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EBU **TECHNICAL**

How much video compression for contribution?

David Wood EBU and Anthony Caruso CBC

EBU·UER

The compression system ‘criticality’ distribution

A Mb/s A+ Mb/s

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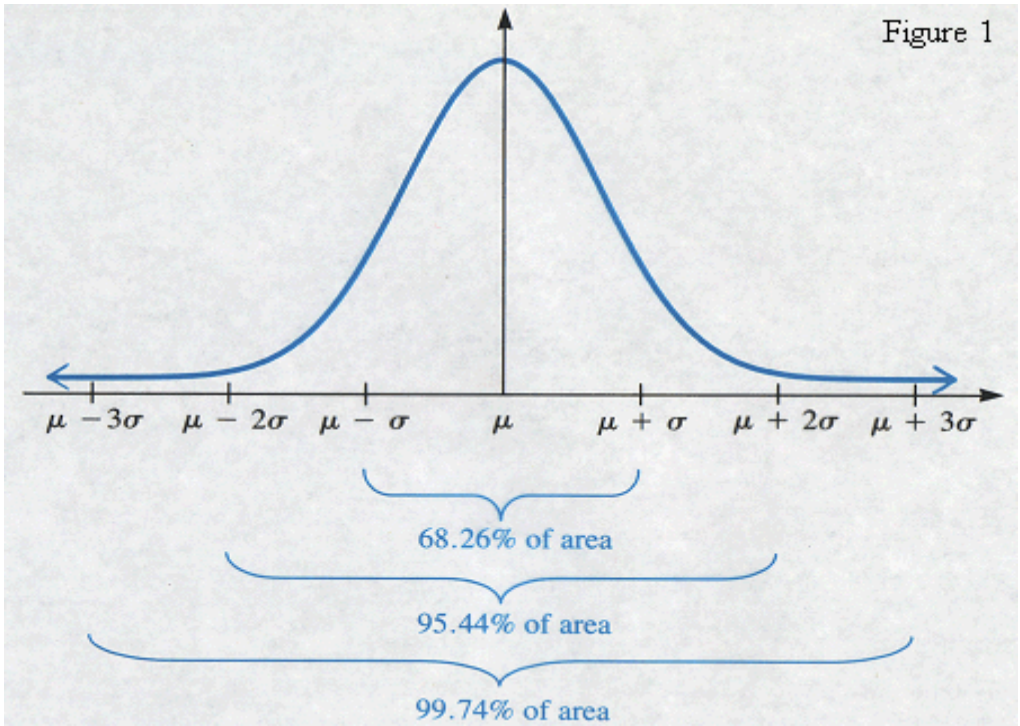


Entropy (amount of detail)

What would we like to know?

- What bit rates are ‘acceptable’?
- What bit rate for ‘transparent’ **basic** HDTV quality?
- What bit rate for acceptable **processing headroom** (picture quality after x processes)?
- What will be the demand, **cost,** and availability of each?
- What bit rates for **ordinary** (news) content?
- What bit rated for **premium** (sports) HDTV content?
- What is the influence of **different manufacturers codecs**? Manufacturers are free to make any encoder as long as it can be decoded by a standard decoder.
- What is the influence of using **MPEG-2 or MPEG-4 AVC?**
- What difference does **Frame Compatible S**3D make?

What can we guess by intuition..

- **AVC** has a larger number of compression tools than MPEG2, and will reduce the bit rate needed for most scenes, but not all.
- The bit rates needed will be different depending on whether the source is **720p or 1080i**. 720p will need lower bit rates that 1080i because, though the net bit rates are about the same at source, motion compensation works better with progressive sources.
- Some **manufacturers encoders** will be more efficient that others, because they will use a selection of the available tools, and implement them in different ways. As a generality those using a 'multiple pass' system will perform better than those using a 'single pass' system. Encoders will continue to improve.
- Where processing headroom is not needed, or is less important, the lowest bit rates will be achieved using AVC (H.264 with Long GOP), probably in the range of **10-20** Mbit/s depending on type of content.

What do we know from tests so far...

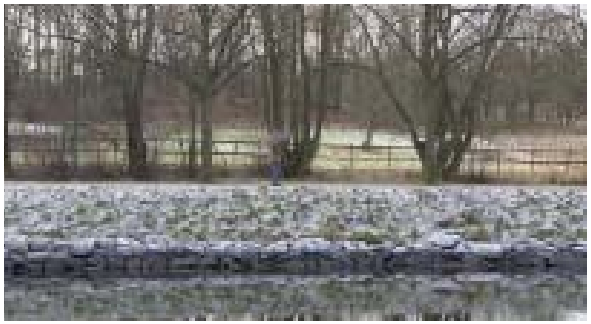
- (Tony's results) Using MPEG2, adequate basic quality HDTV can usually be achieved at 20-30 Mbit/s.
- (Adi's results) Using AVC is useful for both broadcasting and contribution, though the gain is less dramatic for contribution networks.
- (Everyone's results) Long GOP makes a lot of difference. There is a big difference in quality between H.264 I-frame and H.264 long GOP

What do we know from tests so far (ClairView PQA meter, tests at CBC)...

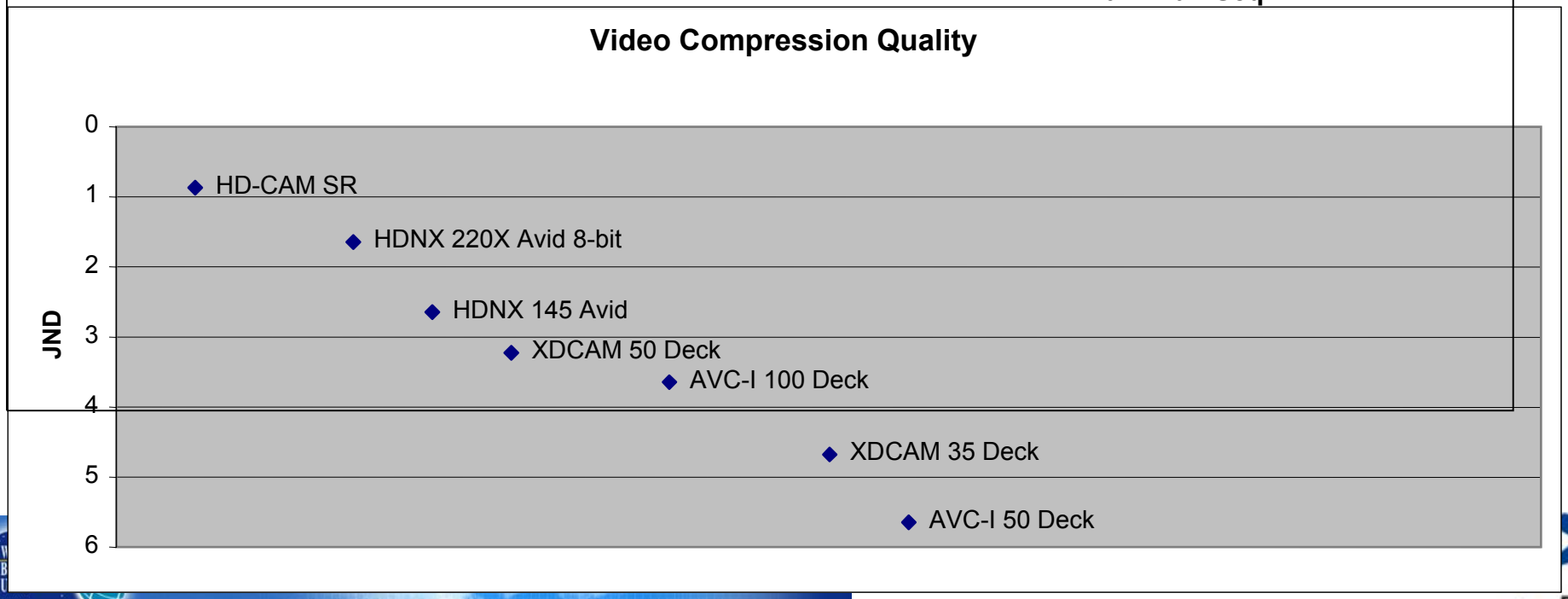
Picture Quality Benchmarks

HD-CAM SR	0.86 JND
HDNX 145	2.65 JND
XD-CAM 50	3.38 JND
XD-CAM 35	4.68 JND

A lower JND is better in quality



Park Run Seq.



What else...

- Recent tests with JPEG2000 at CBC have established that 90 Mbps I-frame renders an acceptable quality for contribution. The new generation of JPEG2000 codecs have improved substantially and CBC found that this rate renders an equivalent quality to 50 Mbps long GOP. However, editing with I-frame is the preferred manner. JPEG 2000 at 90 Mbit/s may be a good way to provide HDTV contribution where I frame editing is needed.
- JPEG2000 is a 'wavelet' transform system, which has advantages because of the easy extraction of lower resolution versions.

What would we like to know?

- Much work still to be done.
- The affect of bit rate and system on processing headroom is not yet known.
- The needs of S3D are not yet known
- Do you have any suggestions?

The results of the ASBU tests .....?

Thank you for listening.