Rec. 601

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ITU-R Recommendation BT.601, more commonly know by the abbreviations **Rec. 601** or **BT.601** or its former name, **CCIR 601**, is a standard published by the CCIR (now ITU-R) for encoding interlaced analogue video signals in digital form. It includes methods of encoding 525 line 60 Hz and 625-line 50 Hz signals, both with 720 luminance samples and 360 chrominance samples per line. The colour encoding system is known as YUV 4:2:2, that being the ratio of Y:Cb:Cr samples (luminance data:blue chroma data:red chroma data). For a pair of pixels, the data are stored in the order Y1:Y2:Cb:Cr, with the chrominance samples co-sited with the first luminance sample.

The CCIR 601 signal can be regarded as if it is a digitally encoded analog component video signal, and thus includes data for the horizontal and vertical sync and blanking intervals. Regardless of the frame rate, the luminance sampling frequency is 13.5 MHz. The luminance sample is at least 8 bits, and the chrominance samples are at least 4 bits each.

The first version of CCIR 601 defined only a parallel interface, but later versions introduced the bit-serial family of **serial digital video** interfaces that are now commonly used. The 8 bit serial protocol (216 Mbit/s) was once used in D1 digital tape recording. Modern standards use an encoding table to expand the data to 9 or 10 bits for improved behavior over long transmission lines. The 9 bit serial version has a data rate of 243 Mbit/s. By far, the most common version of the interface is the 10-bit Serial Digital Interface (which was later standardized as *SMPTE 259M*), which is now a ubiquitous interconnect standard for professional video equipment which operates on standard-definition digital video. This format, originally used in D5 digital tape recording, has a data rate of 270 Mbit/s. Additionally, a 360 Mbit/s version of the interface has been defined, which is sometimes used in widescreen applications.

There is an 8 bit version in which only data from the active video periods are transmitted, with a bit rate of only 165.9 Mbit/s.

In each 8 bit luminance sample, the value 16 is used for black and 235 for white, to allow for overshoot and undershoot. The values 0 and 255 are used for sync encoding. The Cb and Cr samples use the value 128 to encode a zero value, as used when encoding a white, grey or black area.

The CCIR 601 video raster format has been re-used in a number of later standards, including MPEG.

See also

- YCbCr
- Chroma subsampling
- D1 (Sony)
- Rec. 709, the equivalent standard for high-definition television
- ITU656

References

- International Telecommunications Union, *ITU-R BT.601*

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