RECOMMENDATION ITU-R BT.1701-1

Characteristics of radiated signals of conventional analogue television systems

(2005-2005)

Scope

This Recommendation provides RF systems specification details for different analogue television systems.

The ITU Radiocommunication Assembly,

considering

a) that many countries have established satisfactory monochrome television broadcasting services based on either 525-line or 625-line systems;

b) that a number of countries have established (or are in the process of establishing) satisfactory colour television broadcasting services based on the NTSC, PAL or SECAM systems;

c) that Recommendation ITU-R BT.1700 provides the definition of the baseband video signal;

d) that Report ITU-R BT.2043 – Analogue television systems currently in use throughout the world, gives information on different television systems used by different countries,

recommends

1 that, for a country wishing to initiate a conventional monochrome television service, a system using 525 or 625 lines as defined in Annex 1 is to be preferred;

2 that, for a country wishing to initiate a conventional colour television service, one of the systems defined in Annex 1 is to be preferred.

NOTE 1 – Pre-1986 editions of the ex-CCIR Volumes, and in particular that of 1982, contain a complete description of System E used in France until 1984, and System A used in the United Kingdom until 1985.

Annex 1

Characteristics of radiated signals of conventional analogue television systems

Table 1, given for information purposes, contains details of a number of different characteristics of radiated signals of analogue television systems in use.

TABLE 1

Characteristics of the radiated signals (monochrome and colour)

Item	Characteristics	M	N[1]	B, B1, G	H	I, I1	D, D1, K	K1	L
	Frequency spacing (see Fig. 2)								
1	Nominal radio-frequency channel bandwidth (MHz)	6	6	B:7 B1, G:8	8	8	8	8	8
2	Sound carrier relative to vision carrier (MHz)	+4.5[2]	+4.5	+5.5 ±0.001 (3), (4), (5), (6)	+5.5	+5.9996 ±0.0005[7]	+6.5 ±0.001[6]	+6.5[8]	+6.5[8]
3	Nearest edge of channel relative to vision carrier (MHz)	–1.25	–1.25	–1.25	–1.25	–1.25	–1.25	–1.25	–1.25
4	Nominal width of main sideband (MHz)	4.2	4.2	5	5	5.5	D, K: 6 D1: 5	6	6[8]
5	Nominal width of vestigial sideband (MHz)	0.75	0.75	0.75	1.25	1.25[32]	0.75	1.25	1.25[9]
6	Minimum attenuation of vestigial sideband (dB at MHz)[10]	20 (–1.25) 42 (–3.58)	20 (–1.25) 42 (–3.5)	20 (–1.25) 20 (–3.0) 30 (–4.43) (11)	20 (–1.75) 20 (–3.0)	20 (–3.0) 30 (–4.43) (32)	20 (–1.25) 30 (–4.33 ±0.1) (12), (13)	20 (–2.7) 30 (–4.3) ref.: 0 (+ 0.8)	15 (–2.7) 30 (–4.3) (9) ref.: 0 (+ 0.8)
7	Type and polarity of vision modulations	C3F neg.	C3F neg.	C3F neg.	C3F neg.	C3F neg.	C3F neg.	C3F neg.	C3F pos.
8	Levels in the radiated signal (% of peak carrier)								
	Synchronizing level	100	100	100	100	100	100	100	< 6[8]
	Blanking level	72.5 to 77.5	72.5 to 77.5 (75 ± 2.5)	75 ± 2.5 (14)	72.5 to 77.5	76 ± 2	75 ± 2.5	75 ± 2.5	30 ± 2
	Difference between black level and blanking level	2.88 to 6.75 (15)	2.88 to 6.75	0 to 2 (nominal)	0 to 7	0 (nominal)	0 to 4.5 (16)	0 to 4.5	0 to 4.5
	Peak white level	10 to 15	10 to 15 (10 to 12.5)	10 to 15 (14), (17)	10 to 12.5	20 ± 2	10 to 15 (18), (19)	10 to 12.5	100 (≈ 110) (20)
9	Type of sound modulation	F3E	F3E	F3E	F3E	F3E	F3E	F3E	A3E
10	Frequency deviation (kHz)	±25	±25	±50	±50	±50	±50	±50	

TABLE 1 (*end*)

Item	Characteristics	M	N[1]	B, B1, G	H	I, I1	D, D1, K	K1	L
11	Pre-emphasis for modulation (μs)	75	75	50	50	50	50	50	
12	Ratio of effective radiated powers of vision and (primary) sound[21]	10/1 to 5/1 (22)	10/1 to 5/1	20/1 to 10/1 (3), (6), (23)	5/1 to 10/1	5/1 10/1[24] 20/1[7], (25)	10/1 to 5/1 (6), (26)	10/1	10/1 10/1 to 40/1 (8), (27)
13	Precorrection for receiver group-delay characteristics at medium video frequencies (ns) (see also Fig. 1)	0	1 MHz 0 ± 100 1 MHz 0 ± 100 1 MHz 0 ± 60	(28)			(29), (31)		
14	Precorrection for receiver group-delay characteristics at colour sub-carrier frequency (ns) (see also Fig. 1)	–170 (nominal)	-170^{+60}_{-40}	–170 (nominal) (28)			(30), (31)		

(1) The values in brackets apply to the combination N/PAL used in Argentina.

(2) In Japan, the values + 4.5 ± 0.001 are used.

(3) In the Federal Republic of Germany, Austria, Italy, the Netherlands, Slovak Republic and Switzerland a system of two sound carriers is used, the frequency of the second carrier being 242.1875 kHz above the frequency of the first sound carrier. The ratio between vision/sound e.r.p. for this second carrier is 100/1. For further information on this system see Recommendation ITU-R BS.707. For stereophonic sound transmissions a similar system is used in Australia with vision/sound power ratios being 20/1 and 100/1 for the first and second sound carriers respectively.

(4) New Zealand uses a sound carrier displaced 5.4996 ± 0.0005 MHz from the vision carrier.

(5) The sound carrier for single carrier sound transmissions in Australia may be displaced 5.5 ± 0.0005 MHz from the vision carrier.

(6) In Denmark, Finland, New Zealand, Poland, Sweden and Spain a system of two sound carriers is used. In Iceland, Norway and Ukraine the same system is being introduced. The second carrier is 5.85 MHz above the vision carrier and is differential quadriphase pulse shift keying (DQPSK) modulated with 728 kbit/s sound and data multiplex. The ratios between vision/sound power are 20/1 and 100/1 for the first and second carrier respectively. For further information, see Recommendation ITU-R BS.707.

(7) In the United Kingdom, a system of two sound carriers is used. The second sound carrier is 6.552 MHz above the vision carrier and is DQPSK modulated with a 728 kbit/s sound and data multiplex able to carry two sound channels. The ratio between vision and sound e.r.p. for the second carrier is 100/1.

(8) In France, a digital carrier 5.85 MHz away from the vision carrier may be used in addition to the main sound carrier. It is modulated in differentially encoded QPSK with a 728 kbit/s sound and data multiplexer capable of carrying two sound channels. The nominal width of the main sideband is limited to 5.1 MHz. With the L standard, the depth of video modulation in the radiated signal is reduced to leave a residual radiated carrier level of 5 ± 2%. For further information, see Recommendation ITU-R BS.707.

Notes to Table 1 (continued):

(9) In France a vestigial sideband of 0.75 MHz is optionally used. In such cases, typical values to be used for minimum attenuation of vestigial sideband are 15 (–1.25) and 30 (–4.3) in dB at MHz.

(10) In some cases, low-power transmitters are operated without vestigial-sideband filter.

(11) For B/SECAM and G/SECAM: 30 dB at –4.33 MHz, within the limits of ±0.1 MHz.

(12) In some countries, members of the former OIRT, additional specifications are in use:

a) not less than 40 dB at –4.286 MHz ± 0.5 MHz;

b) 0 dB from –0.75 MHz to +6.0 MHz;

c) not less than 20 dB at ±6.375 MHz and higher.

Reference: 0 dB at +1.5 MHz.

(13) In China, the attenuation value at the point (–4.33 ± 0.1) has not yet been determined.

(14) Australia uses the nominal modulation levels specified for system I.

(15) In Japan, the values of 0 to 6.75 have been adopted.

(16) In China, the values 0 to 5 have been adopted.

(17) Italy is considering the possibility of controlling the peak white level after weighting the video frequency signal by a low-pass filter, so as to take account only of those spectrum components of the signal that are likely to produce inter-carrier noise in certain receivers when the nominal level is exceeded. Studies should be continued with a view to optimizing the response of the weighting filter to be used.

(18) The former USSR has adopted the value 15 ± 2%.

(19) A new parameter “white level with sub-carrier” should be specified at a later date. For that parameter, the former USSR has adopted the value of 7 ± 2%.

(20) The peak white level refers to a transmission without colour sub-carrier. The figure in brackets corresponds to the peak value of the transmitted signal, taking into account the colour sub-carrier of the respective colour television system.

(21) The values to be considered are:

– the r.m.s. value of the carrier at the peak of the modulation envelope for the vision signal. For system L, only the luminance signal is to be considered. (See Note (16) above);

– the r.m.s. value of the unmodulated carrier for amplitude-modulated and frequency-modulated sound transmissions.

(22) In Japan, a ratio of 1/0.15 to 1/0.35 is used. In the United States, the sound carrier e.r.p. is not to exceed 22% of the peak authorized vision e.r.p.

(23) Recent studies in India confirm the suitability of a 20/1 ratio of effective radiated powers of vision and sound. This ratio still enables the introduction of a second sound carrier.

(24) The ratio 10/1 is used in South Africa.

(25) The ratio 20:1 is used in the United Kingdom.

(26) In China, the value 10/1 has been adopted.

Notes to Table 1 (end):

(27) In France, the ratios 10/1 and 40/1 are used.

(28) In the Federal Republic of Germany, the Netherlands, Slovak Republic and Republic of Slovenia the correction for receiver group-delay characteristics is made according to curve B in Fig. 1. Tolerances are shown in the Table under Fig. 1. Spain uses curve A. Some former OIRT countries using the B/SECAM and G/SECAM systems use a nominal precorrection of 90 ns at medium video frequencies. In Sweden, the precorrection is 0 ± 40 ns up to 3.6 MHz. For 4.43 MHz, the correction is –170 ± 20 ns and for 5 MHz it is –350 ± 80 ns. In New Zealand, the precorrection increases linearly from 0 ± 20 ns at 0 MHz to 60 ± 50 ns at 2.25 MHz, follows curve A of Fig. 1 from 2.25 MHz to 4.43 MHz and then decreases linearly to –300 ± 75 ns at 5 MHz. In Australia, the nominal precorrection follows curve A up to 2.5 MHz, then decreases to 0 ns at 3.5 MHz, –170 ns at 4.43 MHz and –280 ns at 5 MHz. Based on studies on receivers in India, the receiver group delay pre-equalization proposed to be adopted in India at 1 MHz, 2 MHz, 3 MHz, 4.43 MHz and 4.8 MHz is 125 ns, 150 ns, 142 ns, –75 ns and –200 ns respectively. In Denmark, the precorrections at 0, 0.25, 1.0, 2.0, 3.0, 3.8, 4.43 and 4.8 MHz are 0, +5, +53, +75, +75, 0, –170 and 400 ns.

(29) In the Czech Republic: –92 ± 20 ns.

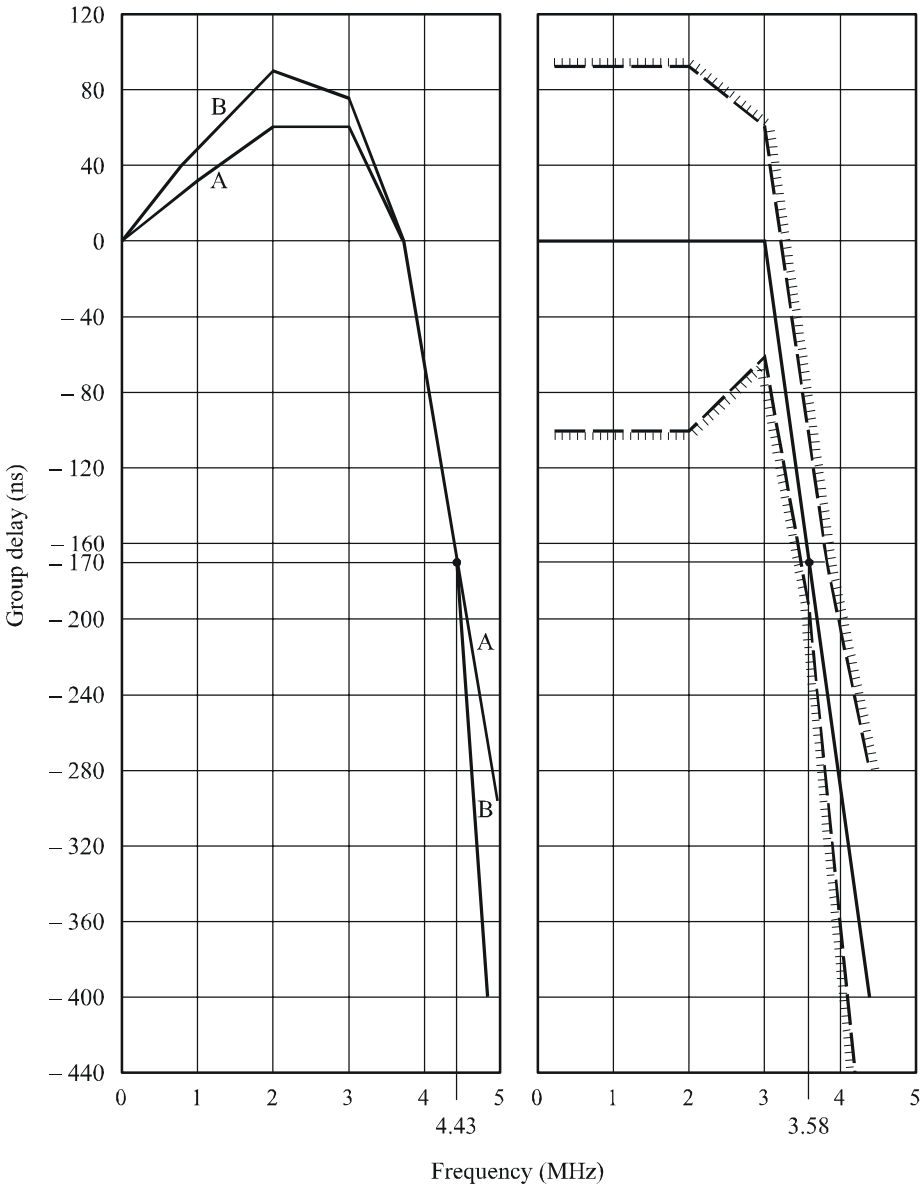
(30) In the Czech Republic: –60 ± 20 ns.

(31) In Poland no group-delay precorrection is used.

(32) In the United Kingdom, for PAL transmissions in the upper-adjacent channel to a DVB-T service, the nominal width of the vestigial sideband is proposed to be 0.75 MHz, with minimum attenuations of the vestigial sideband of 20 dB (–1.25 MHz), 45 dB (–1.45 MHz) in dB. Such transmission will be referred to as System I1 (I version 1).

FIGURE 1

Curve of pre-correction for receiver group-delay characteristics



a) B/PAL and G/PAL systems (see Table 1 [28])

b) M/PAL and M/NTSC systems

Nominal values and tolerances (ns)

Frequency (MHz)	Curve A	Curve B
0.25		+5 ± 0
1.00	+30 ± 50	+53 ± 40
2.00	+60 ± 50	+90 ± 40
3.00	+60 ± 50	+75 ± 40
3.75	0 ± 50	0 ± 40
4.43	–170 ± 35	–170 ± 40
4.80	–260 ± 75	–400 ± 90

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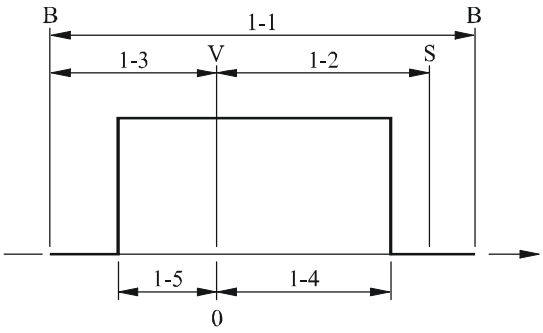
FIGURE 2

Significance of items 1 to 5 in Table 1 (1-1 to 1-5)



B: channel limit
V: vision carrier
S: sound carrier

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