What is broadcast quality?

'Broadcast Quality: Does it Matter?' asked a two day EBU seminar in Geneva in October. Naturally, the broadcast engineers present said 'Yes' – but there were some very important suggestions made during the seminar that covered the quality gamut, from HDTV to TV for mobiles. Nick Radlo reports

EBU HQ: Technical committees are working hard on display references that can replace familiar CRT characteristics

It's HDTV that's putting a renewed focus on broadcast quality, or the perceived lack of it, according to the EBU's technical director Phil Laven. "While it's true some European broadcasters are delivering standard definition TV below 2 Mbps using MPEG-2 compression, ordinary viewers are becoming more demanding in terms of picture quality due to the arrival of DVD's, large screens and HDTV. Broadcasters must take care they don't alienate the public with quality that's too low," he said.

Even with the latest compression technologies, higher quality costs real money for transmission capacity and spectrum. "Having bought expensive HDTV equipment, consumers now expect high quality pictures and sound, and broadcasters would be very foolish to offer poor quality HDTV," said Laven.

NRK's experience last June with its World Cup coverage provided a warning for all broadcasters. There were huge expectations from the Norwegian public for its HDTV service of World Cup soccer, but when it began, NRK principal engineer Per Bohler was receiving calls from leading newspapers in Norway asking why the first HDTV pictures from Germany were so poor.

"I had to admit it was poor quality, and at first we couldn't explain why. The EBU satellite feed was fine, giving us MPEG-2 422 profile at 24 Mbps. We recorded it to DigiBeta, and our transmission output looked good when it left us — but the viewers received disappointing pictures.

"It really astonished me that the pictures from the satellite looked so good, but collapsed so quickly when we compressed them for transmission. It seems that concatenation of different compressions from acquisition, to the EBU and on to us, meant all the headroom in the signal had been lost by the time it reached us, with nothing left for the last encoder to work on," he said.

Bohler, who also chairs an EBU technical committee, believes what happened to the Scandinavian broadcasters this year is a timely reminder for all broadcasters now using digital broadcast chains. "We're in a very complex situation. We're seeing more flat panel displays that will ruthlessly expose picture errors, and it's a challenge for production and distribution. We need to be much more careful about what we do. In the past CRT displays in the home filtered away very gently all the mistakes we made. That's not the case any more, and we need to be much more quality conscious," he said.

Bohler said there had been a trend to go for simpler, cheaper production equipment, operating with digital video at low bit rates, "but now we're paying the penalty," he said. "The complexities of flat panel displays mean you have to have a full understanding of your entire production and distribution chain, from camera and lighting to the viewer's screen — and be very careful how you use compression, especially the concatenation of different compressions. If you don't know the history of your source signal, you may get some unwelcome surprises," he said.

Hopelessly out of sync

While flat panel displays show no mercy in exposing poor broadcast quality, they are a source of a series of problems themselves. The meaning of 'HD Ready' appears to be a very movable feast — while the various techniques within the new displays and set top boxes mean they're using more processing power, which adds significant delays to the video output.

Phil Laven was highly critical of the loss of lip sync in much current broadcasting. "How can we pretend to be quality broadcasters when we transmit much of our programming out of sync?" he asked, "It's getting worse, and no-one seems to be doing anything about it!"

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Kevin Murray from NDS explained that it was another aspect of the demise of the CRT, since the added processing in flat panel displays caused the faults. "Even if it's in sync leaving the studio, by the time it goes through the viewer's receiver, video and audio are hopelessly out of sync," he said.

Moves were being made to encourage vendors to pay more attention to ensuring the retention of lip sync as the signals went through their equipment, and at the display end, there is a new version of the HDMI interface on the way that will address the problems in flat panel displays.

"Lip sync is a very big challenge, and broadcasters need to take more care over it. New receivers are allowing lip sync to drift. Even changing channels can add delay and make it worse," said BBC R&D's Richard Salmon, who chairs an EBU working group on displays.

Even though broadcasters do put out timestamps in the digital transport streams to keep audio and video in sync, many displays cannot deal with the changes in a dynamic way. However Salmon said a specification within HDMI v1.3 would include an option to deal with this particular problem.

Virtual CRT SMPTE standard?

The demise of CRTs in favour of flat panel displays also presents a problem due to the lack of standards to ensure that reliable and consistent pictures reach the viewer. While CRTs tended to have a consistent colorimetry, that's not the case with flat panel displays — and so far there's been no method to standardise such a colorimetry, with the result there are widely varying displays on sale, with no way of ensuring the colours in programmes that leave the broadcaster approximate to the colours on the flat panel display in the viewer's home.

However, suggestions at IBC 2006 by Charles Poynton and others have now been picked up by the chairmen of the display groups of both SMPTE and the EBU. David Bancroft, manager of advanced technology at Thomson Grass Valley, and chairman of the SMPTE study group on displays, suggested to the EBU seminar that it might be possible to create a virtual CRT exchange standard to help standardise the quality of displays in a world where CRTs no longer existed! He emphasised that this was his personal view, and the argument is that the existing de facto standards for CRTs work, so why not define the existing parameters properly and use that 'virtual' CRT standard as a benchmark for flat panel display manufacturers?

"There's an advantage to sticking to those existing standards — even if the CRT disappears — since they match the physical responses of the human eye far more closely than the S-curve response of LCDs. No living creature has an S-curve response!" Bancroft said.

There's a compatibility issue too, as there are millions of legacy devices in use, which will remain an important facility for the TV industry. "The service life of broadcast products is far longer than the 18 months of the IT industry," he said.

The ideas for this new standard are being raised at SMPTE and EBU standardisation committees, and could be in play by next spring. "If it makes its way into the final report of the study group on display technology, it will be up to SMPTE to put it through its due process procedures, and decide if they want to convert this recommendation into a set of standards or recommended practices.

"There's the possibility of a SMPTE standard that draws a line in the sand, saying that broadcasters will produce signals with these distinct gamma characteristics, rendered with such and such a chromaticity and display gamma. Broadcasters will in effect be saying, 'we'll be just as consistent in the future with this virtual CRT interface, when there are no CRTs, as we have been in the physical CRT world in the past.'"

EBU senior engineer Hans Hoffmann said Bancroft had been invited to present his ideas to the EBU displays group, which

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group on displays, suggested to the EBU seminar that it might be possible to create a virtual CRT exchange standard to help standardise the quality of displays in a world where CRTs no longer existed! He emphasised that this was his personal view, and the argument is that the existing de facto standards for CRTs work, so why not define the existing parameters properly and use that 'virtual' CRT standard as was already working on definitions for the flat panel equivalents of three key professional monitoring requirements in the studio environment — the reference monitor, the control monitor and the observation monitor. "The EBU has set a really aggressive timetable for this work. We're involving vendors and intend to get the specifications done as quickly as we can — possibly by next spring," said Hoffmann.