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ITU-T

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STANDARDIZATION SECTOR
OF ITU

J.80

(ex CMTT.721)

(09/93)

TELEVISION AND SOUND TRANSMISSION

**TRANSMISSION OF COMPONENT-CODED
DIGITAL TELEVISION SIGNALS FOR
CONTRIBUTION-QUALITY APPLICATIONS
AT BIT RATES NEAR 140 Mbit/s**

ITU-T Recommendation J.80

(Formerly Recommendation ITU-R CMTT.721)

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation J.80 (formerly Recommendation ITU-R CMTT.721) was revised by the former ITU-R Study Group CMTT and was approved under the CCIR Resolution 97 procedure on 8 September 1993. See Note 1 below.

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector (ITU-R).

Conforming to a joint decision by the World Telecommunication Standardization Conference (Helsinki, March 1993) and the Radiocommunication Assembly (Geneva, November 1993), the ITU-R Study Group CMTT was transferred to ITU-T as Study Group 9, except for the satellite news gathering (SNG) study area which was transferred to ITU-R Study Group 4.

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Recommendation J.80¹⁾

TRANSMISSION OF COMPONENT-CODED DIGITAL TELEVISION SIGNALS FOR CONTRIBUTION-QUALITY APPLICATIONS AT BIT RATES NEAR 140 Mbit/s

(1990; revised 1992, 1993)

The ITU-R,

considering

- (a) that for contribution-quality applications, transmission should be based on component-coded digital video signals conforming to Recommendation ITU-R BT.601;
- (b) that such transmission should satisfy the user requirements for contribution-quality codecs at 60/70 to 140 Mbit/s as specified by ITU-R Study Group 11, in Recommendation ITU-R BT.800;
- (c) that according to these user requirements such transmission should preserve the picture quality inherent in the 4:2:2 encoding process based on Recommendation ITU-R BT.601 to the maximum extent possible;
- (d) that such transmission should similarly preserve the downstream processing capabilities by maintaining the spatial and temporal resolution of the 4:2:2 signals as given by Recommendation ITU-R BT.601;
- (e) that in addition to component-coded digital video signals conforming to Recommendation ITU-R BT.601, some features should be applicable for the transmission of TV signals resulting from other source coding methods, in particular, component-coded TV signals for distribution, multiplexed analogue component (MAC) signals in digital form, or composite signals encoded according to Recommendation CMTT.658;
- (f) that additional transmission capacity should be provided for two pairs of stereo-sound channels, ancillary signals (e.g. Teletext, test signals) and error-protection data;
- (g) that for transmission the complete TV signal could be fitted into the fourth hierarchical level given by Recommendation G.702 as well as into the STM-1 level given by Recommendation G.707;
- (h) that such transmission could be realized by hardware implementation at a moderate level of complexity and cost,

recommends

that for transmission at data rates near 140 Mbit/s of component-coded digital video signals for 625-line systems according to Recommendation ITU-R BT.601, the bit rate reduction codec should be characterized as follows²⁾:

1 Video input/output

A standard 4:2:2 video signal conforming with Recommendation ITU-R BT.601 is used. Bit-parallel or bit-serial interfacing in accordance with Recommendation ITU-R BT.656 can be applied.

¹⁾ Formerly Recommendation ITU-R CMTT.721.

²⁾ The main parameters of a proposal for transmitting YUV contribution signals in countries using the 525-line TV system is given in Annex A.

2 **Signal pre-processing**

The horizontal and vertical blanking intervals are removed. Ancillary data such as Teletext or test signals which are normally transmitted in the vertical blanking interval of the video signal are assigned to separate slots in the video multiplex.

No sub-sampling is used in order to satisfy the down-stream processing requirements of inter-studio links.

3 **Coding scheme**

Fixed two-dimensional predictors are applied both for the luminance and colour-difference components. Non-adaptive hybrid DPCM in combination with folded quantizers form the main elements of the coding scheme which reduces significantly the picture quality degradations due to overload effects as shown by simple DPCM systems. In addition, sensitivity to transmission errors comparable to systems with PCM representation is obtained. The same folded quantizer characteristic is used for the DPCM and PCM quantization of the luminance and colour-difference components.

Details of the quantizer characteristics used for the DPCM and PCM quantization of the luminance and colour-difference components are given in Table 1.

The necessary limitation is performed for the reconstructed values in the DPCM-loop.

No variable-length coding will be used and no post-processing is provided for the output signal.

TABLE 1/J.80
Quantizer characteristics

Level No.	From	Value	To
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	11	12
11	13	14	15
12	16	17	18
13	19	20	21
14	22	23	24
15	25	26	27
16	28	30	32
17	33	35	37
18	38	40	42
19	43	45	47
20	48	50	52
21	53	55	57
22	58	61	64
23	65	68	71
24	72	75	78
25	79	82	85
26	86	89	92
27	93	96	99
28	100	103	106
29	107	110	113
30	114	117	120
31	121	124	127

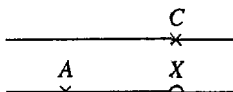
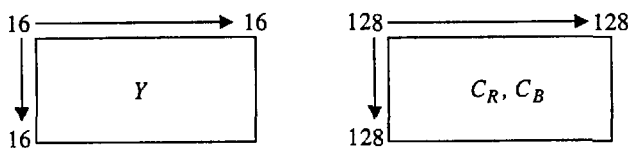
4 Video bit rate

A 6 bit/sample for each of the luminance and colour-difference components results in a video bit rate of 124 416 kbit/s.

The main characteristics of the video coding are summarized in Table 2.

TABLE 2/J.80

Summary of the main characteristics recommended for the coding of component-coded digital television signals for contribution-quality applications at bit rates near 140 Mbit/s

Video input/output	Standard	625-line digital video in component form
	Coding	4:2:2 signals according to Recommendation ITU-R BT.601
	Interface	Bit parallel or bit-serial in accordance with Recommendation ITU-R BT.656
Pre-processing	Blanking	Removal of horizontal and vertical blanking intervals
	Sub-sampling	None
	Pre-filtering	None
Coding	Predictor	Two-dimensional intra-field for luminance and colour-difference components
	Calculation of the prediction value X	$X = \frac{A + C}{2}$  The prediction value X is calculated with 8-bit accuracy (rounded)
	Predictor preset	Video levels outside the active picture are set to 16 for Y and 128 for C_R, C_B to preset the initial value of the predictor in both the coder and decoder 
	Adaptive control of predictors	None
	Motion compensation	None
	Quantizer characteristics	Folded quantizer combined with non-adaptive hybrid DPCM (Table 1)
	Bits/sample	6, for each of the luminance Y , and colour-difference components C_R, C_B
	Variable length code	None
Post-processing		None
Video data rate		124 416 kbit/s

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