



**1 – 1080p/50 is an evolutionary, and more future-proof, HDTV image format, with 1920 pixel x 1080 lines and 50 frames progressively scanned**

*It overcomes limitations of the 1080i/25 scanning format (resolution, interlace artefacts, lack of processing headroom) and the 720p/50 format (resolution). 1080p/50 can be the “future proof FULL HDTV” format. EBU Project Group P/HDTV, and the EBU Technology Management Committees, are actively encouraging the development of the 1080p/50 format.*

**2 – 1080p/50 is quite similar to the 2k DCI/ISO format for digital cinema production and distribution**

*This medium where it is largely used for movie drama, but it is also suitable for the fast action events often needed for television production.*

**3 – Using 1080p/50 as a master format in production allows very high quality 720p/50 and 1080i/25 to be easily derived for the short term of HDTV broadcasting**

*Because of its vertical/temporal and spatial resolution, 1080p/50 is an ideal master format for production. 1080p/50 professional cameras and routers are available, but not all production equipment for a complete IT-based workflow is available yet...*

**4 – EBU TECHNICAL recognises that manufacturers are investing in 1080p/50 equipment development**

*One of the challenges is that the 1080p/50 signal requires a 3 Gbit/s baseband bit-rate: double that for 1080i/25 or 720p/50. ‘HD-SDI’ interfaces are available, but care need to be taken with coaxial cable lengths. Users might be advised to consider also alternative interfaces (optical HD-SDI or networks).*

**5 – 1080p/50 production compression will require higher bit-rates than present HDTV formats**

*For currently used HDTV formats (1080i/25, 720p/50 and 1080p/25), the latest production compression formats operate at bit-rates between 50 Mbit/s (the ‘long GOP’ compression format) and 100 Mbit/s or more (the I frame formats) in the production environment. For 1080p/50 a higher bit-rate will be required. The industry needs to investigate which compression system, and what bit-rates, should be used to maintain 1080p/50 quality in a multi-generation production environment. EBU TECHNICAL encourages manufacturers to cooperate with EBU on compression formats, before products are introduced into the market.*



**6 – Broadcasters can distribute studio-to-studio and intra-studio (contribution networks) as well as produce in 1080p/50, and some may eventually use 1080p/50 for broadcasting itself**

*New MPEG-4 H.264/AVC Level 4.2 encoders are required for contribution networks.*

**7 – What bit-rate is required for broadcasting with MPEG-4 H.264/AVC?**

*The DVB Project has incorporated 1080p/50 in its recommended distribution compression formats, which may be used for future broadcasting. Perhaps surprising at first, initial tests at the EBU have shown that 1080p/50 will not require more bit-rate than 1080i/25 for broadcasts, but naturally it will show better picture quality on large displays. Ask an EBU Engineer for the detail of the results. So, whilst production systems will require more bit-rate than older HDTV formats, distribution should require the same bit-rate as 1080i/25, and only about 15-20% more than 720p/50.*

**8 – Broadcasters can use the MPEG-4 SVC system to provide 1080p/50 as a ‘top up’ signal in conjunction with an older HD format, for markets where both newer and older HD decoders exist**

*This is where a 1080p/50 ‘top-up’ signal and 720p/50 is provided to the consumer at the same time. 1080i/25 can also be used as a base layer, but it is less efficient than the 720p/50 - 1080p/50 combination. New SVC receivers would be able to decode the 1080p/50 signal, whilst older receiver would only decode the 720p/50 (or 1080i/25) signal. Using SVC to broadcast 1080p/50 will require more bit-rate than straight single layer encoding in H.264/AVC, but exactly how much is the subject of study. EBU TECHNICAL and others are investigating the comparative bit-rates for SVC-derived 1080p/50 and H.264/AVC-derived 1080p/50. The difference is likely to be of the order of perhaps 10%.*

**9 – The good news for 1080p/50 broadcasting is that many consumer-type “1080p HD Ready” displays already exist**

*Such “1080p HD Ready” displays can normally display 1080p/50 images. 1080p is popular today because of its use with the 1080p/24-25 format of many BluRay movies. But consumers will need a new set-top-box that can decode MPEG-4 H.264/AVC Level 4.2 (or SVC as mentioned above) to show the benefit of 1080p/50 on their 1080p display.*

**10 – Will broadcasters migrate to 1080p/50?**

*For production, EBU TECHNICAL sees a step-by-step migration in high-quality production environments. While it would be good to see 1080p/50 in ‘mainstream’ production soon, its use there will depend on how manufacturers develop products and price 1080p/50 products. EBU TECHNICAL closely cooperates on this and has a role to play in testing 1080p/50 systems in the overall chain. For distribution and broadcasting of 1080p/50, the technology is developed, but the market situations are more complex. Needing a new set top box may be a serious barrier, even if 1080p/50 displays are readily available. Displays are ever larger and larger. ‘4K’ displays will soon be available. Broadcasters’ HDTV archives of 1080i/25 or 720p/50 may not be of sufficiently high quality to be future proof. Broadcasters need to ensure that their archives retain the quality necessary to provide a compelling offering to viewers. The value of 1080p/50 is essentially the value of future proofing HDTV programme production, and of being ready to meet the needs of an ever more discerning viewing public that has 1080p displays.*