

# G0067: CHROMA ADJUSTMENT FOR SDR VIDEO

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Ericsson Research

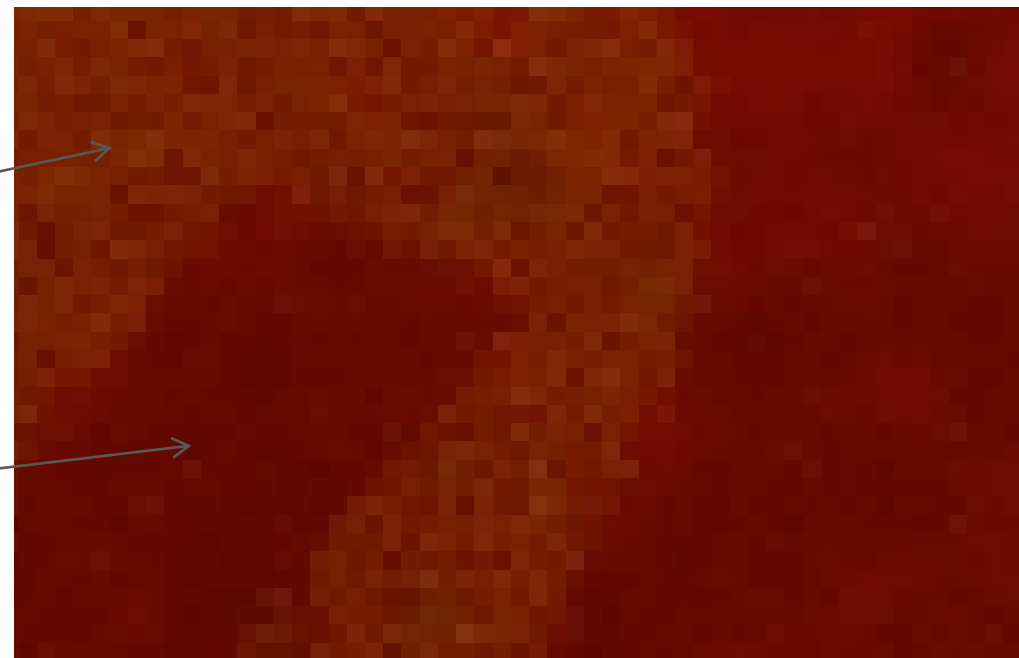
# BACKGROUND

- › When investigating the CampfireParty sequence, we found some strange artifacts. Noise seemed to vary with color a lot in the uncompressed 4:2:0.



noise

no noise

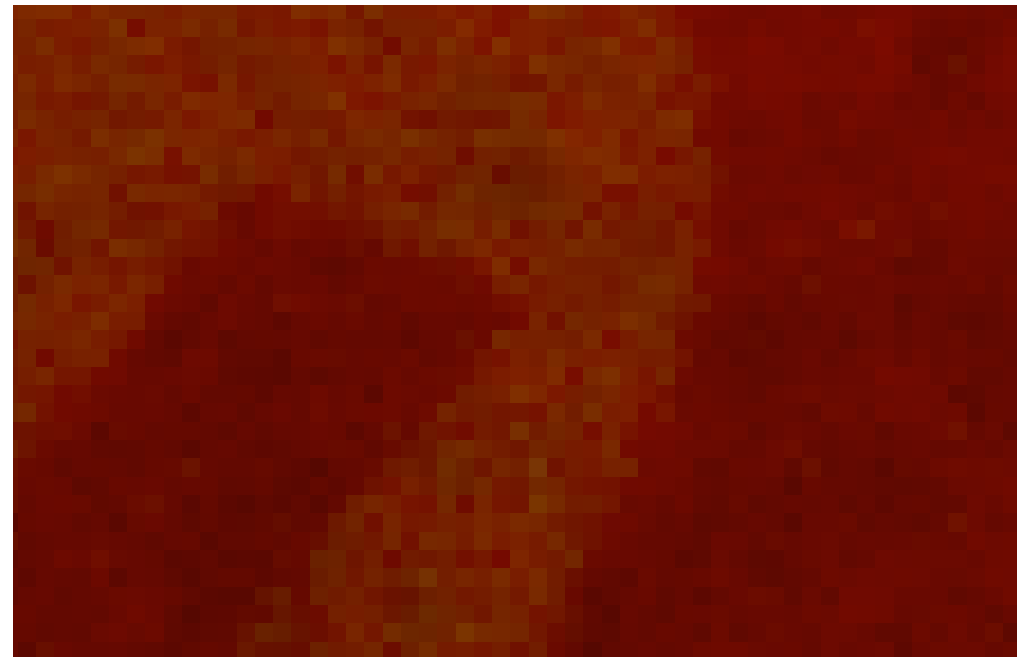


JVET test sequence 4:2:0 uncompressed

# BACKGROUND

- › When investigating the CampfireParty sequence, we found some strange artifacts. Noise seemed to vary with color a lot in the uncompressed 4:2:0.
- › The original 4:4:4 sequence showed no such strange noise behavior.

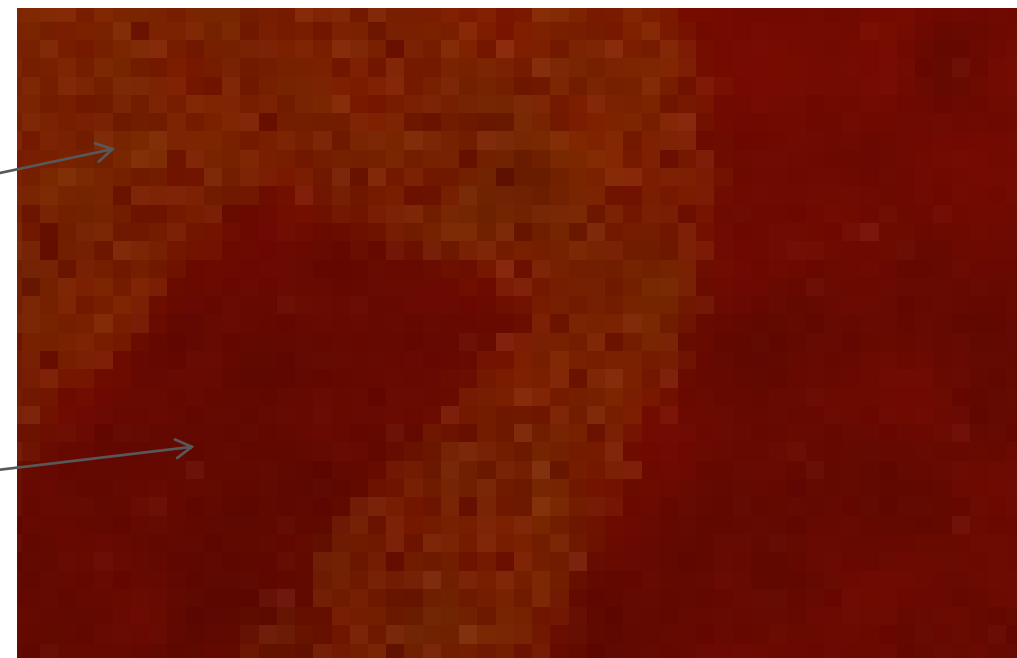
4:4:4  
data



noise



no noise

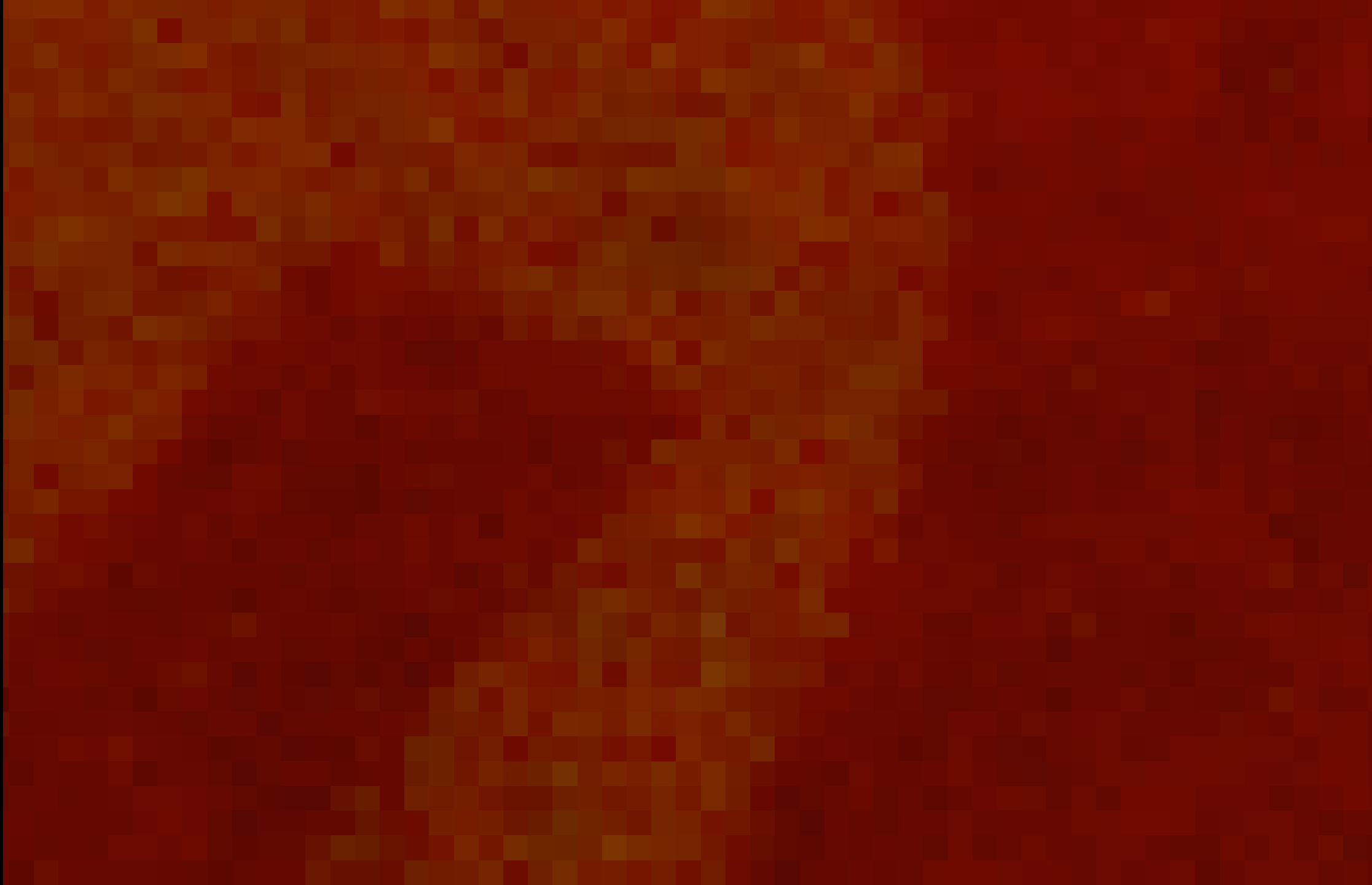


JVET test sequence 4:2:0 uncompressed

4:2:0



4:4:4



# BACKGROUND

- › From the work on HDR video in MPEG and JCT-VC, we know that NCL Y'CbCr with a highly non-linear transfer function such as PQ can give rise to noise amplification during subsampling.
- › Could this be the case here too?
- › Test: subsample the 4:4:4 sequence. Same artifacts appeared.
- › Hence, the subsampling is to blame.

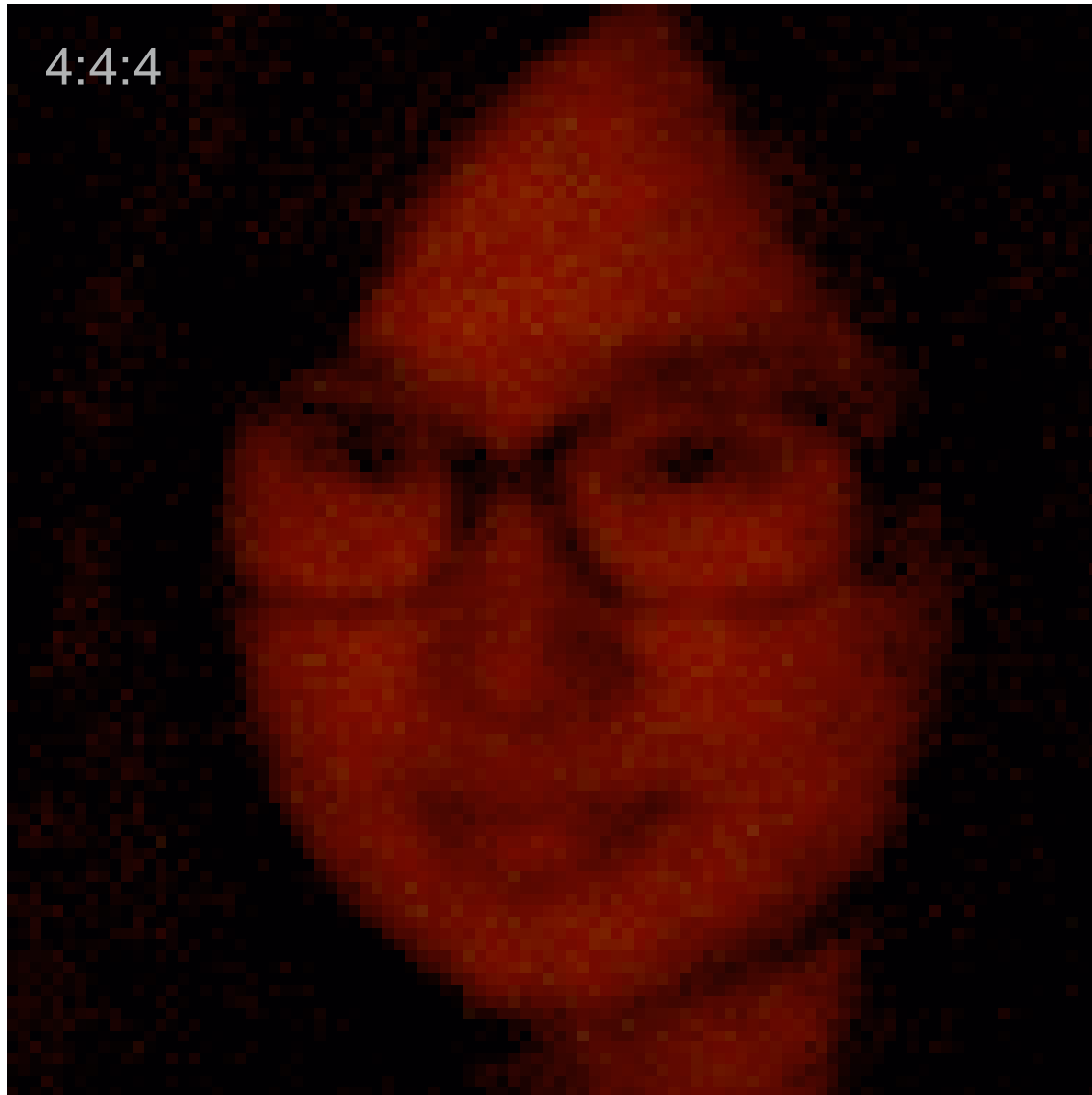


original 4:4:4



subsampled 4:2:0

# ARTIFACTS









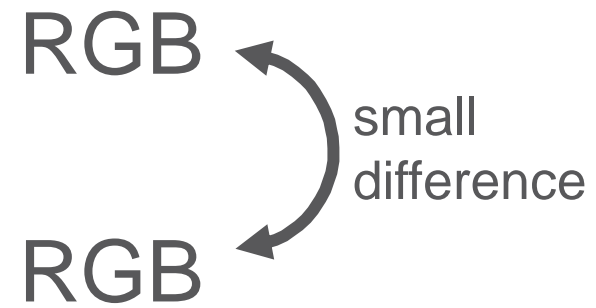
# PROBLEM



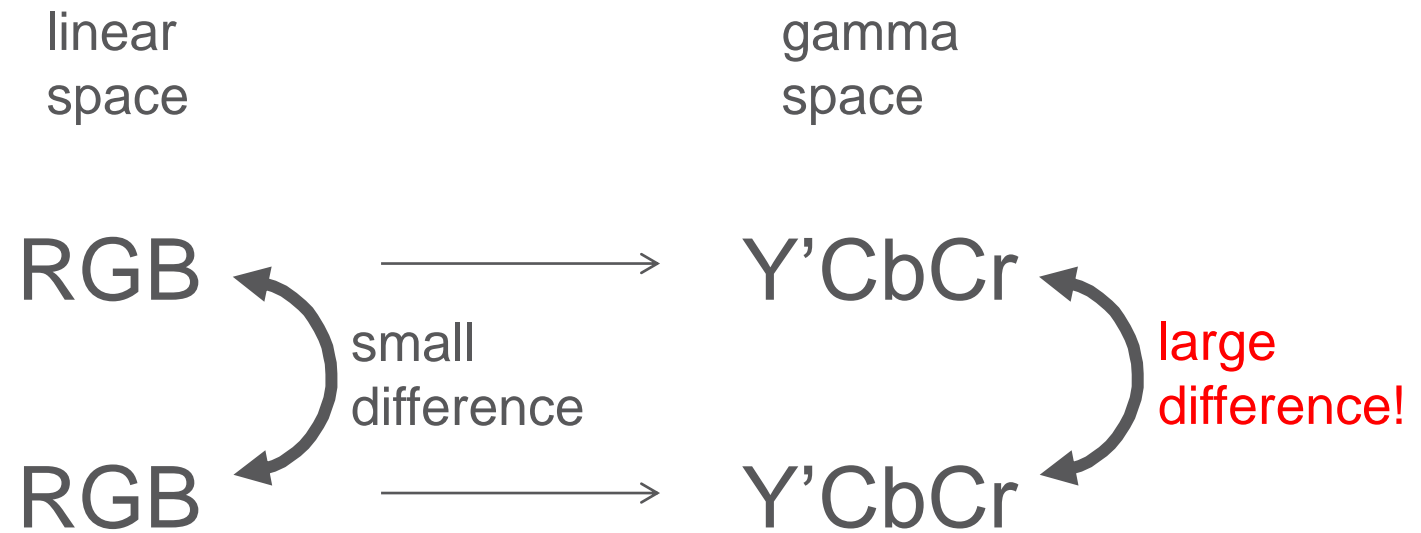
# PROBLEM



linear  
space



# PROBLEM



# CHROMA ADJUSTMENT



linear

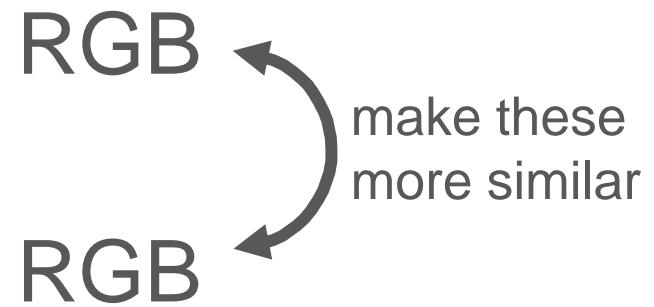
RGB

RGB

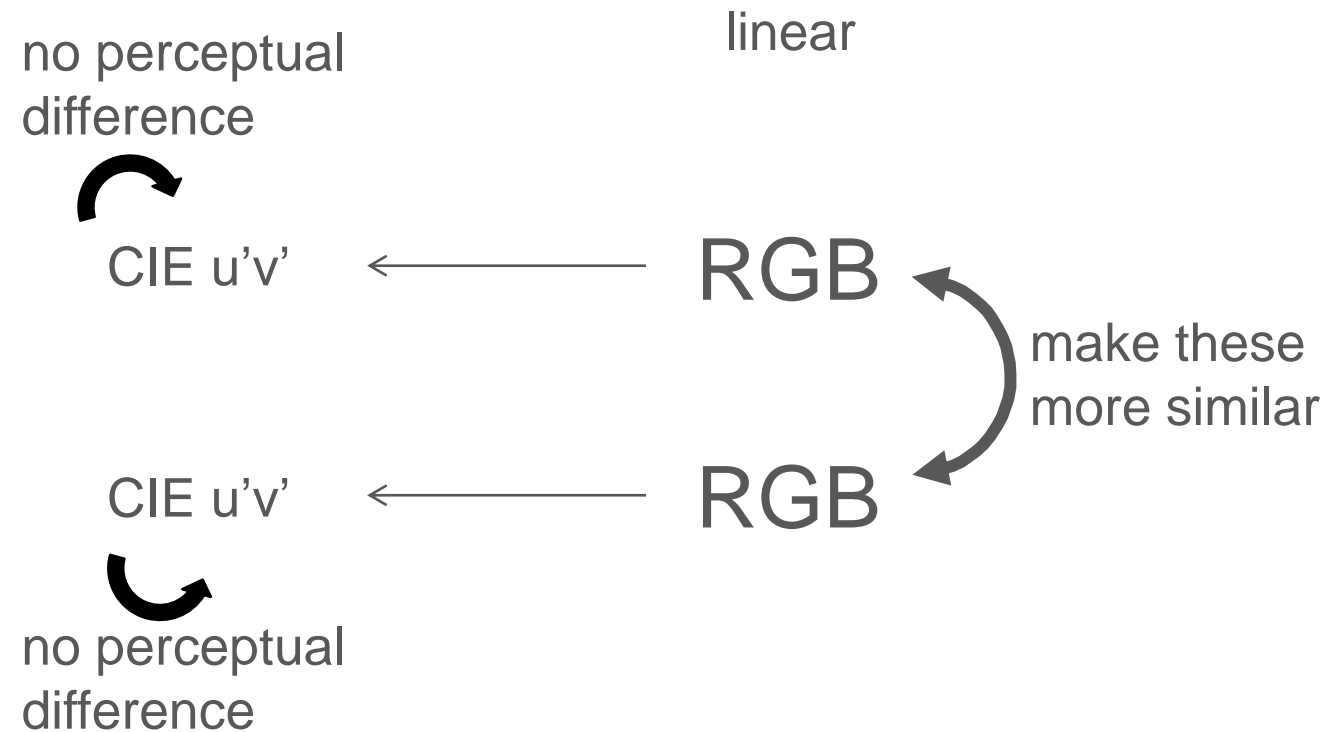
# CHROMA ADJUSTMENT



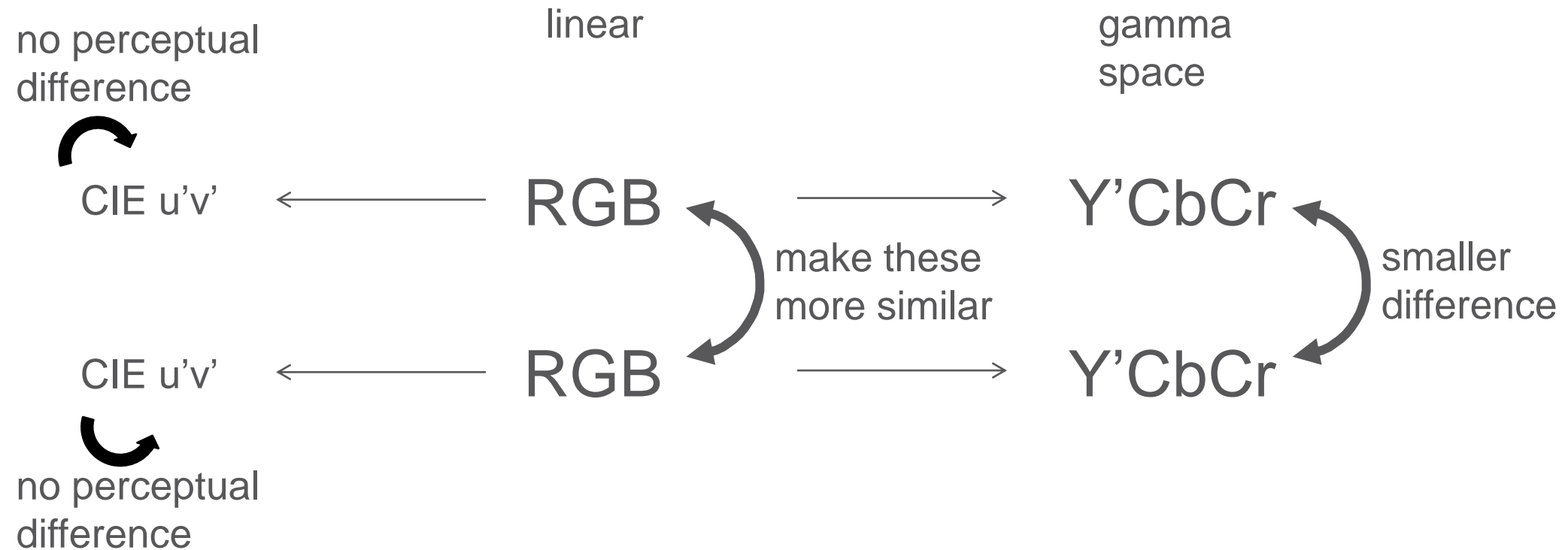
linear



# CHROMA ADJUSTMENT

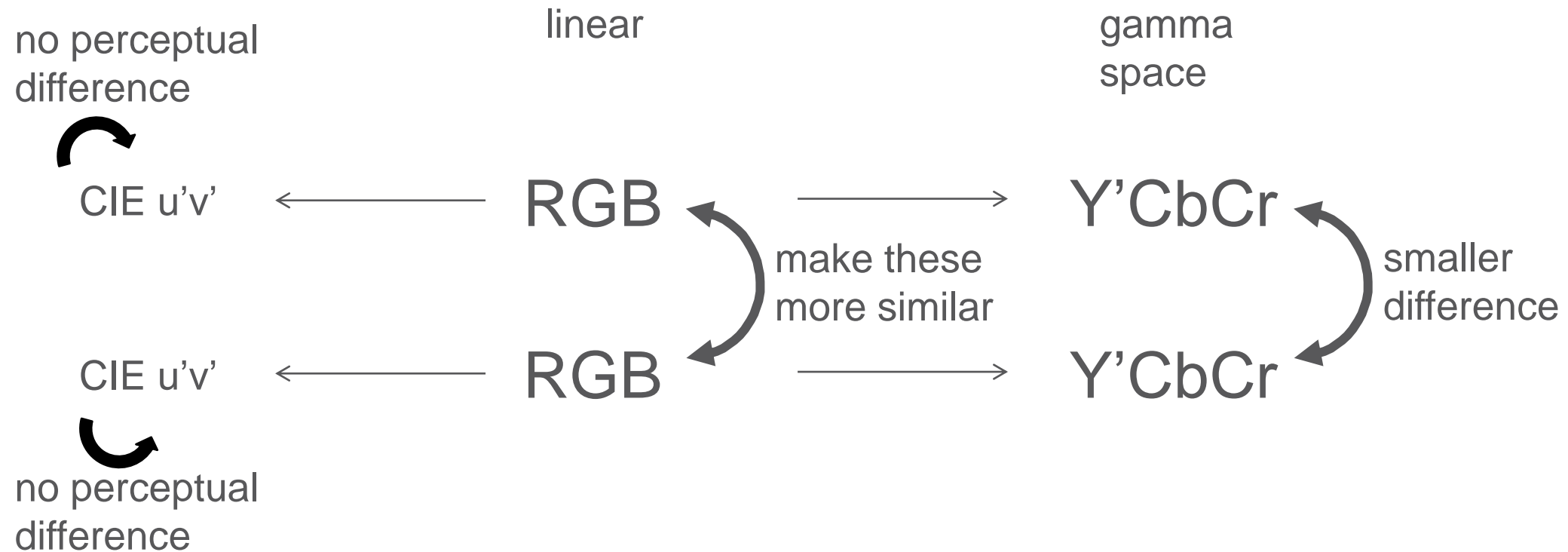


# CHROMA ADJUSTMENT





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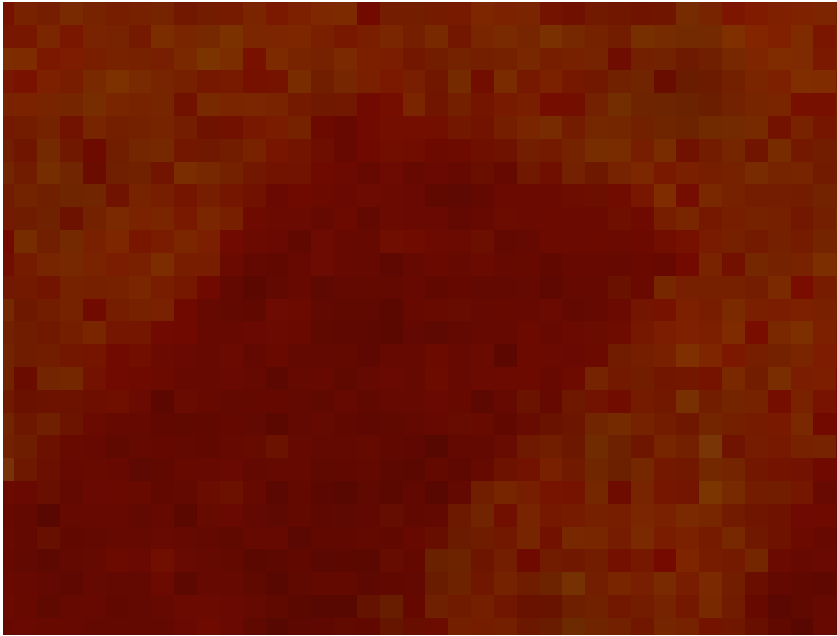
luma is also changed to match original luminance

# EFFECT

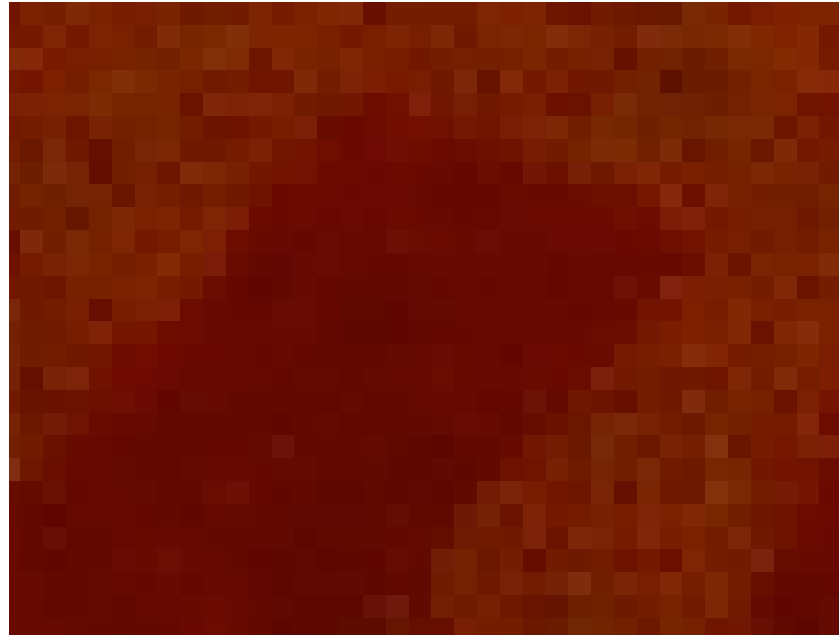


- › Avoids noise amplification
- › Avoids noise suppression
- › Avoids blurring

# NOISE AMPLIFICATION AND SUPPRESSION AVOIDED



original 4:4:4

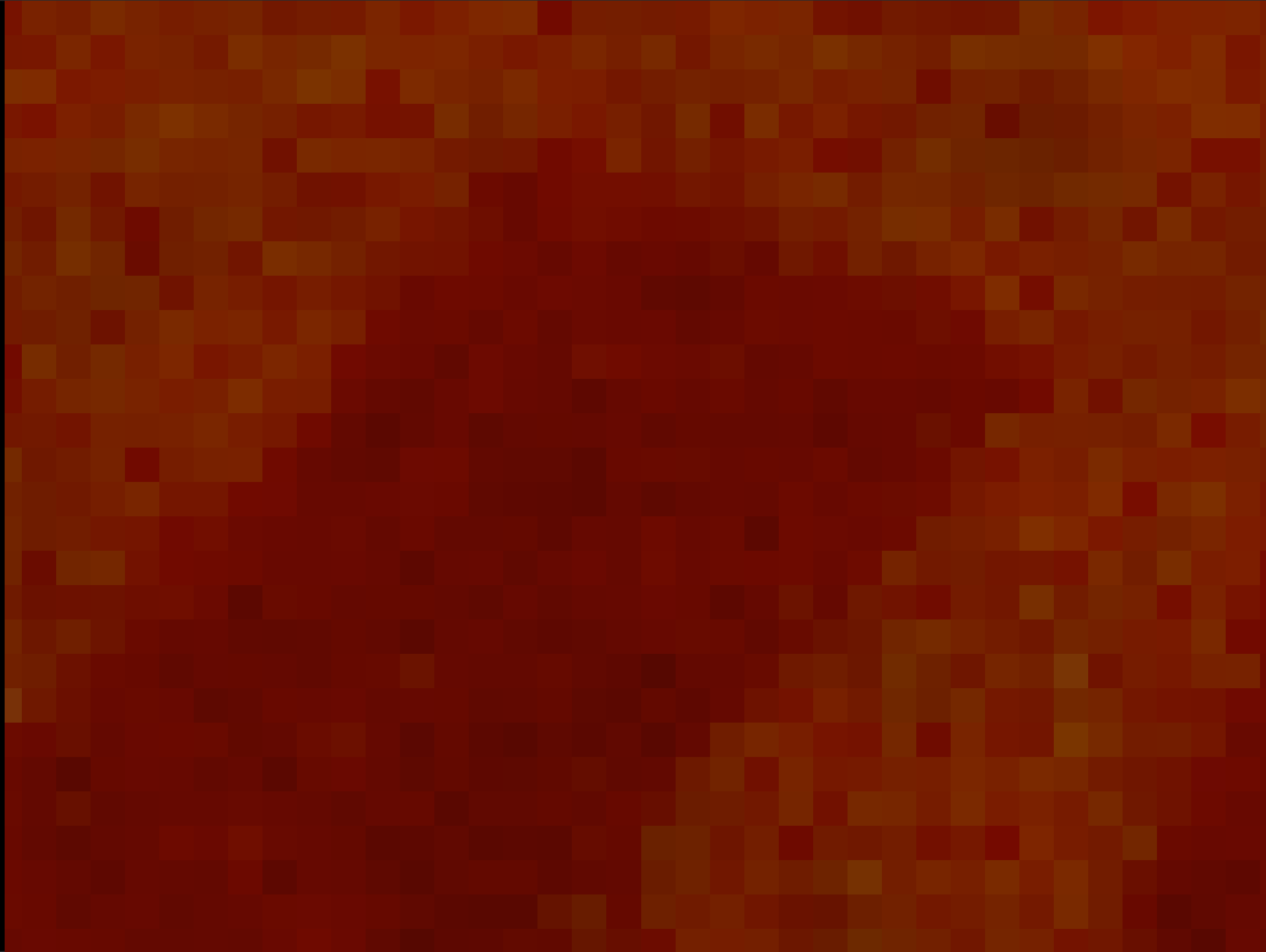


current JVET 4:2:0  
(uncompressed)



proposed 4:2:0  
(uncompressed)

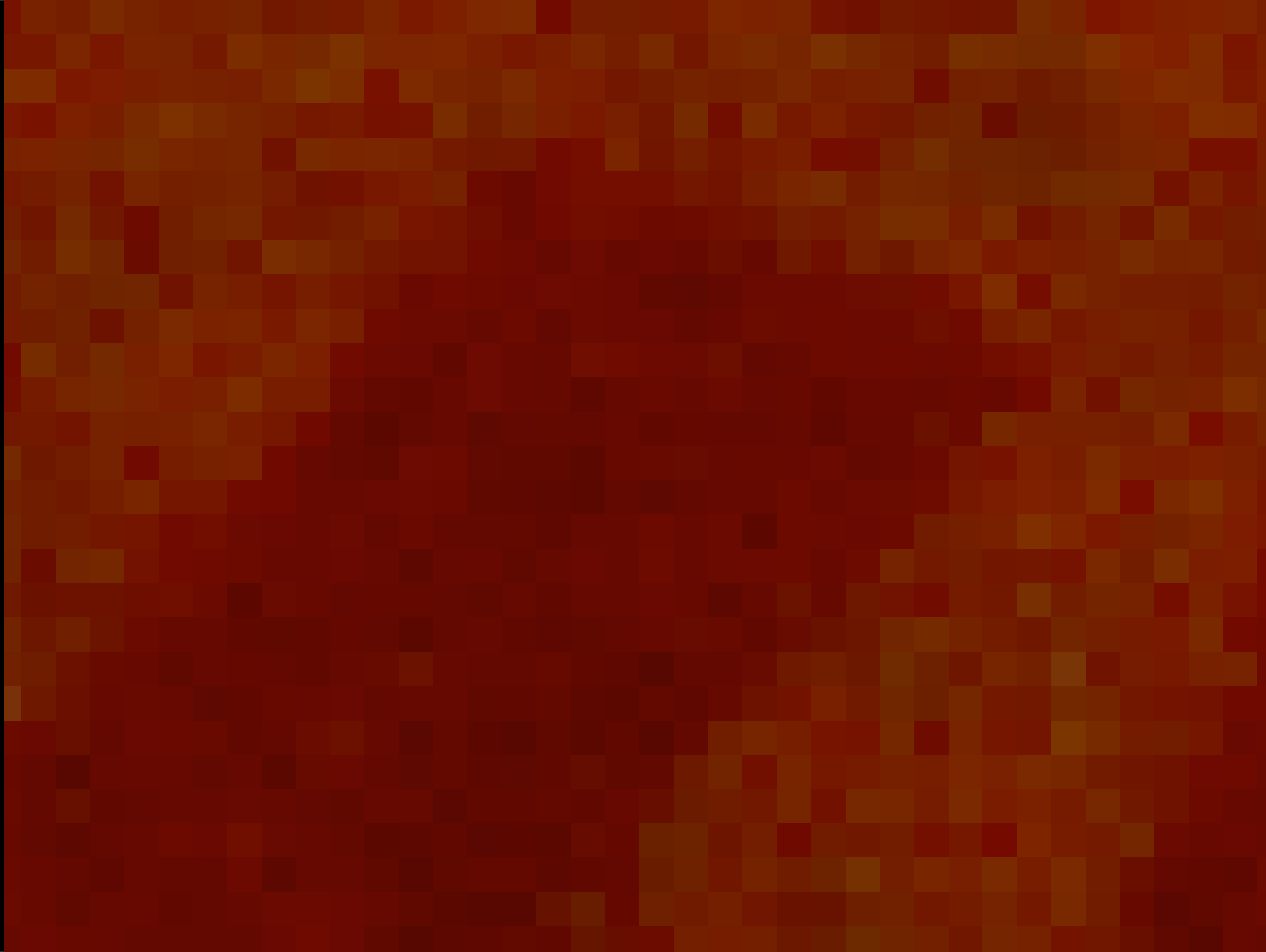
original  
4:4:4



current  
4:2:0



original  
4:4:4



proposed  
4:2:0

# COMPRESSED QP 22





# COMPRESSED QP 22



original 4:4:4



current 4:2:0



proposed 4:2:0

# LUMA SIMPLER

current  
4:2:0



proposed  
4:2:0



current  
4:2:0





proposed  
4:2:0

# OBJECTIVE MEASUREMENTS



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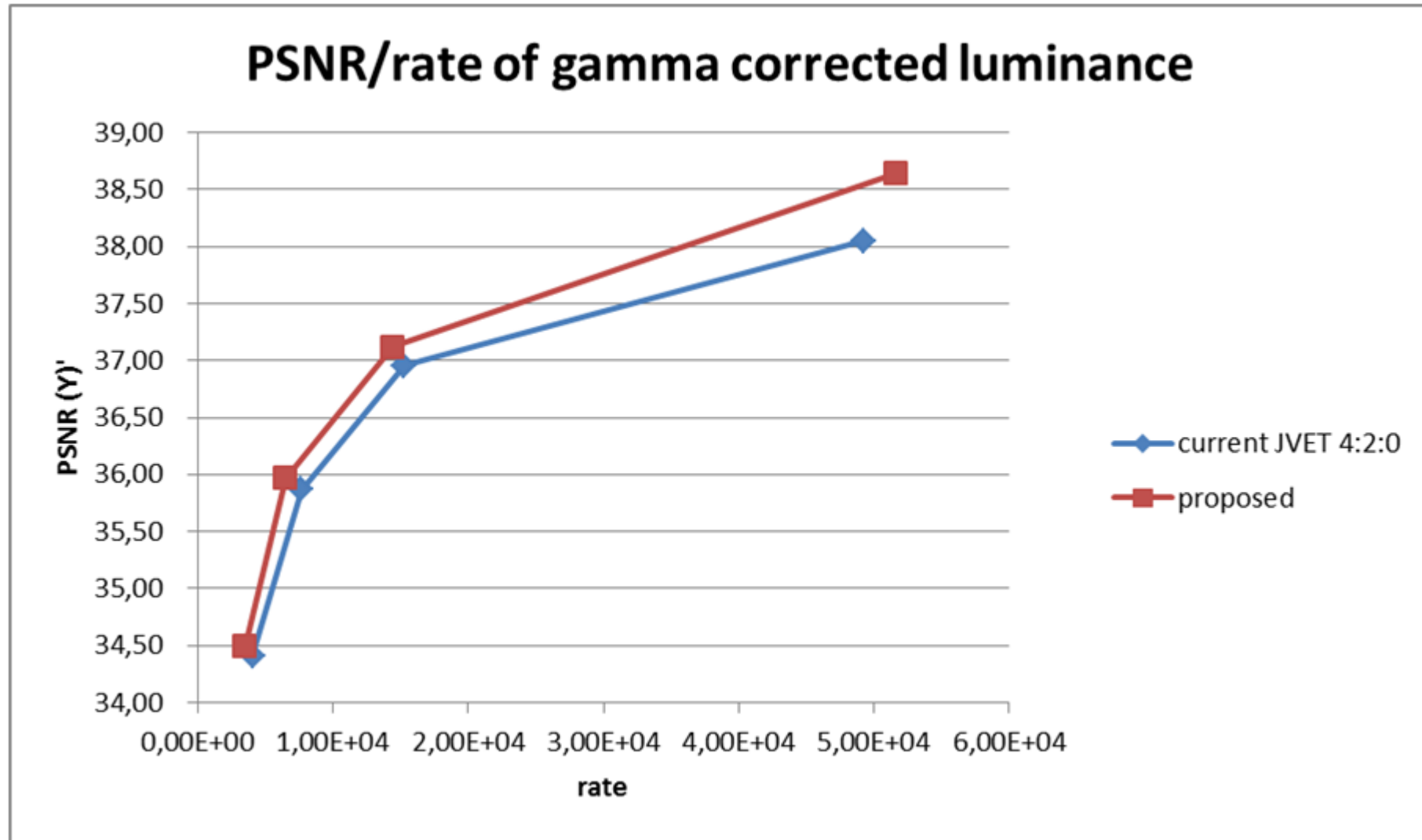
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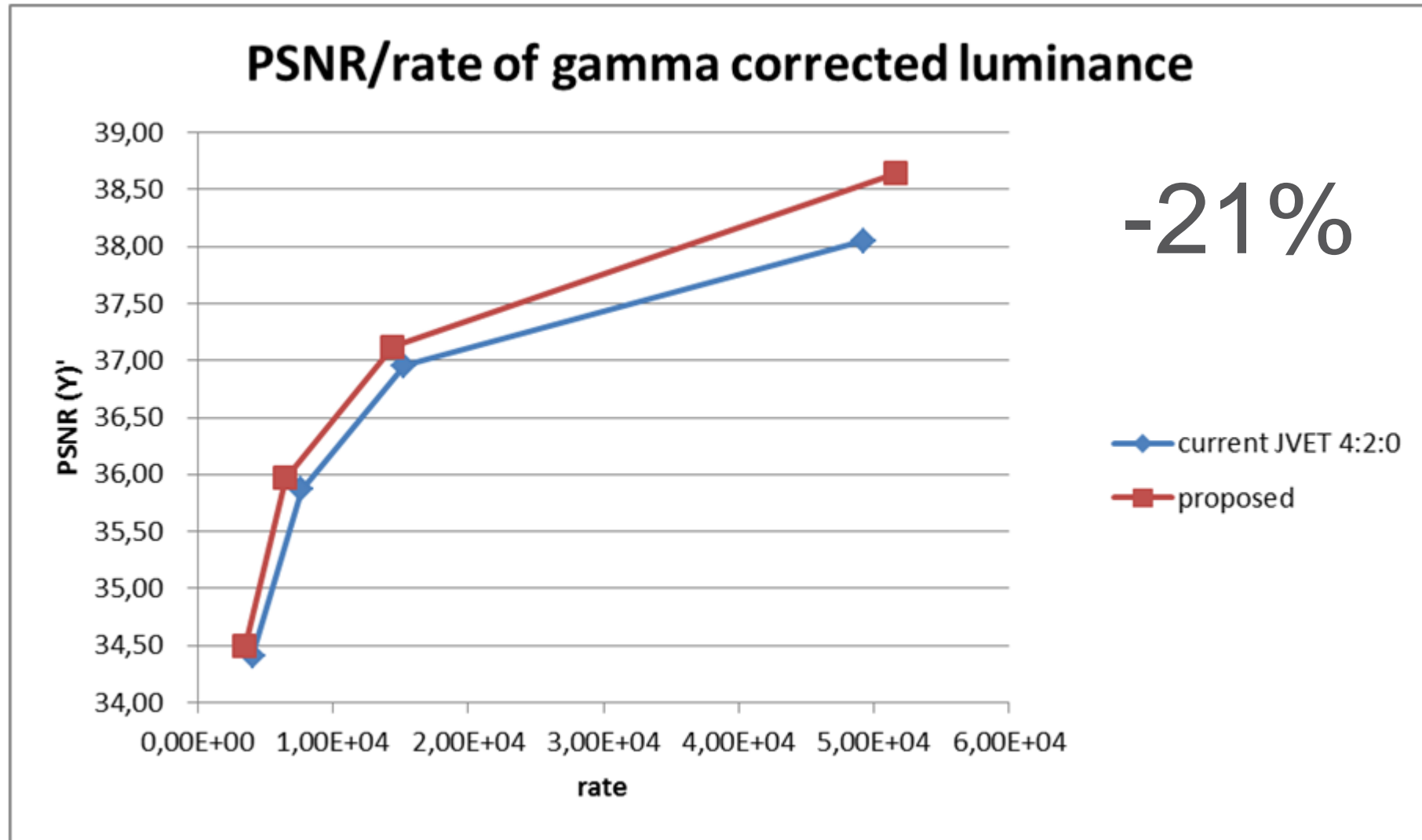
BD-rate



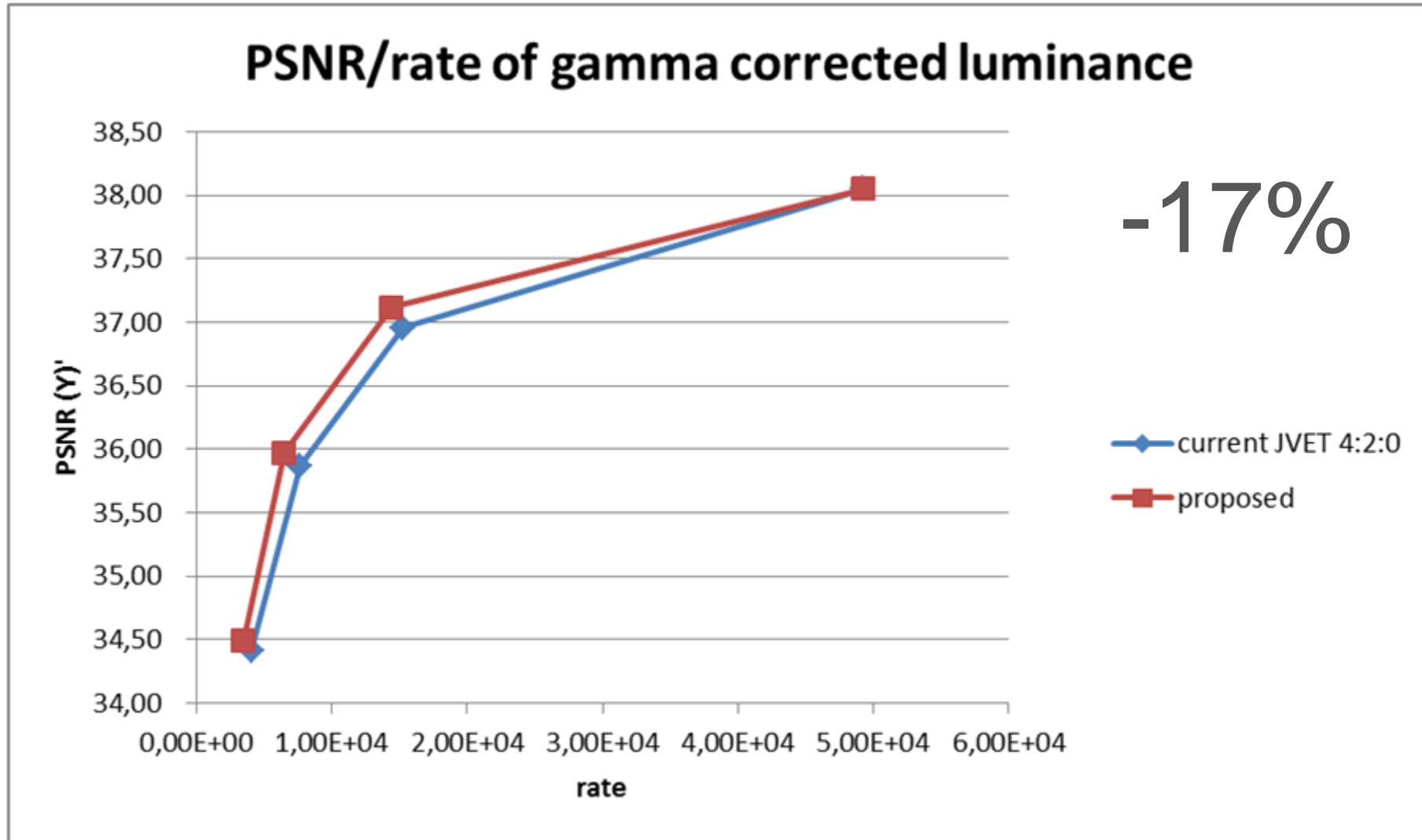
# OBJECTIVE MEASUREMENT RA



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# EXCLUDING HIGHEST RATE

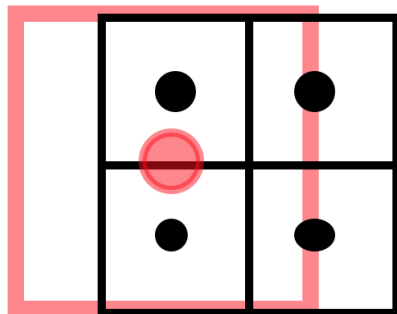


# CHROMA POSITIONS

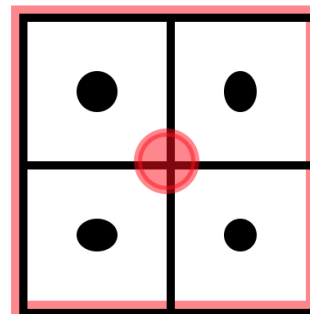


- › During this work, it was also rediscovered that the chroma positions seems to be in the wrong place. It should be Type 2 but was Type 1.
- › This was taken into account when doing the objective measurements.

Type 0



Type 1



Type 2

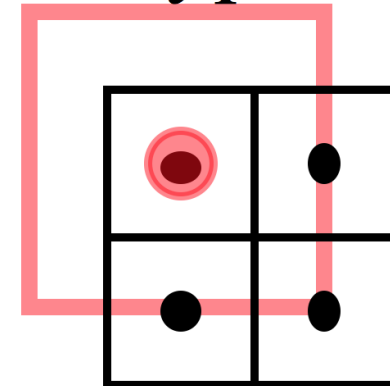


Image taken from C. Fogg JCTVC-AB0027

# CAVEAT

- › JVET-G0004 reports that the conversion to Y'CbCr has been done incorrectly.
- › Therefore, the original 4:4:4 sequence we have used as our starting point is not correct, and result may differ once the new 4:4:4 sequences are available.
- › However, we have looked at the first frames of the new sequences, and the noise amplification effect still appears in a 4:2:0 subsampled version.



4:2:0 subsampled  
from new 4:4:4 sequence



4:2:0 subsampled  
from new 4:4:4 sequence



# PROPOSAL



- › We proposed to replace the 4:2:0 version in CampfireParty with a new version
  - The new version should have the correct chroma positions
  - The new version should be subsampled using the proposed method.
- › We propose that 4:4:4 versions of the test sequences should be made available.



**ERICSSON**