



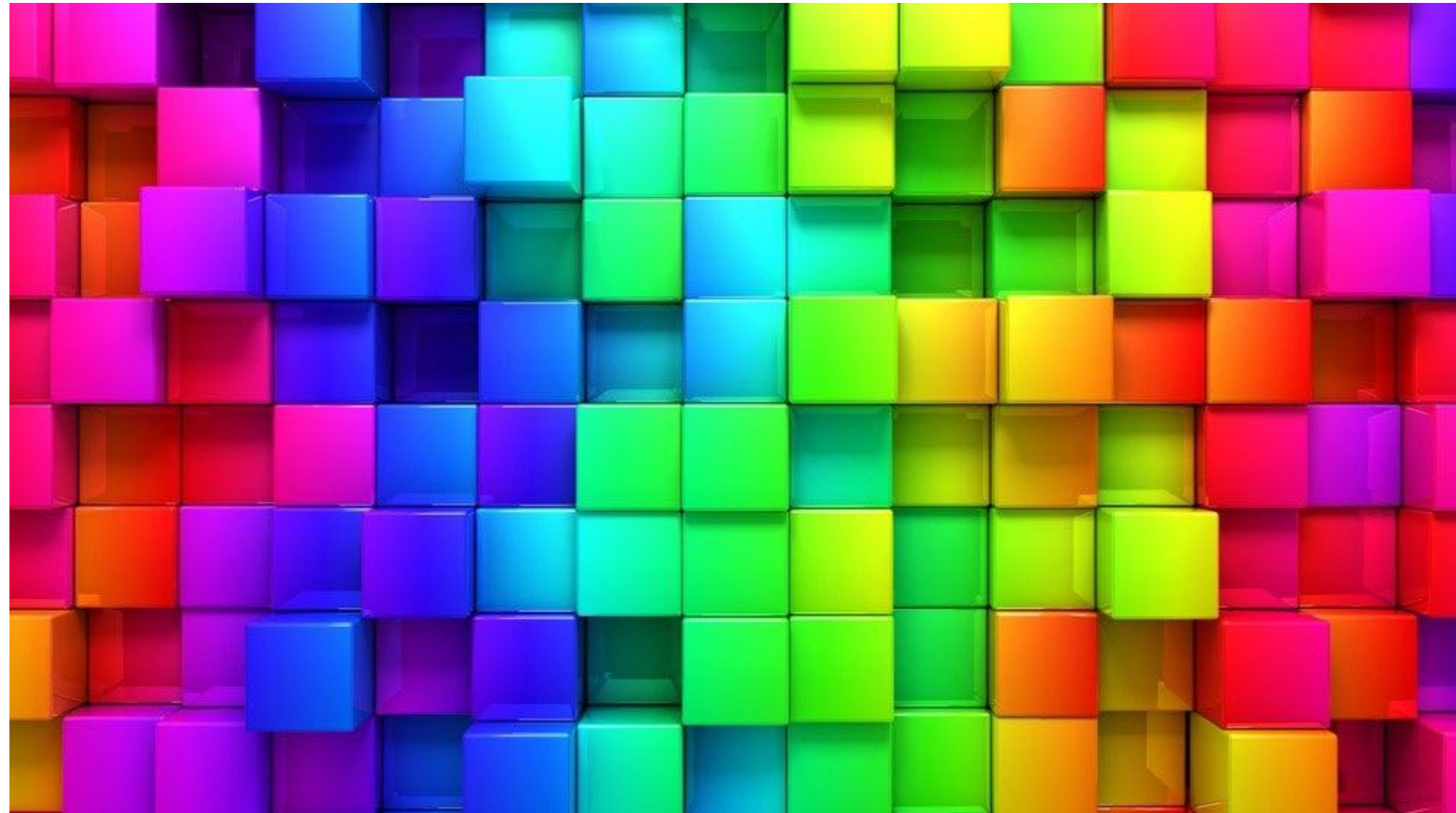
北京国际电影节  
BEIJING INTERNATIONAL FILM FESTIVAL

# Next Generation Cinema: On the Way to HDR

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April 2017

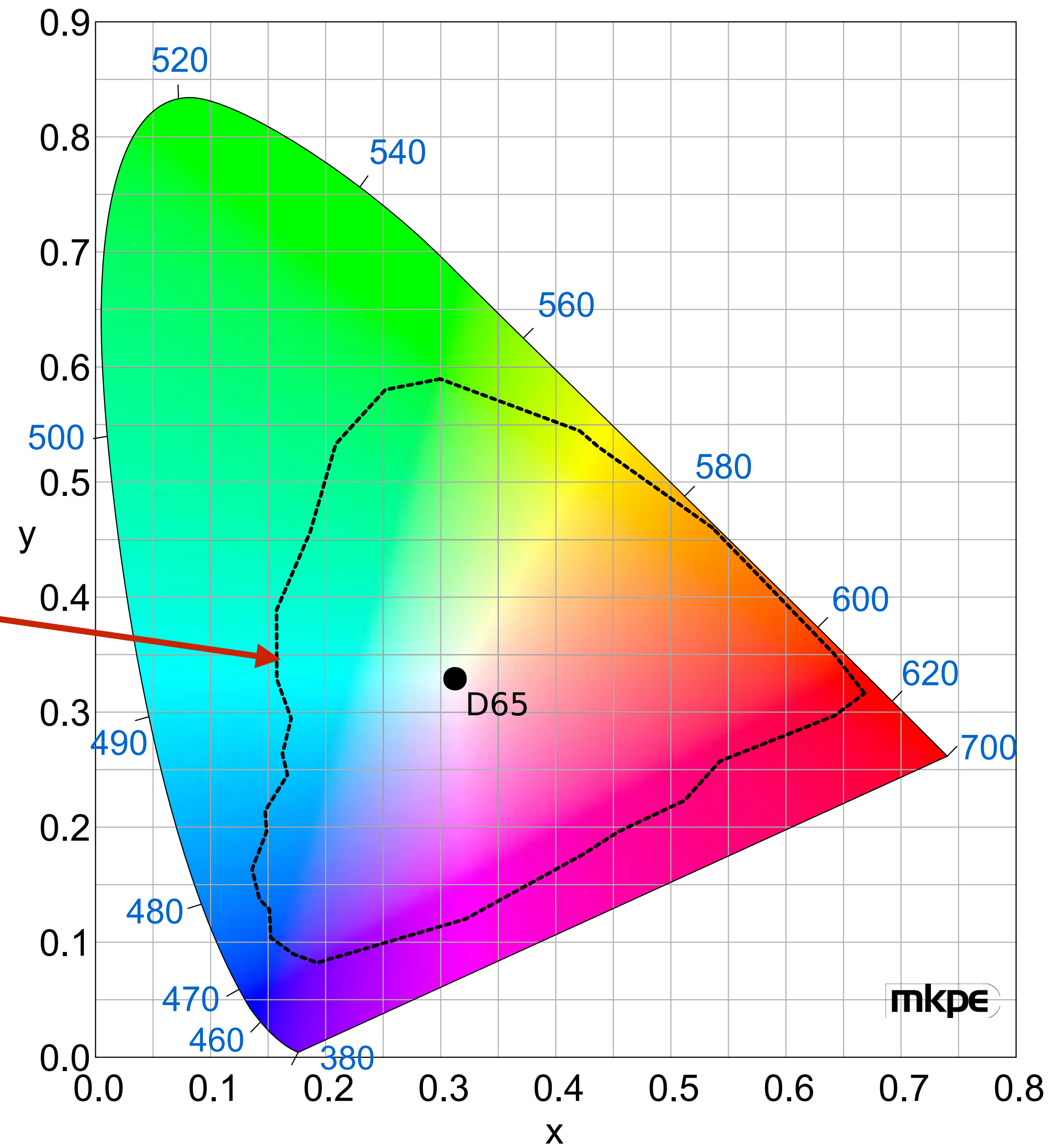
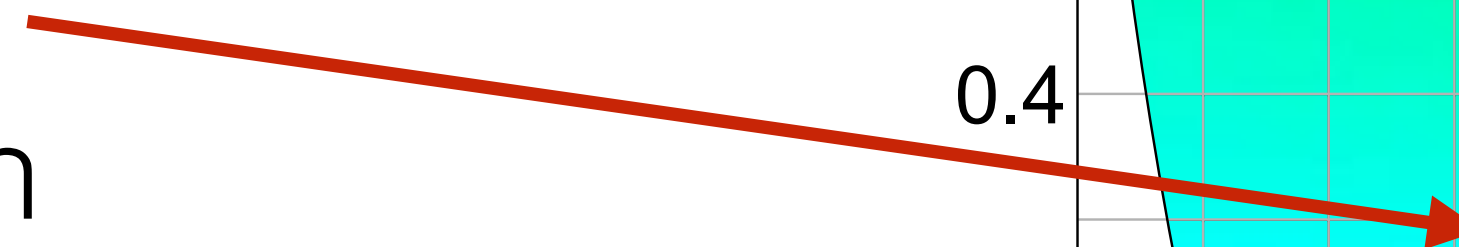




Color

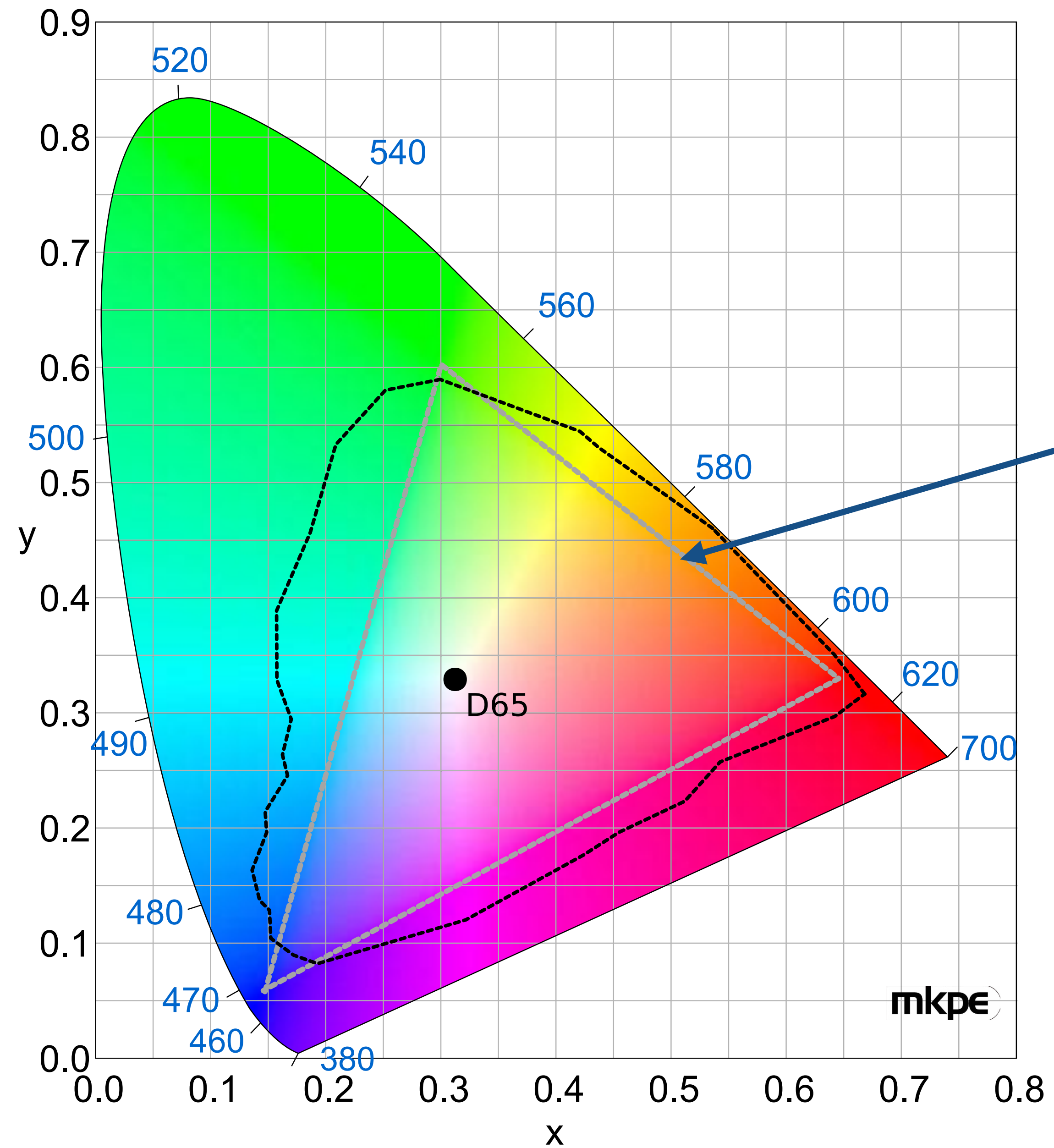
# Pointer's Gamut

The gamut of real surface colors found in nature



# Rec 709

The color gamut for HDTV



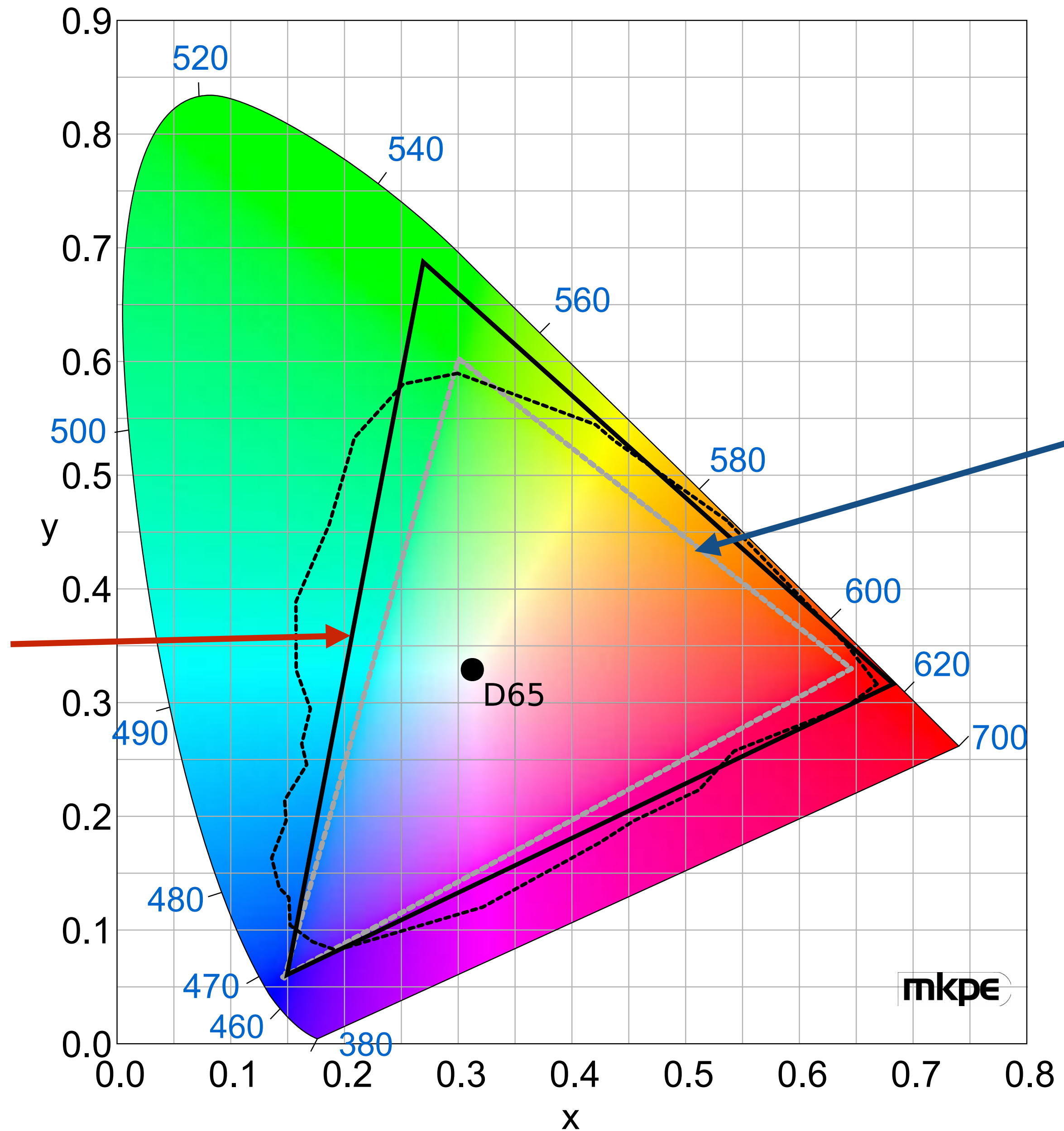
Rec 709

# DCI P3

The *minimum* color space for digital cinema

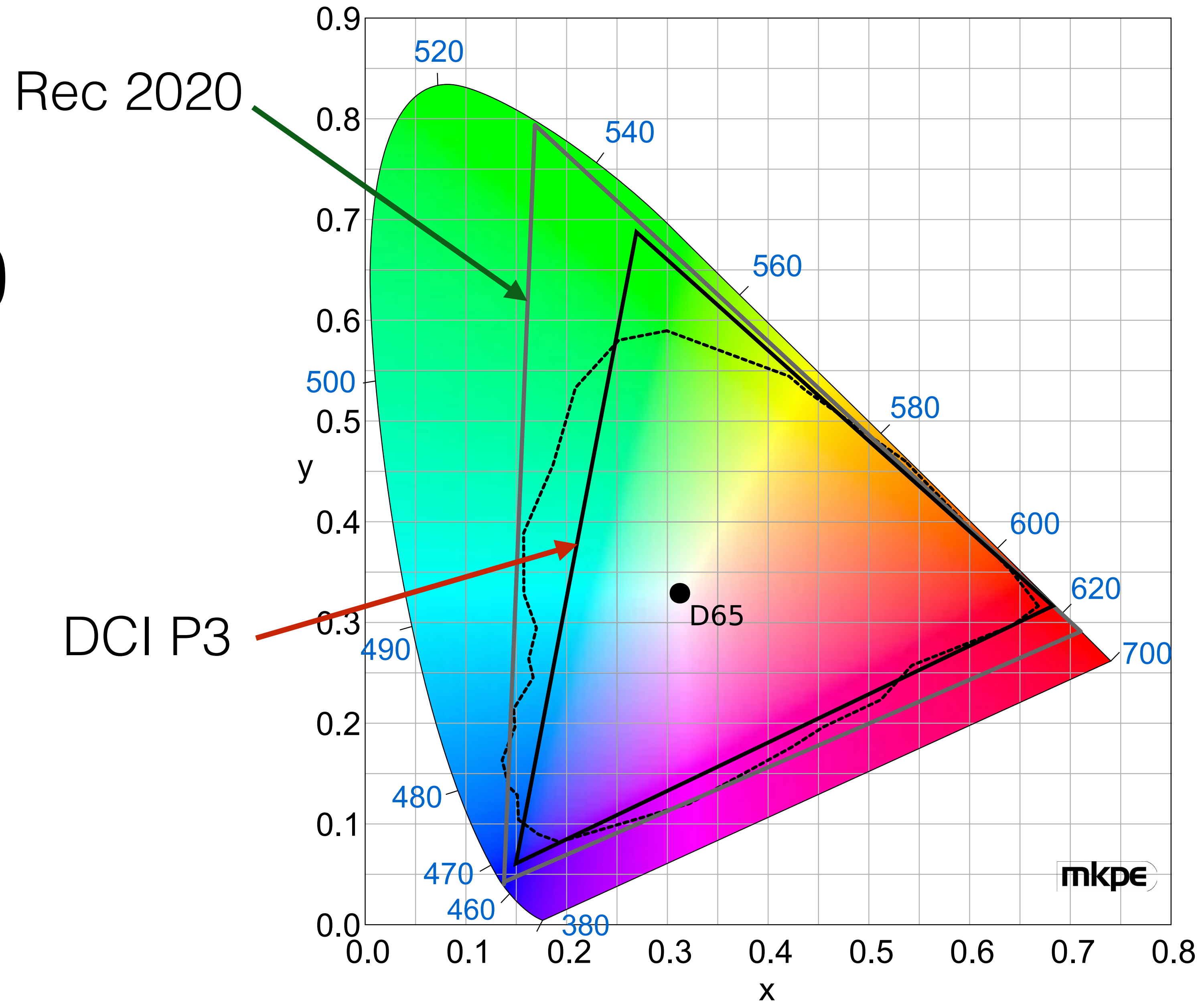
The container gamut is X'Y'Z' defined in SMPTE 428-1

P3

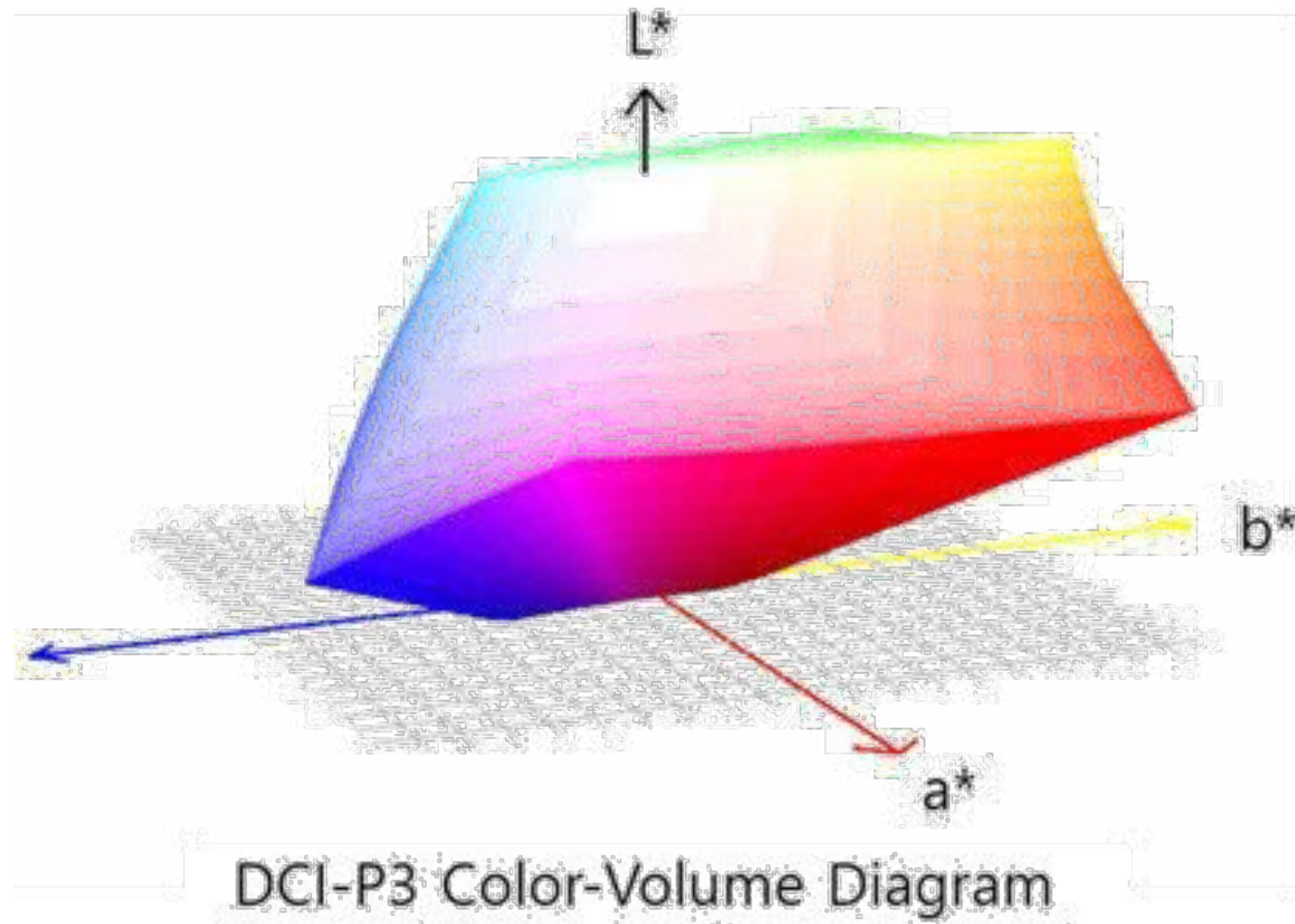


# Rec 2020

The *container*  
color gamut  
for UHD



# Color Volume Matters



source: AVS Forum



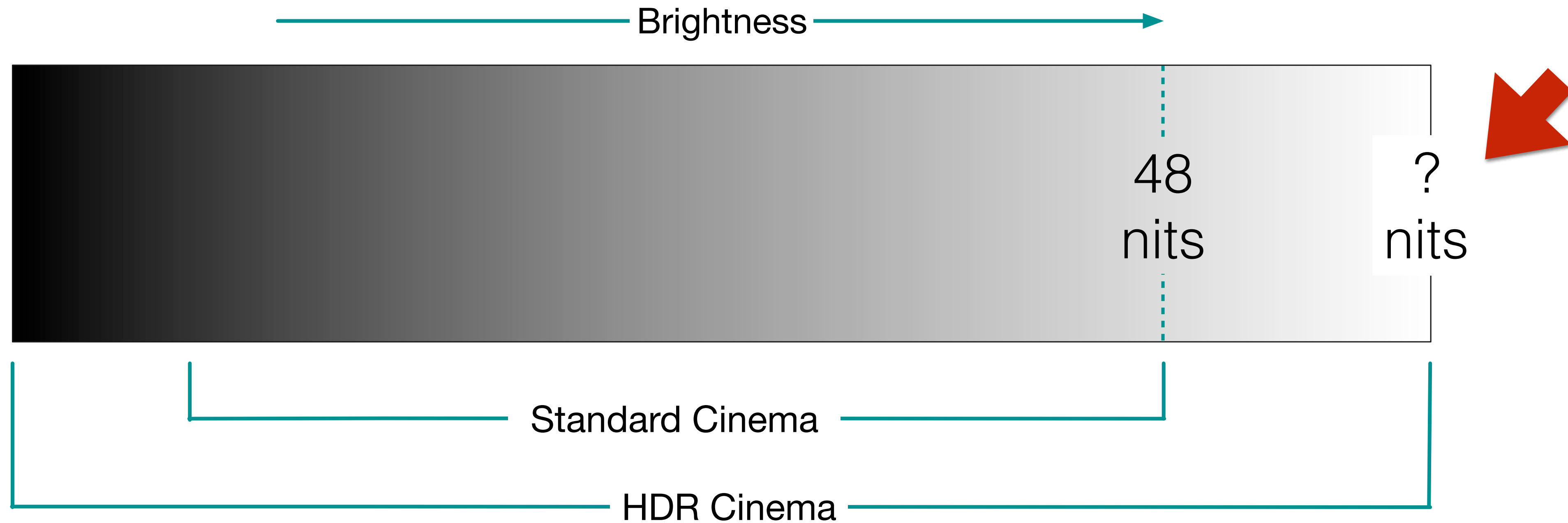
source: Samsung



Light

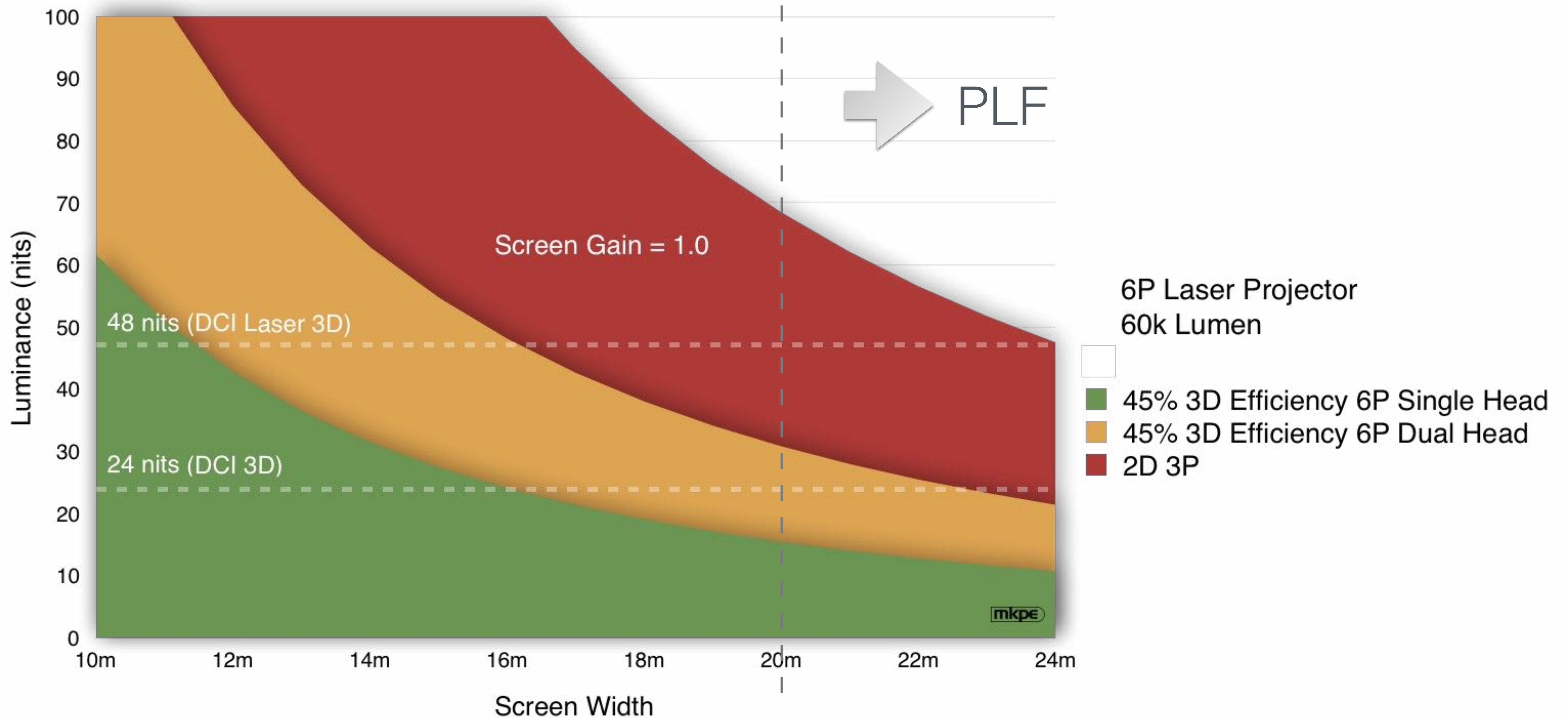


# High Dynamic Range (HDR)

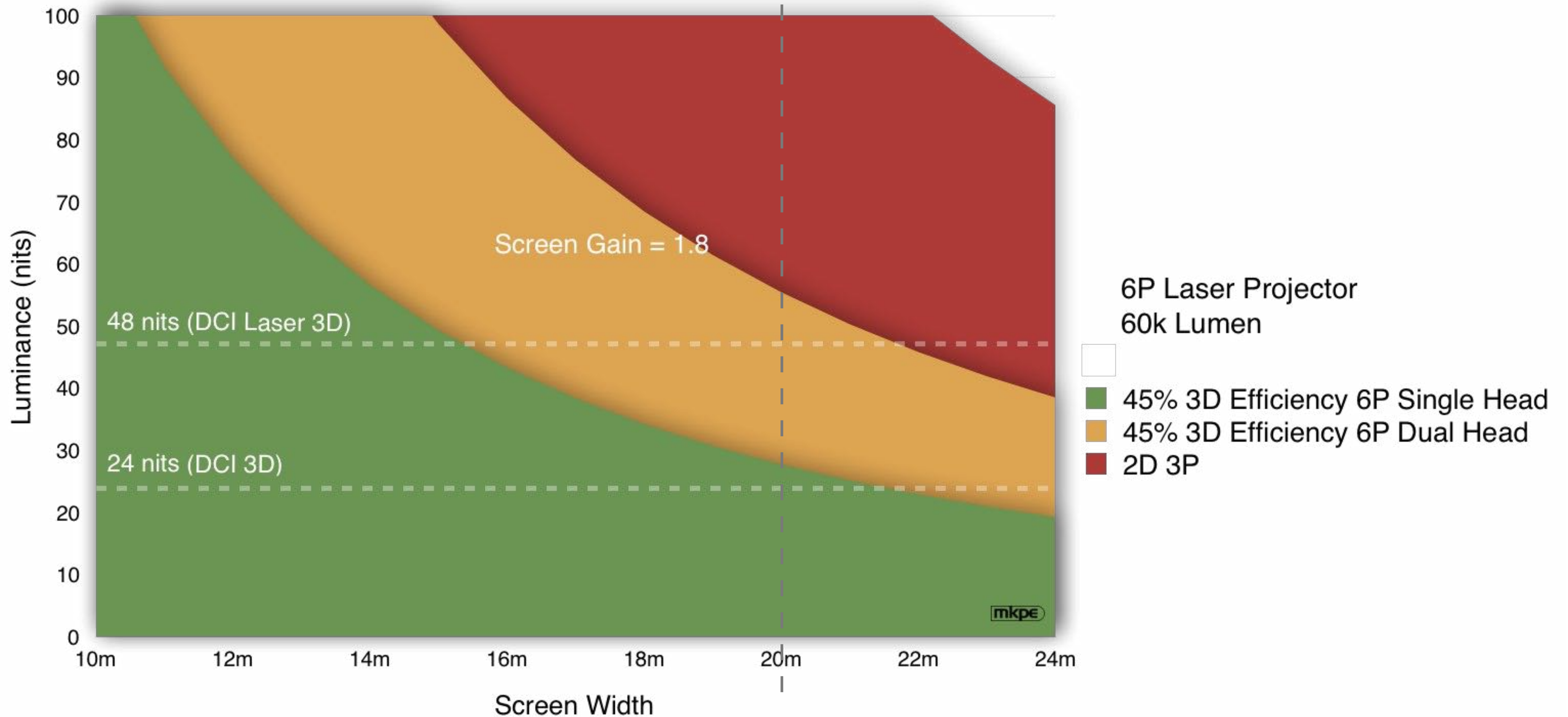


*Peak White for Cinema is technology dependent*

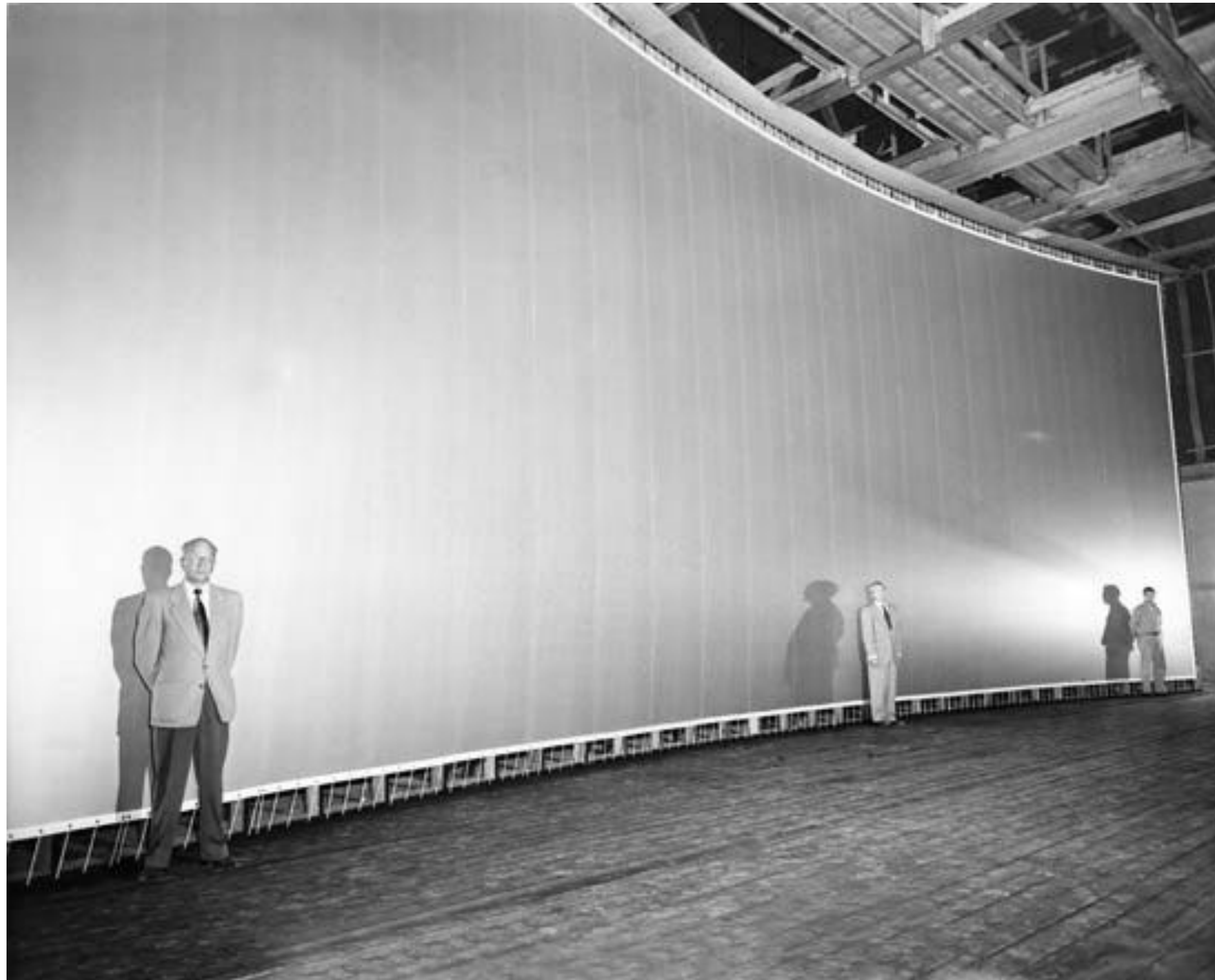
# 100 Nits Is Not Easy



# 100 Nits Is Not Easy



# Screen Technologies Have Improved



- ❑ Coated
- ❑ Polarization Preserving (“Silver”)
- ❑ Reflective Gaussian Diffuser

# Laser Light: Regulatory

- ▣ Laser Illuminated Projector Association (LIPA)
- ▣ IEC 62471-5 Projector Safety (June 2015)

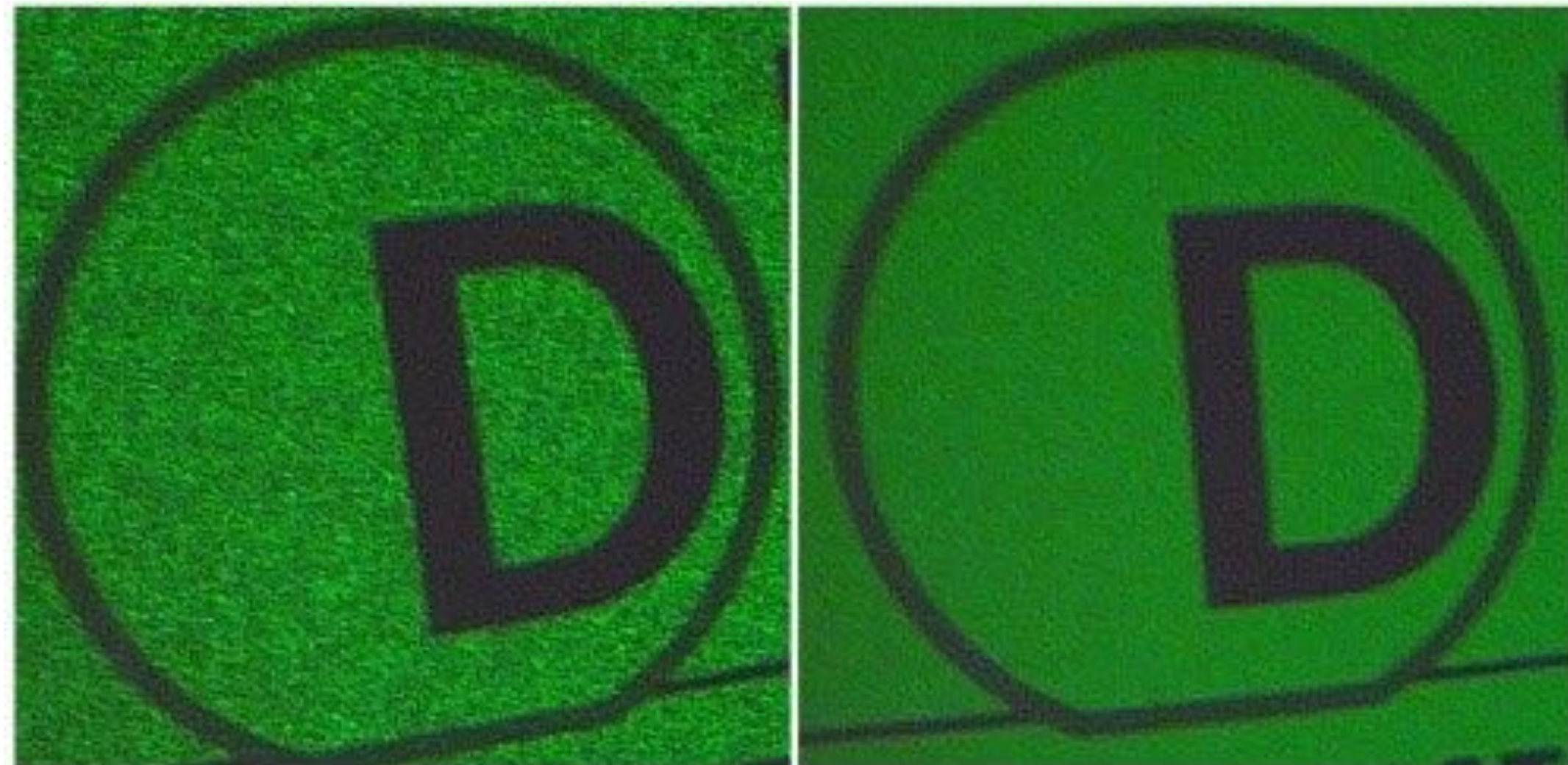


# Laser Light: Metameric Variability



Aggravated by narrow bandwidth primaries

# Laser Light: Speckle

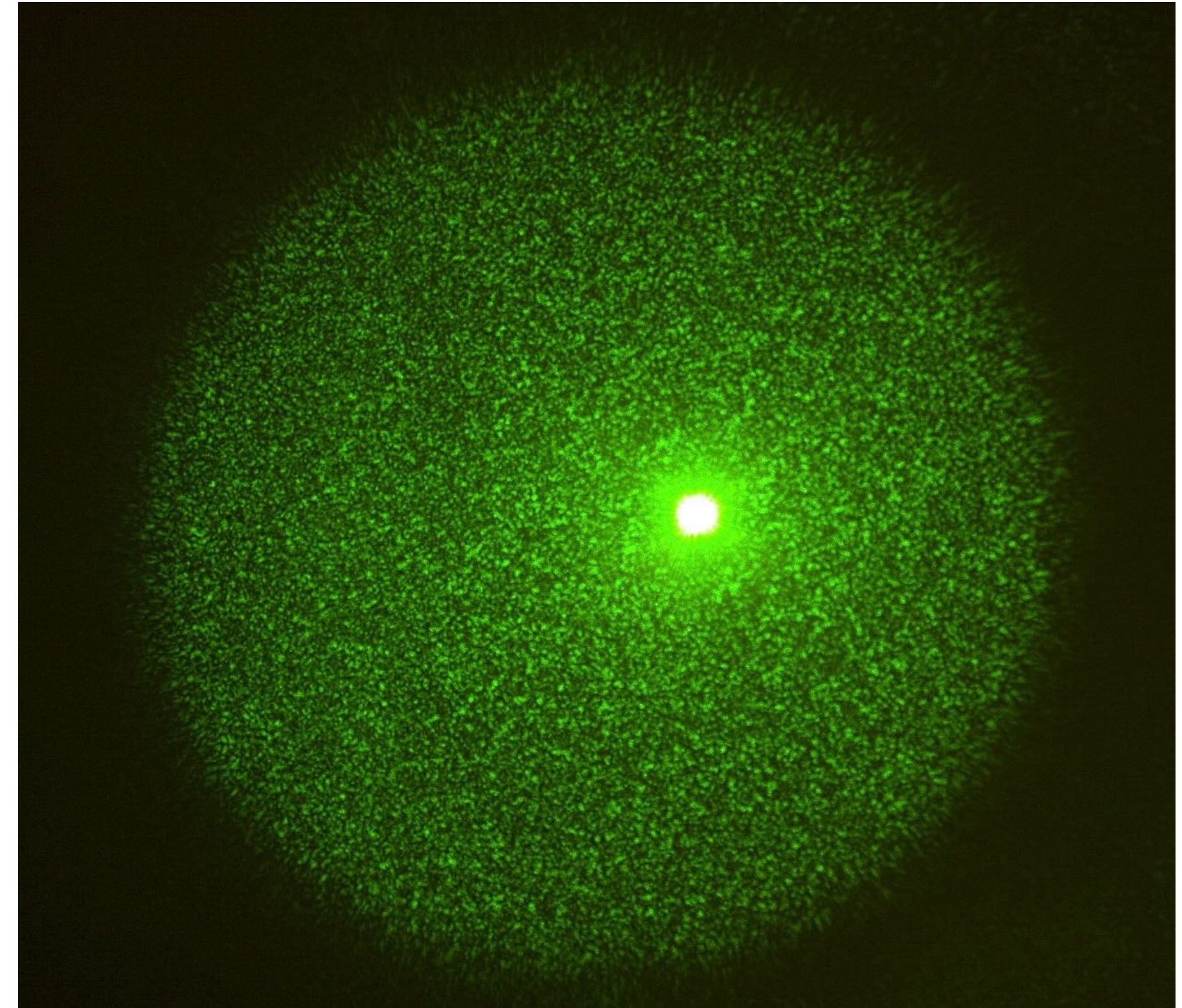


- LIPA Recommended Practice: Speckle Measurement (See <http://lipainfo.org/laser-projection/speckle-metrology/>)
- ...but scene and seating dependence makes measurement irrelevant as a marketing tool (See <http://www.nature.com/articles/srep14105#f1>)

Also aggravated by narrow bandwidth primaries

# Laser Light: Speckle Reduction

- Angle diversity
- Polarization diversity
- Wavelength diversity
- Vibrating screens







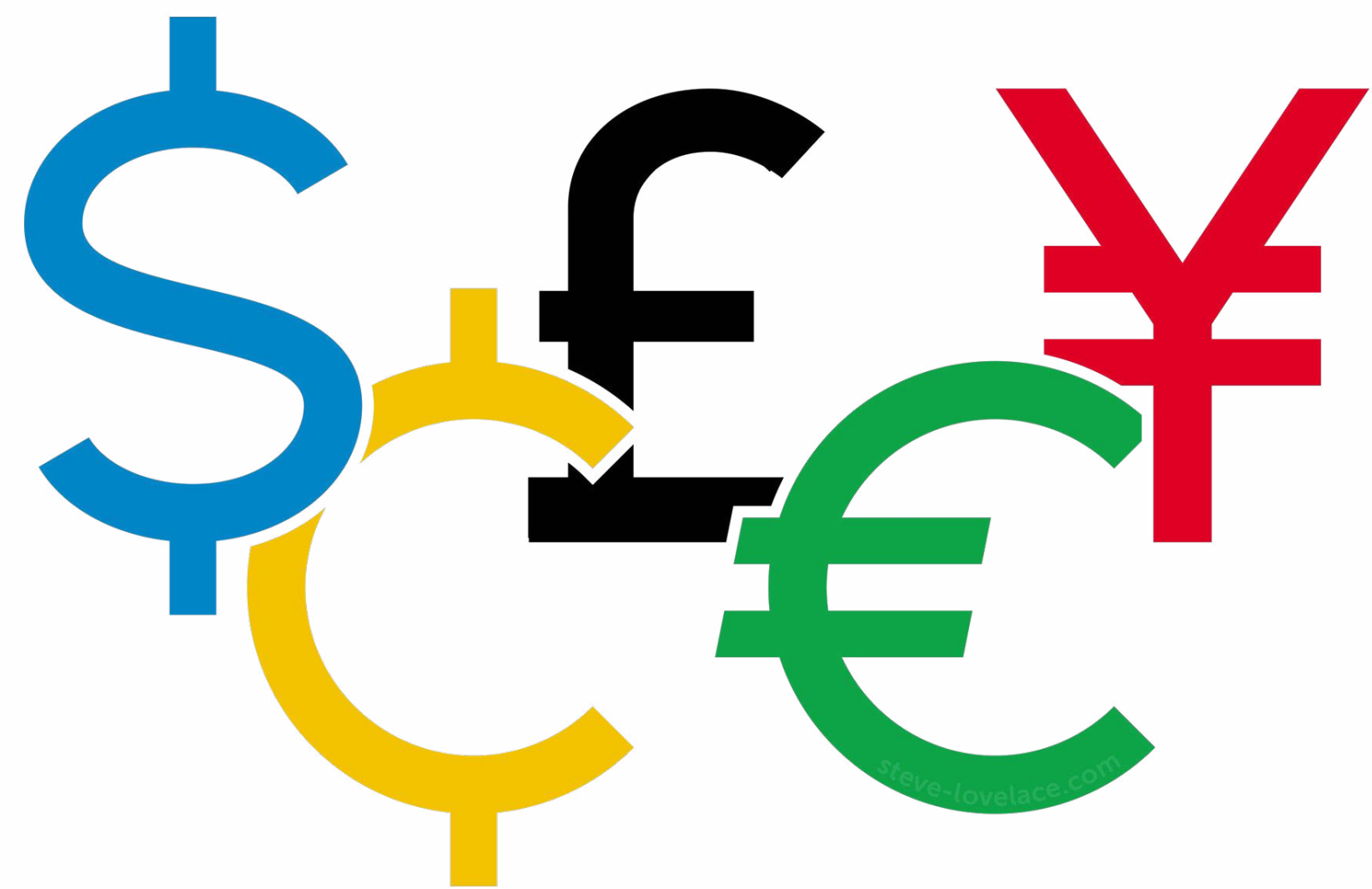
# Direct LED Display

- ❑ *Off-the-shelf not good enough.*  
12-bit color & security required.
- ❑ *Samsung's Cinema Display will be released Q4 2017.*
- ❑ Where do the speakers go?

# Projector Innovations Ahead



Phase Modulation pre-Imaging Device  
for Improved Contrast and Light Efficiency



Creating Value

# What Sells?



THE  
OSCAR<sup>®</sup>

Higher Frame Rates, anyone?

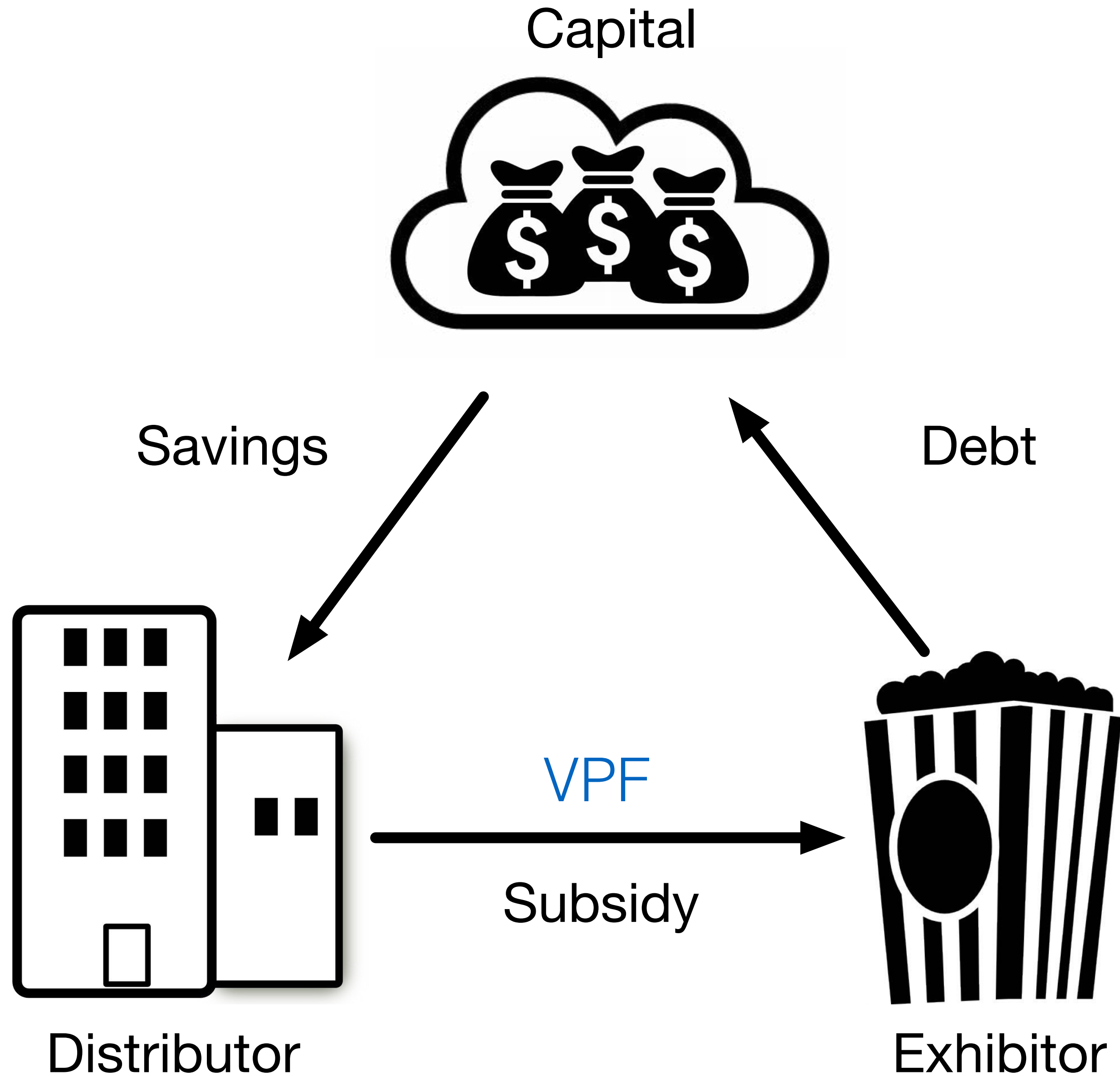


ASC NEXT GENERATION CINEMA DISPLAY  
CINEMA DISPLAY EVALUATION  
PLAN & TEST PROTOCOL

<http://bit.ly/asc-cinema-test-protocol>

# Rolling It Out





The Digital  
Cinema Rollout:

Replacement  
Technology

# Institutions Driven by the Digital Rollout

- Digital Cinema Initiatives (DCI)
  - => Common Specification among Studios necessary to stimulate R&D and gain support from the Finance Industry
- SMPTE
  - => Industry Discussions over Technology  
(not so much standards - only 40% of SMPTE cinema standards in regular use)
- *No institution has authority over rollout of new technology*



# In Summary...

- ❑ HDR for Cinema is not simple.
- ❑ Technology is changing.  
Too early to establish targets.
- ❑ Rollout cannot rely on institutions. Different thinking is needed to address capital investment and technology.





 Cinepedia  
[cinepedia.com](http://cinepedia.com)

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