

Euro 2020 in Ultra HD

Consumer experiences

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kpn. Het netwerk van Nederland



Contents

NPO 1 Ultra HD in 4K and in High Dynamic Range,
available during Euro 2020 from 17 June until 12 July 2021

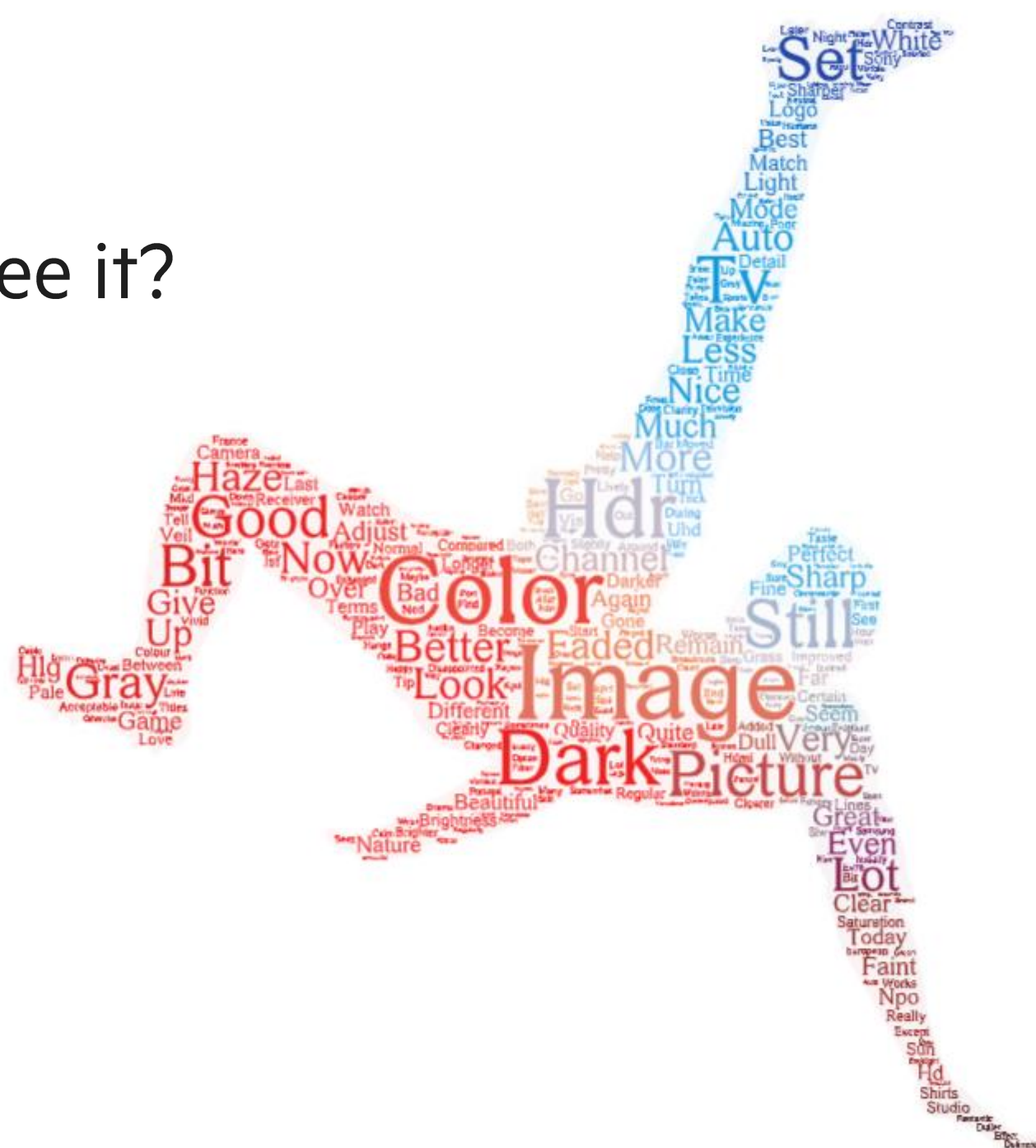


How many households could receive it?
Which technical choices made in distribution?
What was the result in the living room?
What can be improved?





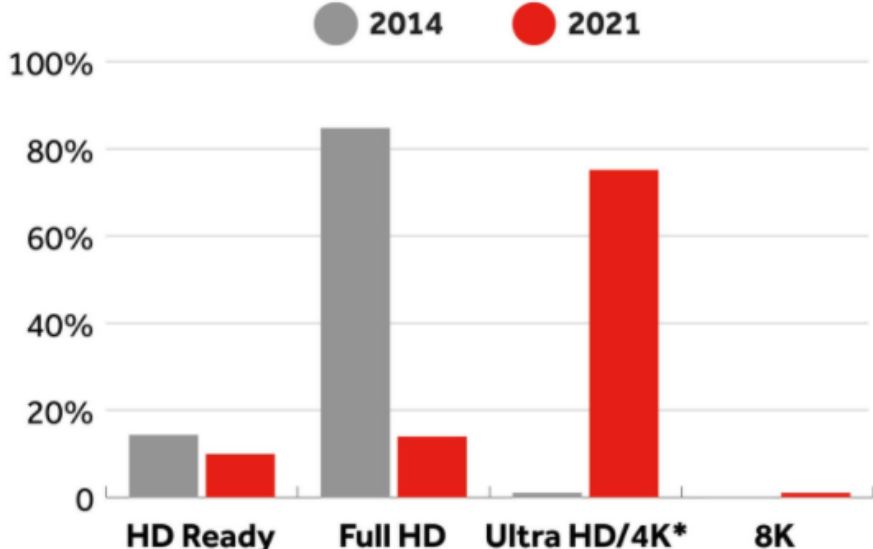
Who could see it?



Summer 2021 Netherlands: nearly 50% of households has one or more ULTRA HD smart TVs



Most sold TV sets in the Netherlands
are Ultra HD
Source GFK



But what is displayed?

Diversity of displays in living rooms

Older HDR SMART TV sets produce less light

- Most new smart TV sets produce 700 NIT's
- Many TVs sold in 2016 to 2018 only produce 350 NITS or less.

HDMI capabilities

- Some old TV sets do not support HLG (HDMI 2.0b)

Some audio bars or cinema systems are limited to HDMI 1.4 or HDMI 2.0a

- Downgrading the TV signal to SDR or HD SDR, when they are not correctly connected



Distributors are catching up: Receivers are the bottleneck

Limited number of customers has an Ultra HD capable receiver (Set top box)

But numbers are growing



All new KPN iTV receivers are Ultra HD capable.



- Default for new customers
- Active swap for upgrading to Ultra HD package (4K package)
- Life cycle management, old boxes will be replaced with new Ultra HD receivers.

Summer 2021

20% of KPN iTV households has one or more UHD receivers



HD



HDMI 2.0b



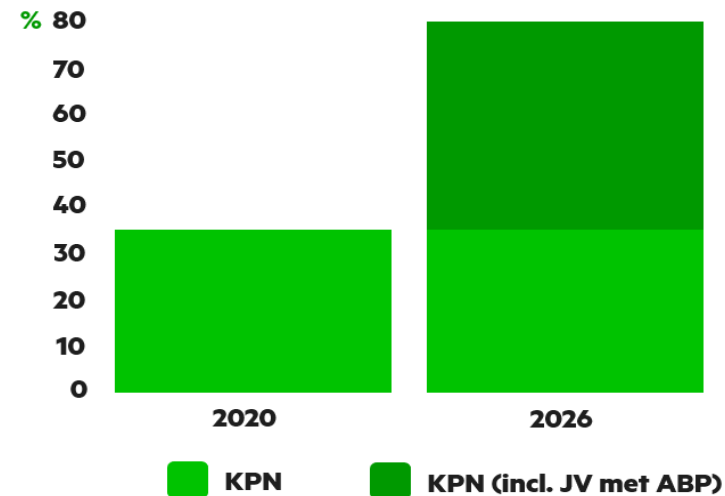
HDMI 1.4

Bandwidth can be a limitation

Summer 2021:

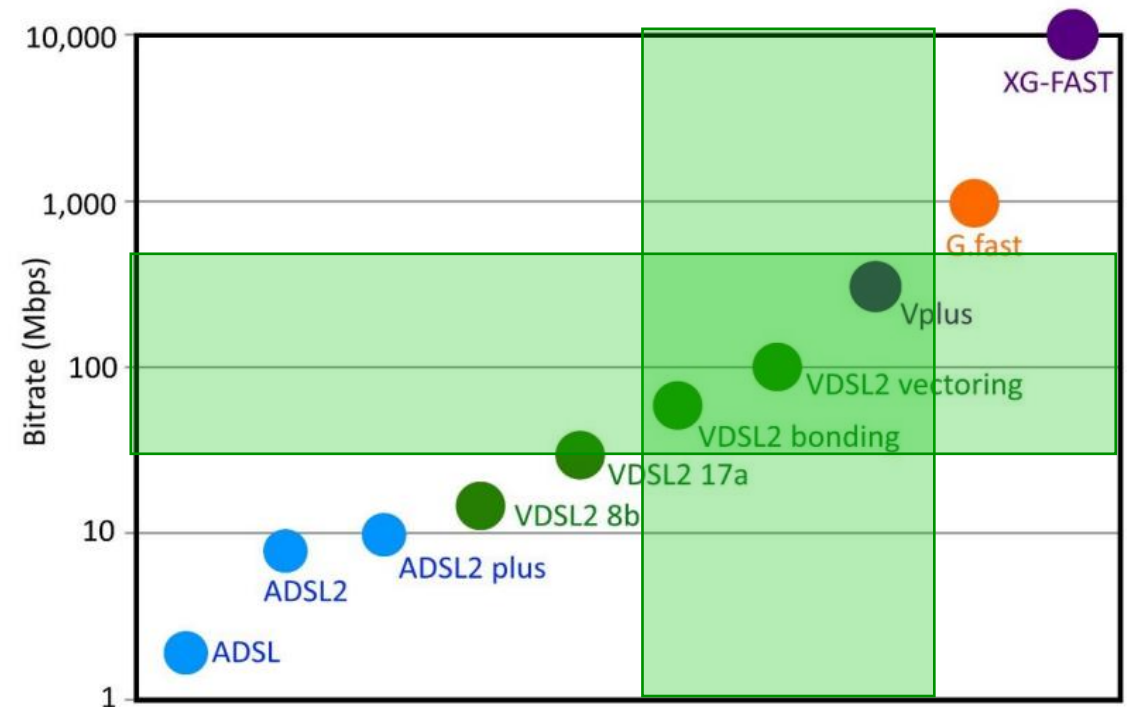
89% of households with KPN UHD receiver has bandwidth for 4K

Numbers are growing due to investments in glass fiber and upgrading existing copper.



KPN has upgraded the copper network (DSL)

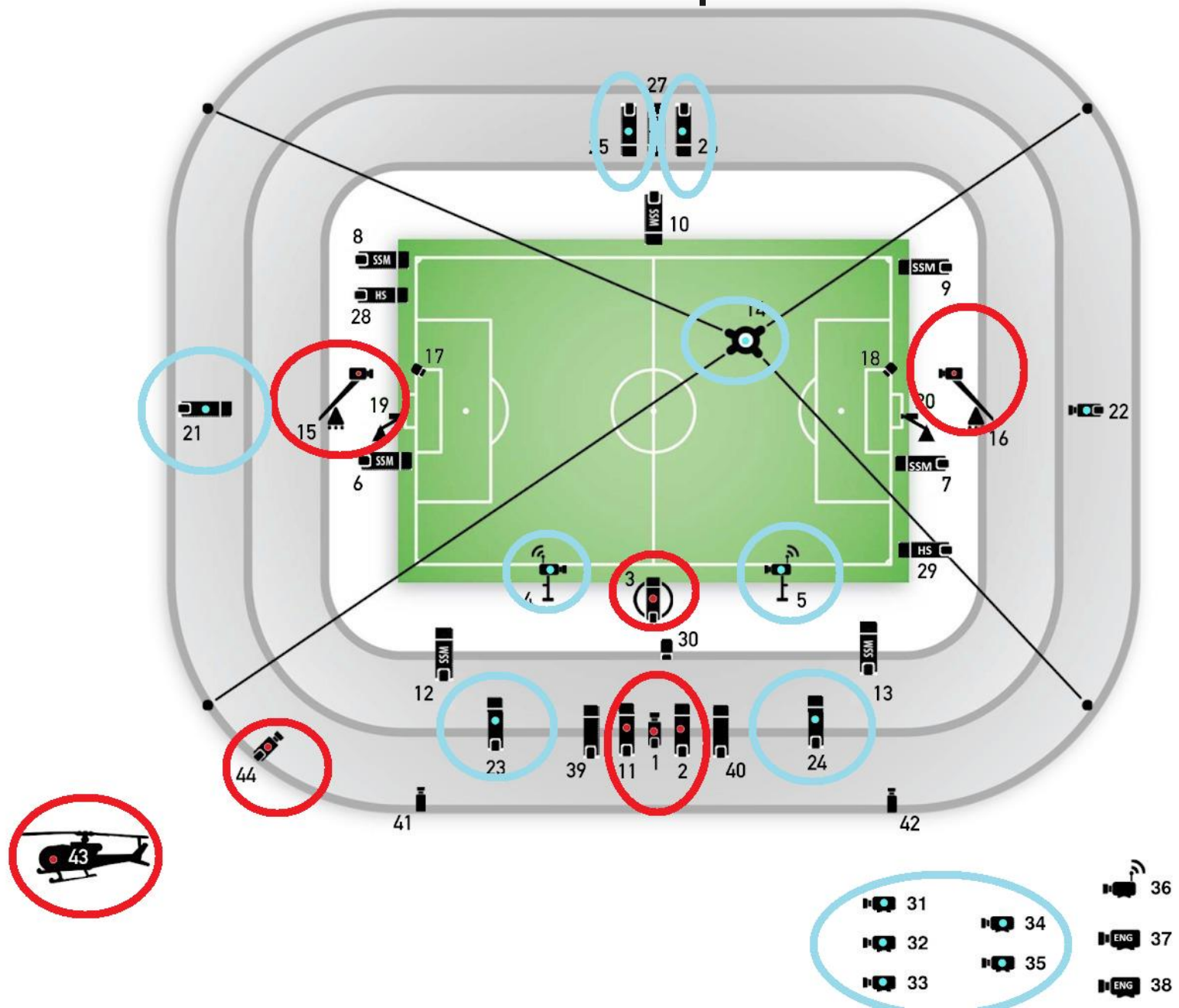
- All glass fiber customers have enough bandwidth
- Bandwidth of copper DSL connections vary with the distance to homes.
- Vplus and Pair-bonding roll out has resulted in an increase of average customer bandwidth allowing Ultra HD on DSL.



UEFA Euro 2020

production

Stadium camera set up



The production was hybrid, contain 2160p HDR, 1080p HDR and 1080p SDR sources

NPO used the 2160p50 HDR HLG feed.

Key – Camera Format

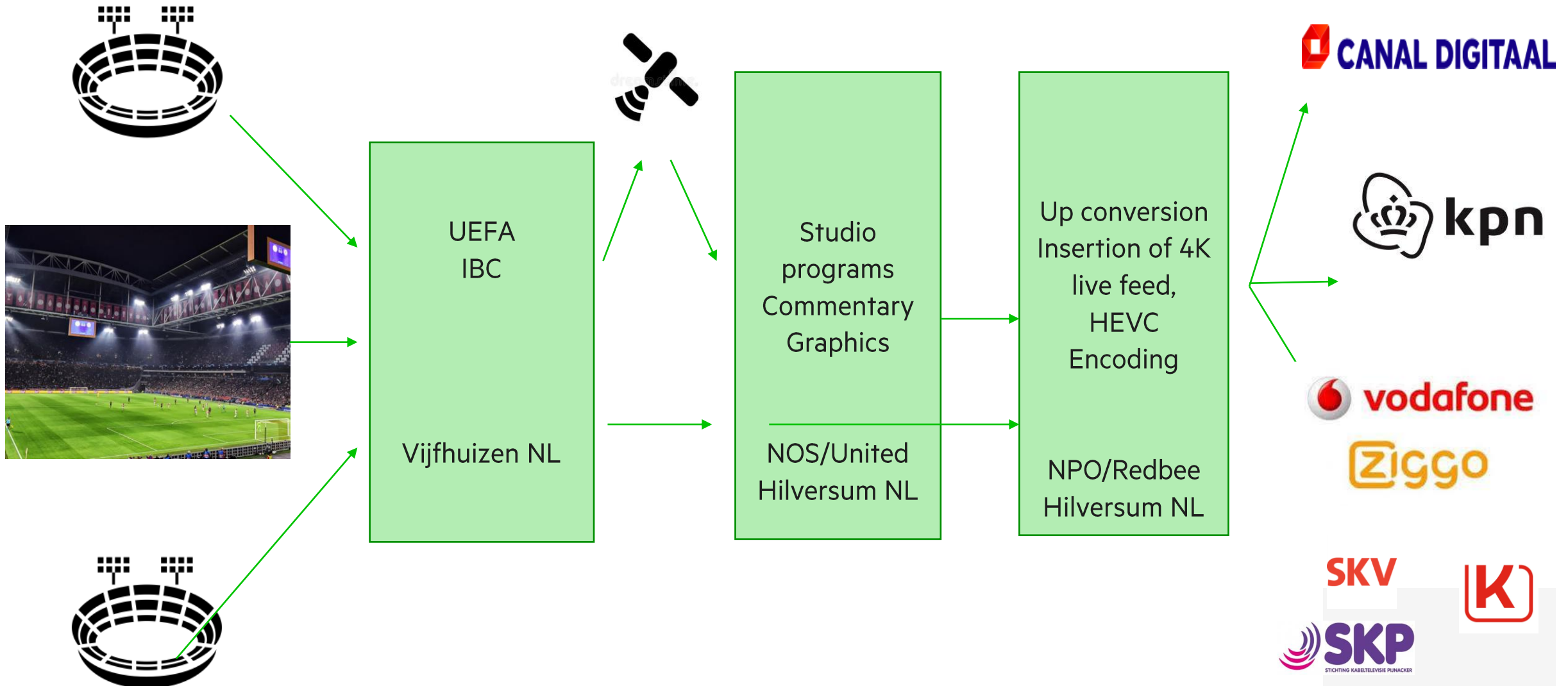
- 1080p SDR
- 1080p HDR
- UHD HDR



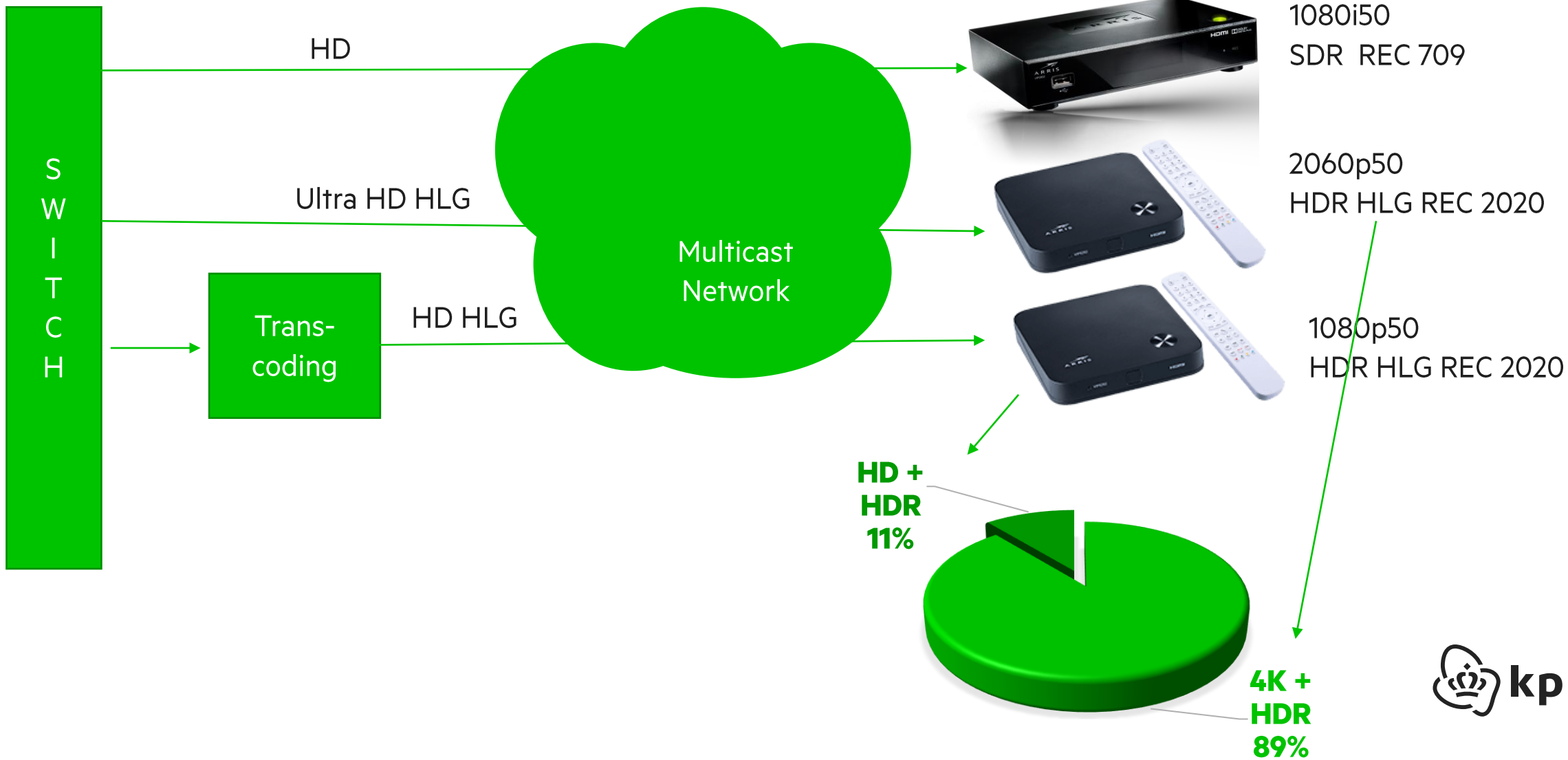
NPO1 Ultra HD

Trial

NPO1 and NPO1 UHD chain



Distribution of NPO1 Ultra HD



KPN Forum

- On the KPN forum customers could share their experiences.
- 774 reactions were logged.
- About 50 reaction could be traced back to the equipment used by the customers
- Many customers had to adjust their TV sets to get an acceptable quality.
- Many customers experiences the image to be too dark during daytime matches or experienced a “gray”, “foggy” or “pale” image.
- There were many responses to the missing graphics during the first two days of the tournament.



retrospective

Analysis made by
Gerhard Nevenzel (Vodafone
Ziggo)

June 18 SWE-SLO HD signal in Rec 709



June 18 SWE-SLO 2160p50 HLG Rec 2020



June 18 SWE-SLO 2160p50 SDR Rec 2020



What does the analysis show?

The first 3 slides from the opening match show:

HD

The HD image has a good color and dynamic range

Ultra HD

Not so good for 4K HLG

Very narrow color and brightness, giving a hazy look

Ultra HD watched in SDR

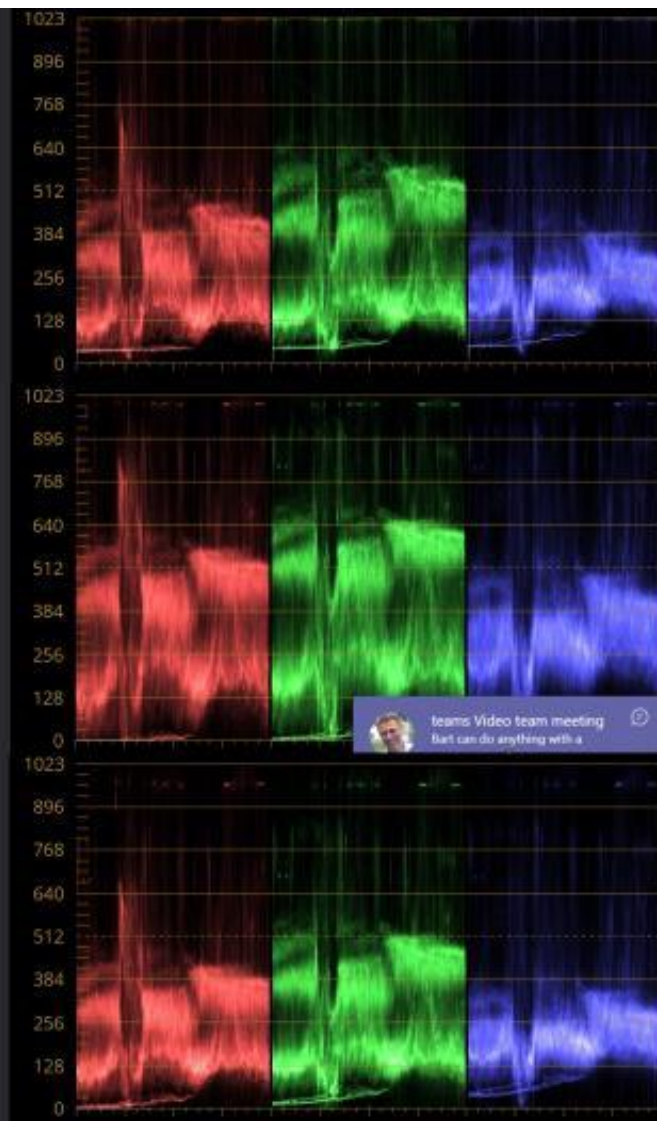
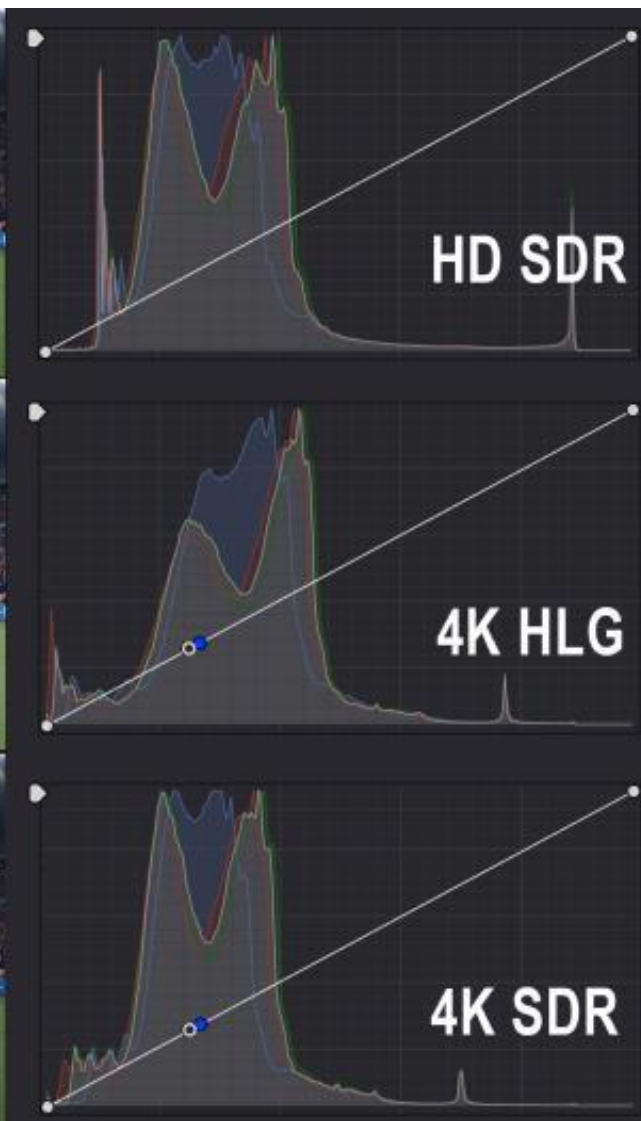
It is even worse when you would watch it in SDR.

The image is displayed too dark.

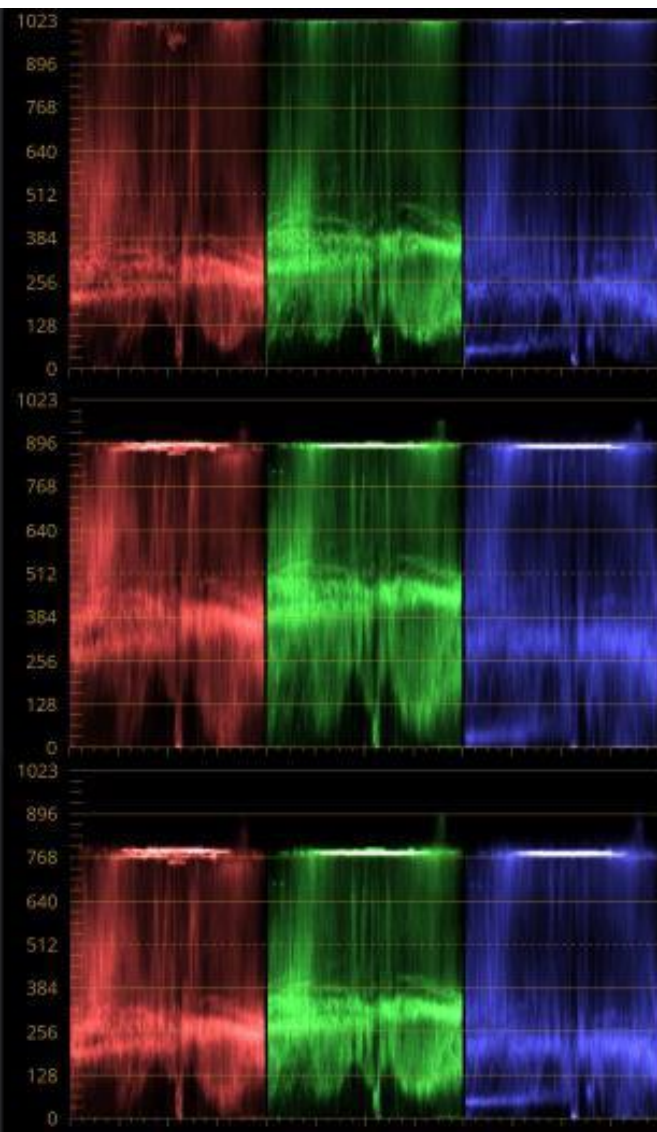
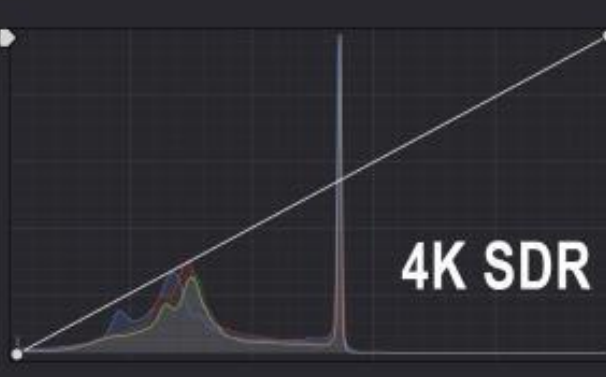
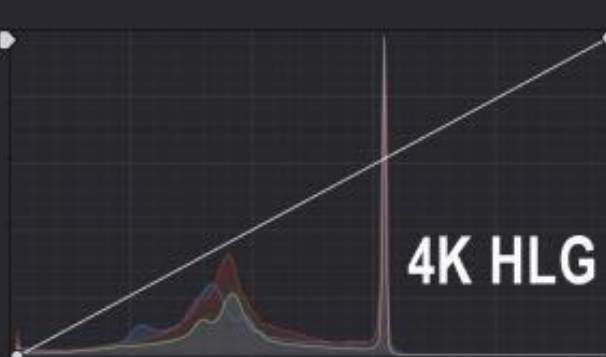
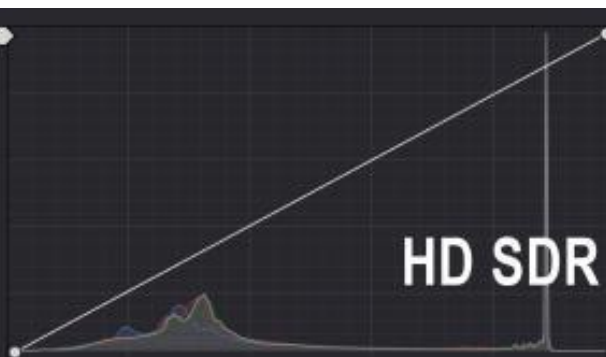
The rest of the tournament some matches were covered in a better quality, but the extra f-stops that HDR gives still seemed hardly used and the colors were never intense.

The analysis results seem to match the consumer observations

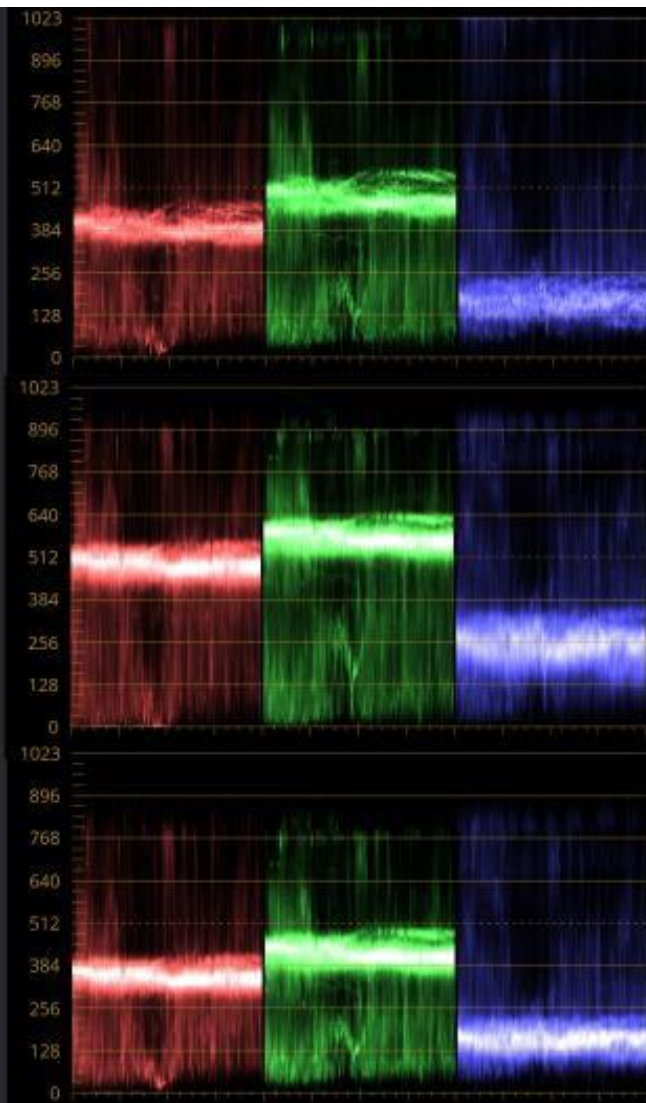
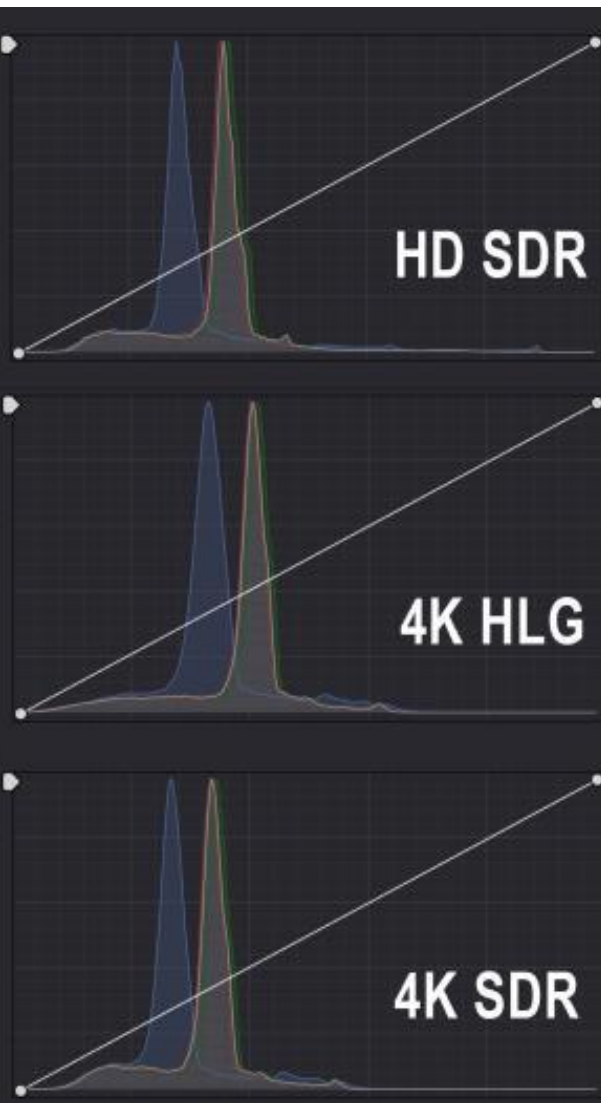
June 23 POR-FRA



June 27 NED-TSJ



Jul 11 ITA-ENG



Conclusions

NPO 1 Ultra HD was a successful project trial.

The signal was distributed over six cable, satellite and IPTV distributors.
All parties involved managed to get it to work.

TV sets with Ultra HD capabilities becoming a majority in households.
Distributors are catching up, but still have a low penetration of ULTRA HD receivers.

Older TV sets are limited in NITs they produce.
TV contrast and brightness settings on the TV do not compensate for this.

HDMI interfaces and lack of HDR capabilities on TV sets can spoil the fun.

Production choices made by UEFA resulted in too dark and “foggy” in combination with displays in the living rooms in many cases.

Thanks fo your attention

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