

# **AHG7: Test report on Content Colour Volume SEI message**

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(JCTVC-Z0027)

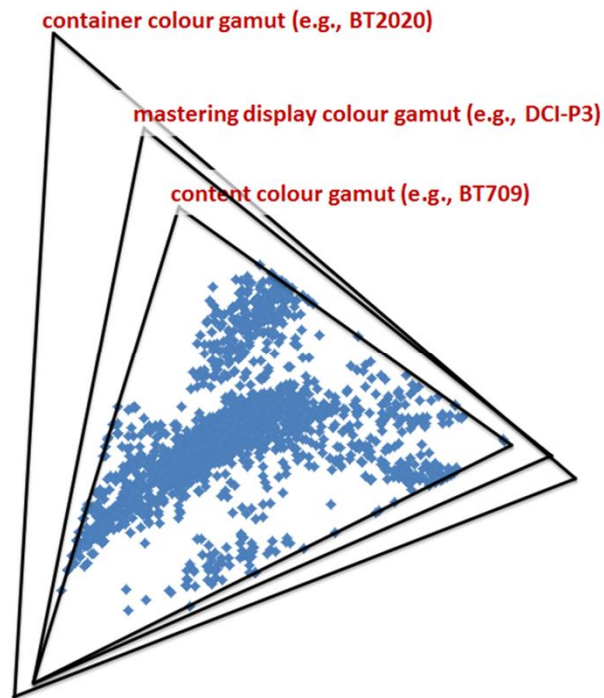
Jan. 2017, Geneva

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# Introduction

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- It was proposed to provide a signaling method to describe a colour volume of a content.
  - Content colour volume describes actual boundary of colour and luminance values.
  - It could provide an additional information which is distinctive from container and mastering display colour volume.
- Based on the discussion on the benefits of the information, It was agreed to define a content colour volume SEI message.



# Introduction

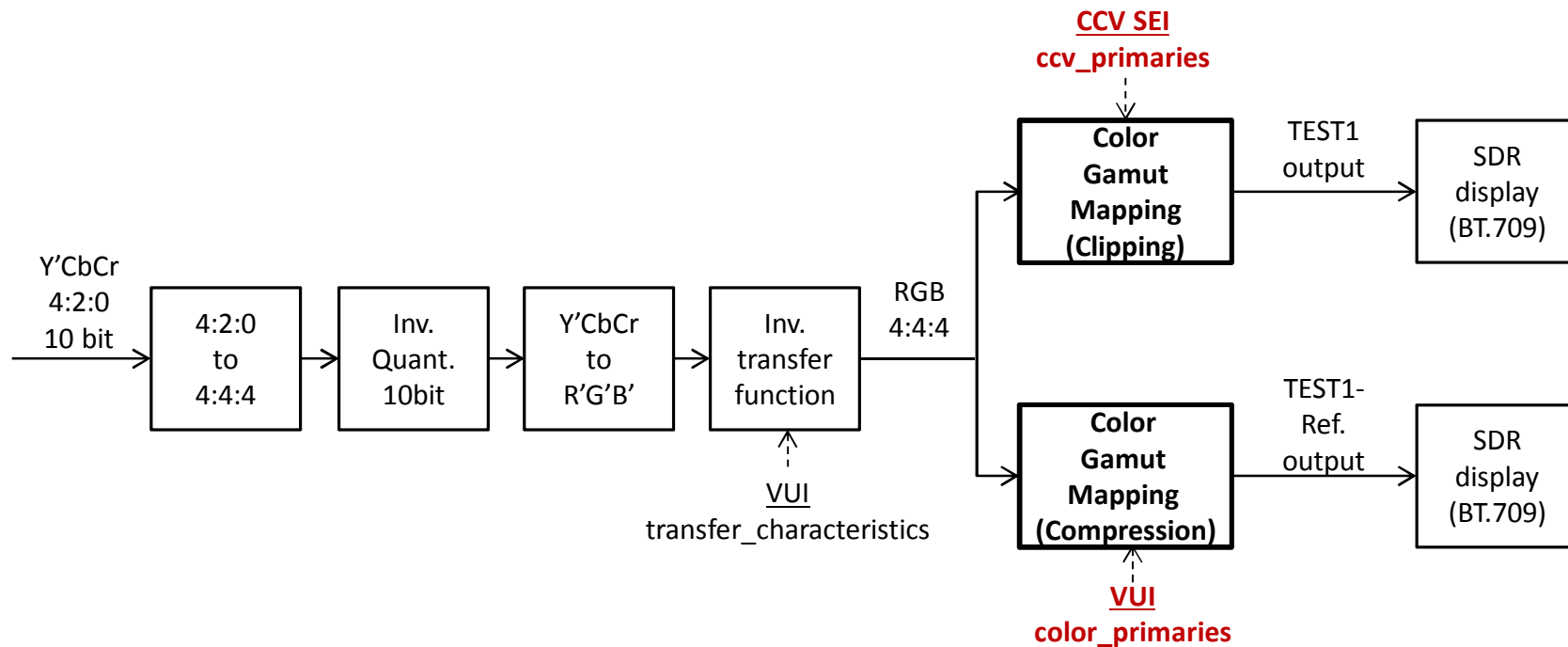
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- A draft specification document for the content colour volume (CCV) SEI message was developed in 25<sup>th</sup> JCT-VC meeting.
  - JCTVC-Y1005 provides a description of content colour volume representation with three colour primaries and minimum and maximum luminance values.

<b>content_colour_volume( payloadSize ) {</b>	<b>Descriptor</b>
<b>ccv_cancel_flag</b>	u(1)
if( !ccv_cancel_flag ) {	
<b>ccv_persistence_flag</b>	u(1)
for( c = 0; c < 3; c++ ) {	
<b>ccv_primaries_x[ c ]</b>	i(16)
<b>ccv_primaries_y[ c ]</b>	i(16)
}	
<b>ccv_min_lum_value</b>	u(32)
<b>ccv_max_lum_value</b>	u(32)
}	
}	

# Introduction

- Also, a test plan was established to show the benefits of the information provided with a different level of colour volume description. (JCTVC-Y0051).
- In this presentation, the experimental result of a test planed in JCTVC-Y0051 will be covered, which shows the benefit of the current CCV SEI message in terms of image quality improvement in video processing.



# Test description in JCTVC-Y0051

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- TEST1 – SDR/BT.709 content in SDR/BT.2020 container, represented in YCbCr 4:2:0 10b, to be displayed on SDR/BT.709 display
    - Participant: LG
  - TEST1-Ref – use only VUI information, apply gamut compression (colour gamut tailoring) from BT.2020 to BT.709 before rendering on BT.709 display
  - TEST1 – use reference SEI, convert to BT.709 with clipping in RGB domain before rendering on BT.709 display
  - Test content: BT.709 SDR versions, converted in BT.2020 container, of the JCTVC HDR test content: Market, Tibul, FireEater, Balloon
  - Check:
    - Objective metrics (PSNR) – test 709 SDR vs source 709 SDR (both in 709 container)
    - Visual test – comparing content resulting from TEST1-Ref rendered on a BT.709 SDR display, to content resulting from TEST1 rendered on a same display
- Note: does not assess the need for the syntax elements min/max luminance.



# Experimental result - Market

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- TEST1-ref





# Experimental result - Market

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- TEST1



# Experimental result - FireEater

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- TEST1-ref





# Experimental result - FireEater

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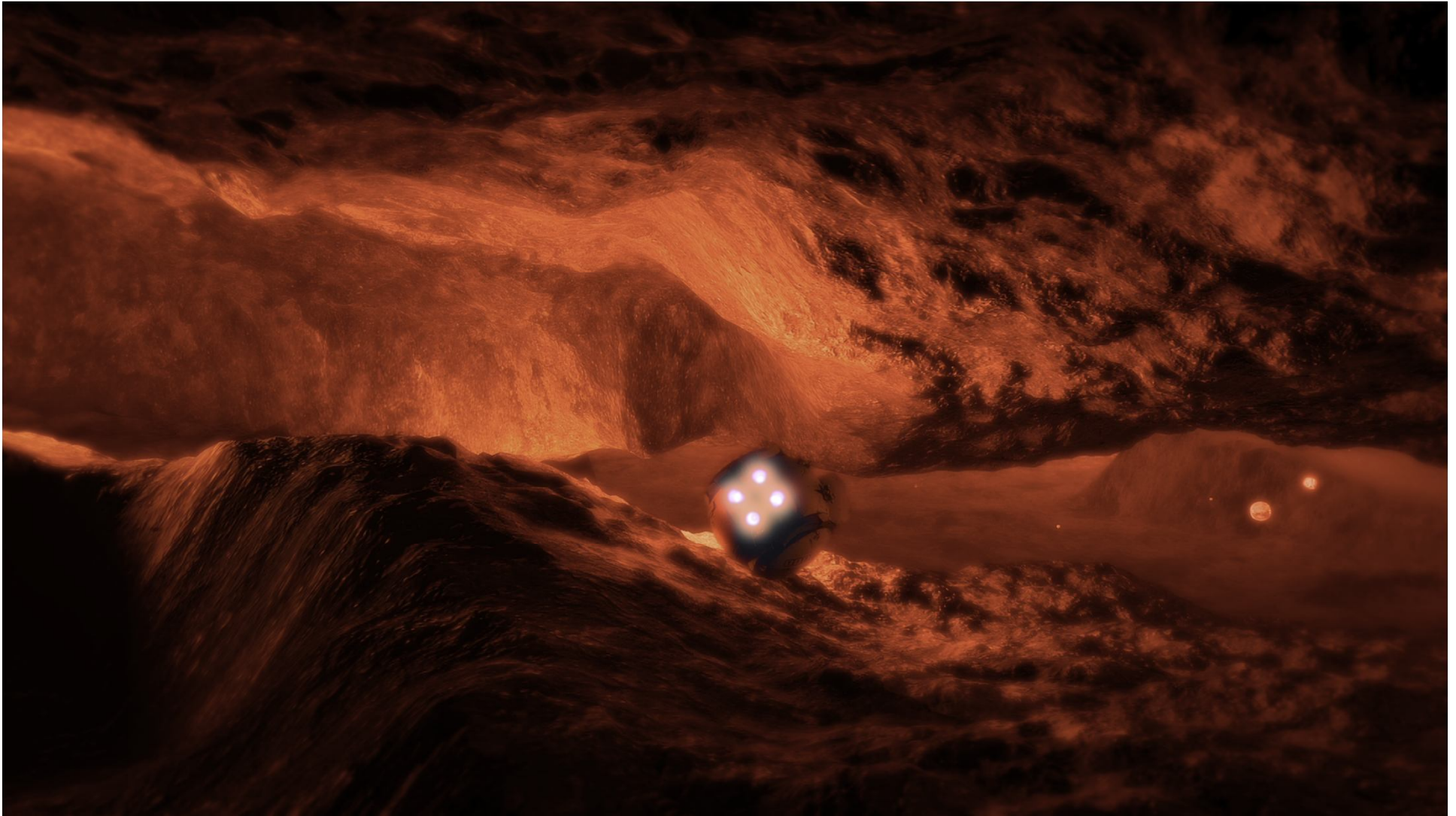
- TEST1



# Experimental result - Tibul

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- TEST1-ref

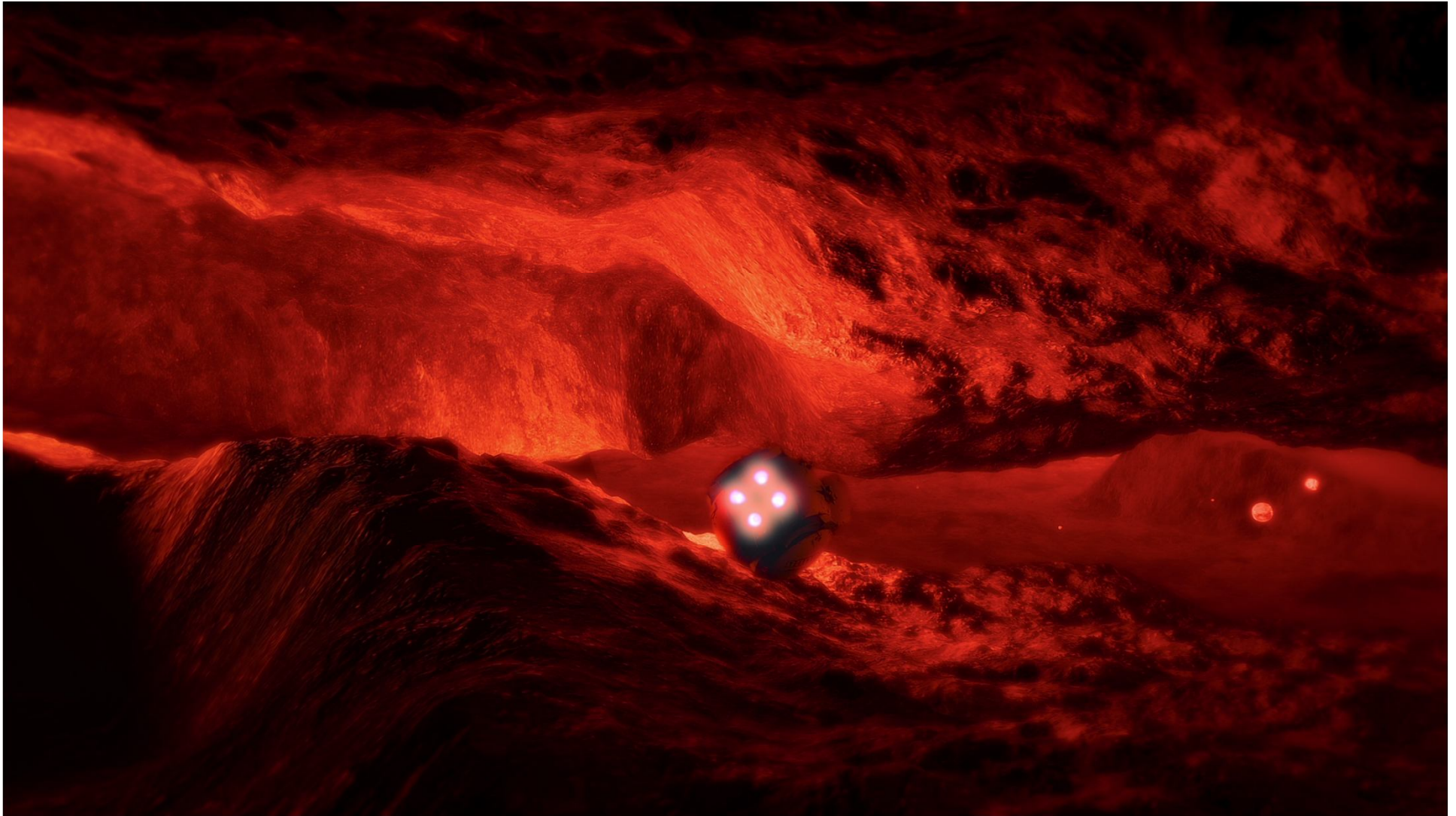




# Experimental result - Tibul

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- TEST1



# Experimental result - Balloon

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- TEST1-ref





# Experimental result - Balloon

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- TEST1



# Experimental result - PSNR

- PSNR

PSNR		TEST1-ref			TEST1		
		Y	U	V	Y	U	V
Market3Clip4000r2_1920x1080p_50_10_709	Avg	46.65738	40.956841	31.409702	<b>58.179117</b>	<b>50.627756</b>	<b>52.077287</b>
	Min	45.674431	39.848068	31.037537	57.605339	47.547194	51.53749
	Max	47.167015	41.424632	31.675765	58.771723	51.783533	52.880606
FireEater2Clip4000r1_1920x1080p_25_10_709	Avg	37.018278	47.265306	31.798007	<b>58.104911</b>	<b>60.411548</b>	<b>58.58184</b>
	Min	35.466959	39.08706	30.468732	56.834409	55.954334	56.654572
	Max	38.634734	54.755521	33.072607	59.6803	65.194771	60.761129
Tibul2Clip4000r1_1920x1080p_30_10_709	Avg	28.163742	42.374461	24.298126	<b>49.299266</b>	<b>51.545731</b>	<b>53.959736</b>
	Min	26.396454	38.042284	22.373204	48.285429	50.461096	52.82802
	Max	30.038667	47.969664	26.913631	51.076399	52.552265	54.961134
BalloonFestival_1920x1080p_24_10_709	Avg	37.012964	32.439633	24.767937	<b>59.394312</b>	<b>54.507954</b>	<b>59.60341</b>
	Min	36.870474	32.30181	24.74388	59.252011	54.145414	59.143364
	Max	37.112844	32.552405	24.782331	59.58679	54.736472	60.057939

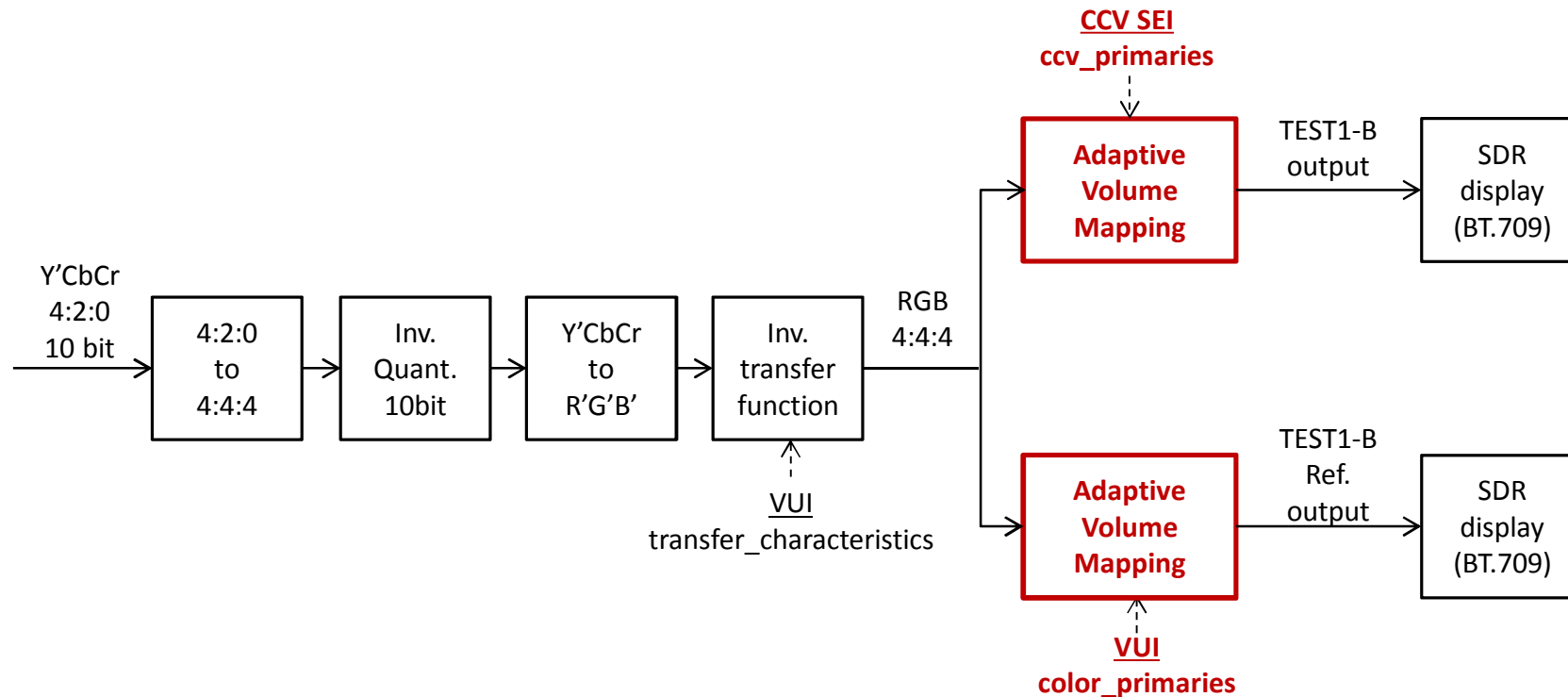
# Experimental result - SSIM

- SSIM

SSIM		TEST1-ref			TEST1		
		Y	U	V	Y	U	V
Market3Clip4000r2_1920x1080p_50_10_709	Avg	38.414	37.95086	26.76274	<b>50.43427</b>	<b>45.22403</b>	<b>44.97026</b>
	Min	37.04745	37.0949	26.30994	49.91528	43.75737	44.24023
	Max	39.14456	38.33366	27.01586	51.10029	45.76937	46.13026
FireEater2Clip4000r1_1920x1080p_25_10_709	Avg	29.00545	40.44223	30.88643	<b>47.72616</b>	<b>50.63842</b>	<b>49.30816</b>
	Min	27.1925	32.70599	29.46175	46.56691	46.43077	47.34938
	Max	31.4551	47.88261	32.40121	48.87585	55.1569	51.34914
Tibul2Clip4000r1_1920x1080p_30_10_709	Avg	16.82135	36.01451	23.48362	<b>36.10553</b>	<b>41.95967</b>	<b>44.89285</b>
	Min	15.96628	31.11565	21.83852	35.17919	40.92786	43.95464
	Max	17.55488	42.32198	25.66452	38.14959	42.86672	45.83817
BalloonFestival_1920x1080p_24_10_709	Avg	32.0507	26.18553	20.09724	<b>49.89516</b>	<b>44.66823</b>	<b>49.84034</b>
	Min	31.82613	26.0454	20.06464	49.78256	44.3412	49.41235
	Max	32.1815	26.3085	20.11881	50.04977	44.88227	50.24788

## Additional test description

- TEST1-B – SDR/BT.709 content in SDR/BT.2020 container, represented in YCbCr 4:2:0 10b, to be displayed on SDR/BT.709 display, **using an advanced algorithm**

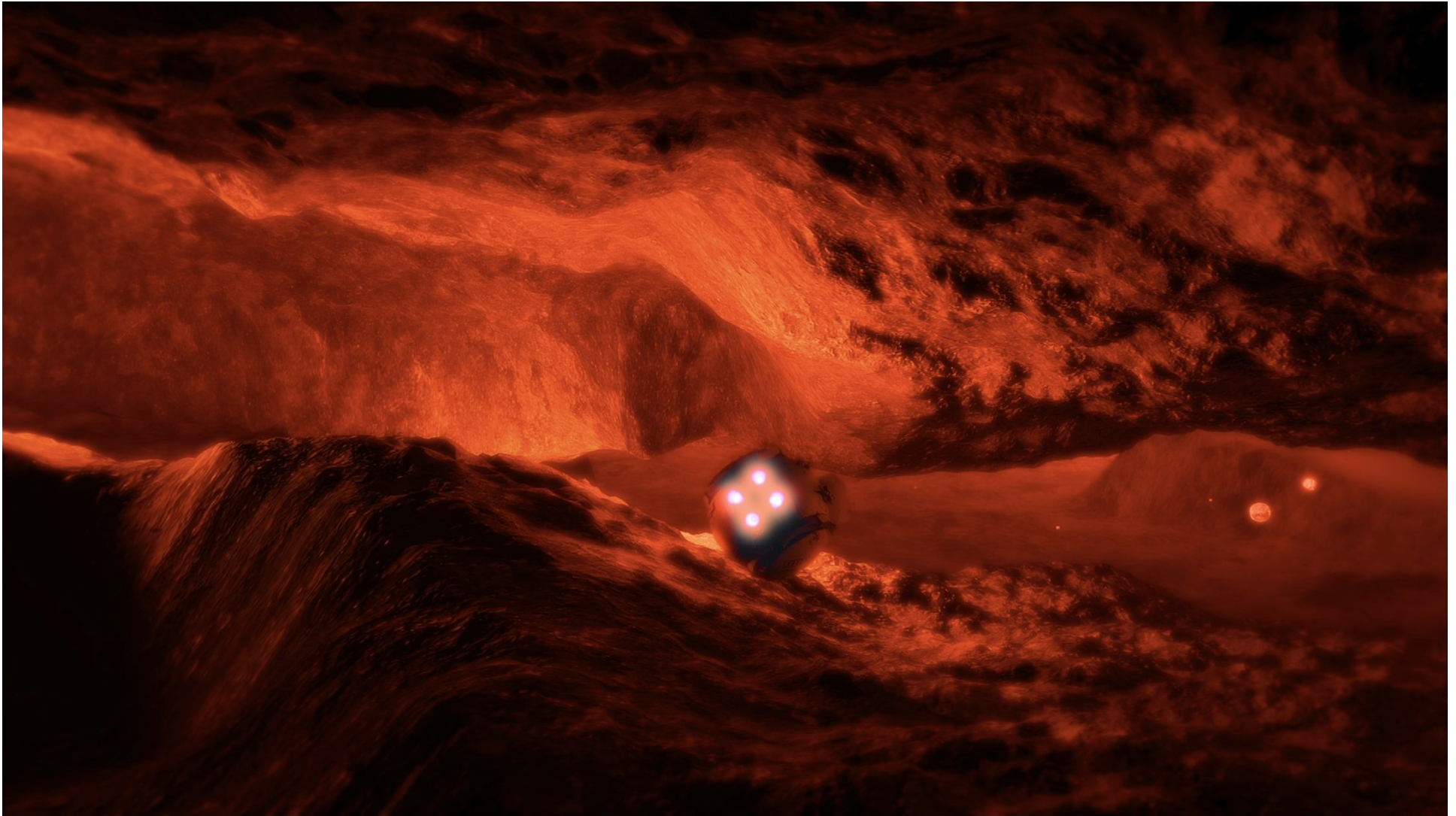




## Additional experimental result - Tibul

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- TEST1-B ref.

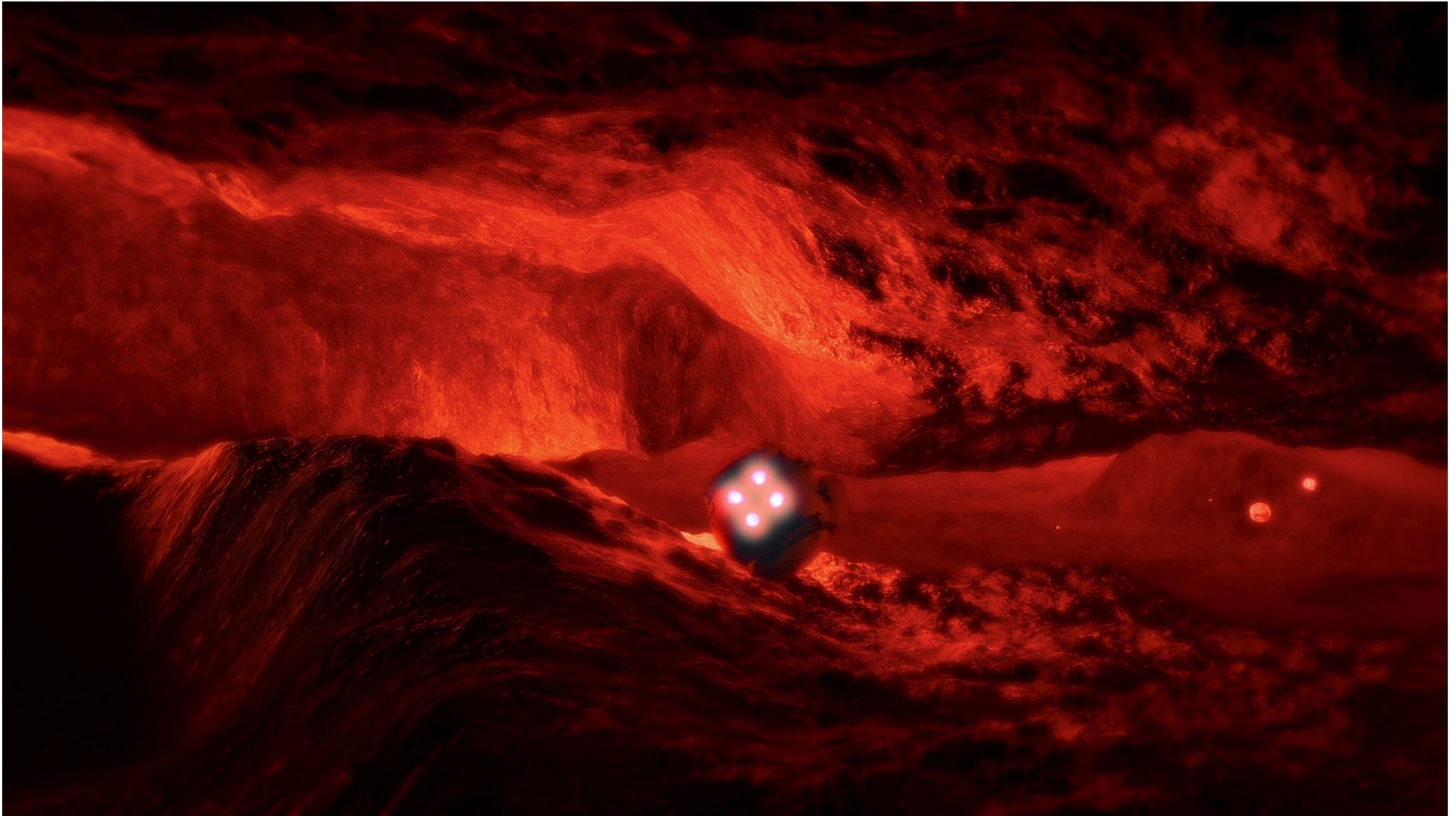




## Additional experimental result - Tibul

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- TEST1-B



## Conclusion

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- A test procedure and its results are described to examine the effect of Content Colour Volume SEI message in JCTVC-Y1005.
- TEST1 in JCTVC-Y0051 was performed by comparing the BT.2020 to BT.709 gamut mapping results when using colour gamut information in Content Colour the SEI message and the one in VUI.
- The subjective and objective metrics shows the improvement of the image quality of colour gamut mapping when use the SEI message.
- Also, the additional test shows the benefit of the SEI message which improves the colour volume mapping results independent to the mapping method.

# Thank you