

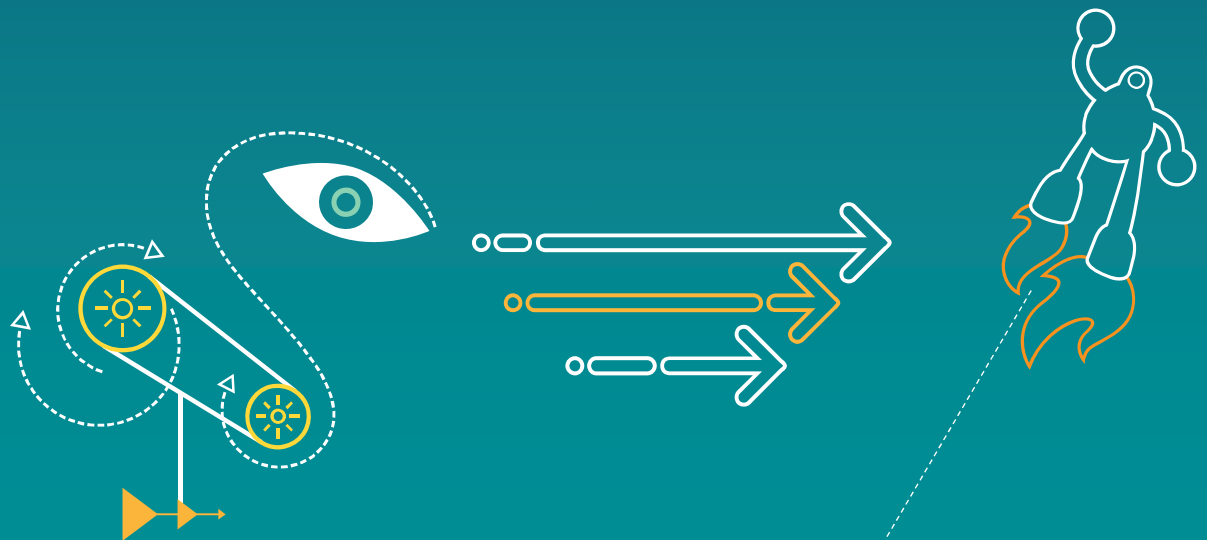
James Goel  
Director – Technical Standards  
Qualcomm Technologies, Inc.

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# Video Quality Analysis for Display Stream Compression

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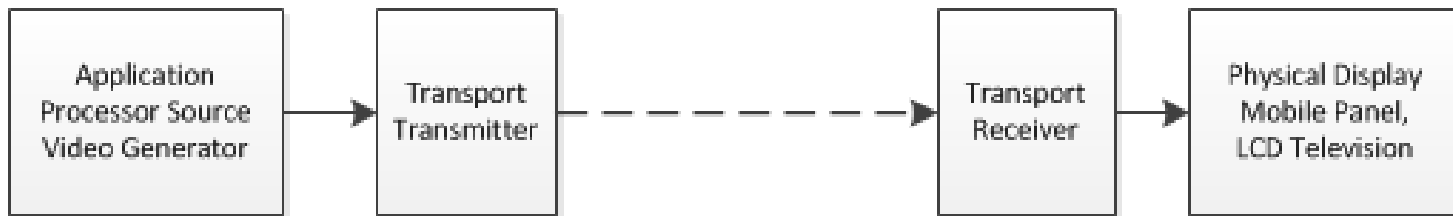


# Display Stream Compression

## Visually Lossless Low-Compression Rate Applications

Compression on physical display links

Used by VESA and MIPI

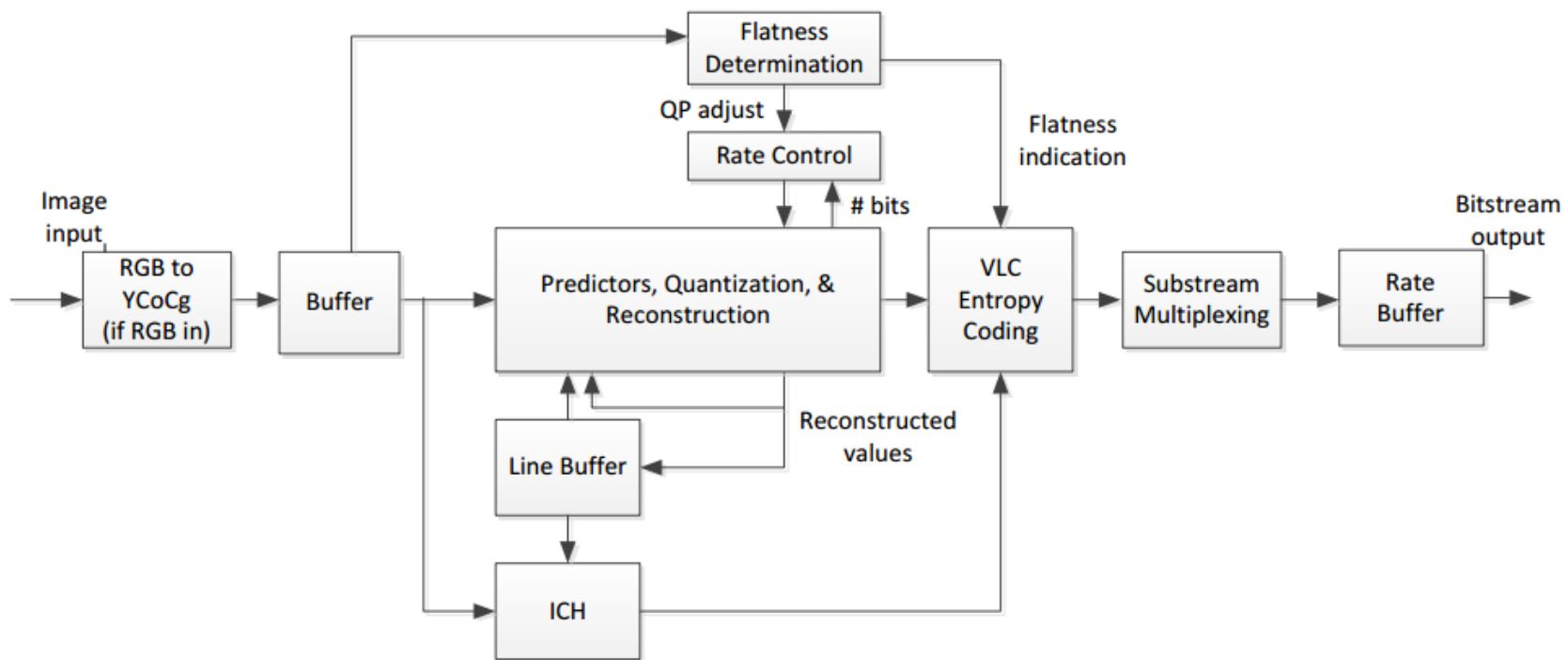


Source Video	Pixel Format	Required Pixel Rate (Mpixel/sec)	Bandwidth in Mbits/Sec	Compression Rate	Compressed Link Rate (Mbit/sec)
Progressive HD 1920x1080	24-bit/pixel RGB	124	2,986	3:1 (24bpp->8bpc)	995
WUXGA 2560x1600	24-bit/pixel RGB	246	5,898	3:1 (24bpp->8bpc)	1,966
Ultra-HD 3840x2160	24-bit/pixel RGB	498	11,944	4:1 (24bpp->6bpc)	2,986
5K Displays (5120x3200)	24-bit/pixel RGB	983	23,593	4:1 (24bpp->6bpc)	5,898
8K Broadcast (7680x4320)	24-bit/pixel RGB	1,991	47,776	4:1 (24bpp->6bpc)	11,944

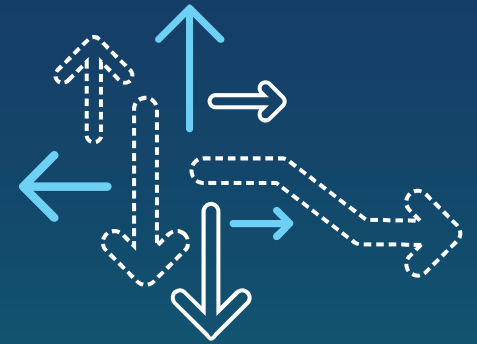
# First Generation Display Stream Compression

Public Whitepaper Available on VESA.org Website

[http://www.vesa.org/wp-content/uploads/2014/04/VESA\\_DSC-ETP200.pdf](http://www.vesa.org/wp-content/uploads/2014/04/VESA_DSC-ETP200.pdf)



**Figure 1 – DSC encoder block diagram**



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# Next Generation Advanced DSC

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# Solution Requirements – Advanced DSC

**Table 1: Image Attributes for Proposals**

Attribute	Values	Comments
<b>Resolutions</b>	Up to 10240 x 4320	Interlaced support is not specifically mandated.
<b>Frame rate</b>	Up to 120Hz	
<b>Component type</b>	RGB, YCbCr; full-range, i.e. each component ranges from 0 to $2^{\text{bpc}} - 1$ in integer format	Input type to the encoder shall match the output type of the decoder. Internal color space conversion is permitted, but if used, it shall be specified as part of the proposal and included in the model.  See “component bit depth” for bpc definition
<b>Component number</b>	= 3	
<b>Component bit depth</b>	8, 10, 12, 14, or 16 bits	Referred to as bits per component (bpc) in this document
<b>Sampling</b>	4:4:4, 4:2:2, 4:2:0	Sampling format at the input to the encoder and output of the decoder match. 4:2:2 and 4:2:0 modes should be designed to code more efficiently than using interpolated samples as is specified in Annex B of DSC 1.1.

# Solution Content Requirements

## **A.3 Content Types**

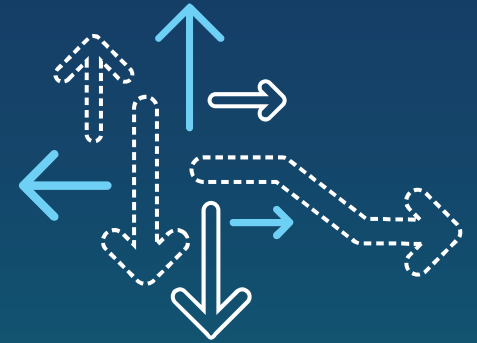
Many types of still images will be evaluated: continuous tone images, landscapes, people portraits, animals, fine text, web pages, graphics, computer screen captures with or without sub-pixel rendering, etc. Test patterns such as noise and zone plates will be evaluated, but some visual loss may be tolerated on certain patterns.

Video tests will include movies, television, computer games, graphics, etc. Source video may be compressed using a standard broadcast compression algorithm before compression testing (e.g., MPEG-2, AVC, HEVC, etc.).

## **A.4 High Dynamic Range (HDR) Testing**

Testing will include high dynamic range displays and content. Content will include BT.2020 10 and 12 bpc source as well as content sourced from other optical-electrical transfer functions (OETF). To cover different color gamut usage modes, content with sRGB, BT.709, and BT.2020 primaries will be tested.

Very bright displays (1000+ nits) will be used for some of the HDR testing.

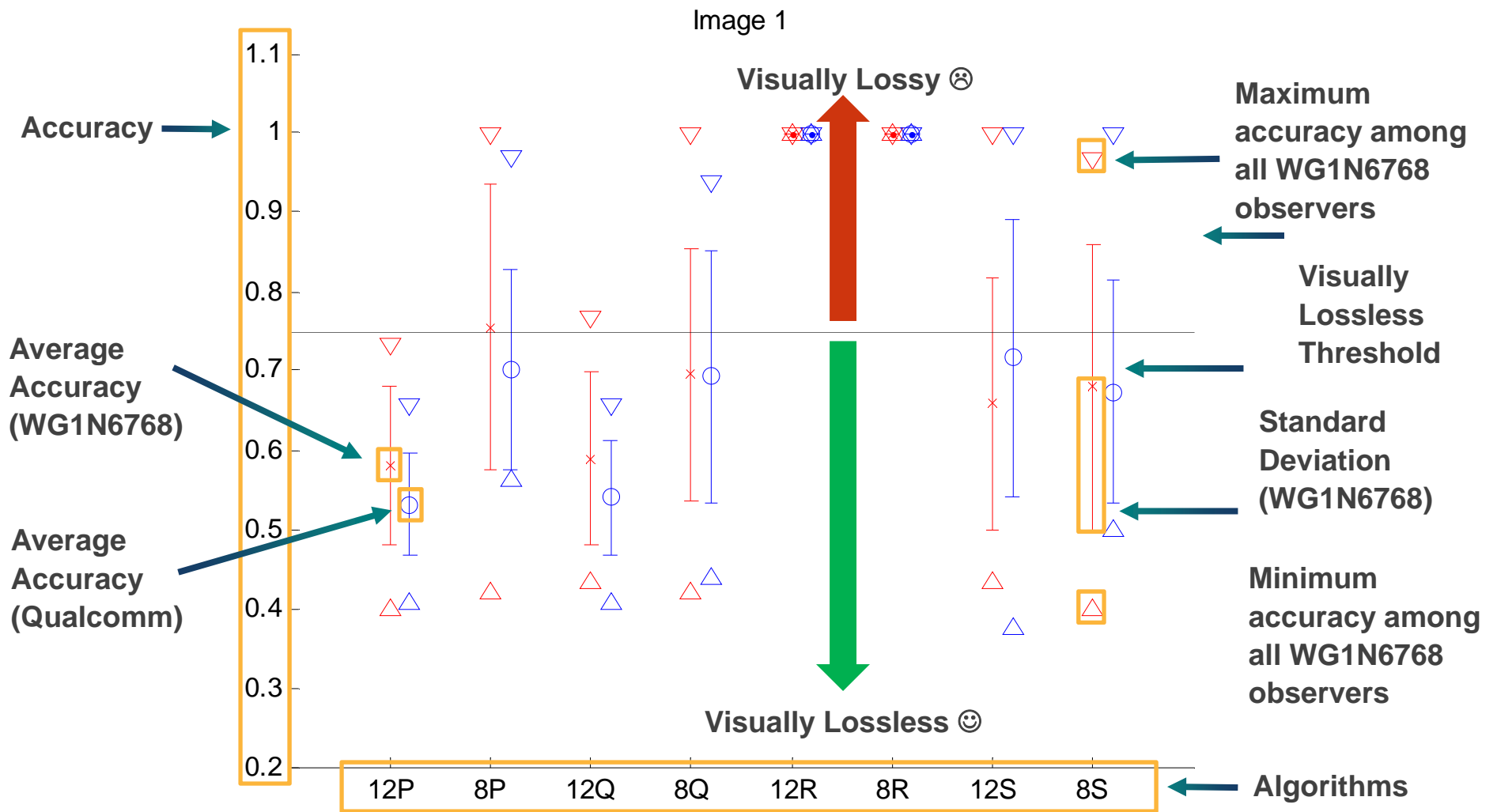


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# ISO/IEC 29170-2 Visually Lossless Methodology

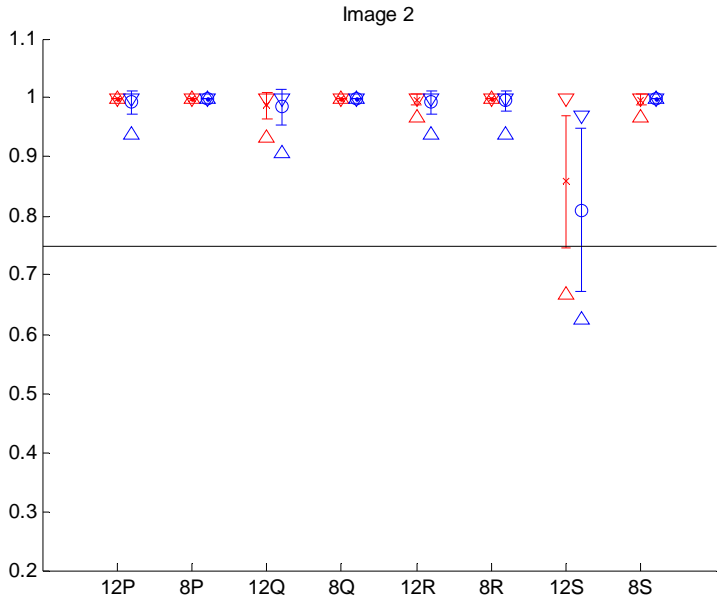
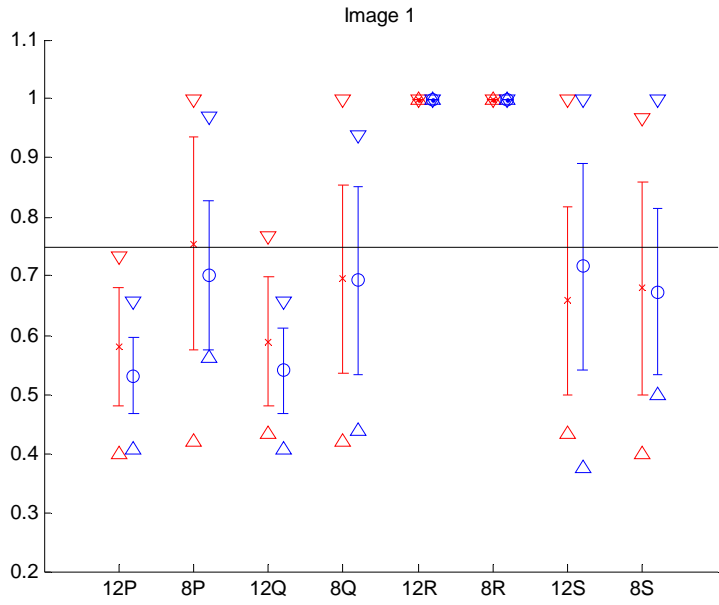
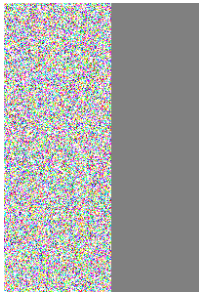
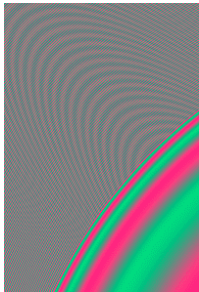
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# Data Analysis Format





# Results



# Results



Image 3

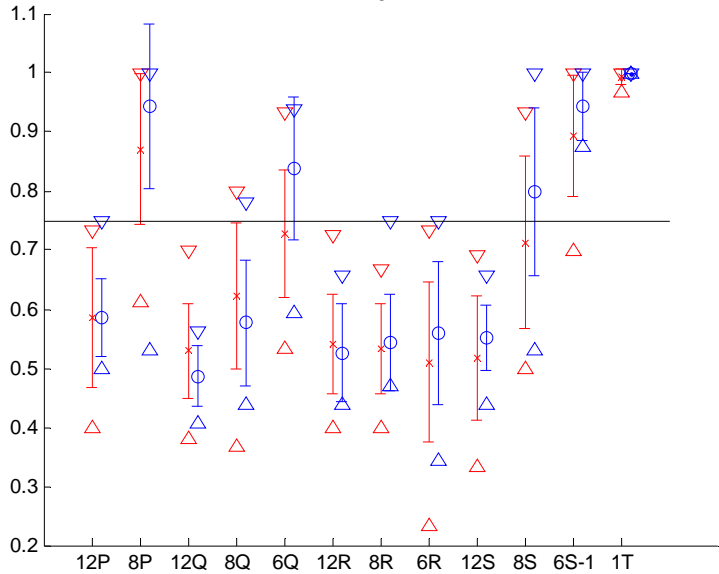
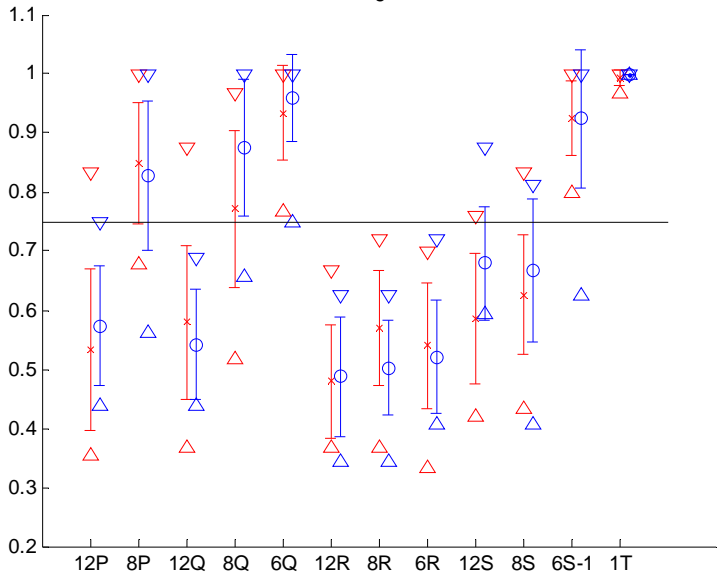


Image 4



# Please Join the VIME Flickr Shoot

DSC requires HDR and high-colour 16/14/12/10-bit images and videos from the following "shot-list":

## RAW Format Images

- Pane color glass window
- Night campfires
- Night flames
- Outdoor sunset
- Indoor scene with window and sunlight
- Birthday night shots
- Tiki torches
- Sparklers on birthday cakes or very bright candles
- Sunset with car and bright lights

# Contact me to join DSC Subjective Trials

If you are interested in following ISO-29170/2 Methodology  
**Subjective Trials start next year**

- 40 volunteers
- Simple configuration
- Multiple Trials required
- Possible corporate funding