APPENDIX D

Technical basis for the terrestrial broadcasting service

Frequency bands, channel spacing and channel distribution

In Bands III, a single channel spacing of 7 MHz is used while in the bands IV and V, a single channel spacing of 8 MHz is used.

In Bands IV and V, the same channel spacing and channel distribution is used for digital and analogue television. Detail of channelling plan is shown in **Appendix C** of this SRSP document.

Reception modes for DVB-T

DVB-T was planned for a number of different reception modes, namely, fixed reception, portable (outdoor and indoor) reception and mobile reception, using a number of appropriate system variants and location probabilities.

1. Fixed reception

The reference receiving antenna height considered to be representative in calculating the field strength for fixed reception is 10 m above ground level. In order to derive the minimum median field-strength levels for Bands IV and V, the receiving antenna gain and feeder-loss values are given in item 1.2 and 1.3 below.

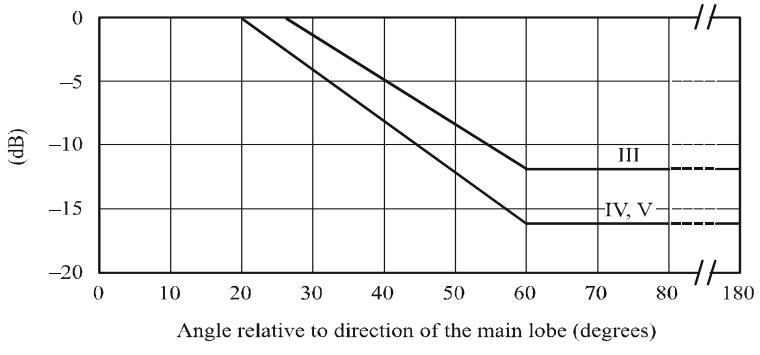
1.1 Radiation patterns for fixed receiving antennas at roof level

Standard radiation patterns for receiving antennas for Bands IV and V are given in Recommendation ITU-R BT.419-3 as shown in figure below.

FIGURE 3-1

Directivity of receiving antennas for Bands III, IV and V

(The number of the broadcasting band is shown on the curve)



RRC06-A2-C3-1

1.2 Antenna gain

The antenna gain values (relative to a half-wave dipole) used in the derivation of the minimum median equivalent field-strength values are given in Table 1

TABLE 1
Antenna gain (relative to a half-wave dipole) in Bands IV and V

Frequency (MHz)	500
Antenna gain (dBd)	10

1.3 Feeder loss

The feeder-loss values used in the derivation of the minimum median wanted signal levels are given in Table 2.

TABLE 2
Feeder loss in Bands IV and V

Frequency (MHz)	500
Feeder loss (dB)	3

1.4 Location probability for fixed reception

For fixed reception, a location probability of 95% shall be used.

1.5 Polarization discrimination for fixed reception

It is possible to take advantage of polarization discrimination for fixed reception. However, in the case of orthogonal polarization, the combined discrimination provided by directivity and orthogonality cannot be calculated by adding together the separate discrimination values. A combined discrimination value of 16 dB shall be applied for all angles of azimuth in Bands IV to V.

2. Portable and mobile reception

2.1 Considerations on height loss

For portable (indoor and outdoor) reception, a receiving antenna height of 1.5 m above ground level is used. The same receiving antenna height is also used for mobile reception. Since all field-strength calculations are for a receiving antenna height of 10 m, a height loss correction factor for an antenna height of 1.5 m

shall be used in the calculation of minimum median field-strength levels.

For planning purposes, the height-loss values for portable and for mobile reception for reference frequencies are given in Table 3.

TABLE 3
Height loss in Bands IV and V

Frequency (MHz)	500
Height loss (dB)	16

These values are those obtained for suburban coverage.

2.2 Building entry loss

Table 4 contains the mean values for building entry loss and the corresponding standard deviation at UHF.

TABLE 4
Building entry loss in Bands IV and V

Band	**Building entry loss**	**Standard deviation**
UHF	8 dB	5.5 dB

2.3 Antenna gain for portable reception

For portable reception, an omnidirectional antenna shall be applied. The antenna gain (relative to a half-wave dipole) is as given in Table 5.

TABLE 5
Antenna gain (dBd) for portable reception

Band	**Gain (dBd)**
Band IV (UHF)	0
Band V (UHF)	0

2.4 Location probability for portable reception

For portable indoor and outdoor reception, a location probability of 95% shall be used.

2.5 Polarization discrimination for portable reception

Polarization discrimination shall not be taken into account in frequency planning for portable reception.

2.6 Antenna gain for mobile reception

The values of antenna gain given in Table 6 shall be used for mobile reception.

TABLE 6
Antenna gain (dBd) for mobile reception

Band	Gain (dBd)
Band IV (UHF)	0
Band V (UHF)	0

2.7 Location probability for mobile reception

For mobile reception of DVB-T, a location probability of 95% shall be used;

2.8 Polarization discrimination for mobile reception

Polarization discrimination shall not be taken into account for mobile reception.

3. Reference planning configurations

A planning configuration describes relevant technical aspects of a broadcasting service implementation. The various aspects of a planning configuration, for the example of DVB-T, are summarized in Table 7.

TABLE 7
Aspects of DVB-T planning configurations

Aspect	Element
Reception mode	Fixed Portable outdoor Portable indoor Mobile
Coverage quality (in terms of percentage of locations)	70% 95% 99%
Network structure	MFN (single transmitter) SFN Dense SFN
DVB-T system variant	From QPSK 1/2 to 64-QAM 7/8
Frequency band	Band III Band IV Band V

4. DVB-T receiver noise figure

A receiver noise figure of 7 dB shall be used for DVB-T.

5. Planning criteria

For the development of the DTTB Plan in band IV and V, the following planning criteria have been used; they shall also be used for the modification of the DTTB plan:

i. minimum median field strengths;
ii. nuisance field strengths;

based on:

i. C/N values;
ii. protection ratios;
iii. building entry loss for indoor reception;
iv. location correction factors and the percentage time;
v. possibly, the constraints of the spectrum mask applied to a digital transmission.

5.1 C/N values for planning

For DVB-T, the *C/N* values are based on current DVB-T receivers in non-hierarchical modes. These *C/N* values, for different DVB-T system variants and for different reception conditions, are indicated in Table 2.1 in Section 1 to this Appendix.

The *C/N* values given for the Ricean channel shall be used for the fixed reception case, and those for the Rayleigh channel shall be used for the portable and mobile reception cases.

5.2 Protection ratios

The protection ratios are summarized in the tables in Section 2 to this appendix.

For DVB-T (vis-à-vis DVB-T and analogue television, and conversely), the protection ratios given in Section 2 to this appendix are based on those developed in Recommendation ITU-R BT.1368-6.

5.3 Minimum signal levels for digital broadcasting systems

For the different reception modes, the field strengths required to provide the desired location probability for reception of the wanted signal can best be compared by using a reference receiving antenna height, location probability and percentage time, as follows:

- Receiving antenna height: 10 m above ground level
- Location probability: 50%

- Percentage time: 50%.

The field strengths corresponding to these conditions are termed the "minimum median field strengths", referred to as E_{med} in Section 1 to this appendix. These field strengths correspond to the minimum signal levels needed to overcome natural and man-made noise (in the absence of interference from other transmitters) known also as the "minimum usable field strengths".

5.4 Minimum signal levels for analogue broadcasting systems

For analogue TV, the minimum field strength and the reference parameters for field-strength representation in Recommendation ITU-R BT.417-5 shall be used.

5.5 Location correction factors and percentage time

Due to the sharp degradation of quality that occurs when the required carrier-to-interference ratio or the required carrier-to-noise ratio is not attained, a higher percentage of location probability is required for the wanted field strengths (and lower percentage for the interfering signals).

Compatibility calculations for the digital broadcasting systems are based on propagation curves for 50% time for the wanted field strength, and 1% for the unwanted field strength.

5.5.1 Signal variations at outdoor locations

Recommendation ITU-R P.1546-2 gives a standard deviation macro-scale of 5.5 dB for wideband signals. This value shall be used to determine the field-strength variation at outdoor locations, which is taken into account by means of the "location correction factor".

The location correction factors for macro-scale variations (see formulas in Section 3 to this appendix) are given in Table 8.

TABLE 8
Oudoor location

Coverage target (location probability) (%)	Location correction factor (UHF) (dB)
99	13
95	9
70	3

5.5.2 Signal variations at indoor locations

The field-strength variation at indoor locations is the combined result of the outdoor variation and the variation due to building attenuation. For UHF, where both signal standard deviations are 5.5 dB, the combined value is 7.8 dB.

The location correction factor for macro-scale variations at indoor locations given in Table 9 shall be used.

TABLE 9
Indoor location

Coverage target (location probability) (%)	Location correction factor (UHF) (dB)
95	13
70	4

5.5.3 Combined location correction factor

The combined location correction factor is used to convert the wanted and nuisance field strengths which refer to 50% of location, to the value corresponding to the percentage of location needed for the wanted service.

The combined location correction factor shall be calculated as follows:

$$CF = \mu\sqrt{\sigma_w^2 + \sigma_n^2} \quad \text{dB}$$

where:
σ_w: standard deviation of location variation for the wanted signal (dB)
σ_n: standard deviation of location variation for the nuisance signal (dB)
μ: distribution factor being 0.52 for 70% locations, 1.64 for 95% locations and 2.33 for 99% locations and can be calculated as follows:

$$\mu = Q_i(1 - x/100)$$

where:
Q_i: multiplying factor
x: percentage of location for which protection is required.

6. Power-sum method

The power sum is the logarithmic value of the sum of the individual field strengths expressed as arithmetic powers:

$$\text{Sum} = 10 \log\left(\sum 10^{\frac{E_i}{10}} \right)$$

where E_i represents the individual field strengths (dB(μV/m)).

7. Spectrum mask

For modifications to the DTTB plan, a spectrum mask with a performance at least equivalent to that of the non-critical mask for DVB-T shall be used.

The spectrum masks for sensitive cases may be used to facilitate coordination between administrations.

7.1 Spectrum mask for DVB-T in 8 MHz

Two spectrum masks are specified in Fig. 1 and the associated Table 10. The upper curve defines the spectrum mask for the non-critical cases and the lower curve defines the spectrum mask for the sensitive cases.

figure 1

Symmetrical spectrum masks for non-critical and sensitive cases

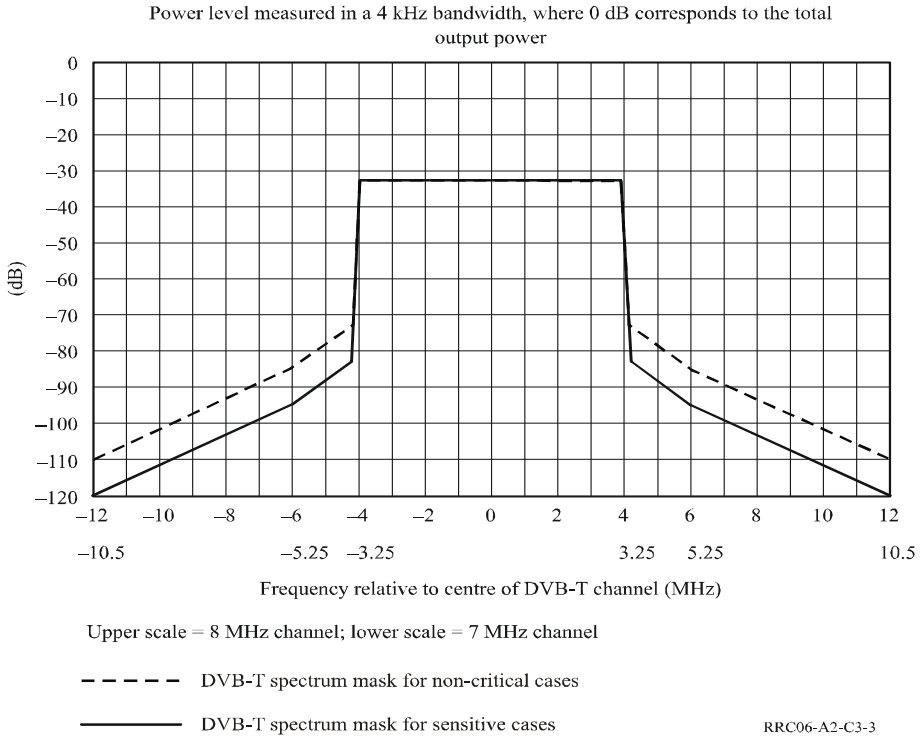


TABLE 10

Symmetrical spectrum masks for non-critical and sensitive cases

Breakpoints		
8 MHz channels		
	Non-critical cases	**Sensitive cases**
Relative frequency (MHz)	**Relative level (dB)**	**Relative level (dB)**
–12	–110	–120
–6	–85	–95
–4.2	–73	–83
–3.9	–32.8	–32.8
+3.9	–32.8	–32.8
+4.2	–73	–83
+6	–85	–95
+12	–110	–120

SECTION 1

C/*N* values and minimum median field-strength values of different DVB-T system variants for different reception conditions

TABLE 2.1

C/*N* (dB) values of different DVB-T system variants for the Gaussian, Ricean and Rayleigh channels and the corresponding values for the case of fixed reception (FX), portable outdoor reception (PO), portable indoor reception (PI) and mobile reception (MO)

System variants	Modulation	Code rate	Gauss	Rice	Rayleigh		
				FX	PO	PI	MO
A1, D1	QPSK	1/2	4.9	5.9	8.1	8.1	11.1
A2, D2	QPSK	2/3	6.8	7.9	10.2	10.2	13.2
A3, D3	QPSK	3/4	7.9	9.1	11.5	11.5	14.5
A5, D5	QPSK	5/6	9.0	10.3	12.8	12.8	15.8
A7, D7	QPSK	7/8	9.9	11.3	13.9	13.9	16.9
B1, E1	16-QAM	1/2	10.6	11.6	13.8	13.8	16.8
B2, E2	16-QAM	2/3	13.0	14.1	16.4	16.4	19.4
B3, E3	16-QAM	3/4	14.5	15.7	18.1	18.1	21.1
B5, E5	16-QAM	5/6	15.6	16.9	19.4	19.4	22.4
B7, E7	16-QAM	7/8	16.1	17.5	20.1	20.1	23.1
C1, F1	64-QAM	1/2	16.2	17.2	19.4	19.4	22.4
C2, F2	64-QAM	2/3	18.4	19.5	21.8	21.8	24.8
C3, F3	64-QAM	3/4	20.0	21.2	23.6	23.6	26.6
C5, F5	64-QAM	5/6	21.4	22.7	25.2	25.2	28.2
C7, F7	64-QAM	7/8	22.3	23.7	26.3	26.3	29.3

TABLE 2.2

Minimum median field-strength values (dB(μV/m)) of different DVB-T system variants for the case of fixed reception (FX), portable outdoor reception (PO), portable indoor reception (PI) and mobile reception (MO)
for reference frequency, 500 MHz

System variants	Modulation	Code rate	MHz	FX	PO	PI	MO
A1, D1	QPSK	1/2	500.0	38.90	64.10	76.10	67.10
A2, D2	QPSK	2/3	500.0	40.90	66.20	78.20	69.20
A3, D3	QPSK	3/4	500.0	42.10	67.50	79.50	70.50
A5, D5	QPSK	5/6	500.0	43.30	68.80	80.80	71.80
A7, D7	QPSK	7/8	500.0	44.30	69.90	81.90	72.90
B1, E1	16-QAM	1/2	500.0	44.60	69.80	81.80	72.80
B2, E2	16-QAM	2/3	500.0	47.10	72.40	84.40	75.40
B3, E3	16-QAM	3/4	500.0	48.70	74.10	86.10	77.10
B5, E5	16-QAM	5/6	500.0	49.90	75.40	87.40	78.40
B7, E7	16-QAM	7/8	500.0	50.50	76.10	88.10	79.10

C1, F1	64-QAM	1/2	500.0	50.20	75.40	87.40	78.40
C2, F2	64-QAM	2/3	500.0	52.50	77.80	89.80	80.80
C3, F3	64-QAM	3/4	500.0	54.20	79.60	91.60	82.60
C5, F5	64-QAM	5/6	500.0	55.70	81.20	93.20	84.20
C7, F7	64-QAM	7/8	500.0	56.70	82.30	94.30	85.30

The minimum median field strengths in Table 2.2 are given for 500 MHz (Bands IV/V). For other frequencies the following interpolation rule shall be used:

- $E_{med}(f) = E_{med}(f_r) + \text{Corr}$;
- for fixed reception, $\text{Corr} = 20 \log_{10} (f/f_r)$, where f is the actual frequency and f_r the reference frequency of the relevant band quoted above;
- for portable reception and mobile reception, $\text{Corr} = 30 \log_{10} (f/f_r)$ where f is the actual frequency and f_r the reference frequency of the relevant band quoted above.

SECTION 2

Protection ratios for terrestrial broadcasting systems

3.1 Overview of tables of protection ratios

Wanted signal	**Unwanted signal**	**Table**
DVB-T	Co-channel DVB-T	3.2.1
DVB-T	Adjacent channel DVB-T	3.2.2
DVB-T	Co-channel analogue TV	3.2.3
DVB-T	Lower channel analogue TV	3.2.4
DVB-T	Upper channel analogue TV	3.2.5
DVB-T (8 MHz)	Overlapping 8 MHz analogue TV	3.2.6
DVB-T (for RPCs)	Co-channel DVB-T	3.3.1
Analogue TV	Co-channel DVB-T	3.4.1
Analogue TV	Overlapping 8 MHz DVB-T	3.4.2

Notes for all tables:

FX: fixed reception
PO: portable outdoor reception
PI: portable indoor reception
MO: mobile reception
Gauss: gaussian channel (for information only)

3.2 Protection ratios for DVB-T

3.2.1 Protection ratios for DVB-T interfered with by DVB-T

TABLE 3.2.1
Co-channel protection ratios (dB) for a DVB-T signal interfered with by a DVB-T signal for different DVB-T variants for the case of fixed reception (FX), portable outdoor reception (PO), portable indoor reception (PI) and mobile reception (MO)

DVB-T system variant	FX	PO	PI	MO
QPSK 1/2	6.00	8.00	8.00	11.00
QPSK 2/3	8.00	11.00	11.00	14.00
QPSK 3/4	9.30	11.70	11.70	14.70
QPSK 5/6	10.50	13.00	13.00	16.00
QPSK 7/8	11.50	14.10	14.10	17.10
16-QAM 1/2	11.00	13.00	13.00	16.00
16-QAM 2/3	14.00	16.00	16.00	19.00
16-QAM 3/4	15.00	18.00	18.00	21.00
16-QAM 5/6	16.90	19.40	19.40	22.40
16-QAM 7/8	17.50	20.10	20.10	23.10
64-QAM 1/2	17.00	19.00	19.00	22.00
64-QAM 2/3	20.00	23.00	23.00	26.00
64-QAM 3/4	21.00	25.00	25.00	28.00
64-QAM 5/6	23.30	25.80	25.80	28.80
64-QAM 7/8	24.30	26.90	26.90	29.90

3.2.2 Protection ratios for overlapping and adjacent channel case

The treatment of overlapping and adjacent channel cases (DVB-T vis-à-vis DVB-T) is described in Recommendation ITU-R BT.1368-6. The protection ratios for the adjacent channels in Table 3.2.2 shall be used.

TABLE A.3.2.2
Protection ratios (dB) for a DVB-T signal interfered with by a DVB-T signal in the lower (N – 1) and upper (N + 1) adjacent channels

Channel	N – 1	N + 1
PR	–30	–30

3.2.3 Protection ratios for DVB-T interfered with by analogue television

TABLE 3.2.3

Co-channel protection ratios (dB) for DVB-T signals interfered with by analogue television signals

DVB-T system variant	Gauss	FX	PO	PI	MO
QPSK 1/2	−12.0	−12.0	−12.0	−12.0	−9.0
QPSK 2/3	−8.0	−8.0	−8.0	−8.0	−5.0
QPSK 3/4	−4.0	−2.8	−0.4	−0.4	2.6
QPSK 5/6	3.0	4.3	6.8	6.8	9.8
QPSK 7/8	9.0	10.4	13.0	13.0	16.0
16-QAM 1/2	−8.0	−8.0	−8.0	−8.0	−5.0
16-QAM 2/3	−3.0	0.0	3.0	3.0	6.0
16-QAM 3/4	0.0	2.5	5.0	5.0	8.0
16-QAM 5/6	9.0	10.3	12.8	12.8	15.8
16-QAM 7/8	16.0	17.4	20.0	20.0	23.0
64-QAM 1/2	−3.0	0.0	3.0	3.0	6.0
64-QAM 2/3	3.0	4.5	6.0	6.0	9.0
64-QAM 3/4	9.0	12.0	15.0	15.0	18.0
64-QAM 5/6	15.0	16.3	18.8	18.8	21.8
64-QAM 7/8	20.0	21.4	24.0	24.0	27.0

3.2.4 Protection Ratio for DVB-T interfered with by Analogue TV

TABLE 3.2.4

Protection ratios (dB) for lower adjacent channel ($N - 1$) interference for DVB-T signals interfered with by analogue television signals including sound

DVB-T system variant	Gauss	FX	PO	PI	MO
QPSK 1/2	−44.0	−44.0	−44.0	−44.0	−41.0
QPSK 2/3	−44.0	−44.0	−44.0	−44.0	−41.0
QPSK 3/4	−42.9	−42.9	−42.9	−42.9	−39.9
QPSK 5/6	−41.8	−41.8	−41.8	−41.8	−38.8
QPSK 7/8	−40.9	−40.9	−40.9	−40.9	−37.9
16-QAM 1/2	−43.0	−43.0	−43.0	−43.0	−40.0
16-QAM 2/3	−42.0	−42.0	−42.0	−42.0	−39.0
16-QAM 3/4	−38.0	−38.0	−38.0	−38.0	−35.0
16-QAM 5/6	−39.4	−39.4	−39.4	−39.4	−36.4
16-QAM 7/8	−38.9	−38.9	−38.9	−38.9	−35.9
64-QAM 1/2	−40.0	−40.0	−40.0	−40.0	−37.0
64-QAM 2/3	−35.0	−35.0	−35.0	−35.0	−32.0
64-QAM 3/4	−32.0	−32.0	−32.0	−32.0	−29.0
64-QAM 5/6	−32.0	−32.0	−32.0	−32.0	−29.0
64-QAM 7/8	−31.1	−31.1	−31.1	−31.1	−28.1

3.2.5 Protection Ratio for DVB-T interfered with by Analogue TV

TABLE 3.2.5

Protection ratios (dB) for upper adjacent channel ($N + 1$) interference for DVB-T signals interfered with by analogue television signals including sound

DVB-T system variant	Gauss	FX	PO	PI	MO
QPSK 1/2	−48.9	−48.9	−48.9	−48.9	−45.9
QPSK 2/3	−47	−47	−47	−47	−44
QPSK 3/4	−45.9	−45.9	−45.9	−45.9	−42.9
QPSK 5/6	−44.8	−44.8	−44.8	−44.8	−41.8
QPSK 7/8	−43.9	−43.9	−43.9	−43.9	−40.9
16-QAM 1/2	−45.4	−45.4	−45.4	−45.4	−42.4
16-QAM 2/3	−43	−43	−43	−43	−40
16-QAM 3/4	−41.5	−41.5	−41.5	−41.5	−38.5
16-QAM 5/6	−40.4	−40.4	−40.4	−40.4	−37.4
16-QAM 7/8	−39.9	−39.9	−39.9	−39.9	−36.9
64-QAM 1/2	−40.2	−40.2	−40.2	−40.2	−37.2
64-QAM 2/3	−38	−38	−38	−38	−35
64-QAM 3/4	−36.4	−36.4	−36.4	−36.4	−33.4
64-QAM 5/6	−35	−35	−35	−35	−32
64-QAM 7/8	−34.1	−34.1	−34.1	−34.1	−31.1

3.2.6 Protection Ratio for DVB-T interfered with by Analogue TV

TABLE 3.2.6

Protection ratios (dB) for a DVB-T 8 MHz signal interfered with by an overlapping 8 MHz analogue television signal including sound for Δf = 0 MHz

DVB-T system variant	Gauss	FX	PO	PI	MO
QPSK 1/2	−11.5	−10.5	−8.3	−8.3	−5.3
QPSK 2/3	−9.6	−8.5	−6.2	−6.2	−3.2
QPSK 3/4	−8.5	−7.3	−4.9	−4.9	−1.9
QPSK 5/6	−7.4	−6.1	−3.6	−3.6	−0.6
QPSK 7/8	−6.5	−5.1	−2.5	−2.5	0.5
16-QAM 1/2	−5.8	−4.8	−2.6	−2.6	0.4
16-QAM 2/3	−3.4	−2.3	0.0	0.0	3.0
16-QAM 3/4	−1.9	−0.7	1.7	1.7	4.7
16-QAM 5/6	−0.8	0.5	3.0	3.0	6.0
16-QAM 7/8	−0.3	1.1	3.7	3.7	6.7
64-QAM 1/2	−0.2	0.8	3.0	3.0	6.0
64-QAM 2/3	2.0	3.1	5.4	5.4	8.4
64-QAM 3/4	3.6	4.8	7.2	7.2	10.2
64-QAM 5/6	5.0	6.3	8.8	8.8	11.8
64-QAM 7/8	5.9	7.3	9.9	9.9	12.9

Correction factor for other values of Δf relative to Δf = 0 MHz

−10.25	−9.75	−9.25	−8.75	−7.25	−3.45	−3.25	−2.25	−1.25	0.00	1.75	2.75	4.25	4.75
−37	−14	−13	−7	−5	−3	2	−1	−2	0	−7	−7	−38	−40

Δ*f*: Analogue television vision carrier frequency minus DVB-T centre frequency.

3.3 Protection ratios for RPCs

For a compatibility analysis, protection ratios for the reference planning configurations are also needed. Since the RPCs represent artificial configurations, no measurements exist for the appropriate protection ratios. The following values shall be used:

- for DVB-T interfered with by DVB-T, see Table 3.3.1;
- for DVB-T interfered with by analogue television:
  - for RPC 1, protection ratio values for DVB-T variant 64-QAM 3/4 – fixed reception, to be found in Tables 3.2.3 3.2.6;
  - for RPC 2, protection ratio values for DVB-T variant 16-QAM 3/4 – portable outdoor reception, to be found in Tables 3.2.3 to 3.2.6;
  - for RPC 3, protection ratio values for DVB-T variant 16-QAM 2/3 – portable indoor reception, to be found in Tables 3.2.3 to 3.2.6.

TABLE 3.3.1
Co-channel protection ratios (dB) for a DVB-T signal interfered with by a DVB-T signal for the RPCs

RPC	PR (dB)
RPC 1	21
RPC 2	19
RPC 3	17

3.4 Protection ratios for analogue terrestrial television

Protection ratios for analogue television signals interfered with by DVB-T

The co-channel protection ratio values for all analogue terrestrial television systems interfered with by digital television are assumed to be the same. However, the protection ratio values differ by 1 dB depending on the unwanted signal is 8 MHz DVB-T. The protection ratios in Table 3.4.1 shall be used.

TABLE 3.4.1

Co-channel protection ratios (dB) for a analogue terrestrial television signal interfered with by co-channel DVB-T signal

	Tropospheric interference	**Continuous interference**
DVB-T 8 MHz(UHF)	34	40

The protection ratios in Table 3.4.2 shall be used for overlapping channel cases.

TABLE 3.4.2

Protection ratios (dB) for analogue B, G /PAL vision signals interfered with by a DVB-T 8 MHz signal (overlapping channels)

Centre frequency of the unwanted DVB-T signal minus the vision carrier frequency of the wanted analogue television signal (MHz)	**Protection ratio**	
	Tropospheric interference	**Continuous interference**
− 8.25	−16	−11
(*N* − 1) −5.25	−9	−5
− 4.75	−4	3
− 4.25	12	20
−3.75	24	30
−3.25	29	36
−2.25	33	39
−1.25	34	40
(*N*) 2.75	34	40
4.75	34	39
5.75	30	37
6.75	27	34
7.75	25	32
8.75	5	11
(*N* + 1) 9.75	−8	−5
12.75	−8	−5

For all SECAM systems the same values apply.

SECTION 3

Calculation of minimum median field strengths

The minimum median field-strength values shall be calculated using the following formulas:

$P_n = F + 10 \log_{10} (k\, T_0\, B)$

$P_{s\,min} = C/N + P_n$

$A_a = G + 10 \log_{10} (1.64\lambda^2/4\pi)$

$\varphi_{min} = P_{s\,min} - A_a + L_f$

$E_{min} = \varphi_{min} + 120 + 10 \log_{10} (120\pi)$

$= \varphi_{min} + 145.8$

$E_{med} = E_{min} + P_{mmn} + C_l$ for fixed reception

$E_{med} = E_{min} + P_{mmn} + C_l + L_h$ for portable outdoor and mobile reception

$E_{med} = E_{min} + P_{mmn} + C_l + L_h + L_b$ for portable indoor reception

$C_l = \mu * \square_c$

$\square_c = \sqrt{\sigma_b^2 + \sigma_m^2}$

where:

P_n : receiver noise input power (dBW)

F : receiver noise figure (dB)

k : Boltzmann's constant ($k = 1.38 \times 10^{-23}$ J/K)

T_0 : absolute temperature ($T_0 = 290$ K)

B : receiver noise bandwidth
(6.66×10^6 Hz for a 7 MHz DVB-T channel,
7.61×10^6 Hz for a 8 MHz DVB-T channel and
1.54×10^6 Hz for a T-DAB frequency block)

$P_{s\,min}$: minimum receiver input power (dBW)

C/N : RF signal-to-noise ratio at the receiver input required by the system (dB)

A_a : effective antenna aperture (dBm^2)

G : antenna gain related to half dipole (dBd)

λ : wavelength of the signal (m)

φ_{min} : minimum power flux-density at receiving place (dBW/m^2)

L_f : feeder loss (dB)

E_{min} : minimum field strength at the location of the receiving antenna (dB(μV/m))

E_{med} : minimum median field strength (dB(μV/m))

P_{mmn} : allowance for man-made noise (dB)

L_h : height loss correction factor (location of the receiving antenna at 1.5 m above ground level) (dB)

L_b : mean building entry loss (dB)

C_l : location correction factor (dB)

$\square_c$: combined standard deviation (dB)

$\square_m$: standard deviation macro-scale (dB) ($\square_m$ = 5.5 dB)

$\square_b$: standard deviation building entry loss (dB)

μ : distribution factor (0.52 for 70%, 1.64 for 95% and 2.33 for 99%).