VISLINK HCAM – HOW QUALITY AND EFFICIENCY ENABLES IMMERSIVE VIEWING

We are now in an age where video platforms are innovating and evolving at a rate never previously witnessed. The choice of content available to the viewer has never been greater. And in the battle for the viewers eyes one program format still has the power to captivate – Live events.

Across the globe, over 50% of the most watched TV programs last year were Live events. Big budget episodic shows are however impacting on Live TV - Viewers are now demanding the same quality of production in Live events as they see in big budget drama. They want to feel like they are there - they want immersive viewing! To achieve this, producers of Live content are looking to new, immersive and cinematic mobile camera views. This presents a challenge to the Live production teams - The new camera views must match the quality of the rest of the production and the demand for mobility means that the cameras need to be wireless.

DELIVERING ON THE DEMAND FOR QUALITY

Understanding the content flow of video through the production process is crucial to delivering on the requirement for quality. Video content passes through many processes to reach the consumer. Local on-site production, International content distributor/rights holder, regional broadcaster and consumer TV platforms may all play a part in content delivery and at each stage that video may undergo some processing. After all the processing, the video quality must still reflect the prestige of the event.

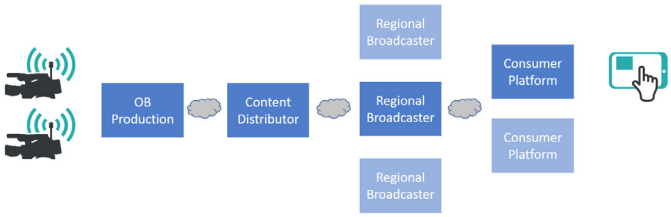


Figure 1 Multiple video processing stages in the content delivery chain

To ensure that video quality is maintained through the broadcast chain, both the color and the luma of the video picture must robustly withstand the effects of multiple stages of compression from source to consumer. High quality 4:2:2 chroma profile must be used from source to protect against color bleeding across edges that occurs with lower profiles. This profile also ensures crisp reproduction of on-screen graphics and realistic edges to any down-stream chroma key processing,

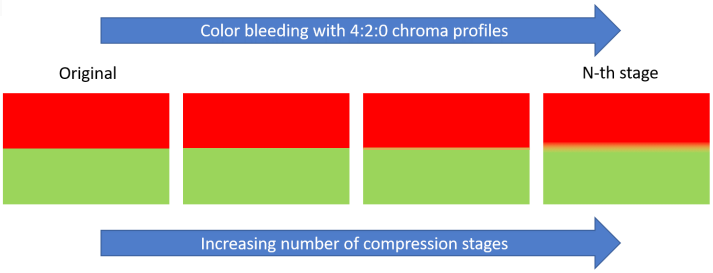


Figure 2 4:2:0 chroma video degrades as it passes through successive compression stages

The quality of the luma must be similarly protected. Whilst some wireless camera solutions have deployed video compression technology that utilizes 8-bit luma quantization, it has been found that these solutions can suffer from posterization or luma banding effects on picture areas of gradual brightness change.

Figure 3 How 8-bit luma video suffers posterization artefacts compared to 10-bit luma video

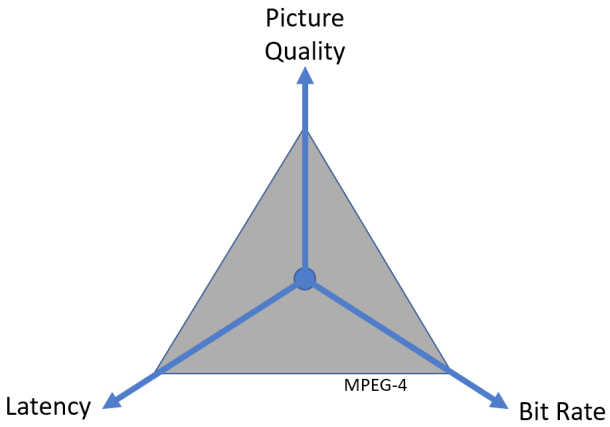
Both degradations can become significantly more pronounced and obvious as consumers migrate to larger displays and take advantage of the new higher quality formats of 4k and HDR. So use of the higher quality tools at the very source of the video chain is a must.

THE VALUE OF COMPRESSION QUALITY

With 4k resolution images requiring raw data rates of 12Gbit/s, video compression technology is the key enabler for wireless cameras. Compression provides the ability to reduce the raw data rate off the camera and deliver high quality video within the bandwidth restrictions of international frequency band allocations. The quality of this video compression matters to ensure that the quality of the image is not degraded at the very start of the production flow. But there are compromises to be made.

Figure 4 Good quality Vs poor quality compression

Clearly bit rate and bandwidth usage affects picture quality – but there is an end-to-end latency consideration too. If a wireless camera is required to match the latency of wired cameras - in order to seamlessly cut between views, then there may have to be a picture quality impact or bit rate increase to consider. The skill in creating wireless camera technology comes from realizing a good balance of low latency, efficient use of bit rate and delivering video quality that compares to that of wired studio cameras.



There is another dimension to consider too – That of Range. The premise of a wireless camera is to deliver images from any location within an event. To do so, reliable, unbroken reception must be achieved.

Wireless video transmissions in an urban environment are subject to many forms of interference but chief among them are reflections of the transmitted signal - creating multi-path signal quality peaks and nulls at the receiving location. OFDM modulation has been well proven to be highly resilient to this type of harsh urban environment reception condition. Vislink has enhanced basic OFDM modulation with advanced Low Density Parity Check Forward Error correction (FEC) techniques and optimized interleaving with the LMS-T system – specifically designed to suit point-to-point transmissions where the transmitter may be in motion.

Range can be optimized by utilizing the best possible modulation technology and choice of appropriate FEC and transmission constellation. The modulation parameter choices directly relate to payload bit rate - meaning that, for an RF transmission, the three-dimensional picture quality, latency, bit rate trade-off now becomes 4-dimenstional.

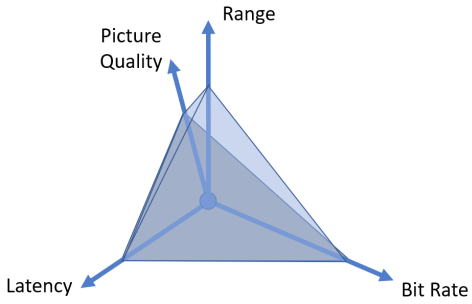


Figure 6 Range as a 4th dimension in video transmission

THE IMPACT OF HEVC

By employing the latest, more efficient HEVC compression algorithm it becomes possible to change the relationship between picture quality, latency and required bit rate – allowing equivalent quality pictures to be transmitted with less bit rate compared to legacy MPEG-4 technology. This compression revolution, given the bandwidth restrictions for wireless cameras, has the power to enable practical deployment of high quality 4k wireless cameras or create space for more HD cameras working within the same RF space. Alternatively, operational parameters can be re-modelled to give more FEC to the transmission to provide greater range – giving the event producers greater operational flexibility.

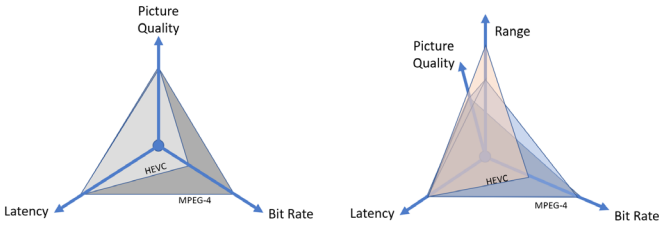


Figure 7 How HEVC compression affects required bit rate and range

CONCLUSION

A wireless camera system needs to draw together what would appear to be competing demands. To move the video image over a limited bandwidth RF link the solution needs to employ highly efficient data compression and RF modulation. This, set against the backdrop of being incorporated into a small, mobile form factor with low enough battery consumption to last the event. Importantly, to give that artistically critical immersive feeling, the wireless camera system needs to deliver high quality images with a low latency to match the production values of the fixed camera infrastructure.

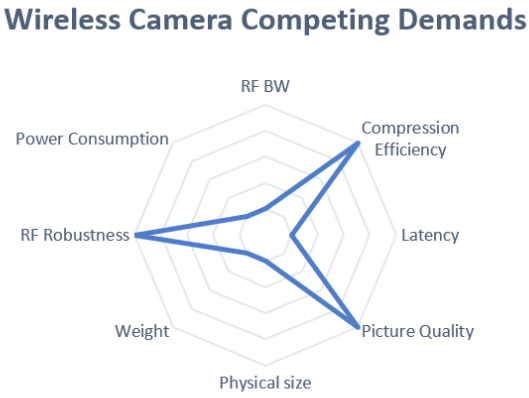


Figure 8 Conflicting needs for a wireless camera transmitter

In the HCAM – 4k wireless camera transmitter, Vislink employs HEVC video compression utilizing 4:2:2 chroma and 10-bit luma profiles - optimized to achieve superior quality, low latency imaging and efficient, robust LMS-T modulation scheme to ensure that truly immersive, mobile camera views capture the imagination of the viewing public.

Figure 9 The Vislink HCAM 4k wireless camera transmitter

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