



**Recommendation ITU-R BT.1206-3**  
(04/2016)

**Spectrum limit masks for digital  
terrestrial television broadcasting**

**BT Series**  
**Broadcasting service**  
**(television)**



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## Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

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### Series of ITU-R Recommendations

(Also available online at <http://www.itu.int/publ/R-REC/en>)

| Series     | Title                                                                                |
|------------|--------------------------------------------------------------------------------------|
| <b>BO</b>  | Satellite delivery                                                                   |
| <b>BR</b>  | Recording for production, archival and play-out; film for television                 |
| <b>BS</b>  | Broadcasting service (sound)                                                         |
| <b>BT</b>  | <b>Broadcasting service (television)</b>                                             |
| <b>F</b>   | Fixed service                                                                        |
| <b>M</b>   | Mobile, radiodetermination, amateur and related satellite services                   |
| <b>P</b>   | Radiowave propagation                                                                |
| <b>RA</b>  | Radio astronomy                                                                      |
| <b>RS</b>  | Remote sensing systems                                                               |
| <b>S</b>   | Fixed-satellite service                                                              |
| <b>SA</b>  | Space applications and meteorology                                                   |
| <b>SF</b>  | Frequency sharing and coordination between fixed-satellite and fixed service systems |
| <b>SM</b>  | Spectrum management                                                                  |
| <b>SNG</b> | Satellite news gathering                                                             |
| <b>TF</b>  | Time signals and frequency standards emissions                                       |
| <b>V</b>   | Vocabulary and related subjects                                                      |

**Note:** This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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## RECOMMENDATION ITU-R BT.1206-3

**Spectrum limit masks for digital terrestrial television broadcasting**

(Question ITU-R 132/6)

(1995-2013-2014-2016)

**Scope**

This Recommendation provides specific spectrum limit masks for digital terrestrial television broadcasting systems specified in Recommendation ITU-R BT.1306. While Recommendation ITU-R SM.1541 provides out-of-band domain emission limits that should be regarded as generic spectrum limit masks, specific spectrum limit masks might be required for specific environments to enhance compatibility with other radiocommunication services.

**Keywords**

Spectrum mask, Digital Terrestrial Television Broadcasting (DTTB), ATSC, DVB-T, ISDB-T, DTMB.

The ITU Radiocommunication Assembly,

*considering*

- a) that for efficient planning for terrestrial broadcasting the spectrum limits for digital television should be defined for maximum compatibility;
- b) that the error-correction, data framing, modulation and emission methods for digital terrestrial television broadcasting (DTTB) systems are specified in Recommendation ITU-R BT.1306;
- c) that planning criteria for digital terrestrial television services in the VHF/UHF bands are specified in Recommendation ITU-R BT.1368;
- d) that digital terrestrial television broadcasting may share frequency bands with analogue terrestrial television broadcasting and other radiocommunication services;
- e) that Recommendation ITU-R SM.1541 provides unwanted emissions in the out-of-band (OoB) domain in the frequency range of 9 kHz to 300 GHz including OoB domain emission limits for television broadcasting systems;
- f) that the spectrum limits specified in Recommendation ITU-R SM.1541 should be regarded as generic limits, which generally constitute the least restrictive OoB emission limits, sometimes called safety net limits, successfully used as national or regional regulations;
- g) that Recommendation ITU-R SM.1541 states that the development of more specific spectrum limit masks for each system and in each channel bandwidth should be encouraged by administrations, taking into account the actual application, modulation, filtering capabilities of the system and also taking care to enhance compatibility with other radio services operating in co-frequency or adjacent bands;
- h) that specific spectrum limit masks for DTTB are defined in some countries or regions where tighter limits are required for efficient planning,

*recommends*

that the spectrum limit masks for digital terrestrial television broadcasting systems in the VHF/UHF bands should be based on those given in Annexes 1, 2, 3 and 4 where specific spectrum limit masks are required beyond the general spectrum limit masks specified in Recommendation ITU-R SM.1541.

## Introduction

This Recommendation contains the following Annexes:

Annex 1 – Specific spectrum limit masks for digital terrestrial television system A (ATSC).

Annex 2 – Specific spectrum limit masks for digital terrestrial television system B (DVB-T).

Annex 3 – Specific spectrum limit masks for digital terrestrial television system C (ISDB-T).

Annex 4 – Specific spectrum limit masks for digital terrestrial television system D (DTMB).

The spectrum limit mask defines emission limits in the in-band and out-of-band domain.

The relative power level is defined in a reference bandwidth of 4 kHz. The 0 dB reference level corresponds to the mean output power measured in the channel bandwidth.

## Annex 1

### Specific spectrum limit masks for digital terrestrial television system A (ATSC)

#### 1 DTTB System A

The spectrum limit masks described in this Annex are applicable to the ITU-R digital terrestrial television broadcasting (DTTB) System A employing the 6 MHz single carrier modulation scheme, eight-level Vestigial-SideBand (8-VSB) modulation.

#### 2 Sampling the transmitter output

To examine the spectrum, the output port of the transmitter (including any RF channel-defining filters) is connected to a spectrum analyser via a coupler or sampling device inserted in the transmission line (coaxial cable or waveguide) between the transmitter and its load or antenna. During the measurement, the transmitter may be operated into either an antenna or a dummy load. The dummy load is preferred, as it minimizes possible problems with off-air signal ingress. The spectrum shaping limits are based upon a measurement (or resolution) bandwidth of 500 kHz. Other measurement bandwidths may be used as long as appropriate correction factors are applied. Measurements need not be made any closer to the channel edge than one-half of the resolution bandwidth of the measuring instrument.

#### 3 Spectrum limit mask for 6 MHz DTTB systems using 8-VSB modulation

The following 6 MHz DTTB spectrum limit masks required outside of the 6 MHz channel are stated relative to a reference amplitude. The reference amplitude for the spectrum shaping limit is the total

transmitter output power, including the pilot signal, contained within the 6 MHz channel. Three cases are considered below. The “high power” spectrum limit mask is intended for high-power transmitters which service large populated areas. These transmitters may be co-located with similar transmitters on adjacent channels avoiding interference. The “low power” spectrum limit mask is intended for low power television (LPTV) transmitters and translators. An LPTV transmitter provides a locally-oriented television service in small communities both rural and within larger urban areas. TV translator stations are stations in the broadcast service operated for the purpose of retransmitting the programmes and signals of a TV broadcast station in areas of poor reception. The “simple” spectrum limit mask is also intended for LPTV transmitters and translators in locations where such transmitters and translators will not cause interference.

A recommended practice for the measurement of these masks can be found in IEEE Std.1631<sup>1</sup>.

### 3.1 High power DTTB spectrum limit mask

- The spectrum shaping limit in the range between one-half of the width of the resolution bandwidth filter used and 500 kHz from the channel edge relative to the total transmitter output power should be:

$$\text{Spectrum shaping limit} \leq -47 \text{ (dB}_{\text{DTV}}) \quad (1)$$

- The spectrum shaping limit at any frequency between 500 kHz and 6 MHz from the channel edge should be:

$$\text{Spectrum shaping limit} \leq -(11.5 (|\Delta F| - 0.5) + 47) \text{ (dB}_{\text{DTV}}) \quad (2)$$

where:

$\Delta F$  is the frequency difference, in MHz, from the channel edge.

- The spectrum shaping limit at any frequency more than 6 MHz from the channel edge should be:

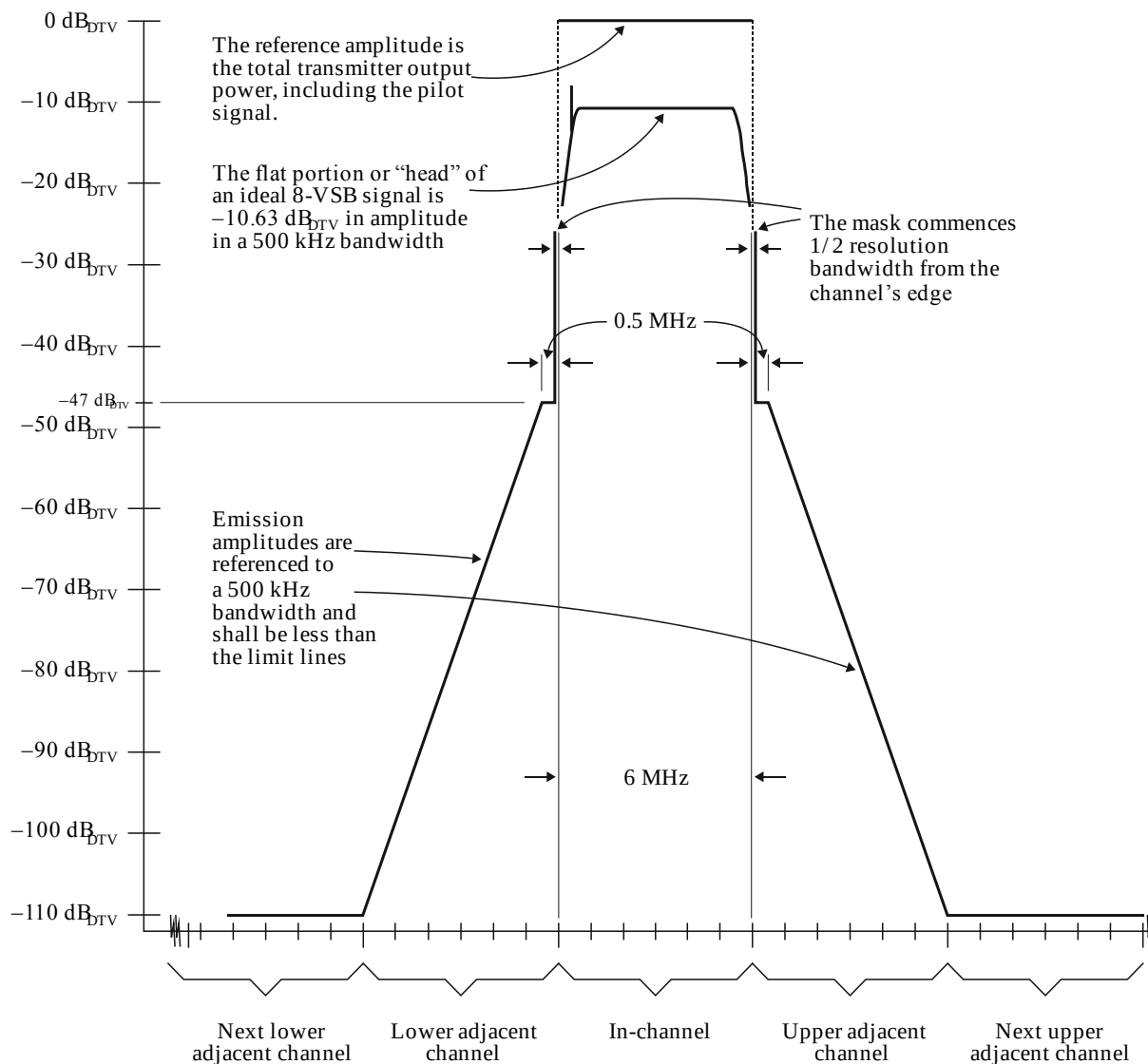
$$\text{Spectrum shaping limit} \leq -110 \text{ dB}_{\text{DTV}} \quad (3)$$

The spectrum limit mask for a high power DTTB transmitter is illustrated graphically in Fig. 1.

<sup>1</sup> IEEE Std. 1631-2008, IEEE Recommended Practice for Measurement of 8-VSB Digital Television Transmission Mask Compliance for the USA.

FIGURE 1

Spectrum limit mask for 6 MHz high power 8-VSB digital terrestrial television systems



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### 3.2 Low power DTTB spectrum limit mask for LPTV transmitters and translators

- The spectrum shaping limit in the range between one-half of the width of the resolution bandwidth filter used and 500 kHz from the channel edge relative to the total transmitter output power should be:

$$\text{Spectrum shaping limit} \leq -47 \text{ (dB}_{\text{DTV}}) \quad (4)$$

- The spectrum shaping limit at any frequency between 500 kHz and 3 MHz from the channel edge should be:

$$\text{Spectrum shaping limit} \leq -(11.5 (|\Delta F| - 0.5) + 47) \text{ (dB}_{\text{DTV}}) \quad (5)$$

where:

$\Delta F$  is the frequency difference, in MHz, from the channel edge.