

Mastering Display Viewing Angle

# The Problem



Recent winter Olympics  
complaint:

*athletes in HD feed  
derived from UHD were  
too small...*

# Problem points

- Some operators may code ultra-wide FoV (100 degree) content as 2160p (4K) bitstreams for compatibility with current generation hardware.
- Decoders / receivers will not understand that 4K bitstreams (2160p) intended to convey the “8K experience” and meant to be viewed on ultra-wide (S-UHD) displays.
- Historically, the camera field of view / display viewing angle is assumed based on video format (SD, HD, UHD, ..) or aspect ratio (4:3, 16:9, 2.4:1 ..)
  - Both UHD (4K) and S-UHD (8K) have the same 16:9 aspect ratio.
- The 4K -> 2K analogy: many 4K programs today are processed as 1080p then scaled up to UHD before encoding, or after decoding.

# Proposed solution

- Indicate ideal horizontal viewing angle of mastering display during content approval.
- Horizontal angle is specified rather than vertical or diagonal due to common practice of coded letterboxing for 1:85, 2.4:1, etc. content.
- Content such as UK 5:3 and golden 4:3 takes FoV into account when inserted into 16:9 with vertical letterbox bars.

## Syntax: SEI message

mastering_display_viewing_info( payloadSize ) {	Descriptor
mastering_display_viewing_info_cancel_flag	u(1)
if( !mastering_display_viewing_info_cancel_flag ) {	
mastering_display_viewing_info_persistence_flag	u(1)
mastering_display_horizontal_viewing_angle	ue(v)
}	
}	

# Semantics

- **mastering\_display\_horizontal\_viewing\_angle** specifies the ideal horizontal viewing angle of the mastering display used during the content authoring, mastering, or approval process. The indicated angle is also considered to be the ideal viewing angle of the content by the end viewer.

# Evolution of field of view



Standard Definition (SD)

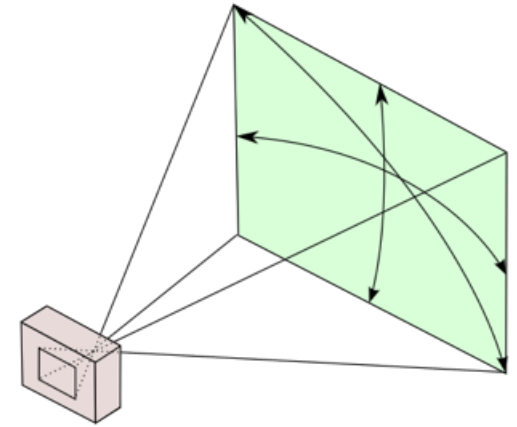


High Definition (HD)



Ultra High Definition (UHD)

Photo and figure from: [https://en.wikipedia.org/wiki/Angle\\_of\\_view](https://en.wikipedia.org/wiki/Angle_of_view)



Viewing angle can be measured horizontally, vertically, or diagonally. Traditionally: horizontal is specified

# Field of View / Viewing Angle

Format	field of view (from ideal seating position)	Aspect ratio
Super Ultra HD ("UHD-2" in DVB language)	100 degrees	16:9
IMAX Digital	~90 degrees	1.9 : 1
4K UHD (ITU-R study)	60 degrees	16:9
Cinemascope ( <a href="#">CEB23</a> ) home theater	43 degrees	2.4 : 1
HD (1080p, 720p, 1080i) EBU study	35 degrees	16:9
SD (480i, 576i) SMPTE viewing comfort	> 20 degrees	4:3

***Content field of view (FoV) and display viewing angle are proportional, but actual scene FoV varies with creative intent, lenses, post cropping, etc..***



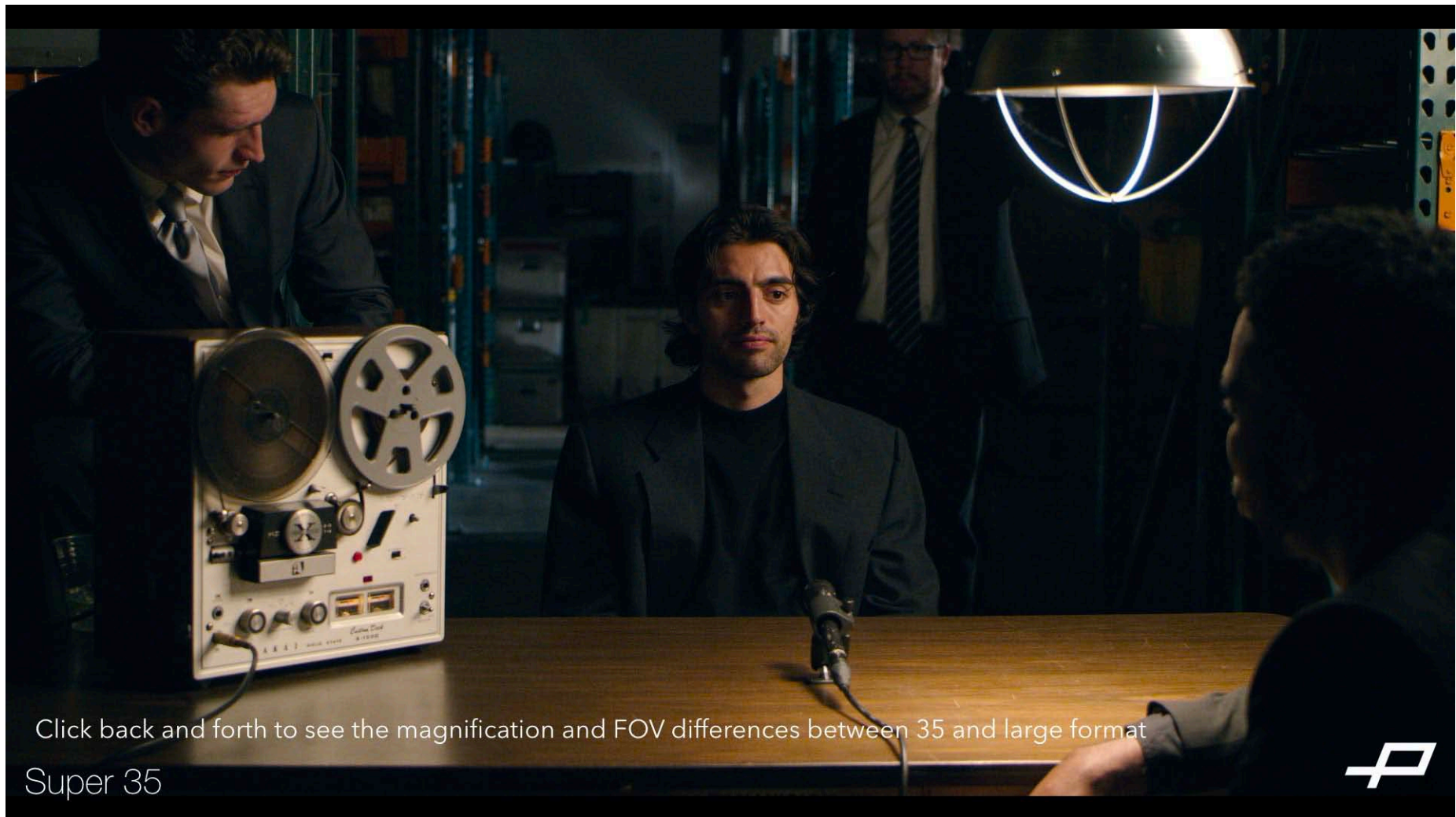


Click back and forth to see the magnification and FOV differences between 35 and large format

Large Format



NAB 2019 presentation at 8K Association Seminar:  
“More than Resolution: The Artistic Side of 8K” (Cioni, Panavision)



Click back and forth to see the magnification and FOV differences between 35 and large format

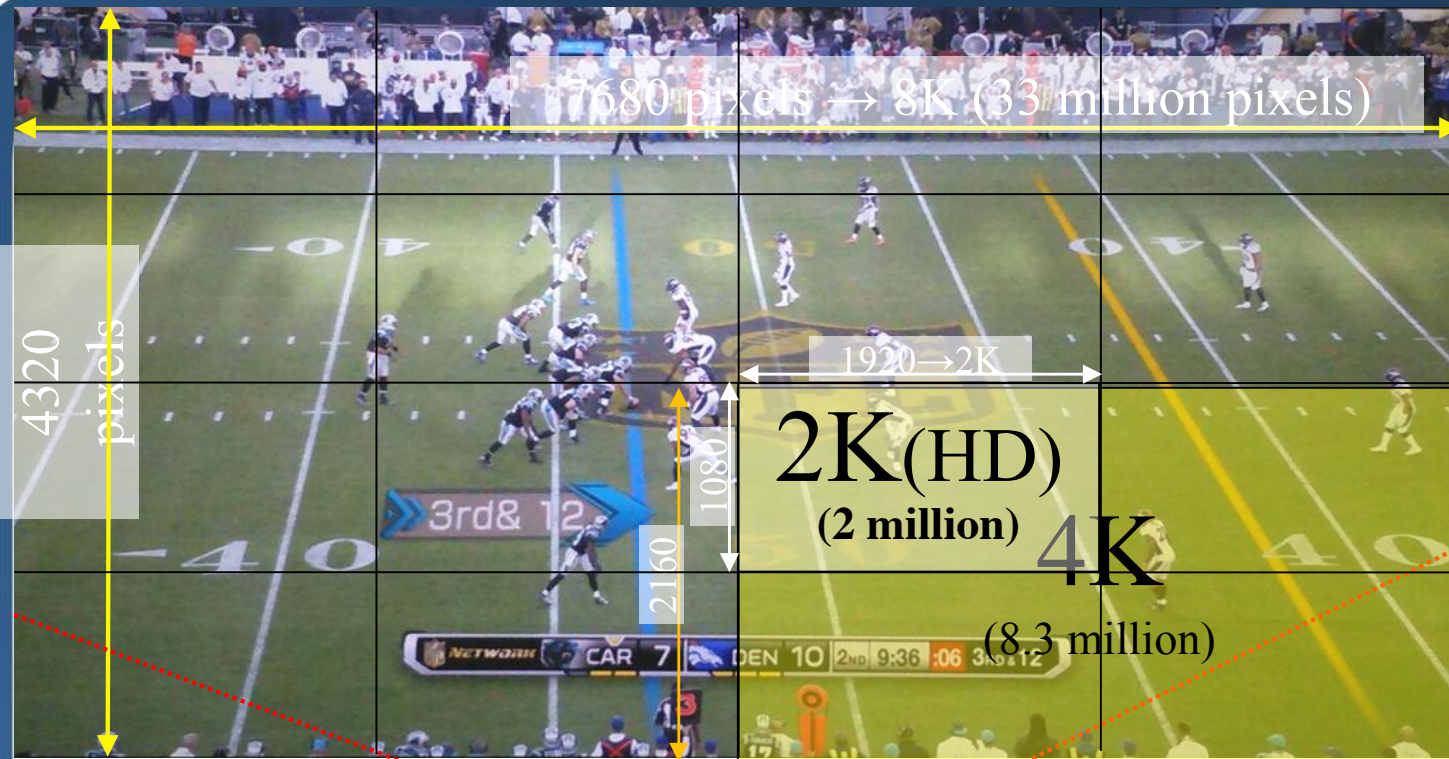
Super 35



NAB 2019 presentation at 8K Association Seminar:  
“More than Resolution: The Artistic Side of 8K” (Cioni, Panavision)



Slide from: "The World's First 8K Broadcasting & 8K Production at Rio Olympics" (Hamaguchi, NHK)



Viewing distance is  
0.75 times of screen height



100°

100 degrees Field of view

**High Resolution**

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