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(10/2018)

**Technical criteria used for DTT planning
in Central American and Caribbean Region**

BT Series
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(television)



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Note: This ITU-R Report was approved in English by the Study Group under the procedure detailed in Resolution ITU-R 1.

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(2018)

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1 Introduction

The International Telecommunication Union (ITU), in close collaboration with the *Comisión Técnica Regional de Telecomunicaciones* (COMTELCA), the Caribbean Telecommunications Union (CTU) and the Inter-American Telecommunication Commission (CITEL), organized during the years of 2017 and 2018 four meetings in Central America and Caribbean Region intended to facilitate the processes of transition from Analogue to Digital Television (DTT) and allocation of the Digital Dividend, taking into account the mutual compatibility among broadcasting and mobile stations in the VHF (174-216 MHz) and UHF (470-806 MHz) bands.

The coordination process was not intended to conclude any formal agreement under the ITU, but to build informal consensus in the Central American region, Caribbean region and other administrations affected from North and South America regions, towards the conclusion of formal agreements between the administrations involved before formal notification of the relevant frequency assignments to the ITU.

During the meetings discussions, some technical parameters and assumptions were agreed by the administrations involved and are detailed in this document. The agreement was necessary due the existence of various combinations of different analogue and digital systems in border zones between the countries in the region, which needed to be detailed in order to be possible to develop the technical coordination calculations. As always, the countries involved can continue this process on a bilateral basis where the discussions can be about parameters to be agreed by mutual consent.

It is important to notice that the parameters, whenever available, were taken from in force ITU-R Recommendations and Reports, which are properly referenced in each table in the next sections. For the missing parameters, a judgements for suitable values was made.

2 Propagation prediction parameters and other assumptions

The scope of this Report is to present a compilation of technical parameters and criteria to be used for digital television planning using the propagation method described in Recommendation ITU-R P.1546-5 in force, and taking into account the use of different television standards and different system combinations for the wanted and unwanted signals.

For 90% of time (needed for planning ATSC and ISDB-T), the formula described in Report ITU-R BT.2383-1 states that Recommendation ITU-R P.1546 can be applied also for 90% of time:

$$FS (90\% \text{ of time}) = FS (50\% \text{ of time}) - [FS (10\% \text{ of time}) - FS (50\% \text{ of time})]$$

Other assumptions in this Report are:

- Unless otherwise stated fixed reception (Rice channel) is considered.
- The considered TV systems are (Ref.: “Television Systems” in § 9.1 of the Preface to the BR IFIC):

Digital systems:

- U0: DVB-T (6 MHz)
- U1: DTMB (6 MHz)
- T1: DVB-T (8 MHz)
- T2: ATSC (6 MHz)
- T6: DVB-T2 (8 MHz)
- T7: DVB-T2 (6 MHz)
- T9: ISDB-T (6 MHz)

Analogue systems:

- M (525 lines/6 MHz) with NTSC/PAL colour encoding;
 - N (625 lines/6 MHz) with PAL colour encoding.
- For adjacent channels, only lower (N-1) and upper (N+1) adjacent channels are considered, being N the wanted TV channel.
- Image channel interference from digital systems to analogue systems is not considered.
- For analogue systems, the considered interference is the modulated vision carrier of the signal.

3 Minimum field strength

TABLE 1

Digital Systems – Minimum field strength (dB(μ V/m)) for UHF (Fr = 650 MHz) ⁽¹⁾

	ATSC	DVB-T 64 QAM – 3/4 rate		DVB-T2 256 QAM – 2/3 rate (Rec. ITU-R BT.2033-1 Table 1)		ISDB-T 64 QAM – 3/4 rate (Report ITU-R BT.2383-1: Note 15 to Table 27)	DTMB 64 QAM – 0.6 rate
		6 MHz	8 MHz	6 MHz	8 MHz		
Prediction (% Location, % Time) Report ITU-R BT.2383-1: Tables 10 and 32	(50,90)	(95,50)	(95,50)	(95,50)	(95,50)	(95,90)	(95,50)
Minimum field strength dB(μ V/m) Report ITU-R BT.2383-1	41 ⁽²⁾	54.75 ⁽³⁾	56 ⁽⁴⁾	53.05 ⁽⁵⁾	54.3 ⁽⁶⁾	55.7 ⁽⁷⁾	53.02 ⁽⁸⁾

⁽¹⁾ Correction factor for other frequencies according to formula under § 11.4, Report ITU-R BT.2383-1.

⁽²⁾ Report ITU-R BT.2383-1: Table 25. For formula for FS (90% time) see footnote 19 to the Report.

⁽³⁾ Calculated using formula from Recommendation ITU-R BT.1368-13 (Attachment 1 to Annex 2), for Bandwidth = 5.71 MHz (Rec. ITU-R BT.1306-7, Table 1 item b).

⁽⁴⁾ Report ITU-R BT.2383-1: Table 19.

⁽⁵⁾ Calculated using formula from Recommendation ITU-R BT.2033-1 (Attachment 1 to Annex 1), for Bandwidth = 5.83 MHz (Rec. ITU-R BT.1877-1, Table 1).

⁽⁶⁾ Rec. ITU-R BT.2033-1: Table 13 (fixed reception).

⁽⁷⁾ 55 for fr = 600 MHz. Report ITU-R BT.2383-1: Table 28. For formula for FS (90% time) see footnote 19 to the Report.

⁽⁸⁾ Including 9.02 dB for 95% location probability factor. Calculated using Attachment 1 to Annex 4, Table 120 of Rec. ITU-R BT.1368-13 and reference C/N for fixed reception 19 dB according to Report ITU-R BT.2383-1 Table 30.

TABLE 2

Digital Systems – Minimum Field Strength (dB(μ V/m)) for VHF ($F_r = 200$ MHz) ⁽¹⁾

	ATSC	DVB-T 64 QAM – 3/4 rate		DVB-T2 256 QAM – 2/3 rate (ITU-R BT.2033-1 Table 1)		ISDB-T 64 QAM – 3/4 rate (Report ITU-R BT.2383-1: Note 15 to Table 27)	DTMB 64 QAM – 0.6 rate
		6 MHz	8 MHz	6 MHz	8 MHz		
Prediction (%Location, %Time) Report ITU-R BT.2383-1: Tables 10 and 32	(50,90)	(95,50)	(95,50)	(95,50)	(95,50)	(95,90)	(95,50)
Minimum field strength dB(μ V/m) Report ITU-R BT.2383-1	35.79 ⁽²⁾	48.75 ⁽³⁾	50 ⁽⁴⁾	46.73 ⁽⁵⁾	47.98 ⁽⁶⁾	47.60 ⁽⁷⁾	46 ⁽⁸⁾

⁽¹⁾ Correction factor for other frequencies according to formula under § 11.4, Report ITU-R BT.2383-1.

⁽²⁾ Rec. ITU-R BT.2036-1: §1.2.6. For formula for FS (90% time) see footnote 19 of Report ITU-R BT.2383-1.

⁽³⁾ Calculated using formula from Rec. ITU-R BT.1368-13 (Attachment 1 to Annex 2), for Bandwidth = 5.71 MHz (Rec. ITU-R BT.1306-7, Table 1 item b).

⁽⁴⁾ Rec. ITU-R BT.2036-1, footnote 3 on page 3.

⁽⁵⁾ Calculated using formula from Rec. ITU-R BT.2033-1 (Attachment 1 to Annex 1), for Bandwidth = 5.71 MHz (Rec. ITU-R BT.1877-1, Table 1) Field strength reference value for 7 MHz: 47.4 on Rec. ITU-R BT.2033-1: Table 12 (fixed reception).

⁽⁶⁾ Using formula from Rec. ITU-R BT.2033-1 (Attachment 1 to Annex 1), for Bandwidth = 7.61 MHz (Rec. ITU-R BT.1877-1, Table 1). Field strength reference value for 7 MHz: 47.4 on Rec. ITU-R BT.2033-1: Table 12 (fixed reception).

⁽⁷⁾ Refer to Table 84 on Rec. ITU-R BT.1368-13. Taking into account that $C/N = 20.1$ (from Table 16 of Rec. ITU-R BT.2036-1) $\rightarrow E_{min} = 40.5 - (22 - 20.1) = 38.6$. Adding 9 dB for 95% locations, Field strength=47.60 dB. For formula for FS (90% time) see footnote 19 of Report ITU-R BT.2383-1.

⁽⁸⁾ Including 9.02 dB for 95% location probability factor. Calculated using Attachment 1 to Annex 4, Table 120 of Rec. ITU-R BT.1368-13 and reference C/N for fixed reception 19 dB according to Report ITU-R BT.2383-1 – Table 30.

TABLE 3

Analogue Systems – Minimum Field Strength (dB(μ V/m))

	Analogue				
Prediction (%Location, % Time) Rec. ITU-R SM.851-1: Table 1	(50,50)				
Minimum field strength dB(μ V/m) Rec. ITU-R BT.417-5 Table 1 and Rec. ITU-R SM.851-1: Table 1	Band I (41-68 MHz)	Band II (76-100 MHz)	Band III (162-230 MHz)	Band IV (470-582 MHz)	Band V (582-960 MHz)
	48	52	55	65	70

4 Protection ratios

4.1 Digital – Digital

TABLE 4
Co-channel protection ratios (dB)

Interfering digital signal		Wanted digital signal						
		ATSC	DVB-T 64 QAM – 3/4 rate		DVB-T2 256 QAM – 2/3 rate		ISDB-T 64 QAM – 3/4 rate	DTMB 64 QAM – 0.6 rate
			6 MHz	8 MHz	6 MHz	8 MHz		
ATSC		23 Rec. ITU-R BT.1368-13: Table 3 Considering $S/N=16$ dB (Rec. ITU-R BT.2036-1, Table 11: Minimum $S/N=15.19$)	21	21 + correction ⁽¹⁾	21	20 + correction ⁽¹⁾	21 (no offset) 20 (with 1/7 MHz offset)	18
DVB-T 64 QAM – 3/4 rate	6 MHz	23	21 Rec. ITU-R BT.1368-13: Table 15	21 + correction ⁽¹⁾	21	20 + correction ⁽¹⁾	21 (no offset) 20 (with 1/7 MHz offset)	18
	8 MHz	23 + correction ⁽¹⁾	21 + correction ⁽¹⁾	21 Rec. ITU-R BT.1368-13: Table 15	21 + correction ⁽¹⁾	20 ³	21 (no offset) 20 (with 1/7 MHz offset) + correction ⁽¹⁾	18 + correction ⁽²⁾ Rec. ITU-R BT.1368-13, Page 27
DVB-T2 256 QAM – 2/3 rate	6 MHz	23	21 ⁽³⁾	21 + correction ⁽¹⁾	21 Rec. ITU-R BT.2033-1: Table 21	20 + correction ¹	21 (no offset) 20 (with 1/7 MHz offset) Rec. ITU-R BT.1368-13: Table 67bis, Notes 1 and 2 below the Table	18
	8 MHz	23 + correction ⁽¹⁾	21 + correction ⁽¹⁾	21 ³	21 + correction ⁽¹⁾	20 Rec. ITU-R BT.2033-1: Table 2	21 (no offset) 20 (1/7 MHz offset) + correction ¹	18 + correction ⁽²⁾ Rec. ITU-R BT.1368-13, Page 27
ISDB-T 64 QAM – 3/4 rate		23	21	21 + correction ⁽¹⁾	21 Rec. ITU-R BT.2033-1: Table 23	20 + correction ⁽¹⁾	21 Rec. ITU-R BT.1368-13: Table 67	18

TABLE 4 (end)

Interfering digital signal	Wanted digital signal						
	ATSC	DVB-T 64 QAM – 3/4 rate		DVB-T2 256 QAM – 2/3 rate		ISDB-T 64 QAM – 3/4 rate	DTMB 64 QAM – 0.6 rate
		6 MHz	8 MHz	6 MHz	8 MHz		
DTMB 64 QAM – 0.6 rate	23	21 Rec. ITU-R BT.1368-13: Table 16	21 + correction ⁽²⁾ Rec. ITU-R BT.1368-13, Page 27	21	20 + correction ⁽²⁾ Rec. ITU-R BT.1368-13, Page 27	21 (no offset) 20 (1/7 MHz offset)	18 Rec. ITU-R BT.1368-13: Table 92

- (1) For overlapping channels and digital system combinations where DTMB system is not involved, in the absence of specific references on ITU-R Recommendations/Reports, the use of formula on page 26 of Rec. ITU-R BT.1368-13 (for DVB-T systems and overlapping less than 1MHz.) is proposed: $PR = CCI + 10 \log_{10} (BO/BW)$.
- (2) For overlapping channels, for DVB-T vis-à-vis DTMB, the PR should be extrapolated from the co-channel PR of the wanted signal using formula on page 27 of Rec. ITU-R BT.1368-13: $PR = CCI + 10 \log_{10} ((0.855784 * BO + 1.153725) / BW)$.
CCI: co-channel PR (value indicated on the Table) | BO: overlapping bandwidth (MHz) | BW: bandwidth of the wanted signal |
If formulas in Notes (1) and (2) above give a PR < -30 dB then the value -30 dB should be used.
- (3) Using as PR the respective C/N value (Report ITU-R BT.2254-2, § 3.4.2.1).

TABLE 5

Adjacent protection ratios (dB) - Digital/Digital

Interfering digital signal		Wanted digital signal						
		ATSC	DVB-T 64 QAM – 3/4 rate		DVB-T2 256 QAM – 2/3 rate		ISDB-T 64 QAM – 3/4 rate	DTMB 64 QAM – 0.6 rate
			6 MHz	8 MHz	6 MHz	8 MHz		
ATSC		N-1: -20 N+1: -20 Rec. ITU-R BT.1368- 13: Table 4	N-1: -27.2 N+1: -27.2		N-1: -36 N+1: -36		N-1: -26 N+1: -27	N-1: -29 N+1: -29
DVB-T 64 QAM – 3/4 rate	6 MHz	N-1: -20 N+1: -20	N-1: -27.2 N+1: -27.2		N-1: -36 N+1: -36		N-1: -26 N+1: -27	N-1: -29 N+1: -29
	8 MHz			N-1: -27.2 N+1: -27.2 Rec. ITU-R BT.1368- 13: Table 17 and Table 50 (correction factor)		N-1: -33 N+1: -30		

TABLE 5 (end)

Interfering digital signal		Wanted digital signal						
		ATSC	DVB-T 64 QAM – 3/4 rate		DVB-T2 256 QAM – 2/3 rate		ISDB-T 64 QAM – 3/4 rate	DTMB 64 QAM – 0.6 rate
			6 MHz	8 MHz	6 MHz	8 MHz		
DVB-T2 256 QAM – 2/3 rate	6 MHz	N-1: –20 N+1: –20	N-1: –27.2 N+1: –27.2		N-1: –36 N+1: –36 Rec. ITU-R BT.2033-1: Table 22		N-1: –27 N+1: –27 Rec. ITU-R BT.1368- 13: Table 69bis (ISDB-T 64QAM - 7/8 rate)	N-1: –29 N+1: –29
	8 MHz			N-1: –27.2 N+1: –27.2		N-1: –33 N+1: –30 Rec. ITU-R BT.2033-1: Table 3		
ISDB-T 64 QAM – 3/4 rate		N-1: –20 N+1: –20	N-1: –27.2 N+1: –27.2		N-1: –39 N+1: –39 Rec. ITU-R BT.2033-1: Table 24		N-1: –26 N+1: –29 Rec. ITU-R BT.1368- 13: Table 69 (ISDB-T 64QAM - 7/8 rate)	N-1: –29 N+1: –29
DTMB 64 QAM – 0.6 rate		N-1: –20 N+1: –20	N-1: –27.2 N+1: –27.2 Rec. ITU-R BT.1368- 13: Table 18 and Table 50 (correction factor)		N-1: –36 N+1: –36		N-1: –26 N+1: –27	N-1: –29 N+1: –29 Rec. ITU-R BT.1368- 13: Table 91

Note: Grey cells correspond to overlapping channels. Refer to Table 4.

4.2 Digital – Analogue

TABLE 6
Co-channel protection ratios for digital wanted signal (dB)

Interfering analogue signal	Wanted digital signal				
	ATSC	DVB-T 64 QAM – 3/4 rate	DVB-T2 256 QAM – 2/3 rate	ISDB-T 64 QAM – 3/4 rate	DTMB 64 QAM – 0.6 rate
System M	7 Rec. ITU-R BT.1368-13: Table 6	3 ^{(1), (2)}	3 ⁽¹⁾ Rec. ITU-R BT.2033-1: Table 25	5 Rec. ITU-R BT.1368-13: Table 71	5 Rec. ITU-R BT.1368-13: Table 96
System N				7 ⁽³⁾	

⁽¹⁾ For 8 MHz bandwidths, the protection ratios can be found in Table 10.

⁽²⁾ In the assumption that the DVB-T value is the same as the one reported for DVB-T2 256QAM.

⁽³⁾ Sub working Group n. °1 – Communications, MERCOSUR (Broadcasting Technical Commission), June 2017.

Note: Grey cells correspond to system combinations that do not apply in the region.

TABLE 7
Co-channel protection ratios for analogue wanted signal (dB)

Interfering digital signal	Wanted analogue signal			
	System M		System N	
	Tropospheric interference	Continuous interference	Tropospheric interference	Continuous interference
ATSC	34 Rec. ITU-R BT.1368-13: Table 10	44 Rec. ITU-R BT.655-7 Annex 1 § 2.1		
DVB-T (6MHz) ⁽¹⁾ 64 QAM – 3/4 rate	34 ⁽²⁾	40 ⁽²⁾		
DVB-T2 (6MHz) ⁽¹⁾ 256 QAM – 2/3 rate	34 ⁽²⁾	40 ⁽²⁾		
ISDB-T 64 QAM – 3/4 rate	39 Rec. ITU-R BT.1368-13: Table 77	44 Rec. ITU-R BT.1368-13: Table 77	34 ⁽³⁾	40 ⁽⁴⁾
DTMB 64 QAM – 0.6 rate	35 Rec. ITU-R BT.1368-13: Table 105	41 Rec. ITU-R BT.1368-13: Table 105		

Notes to Table 7:

- (1) For 8 MHz bandwidth, the protection ratios can be found in Table 11.
- (2) In the assumption that the values for DVB-T and DVB-T2 6 MHz are the same as the ones reported for 7 and 8 MHz.
- (3) Sub-Working Group n. ° 1 – Communications, MERCOSUR (Broadcasting Technical Commission), June 2017.
- (4) Argentina: Decreto 835/2011, available at: <http://servicios.infoleg.gob.ar/infolegInternet/anexos/180000-184999/183617/norma.htm>.

Note: Grey cells correspond to system combinations that do not apply in the region.

TABLE 8
Adjacent protection ratios for digital wanted signal (dB)

Interfering analogue signal	Wanted digital signal				
	ATSC	DVB-T ⁽¹⁾ 64 QAM – 3/4 rate	DVB-T2 ⁽¹⁾ 256 QAM – 2/3 rate	ISDB-T 64 QAM – 3/4 rate	DTMB 64 QAM – 0.6 rate
System M	N-1: -48 N+1: -49 Rec. ITU-R BT.1368-13: Tables 7 and 8	N-1: -32 ⁽²⁾ (PAL G, B1) N+1: -38 ⁽²⁾ (for 64QAM 2/3, PAL/SECAM) Rec. ITU-R BT.1368-13: Tables 20 and 21	N-1: -32 ⁽³⁾ (PAL G, B1) N+1: -38 ⁽³⁾ (for 64QAM 2/3, PAL/SECAM) Rec. ITU-R BT.1368-13: Tables 20 and 21	N-1: -31 N+1: -33 Rec. ITU-R BT.1368-13: Tables 73 and 75	N-1: -37 N+1: -43 Rec. ITU-R BT.1368-13: Tables 99 and 100
System N				N-1: -31 N+1: -33	

(1) For 8 MHz bandwidths the Protection ratios can be found in Table 10.

(2) In the assumption that the values for DVB-T 6 MHz are the same as the ones reported for 7 and 8 MHz.

(3) In the assumption that the DVB-T2 values are the same as the ones reported for DVB-T.

Note: Grey cells correspond to system combinations that do not apply in the region.

TABLE 9

Adjacent protection ratios for analogue wanted signal (dB)

Interfering digital signal	Wanted analogue signal			
	System M		System N	
	Tropospheric interference	Continuous interference	Tropospheric interference	Continuous interference
ATSC	N-1: -16 N+1: -17 Rec. ITU-R BT.1368-13: Table 10	N-1: -6 N+1: -7 Rec. ITU-R BT.655-7 – Annex 1 § 2.1		
DVB-T (6MHz) ⁽¹⁾ 64 QAM – 3/4 rate	N-1: -9 ⁽²⁾ N+1: -8 ⁽²⁾	N-1: -5 ⁽²⁾ N+1: -5 ⁽²⁾		
DVB-T2 (6MHz) ⁽¹⁾ 256 QAM – 2/3 rate	N-1: -9 ⁽²⁾ N+1: -8 ⁽²⁾	N-1: -5 ⁽²⁾ N+1: -5 ⁽²⁾		
ISDB-T 64 QAM – 3/4 rate	N-1: -6 N+1: -6 Rec. ITU-R BT.1368-13: Table 77	N-1: -3 N+1: -3 Rec. ITU-R BT.1368-13: Table 77	N-1: -11 ⁽³⁾ N+1: -11 ⁽³⁾	N-1: -1 N+1: -1 Rec. ITU-R BT.655-7 – Appendix 2 to Annex 1 § 2 (tropospheric +10 dB)
DTMB 64 QAM – 0.6 rate	N-1: -8 N+1: -8 Rec. ITU-R BT.1368-13: Tables 108, 111	N-1: -4 N+1: -4 Rec. ITU-R BT.1368-13: Tables 108, 111		

⁽¹⁾ For 8 MHz bandwidth, the protection ratios can be found in Table 11.

⁽²⁾ In the assumption that the values for DVB-T and DVB-T2 6MHz are the same as the ones reported for 7 and 8 MHz.

⁽³⁾ Sub-Working Group n° 1 – Communications, MERCOSUR (Broadcasting Technical Commission), June 2017.

Note: Grey cells correspond to system combinations that do not apply in the region.

TABLE 10

Overlapping channel protection ratios for digital wanted signal (dB)

Interfering analogue signal	Wanted digital signal												
	DVB-T (8MHz) ⁽¹⁾ 64 QAM – 3/4 rate and DVB-T2 (8 MHz) ⁽¹⁾ 256 QAM – 2/3 rate												
	Δf (frequency of the unwanted analogue vision carrier minus centre frequency of the wanted DVB-T signal)												
	-9.75	-9.25	-8.75	-8.25	-6.75	-3.95	-3.75	-2.75	-0.75	2.25	3.25	4.75	5.25
System M	-37 ⁽²⁾	-14 ⁽²⁾	-8 ⁽²⁾	-4 ⁽²⁾	-2 ⁽²⁾	1 ⁽²⁾	3 ⁽²⁾	3 ⁽²⁾	3 ⁽²⁾	2 ⁽²⁾	-1 ⁽²⁾	-29 ⁽²⁾	-36 ⁽²⁾

⁽¹⁾ For 6 MHz bandwidths, the protection ratios can be found in Table 4.

⁽²⁾ In the absence of specific values on ITU-R Recommendations/Reports, the PR from Table 22 of Rec. ITU-R BT.1368-13 are proposed for both, DVB-T and DVB-T2 interfered by an overlapping system M signal.

TABLE 11

Overlapping channel protection ratios for analogue wanted signal (dB)

Interfering digital signal	Wanted analogue signal (system M)		
	Δf (centre frequency of the unwanted DVB-T signal minus frequency of the wanted analogue vision carrier)	Tropospheric interference	Continuous interference
DVB-T (8 MHz) ⁽¹⁾ 64 QAM – 3/4 RATE and DVB-T2 (8 MHz) ⁽¹⁾ 256 QAM – 2/3 RATE	-8.25	-20 ⁽²⁾	-15 ⁽²⁾
	-5.25	-13 ⁽²⁾	-9 ⁽²⁾
	-4.75	-11 ⁽²⁾	-4 ⁽²⁾
	-4.25	5 ⁽²⁾	13 ⁽²⁾
	-3.75	24 ⁽²⁾	30 ⁽²⁾
	-3.25	29 ⁽²⁾	36 ⁽²⁾
	-2.25	33 ⁽²⁾	39 ⁽²⁾
	-1.25	34 ⁽²⁾	40 ⁽²⁾
	2.75	34 ⁽²⁾	40 ⁽²⁾
	4.75	34 ⁽²⁾	40 ⁽²⁾
	5.75	30 ⁽²⁾	37 ⁽²⁾
	6.75	27 ⁽²⁾	34 ⁽²⁾
	7.75	25 ⁽²⁾	32 ⁽²⁾
	8.75	5 ⁽²⁾	11 ⁽²⁾
	10.75	-15 ⁽²⁾	-12 ⁽²⁾
	12.75	-15 ⁽²⁾	-12 ⁽²⁾

⁽¹⁾ For 6 MHz bandwidths the Protection ratios can be found in Table 7.

⁽²⁾ In the absence of specific values on ITU-R Recommendations/reports, the PR from Table 115 of Rec. ITU-R BT.1368-13 (analogue vision signal interfered by an overlapping DTMB 8 MHz signal) are proposed for analogue M system interfered by overlapping DVB-T 8 MHz or DVB-T2 8 MHz signals.

4.3 Analogue – Analogue

TABLE 12

Co-channel protection ratios for analogue wanted signal (dB)

Interfering analogue signal	Wanted analogue signal			
	System M		System N	
	Tropospheric interference	Continuous interference	Tropospheric interference	Continuous interference
System M ⁽¹⁾ and system N	45 Rec. ITU-R BT.655-7 – Appendix 1 to Annex 1 § 1.1 (carriers separated by less than 1 000 MHz)	55 Rec. ITU-R BT.655-7 – Appendix 1 to Annex 1 § 2 (tropospheric +10 dB)	45 Rec. ITU-R BT.655-7 – Appendix 2 to Annex 1 § 1.1 (carriers separated by less than 1 000 MHz)	55 Rec. ITU-R BT.655-7 – Appendix 2 to Annex 1 § 2 (tropospheric +10 dB)
	Offset systems (applies only to same-line systems: M interfered by M or N interfered by N)			
	Different offsets: $\pm 1/2, \pm 3/2, \pm 5/2 \dots$ LF ($\approx \pm 7$ kHz, ± 23 kHz, ± 39 kHz...) → 25 $\pm 1/3, \pm 2/3, \pm 4/3 \dots$ LF ($\approx \pm 5$ kHz, ± 10 kHz, ± 21 kHz...) → 28 (Rec. ITU-R BT.655-7 - Appendix 1 to Annex 1 § 1.2) Same offsets → 45	35 38 55 Rec. ITU-R BT.655-7 – Appendix 1 to Annex 1 § 2 (tropospheric +10 dB)	Different offsets: Carriers separated by multiples of a 12 th of the line frequency up to $\pm 36/12 f_{line}$ → 22 to 45 (Rec. ITU-R BT.655-7: Table 6) Same offsets → 45	Different offsets: Carriers separated by multiples of a 12 th of the line frequency up to $\pm 36/12 f_{line}$ → 27 to 52 (Rec. ITU-R BT.655-7: Table 6) Same offsets → 55

⁽¹⁾ For system M, for offsets not included in Rec. ITU-R BT.655-7, it is proposed to take the ‘worst case’ and use PR corresponding to non-offset systems.

TABLE 13

Adjacent protection ratios for analogue wanted signal (dB)

Interfering analogue signal	Wanted analogue signal			
	System M		System N	
	Tropospheric interference	Continuous interference	Tropospheric interference	Continuous interference
System M and system N	N-1: -13 + correction N+1: -10 Rec. ITU-R BT.655-7 App. 1 to Annex 1 § 2.1 and § 2.2	N-1: -3 + correction N+1: 0 Rec. ITU-R BT.655-7 App. 1 to Annex 1 § 2 (tropospheric +10 dB)	N-1: -12	N-1: -2
			N+1: -12 Rec. ITU-R BT.655-7 App. 2 to Annex 1 § 2.2	N+1: -2 Rec. ITU-R BT.655-7 App. 2 to Annex 1 § 2 (tropospheric +10 dB)

TABLE 14

Overlapping channel protection ratios for analogue wanted signal (dB)

Interfering analogue signal	Wanted analogue signal					
	System M (NTSC/PAL)			System N (PAL)		
	Fu -Fw (MHz)	Tropospheric ⁽¹⁾ interference	Continuous ⁽²⁾ interference	Fu -Fw (MHz)	Tropospheric ⁽³⁾ Interference	Continuous ⁽⁴⁾ Interference
System M and system N	-1.5	0	10	3.6 – 4.8	28 to 45 (offsets from 0 to 12/12)	34 to 53 ⁽⁴⁾ (offsets from 0 to 12/12)
	-1	30	40			
	-0.75	40	50			
	0.3	50	60			
	1	50	60			
	2.5	37	47			
	3	45	55	5.7 – 6.0	15 to 25 (offsets from 0 to 12/12)	21 to 35 ⁽⁴⁾ (offsets from 0 to 12/12)
	3.5	50 (45 for PAL)	60 (55 for PAL)			
	3.7	50 (45 for PAL)	60 (55 for PAL)			
	4.1	45	55			
4.5	15	25				

¹ Rec. ITU-R BT.655-7 – Table 4.² Rec. ITU-R BT.655-7 – Appendix 1 to Annex 1 § 2: “For continuous interference, the values should be increased by 10 dB.”³ Rec. ITU-R BT.655-7 – Table 12 (no specific mention of system N).⁴ Rec. ITU-R BT.655-7 – Table 13 (no specific mention of system N).

Annex

List of relevant ITU-R Reports and Recommendations

Additional information on the characteristics which are referred to in this Report can be found in the following ITU-R documents:

- Recommendation ITU-R BT.1368 – Planning criteria, including protection ratios, for digital terrestrial television services in the VHF/UHF bands
- ITU-R DTTB Handbook
- Recommendation ITU-R BT.1206 – Spectrum limit masks for digital terrestrial television broadcasting
- Recommendation ITU-R BT.1877 – Error-correction, data framing, modulation and emission methods for second generation of digital terrestrial television broadcasting systems
- Recommendation ITU-R BT.1306 – Error correction, data framing, modulation and emission methods for digital terrestrial television broadcasting

Additional information on the protection requirements which are referred to in this Report can be found in the following ITU-R documents:

- Recommendation ITU-R BT.1368 – Planning criteria, including protection ratios, for digital terrestrial television services in the VHF/UHF bands
- Recommendation ITU-R BT.1735 – Methods for objective reception quality assessment of digital terrestrial television broadcasting signals of System B specified in Recommendation ITU-R BT.1306
- Recommendation ITU-R BT.1895 – Protection criteria for terrestrial broadcasting systems
- Final Acts of RRC06 – The GE06 Agreement
- Recommendation ITU-R BT.2033 – Planning criteria, including protection ratios, for second generation of digital terrestrial television broadcasting systems in the VHF/UHF bands
- Report ITU-R BT.2215 – Measurements of Protection Ratios and Overload Thresholds for Broadcast TV Receivers
- Report ITU-R BT.2265 – Guidelines for the assessment of interference into the broadcasting service
- Recommendation ITU-R BT.2036 – Characteristics of a reference receiving system for frequency planning of digital terrestrial television systems
- Report ITU-R BT.2254 – Frequency and network planning aspects of DVB-T2

Information on sharing and compatibility studies involving DTTB can be found in the following ITU-R documents:

- Report ITU-R BT.2247 – Field measurement and analysis of compatibility between DTTB and IMT
- Report ITU-R BT.2248 – A conceptual method for the representation of loss of broadcast coverage
- Report ITU-R BT.2337 – Sharing and compatibility studies between digital terrestrial television broadcasting and terrestrial mobile broadband applications, including IMT, in the frequency band 470-694/698 MHz

- Report ITU-R BT.2339 – Co-channel sharing and compatibility studies between digital terrestrial television broadcasting and international mobile telecommunication in the frequency band 694-790 MHz in the GE06 planning area

Information on propagation matters referred to in this Report can be found in the following ITU-R documents:

- Recommendation ITU-R P.1546 – Method for point-to-area predictions for terrestrial services in the frequency range 30 MHz to 3 000 MHz
 - Recommendation ITU-R P.1812 – A path-specific propagation prediction method for point-to-area terrestrial services in the VHF and UHF bands.
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