

RECOMMENDATION ITU-R BT.804^{*,**}**Characteristics of TV receivers essential for frequency planning with PAL/SECAM/NTSC television systems**

(1992)

The ITU Radiocommunication Assembly,

considering

- a) that conventional television systems have been in use for a long period of time;
- b) that the characteristics of television receivers, essential for frequency planning, are well established for the various PAL/SECAM/NTSC television systems;
- c) that those characteristics continue to be upgraded;
- d) that characteristics referred to in § c) have been the basis for planning parameters and methods used for the Second Session of the Regional Administrative Conference for the planning of VHF/UHF television broadcasting in the African Broadcasting Area and Neighbouring Countries (AFBC(2));
- e) that conventional television systems will remain in use for a considerable period of time;
- f) that the IEC has responsibilities relating to television receiver standards and methods of measurement and definitions,

recommends

- 1 that the characteristics of television receivers given in Annex 1 be employed as a basis for frequency planning;
- 2 that the characteristics given in Annex 2 be regarded as information on the performance characteristics of receivers in use, by some administrations. Other administrations are urged to provide similar information.

ANNEX 1

Television receiver characteristics**1 Introduction**

Many characteristics of television receivers may be defined, together with methods of measurement and practical values.

* This Recommendation should be brought to the attention of the IEC.

** Radiocommunication Study Group 6 made editorial amendments to this Recommendation in 2002 in accordance with Resolution ITU-R 44.

These characteristics are tabulated in § 2 in which it is suggested that the most recent mean numerical values should be included.

The quality of the picture displayed and of the sound heard depends on characteristics of the complete television system from the studio to the receiver screen or loudspeaker.

Characteristics essential for planning are given in Tables 1 to 3 together with typical values in current use for the various television systems.

Attention is drawn to the importance of effective participation by ITU-R representatives in IEC work, especially in the field of definitions and methods of measurement of television receiver characteristics (Sub-Committee 12A). This information is important for planning and for achieving satisfactory quality targets in an overall television system, from picture source up to and including the receiver.

Apart from these characteristics, those relating to interference caused by television receivers should conform to the relevant CISPR Recommendations.

2 Intermediate frequencies for television receivers

TABLE 1

Examples of current systems intermediate frequency values

No. of lines in system	Country	System ⁽¹⁾	Channel limits at intermediate frequency (MHz)	Intermediate frequency (MHz) ⁽²⁾	
				Sound-channel	Video-channel
525	USA	M	41 to 47 ⁽³⁾	41.25	45.75
525	Japan	M	54 to 60 ^{(4) (5)}	54.25	58.75
625	Spain, Norway, Netherlands, Federal Republic of Germany, Sweden, Switzerland, Italy, Yugoslavia	B, G	33.15 to 40.15	33.40	38.90
	The Russian Federation	D, K	31.25 to 39.25	31.50	38.00
	People's Republic of China	D			
	France	L	31.00 to 39.50	39.20 ⁽⁶⁾	32.70 ⁽⁶⁾
	UK	I	33.25 to 41.25	33.50	39.50
	African broadcasting area	K1	33.45 to 41.45 33.15 to 40.15 31.00 to 39.50	33.70 33.40 39.20	40.20 39.90 32.70

⁽¹⁾ See Recommendation ITU-R BT.470.

⁽²⁾ The usual position of the local oscillator is high. In those cases where it is low, the vision intermediate frequency is below the sound intermediate frequency.

⁽³⁾ According to Electronic Industries Association Standard Recommendation No. 109 C.

⁽⁴⁾ Protected bands.

⁽⁵⁾ Television receivers, all channels (VHF and UHF).

⁽⁶⁾ According to Recommendation No. 103 of the Syndicat des constructeurs d'appareils radiorécepteurs et téléviseurs (SCART). In Band I, a double transposition is used.

The multiplicity of values of the intermediate frequency is a cause of increased cost of receivers, particularly those suitable for frontier regions where countries use standards with different radio frequencies.

Reception of television programmes with different standards may require adequate values of the intermediate frequency involving the same number of multi-standard receiver types.

2.1 Reference receiver characteristics

In order to obtain the protection ratios given in Recommendation ITU-R BT.655, the minimum field-strength values given in Recommendation ITU-R BT.417, and meet other frequency planning constraints, the values given in Table 2 for reference receivers for different transmission systems should be met.

As receiver technology is improving rapidly, administrations are invited to study any improvement of the planning parameters which can result from improved receiver characteristics.

TABLE 2

Reference receiver characteristics

Item	Characteristics	Systems							
		B, G		L		D/PAL		I	
		VHF	UHF	VHF	UHF	VHF	UHF	VHF	UHF
1	Noise-limited sensitivity (dBm)	-61	-58	-61	-58	-61	-58	-61	-58
2	Rejection of adjacent picture carrier (dB) ⁽¹⁾	40	40	40	40	40	40	40	40
3	Rejection of adjacent sound carrier (dB) ⁽¹⁾	40	40	45	45	30	30	43	43
4	Image frequency rejection (dB)		40		40	45	40		50
5	Intermediate frequency rejection (dB)	35	50	30	50	45	40	35	50
6	Oscillator position	High	High	Low ⁽²⁾	High	High	High	High	High
7	Maximum receiver local oscillator level (dBm) at antenna connector								
	– Fundamental	-49 ⁽³⁾	-43 ⁽³⁾	-63	-55			-49 ⁽³⁾	-43 ⁽³⁾
	– Harmonics	-57 ⁽³⁾		-63				-57 ⁽³⁾	
8	Maximum input level (dBm) limited by transmodulation and intermodulation distortion ⁽⁴⁾	-10	-10	-10	-10	-8.8	-8.8	-10	-10

⁽¹⁾ An input level to receiver of about 3 mV has been assumed.

⁽²⁾ High in Band I.

⁽³⁾ These values are recommended by CISPR (Publication 13) and can be improved. For example, -63 dBm is a common limit value for fundamental and harmonic levels in both the VHF and UHF bands applicable to European countries. In the Federal Republic of Germany, the recommended value is -65 dBm in the VHF and UHF bands for both fundamental and harmonics.

⁽⁴⁾ Limiting values of: -30 dB, vision into sound, and
-40 dB, sound into vision
have been assumed (see IEC Publication 107-1).

The values given in Table 2 for noise-limited sensitivity are consistent with the minimum field-strength values given in Recommendation ITU-R BT.417. Values for antenna gain and cable loss are given in Table 3.

TABLE 3

	Band I	Band III	Band IV	Band V
Minimum field strength (dB(μ V/m))	47	53	62 ⁽¹⁾	67 ⁽¹⁾
Antenna gain (dB)	3.5	7.5	10	12
Cable loss (dB)	1	1.5	3	4.5
Dipole conversion factor ⁽²⁾ (dB)	2	13	20.5	25

⁽¹⁾ The values shown should be increased by 2 dB for System K.

⁽²⁾ $20 \log 2\pi/\lambda$.

If receivers with a better noise performance, low noise pre-amplifiers or higher gain antennas are used, the minimum field-strength values could be considerably lower, as is indicated in Recommendation ITU-R BT.417.

ANNEX 2

The definitions, methods of measurement and presentation of results, used in Table 4 are consistent with the relevant IEC Recommendation shown in Table 5.

TABLE 4

Principal receiver characteristics (in use by various administrations)

Item	Characteristic	Country		
		Italy	United Kingdom ⁽¹⁾	Russian Federation
1	Noise-limited sensitivity (dBm) Broadcasting band I III IV/V 12 GHz	(2) -60 -60 -55	-65	(3) -72 -72 -69
2	Protection ratio (dB) Broadcasting band I III IV/V 12 GHz	See Rec. ITU-R BT.655		See Rec. ITU-R BT.655
3	Rejection of adjacent picture carrier (dB) Broadcasting band I III IV/V 12 GHz	40 40 40	56	40 40 40

TABLE 4 (continued)

Item	Characteristic	Country		
		Italy	United Kingdom ⁽¹⁾	Russian Federation
4	Rejection of adjacent sound carrier (dB) Broadcasting band I III IV/V 12 GHz	40 40 40	43	40 40 40
5	Image frequency rejection (dB) Broadcasting band I III IV/V 12 GHz	50 50 44	51	45 45 30
6	Intermediate frequency rejection (dB) Broadcasting band I III IV/V 12 GHz	40 50 50	47	40 50 60
7	Oscillator position Broadcasting band I III IV/V } 12 GHz	High	High	High
8	Tuning tolerance (kHz) Broadcasting band I III IV/V 12 GHz	± 350 ± 350 ± 350 } ⁽⁴⁾	± 50 ⁽⁵⁾	± 100 ± 100 ± 100
9	Receiver radiation Broadcasting band I III IV/V 12 GHz			
10	Susceptibility of receiver to external interference Broadcasting band I III IV/V 12 GHz			

TABLE 4 (continued)

Item	Characteristic	Country		
		Italy	United Kingdom ⁽¹⁾	Russian Federation
11	Intermediate frequency values Broadcasting band <div style="text-align: center;"> I III } IV/V 12 GHz </div>	See Table 1	See Table 1	See Table 1

- (1) The following characteristics relate to System I colour television receivers.
- (2) For a luminance signal-to-unweighted noise ratio of 30 dB and a normalized output level.
- (3) For a luminance signal-to-unweighted noise ratio of 20 dB and a normalized output level.
- (4) The tuning tolerance must be reduced to ± 50 kHz if the television set is provided with a Teletext decoder. This tuning tolerance is achievable using an automatic frequency control or a frequency synthesizer.
- (5) With automatic frequency control.

TABLE 5

List of characteristics (from relevant IEC and CISPR documents)

Item	Characteristic	Publication IEC 107-1			Remarks
		Definition	Measuring method	Presentation of results	
1	Noise-limited sensitivity	Clause 105 and Clause 109	Clause 110	For a peak-to-peak luminance signal-to-non-weighted noise ratio of 30 dB	The most unfavourable value for each of the broadcasting bands
2	Protection ratios	See Recommendation ITU-R BT.655			
3	Rejection of adjacent picture carrier	Clause 136	Clause 137	Clause 138	The most unfavourable value for each of the broadcasting bands
4	Rejection of adjacent sound carrier	Clause 136	Clause 137	Clause 138	
5	Image-frequency rejection	Clause 146	Clause 147	Clause 138	
6	Intermediate-frequency rejection	Clause 144	Clause 145	Clause 138	
7	Oscillator position	High or low			
8	Tuning tolerance	Clause 47	Clause 48	Clause 51	As a function of time
9	Receiver radiation	As specified in CISPR Recommendation No. 24/2			
10	Susceptibility of receiver to external interference	Under study			Interference not entering by the antenna
11	Intermediate-frequency values	See Table 4			