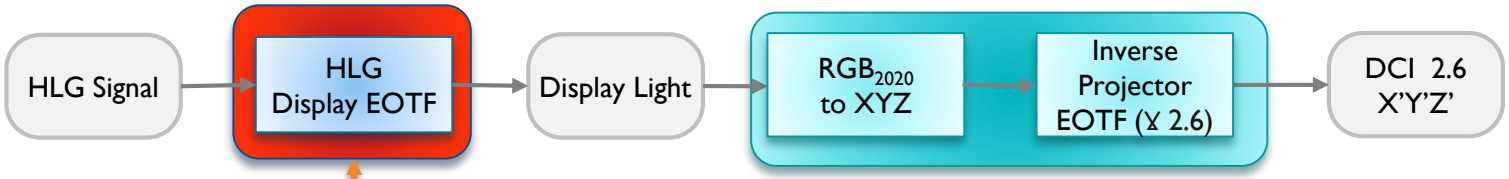
HLG Grading Environment

- In principle, any brightness display can be used
- BT.2100 recommends 1000 cd/m^2 at E'=1.0 (cv 940)
  - Ref. level for graphics (75%) = 203 cd/m^2
- We prefer ~ 600 cd/m^2 at E'=1.0
  - Used for PEII (Dolby PRM4220)
  - A 1000 cd/m^2 display can then show "super-whites"
  - Ref. level for graphics (75%) = ~135 cd/m^2
    - More comfortable viewing
    - Closer to PQ indoor "diffuse white" of 140 cd/m^2
    - Similar to current working practice
- Display surround 5 cd/m^2
  - Dimmer surrounds require higher gamma (BT.2390)

Transcoding HLG to PQ for HDR Blu-Ray



Transcoding HLG for Cinema



0.85
100 cd/m^2 peak
See BT.2390 Figure 22

+ 0.15
Estimate for HPA
See BT.2390 Section 6.2

$$-0.076\log_{10}\left(\frac{L_{amb}}{5}\right)$$

+0.2 likely better for darker exhibition theatres (Based on RP432-2)

Thank you

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