

TECHNICAL REQUIREMENTS FOR OPERATION OF THE ELECTRONIC COMMUNICATIONS NETWORKS OF THE TERRESTRIAL BROADCASTING SERVICE AND THE RELATED EQUIPMENT

Approved with Decision of the Communications Regulation Commission # 1306 dd. 25.10.2007, promulgated in the SG, # 98 dd. 27.11.2007, in force since 27.11.2007

Section I

GENERAL TERMS

Art. 1. (1) The technical requirements define the technical characteristics and operation parameters of the electronic communications networks of the Terrestrial Broadcasting Service and the related equipment used for terrestrial broadcasting of radio and television signals.

(2) The electronic communications networks of the Terrestrial Broadcasting Service are operated within individually assigned scarce resource – radio frequency spectrum.

(3) Depending on the territorial coverage, the electronic communications networks for terrestrial broadcasting are differentiated in networks with local, regional and national coverage.

(4) Depending on the used technology, the electronic communications networks for terrestrial broadcasting are defined as analogue and digital.

Art. 2. The rules for provision for use of individually assigned scarce resource – radio frequency spectrum for electronic communications networks of the Terrestrial Broadcasting Service are given in Appendix 1.

Section II

General requirements for operation of electronic communications networks of the Terrestrial Broadcasting Service and the related equipment

Art. 3. The electronic communications networks should be in conformity with the standards, recommendations and technical requirements in Appendix 2 and any other standards approved by the Communications Regulation Commission (CRC) as applicable.

Art. 4. (1) The companies must submit to the CRC the technical parameters of the electronic communications network and equipment for terrestrial analogue broadcasting, calculated and shown in conformity with the requirements of Appendix 3.

(2) The definition of technical parameters of electronic communications networks should take into account the technical parameters of transmitter or receiver equipment which uses the adjacent spectrum bands in order to minimize the level of unwanted emissions.

Art. 5. (1) Transmitting equipment of the Terrestrial Broadcasting Service should conform to the requirements of Ordinance # 9 of 1991 for the maximum levels of electromagnetic fields in populated areas and definition of the sanitary zones around emitting objects (Ordinance # 9).

(2) Pursuant to para. 1 for radio stations with emitting points located in populated areas, and pursuant to Article 2 of Ordinance # 9, the undertakings must submit to CRC an assessment for the sanitary zone, issued by the Ministry of Health.

Art. 6. (1) All radio equipment included in the electronic communications networks of the Terrestrial Broadcasting Service should be marked for conformity with the essential requirements as defined by the Ordinance on the Essential Requirements and Conformity Assessment of Radio and Terminal Telecommunication Equipment, approved by government decree # 175 / 2002.

(2) The radio equipment stipulated in para. 1 should be in good technical order and must be used only in conformity with the manner and purpose defined by the manufacturer.

(3) The nominal output power of the radio/TV transmitter should not be higher than the second nearest higher value of the calculated maximum power at the output of the transmitter rated by the manufacturer.

Art. 7. (1) For the purpose of efficient allocation and use of the radio frequency spectrum and for safety of aeronautical navigation, the following limitations for electronic communications networks for terrestrial analogue audio broadcasting with local coverage in the VHF-FM band shall be obligatory:

1. the point of transmission must be in the settlement envisaged for coverage or at a distance from its borders not exceeding half the distance between the outermost points of the service area;

2. the maximum effective height of the antenna system should not exceed 500 m;

3. the maximum effective height of transmitting antenna in Sofia can be up to 800 m, provided that:

a) it does not interfere with another Bulgarian radio station;

b) the transmitter's maximum output power does not exceed 500 W;

c) the antenna system is with slope of the vertical diagram directed to Sofia.

(2) The following requirements shall be applicable to all electronic communications networks for terrestrial analogue audio broadcasting which operate in the VHF-FM band:

1. the antenna system should be multistage with vertical polarization;

2. the radio transmitter should be equipped with deviation limiter;

3. filters or filter-multiplexers should be used between the output of the transmitter and the antenna input;

4. installed direction couplers (DC) for control measurements, which shall be activated:

a) during work of a single transmitter with standalone antenna – one DC at the filter output;

- b) during operation of more transmitters through filter-multiplexers at a common antenna:
- ba) at the output of each transmitter – individual DC before the filter-multiplexer, and
- bb) at the output of the filter-multiplexer – a single common DC;
- c) DCs built-in by the manufacturer, if they are in conformity with Appendix 5, do not require installation of external DCs;

5. the filters/filter-multiplexers and DC should be in conformity with the requirements in Appendices 4 and 5;

6. in collocation of transmitters at one site, the installed equipment should conform with the requirement that the intermodulation products (IMP) of 3rd order are at a level lower than -85 dBc.

Art. 8. For the purpose of minimizing transborder interference in the VHF and TV bands the following is defined:

1. for local radio stations in the 20 km border zone and on the Black Sea coast – maximum permitted effective radiated power 3,000 W if there is no violation of the sanitary zone;

2. for national radio and TV stations – broadcasting at the maximum power in accordance with the internationally coordinated values.

Art. 9. (1) The undertaking determines the number of transmitters operating in a single frequency network, designing the terrestrial digital television networks.

(2) The system configuration of terrestrial digital television is selected according to the particular application and the technical parameters can be different from those in the planned standard configuration. The table below shows two example configurations:

Parameters	Option 1	Option 2
Band width	8 MHz	8 MHz
Mode	8 k	8 k
Guard interval	1/8	1/8
Code correlation (code rate)	2/3	3/4
Modulation	64 QAM	16 QAM

Probability of area coverage	95 %	95 %
Speed of transport stream Net bit rate	22.12 Mbit/s	16.59 Mbit/s

Art. 10. The requirements for operation and maintenance of electronic communications networks of the Terrestrial Broadcasting Service are given in Attachment 6.

Section III

Technical parameters of electronic communications networks of the Terrestrial Broadcasting Service and the related equipment.

Art. 11. The Terrestrial Broadcasting Service, in accordance with the National Plan for Radio Frequency Spectrum Allocation, uses radio frequency bands as shown in Appendix 7.

Art. 12. The main technical parameters for operation of electronic communications networks for terrestrial broadcasting are:

1. frequency band width;
2. maximum allowed deviation from the transmitter frequency;
3. maximum allowed level of out-of-band emissions;
4. intensity of the electromagnetic field (EMF).

Art. 13. The bandwidth should conform to the values given in Appendix 8.

Art. 14. The allowable deviations of the transmitter's frequency should conform to the values given in Appendix 9.

Art. 15. The maximum allowed level of out-of-band emissions should conform to the values given in Appendix 10.

Art. 16. (1) For electronic communications networks for analogue terrestrial broadcasting, the required median value of the EMF intensity at the border of service area is to be guaranteed for 50 percentage of the time and for 50 percentage of the location.

(2) For electronic communications networks for terrestrial digital broadcasting of television signal, the required median value of EMF intensity at the border of service area is to be guaranteed depending on the type of receiving.

(3) The median value of the EMF intensity at the border of service area, required for quality reception as per para 1 and 2 should not be less than the values given in Appendix 11.

SUPPLEMENTARY CLAUSE

§ 1. For the purposes of the technical requirements:

1. “border of the settlement” means the construction borders of a town or a village as defined in a general and/or detailed area structure plan (as stipulated by the Structure of the Territory Act), except the pertaining territory around the settlement;

2. “service area” is the area relevant to a transmitter, in which the field intensity is higher or equal to a preliminarily determined median value required to ensure the target quality of reception in the presence and with consideration of interference;

3. “output power” of an VHF-FM transmitter is the effective power of the high frequency sinusoid signal within the operating frequency band at the transmitter’s output;

4. “output power” of a television transmitter:

a) “video output power” is the effective power value of the sinusoid signal with the image carrier frequency at a level equal to the level of synchronized pulse;

b) “audio output power” is the effective power value of the sinusoid signal in the operational frequency band of the sound carrier frequency;

5. “maximum effective radiated power” is the product of the antenna input power and the antenna gain related to a half-wave dipole at the maximum of the antenna directivity pattern;

6. “median value” of the intensity of EMF is the value dividing actual values of intensity in two sequences of equal number of readings, half of which contains higher, and the other half contains lower values; the measurements must be done with antenna situated at 10 m above the ground level, the number of readings being odd and at different place and time;

7. “unwanted emissions” – spurious and out-of-band emissions:

a) “spurious emissions” is the emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions;

b) “out-of-band emission” is the emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions;

c) “intermodulation product” is a new frequency component produced by the interaction within a non linear element of two or more primary frequency components, and forms a linear combination of the primary frequencies and their harmonic frequencies;

8. “quality reception” – defined by the ratio of pay signal to the noise plus interference in conformity with the internationally accepted norms;

9. “nominal power” of a transmitter is the output power designed and calculated for the transmitter’s purpose;

10. “signal to noise sound frequency ratio” is the ratio (usually in dB) between the voltage values of useful signal and interference, measured in specific conditions at the receiver's sound frequency output;

11. Radio frequency “signal to interference ratio” is the ratio (usually in dB) between the values of the high frequency voltage of the useful signal and the high frequency voltage of the interfering signal, measured at the receiver's input in specific conditions;

12. “transmitting station” is a transmitter, antenna-feeder system and supplementary equipment, needed for radio/TV broadcasting in the populated area covered by the license;

13. “adjacent interfering station” is a station broadcasting on a frequency and with power which may deteriorate the quality of sound or image from the planned station;

14. “point of emission” is the place above the ground where the transmitter antenna is located; the point of emission is defined by geographic coordinates, the site altitude and the height above the site altitude where the phase centre of the transmitter's antenna is located;

15. “frequency deviation” is the deviation of the frequency of a frequency modulated signal from the non-modulated carrier:

a) “maximum frequency deviation” – the absolute maximum of the difference between the non-modulated carrier frequency and the actual frequency in any target period of time;

b) “maximum permissible frequency deviation” is the maximum value of frequency deviation.

FINAL PROVISIONS

§ 2. These Technical Requirements are approved on the grounds of Art. 32, item 2 of the Electronic Communications Act.

§ 3. These Technical Requirements shall enter into force from the date of their promulgation in the State Gazette.

Appendix 1
to Art. 2

‘Rules for use of individually assigned scarce resource – radio frequency spectrum by the electronic communications networks of the Terrestrial Broadcasting Service.

Constructing electronic communications networks for terrestrial broadcasting is allowed only to undertakings which have been granted an authorization, in accordance with the Electronic Communications Act, for use of individually assigned scarce resource – radio frequency spectrum.

The provision for use of individually assigned scarce resource – radio frequency spectrum for the electronic communications networks of the Terrestrial Broadcasting Service is made after preparation of preliminary design, which includes:

1. Frequency planning.

The procedure of frequency planning defines the technical parameters of all radio/TV transmitting stations covering a certain area in order to achieve optimum coverage of this area with respect to the requirements and regulations for the areas and protection aspects concerning the signals of adjacent interfering stations.

2. Electromagnetic compatibility (EMC) survey

2.1. In order to avoid any harmful interference in the ranges of the services Aeronautical radionavigation and Aeronautical Mobile (R) – 108.0 – 137.0 MHz, a survey for EMC must be performed for each assigned frequency for radio broadcasting station in the VHF-FM range 87.5 – 108.0 MHz.

2.2. The EMC survey is done by the CRC according to a methodology based on recommendation Rec. ITU-R SM.1009-1 of the International Telecommunications Union (ITU).

2.3. EMC survey is to be made for each newly planned frequency for VHF-FM radio broadcasting and for each newly planned frequency for the aeronautical navigation (ILS and VOR) and communications (COM) services.

2.4. The database for VHF-FM stations is maintained by the CRC. The data base for aeronautical systems ILS, VOR and COM is maintained by the Ministry of Transport – for civil aviation, and by the Ministry of Defence – for the air force.

2.5. In the cases when the EMC survey for the aviation radio services establishes negative results, i.e. possible radio interference, measurements for inadmissible level of IMP are performed by a Methodology for Measuring of IMP Type A1 resulting from the operation of adjacent VHF-FM radio transmitters.

3. National coordination

A national coordination procedure is performed for the purpose of ensuring safety of aviation and defence. The technical parameters of each planned broadcasting station are coordinated by a consultative Commission for national coordination which includes representatives of the parties concerned.

4. International coordination and registration

4.1. If the use of a radio frequency/radio frequency band by a broadcasting station may cause harmful interference to a radio service of another administration or if international recognition for use of a radio frequency/radio frequency band is needed along with entry in the International Frequencies Register, a procedure of international coordination and registration is performed.

4.2. The international coordination is a process of approval of putting a broadcasting station into operation by all neighbour countries where part of their broadcasting stations might suffer interference from the newly planned station. The international coordination procedure is performed by the CRC.

4.3. The international registration is a process of entering the internationally coordinated station in the relevant register of the ITU, certifying that the station may be put into operation.

4.4. When coordination and registration of frequency assignments is performed for radio broadcasting stations in the long / medium wave ranges, two different cases are to be indicated for some of the parameters – for daytime broadcasting and for night time broadcasting.

4.5. The frequency assignments for radio broadcast stations in the short wave range are specified by seasons (winter plan, summer plan) and are approved by international conferences which are held twice a year.

**Appendix 2
to Art. 3**

Standard/Recommendation/ Technical requirement	Description
BNS 4616:1984	VHF-FM Broadcasting. Basic parameters
BNS 15886:1984	Fixed radio broadcasting transmitters in the low and medium frequency range, automated. Basic parameters, technical requirements and measuring methods
BNS 17224:1996	Television broadcasting systems. Basic parameters
BNS EN 50067:2000	Specifications of a radio data system (RDS)
BNS EN 50255:2000	Digital sound broadcasting system. Specification for data reception interface (RDI)
BNS EN 60244-5:2000	Methods for measuring radio transmitters
BNS EN 62106:2003	Specifications of a radio data system (RDS) with VHF-FM audio broadcasting in the frequency range 87.5 MHz to 108 MHz (IEC 62106:2000)
BNS EN 300 401:2003	Radio broadcasting systems. Digital audio broadcasting (DAB) for mobile, portable and fixed receivers
BNS EN 300 468:2003	Digital video broadcasting (DVB). Specification for service information (SI) in DVB systems
BNS EN 300 472:2003	Digital video broadcasting (DVB). Specification for transfer of ITU-R Teletext System B in DVB digital streams
BNS EN 300 708:2003	Television systems. Transfer of data via Teletext
BNS EN 300 743:2003	Digital video broadcasting (DVB). System for subtitle entering
BNS EN 300 744:2003	Digital video broadcasting (DVB). Frame structure, channel coding

	and modulation for digital terrestrial television
BNS EN 301 192:2003	Digital video broadcasting (DVB). DVB specification for data broadcasting
BNS EN 301 234:2003	Digital audio broadcasting (DAB). Protocol for multimedia objects transfer (MOT)
BNS EN 301 700:2003	Digital audio broadcasting (DAB). VHF-FM broadcasting: mutual indication of simultaneous DAB services through RDS-ODA 147
BNS EN 301 701:2001	Digital video broadcasting (DVB). Orthogonal modulation with frequency multiplexing for microwave digital terrestrial television
BNS EN 301 958:2003	Digital video broadcasting (DVB). Interaction channel for terrestrial digital television (RCT), including OFDM with multiple access
BNS EN 302 018-1	Electromagnetic compatibility and radio spectrum matters (ERM). Transmitting equipment for frequency modulation (FM) broadcasting. Part 1: Technical parameters and test methods
BNS EN 302 297	Electromagnetic compatibility and radio spectrum matters (ERM). Transmitter equipment for analogue television broadcasting. Harmonized European standard as per Section 3.2 of Directive for Radio and Terminal Telecommunication Equipment (R&TTED)
BNS ETS 300 384:1995	Radio broadcasting devices. VHF-FM transmitters. Audio broadcasting
ISO/IEC 13818/1-10	General encoding of moving images and the accompanying audio information
ETSI EN 102 154	Digital Video Broadcasting (DVB); Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in Contribution and Primary Distribution Applications
ETSI EN 300 468	Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems
ETSI EN 300 744	Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for digital terrestrial television
ETSI EN 301 958	Digital Video Broadcasting (DVB); Interaction Channel for Digital Terrestrial Television (RCT) Incorporating Multiple Access OFDM

ETSI TS 102 812	Digital Video Broadcasting (DVB); Multimedia Home Platform (MHP)
ETSI TR 101 190	Digital Video Broadcasting (DVB); Implementation guidelines for DVB terrestrial services; Transmission Aspects
ETSI TS 101 197, ETSI TS 103 197	Digital Video Broadcasting (DVB); DVB SimulCrypt; Head-end architecture and synchronization
ETSI ETR 289	Digital Video Broadcasting (DVB); Support for use of scrambling and Conditional Access (CA) within digital broadcasting systems
ETSI ETR 132	Radio broadcasting systems; Code of practice for site engineering Very High Frequency (VHF), frequency modulated, sound broadcasting transmitters
EBU Tech. 3291	Primary distribution of TV signals using MPEG-2 technologies—2001
EBU Tech. 3299	HD Image Formats for TV production—2004
EBU Tech. 3307	Service Requirements for Free-to-air HDTV Receivers
EBU Tech. 3308	Broadband TV—opportunities and challenges—2005
EBU Tech. 3312	Digital Terrestrial HDTV Broadcasting in Europe
Rec. ITU-R SM.329	Unwanted emissions in the spurious domain
Rec. ITU-R BS.412	Planning standards for terrestrial FM sound broadcasting at VHF
Rec. ITU-R BT.417	Minimum field strengths for which protection may be sought in planning an analogue terrestrial television service
Rec. ITU-R SM.1268	Method of measuring the maximum frequency deviation of FM broadcast emissions at monitoring stations
Rec. ITU-R P.1546	Method for point-to-area predictions for terrestrial services in the frequency range 30 MHz to 3 000 MHz
Note. The latest revisions of international standards, recommendations and technical requirements are given on the web pages of the relevant organizations.	

Appendix 3 to Art. 4, para

1 Requirements for preparation of Technical Specifications of electronic communications

network and equipment for terrestrial analogue broadcasting

The undertakings shall prepare Technical Specifications of the electronic communication network and equipment when any changes of position or basic technical parameters of the transmitting station are necessary.

The initial data for preparation of the technical characteristics shall be defined by the CRC in the authorization for use of scarce resource – radio frequency spectrum – Appendix 1 ‘Basic Parameters of the Network’, as follows:

- territorial coverage;
- position of the transmitting station - name of the area or address of the point of emission;
- geographic coordinates (degrees, minutes, seconds) and altitude of the site level (in metres) of the point of emission;
- operating frequency of radio transmitter / channel of a TV transmitter;
- median value of the intensity of EMF at the border of the service area;
- admissible value of power at the output of the transmitter and of the maximum effectively radiated power.

To determine the technical parameters of the transmitting station, calculations are to be made for:

- determination of the effective height of the antenna – h_{eff}/h_1 (as per Annex 5 of the latest revision of Rec. ITU-R P.1546);
- determining of the necessary maximum effective radiated power;
- determination of the relevant patterns, the type of elements and configuration of the antenna system;
- determining of the total loss in the antenna-feeder system and the required output power of the transmitter.

The determined technical parameters shall be filled in the table form in Annex P101-P/Annex P101-T, depending on the type of terrestrial analogue broadcasting – radio or television. The table shall be integral part of the application for change and/or addition , together with the following appendices:

1. Motivation and calculations for definition of the necessary maximum effective radiated power and terrain profile in the main direction of emissions of the antenna. Undertakings which have authorizations for national or regional coverage shall present a list of towns and villages within the service area.

2. A Table with calculations for the parameters of the transmitting station for all directions at any 10° in azimuth sectors 0° ÷ 350° – in the form included in the technical requirements for operation of the Terrestrial Broadcasting Service.

3. Directivity pattern of the antenna system in the horizontal plane of a polar coordinate system.

4. Directivity pattern of the antenna system in the vertical plane in a Cartesian coordinate system (from +30° to -90°). If there is physical or electric slant of the antenna elements, such slant shall be mentioned.

5. General drawing with diagram of all antenna systems located on the site with calculated altitudes of their phase centres. Drawing of the antenna support with location of the antenna system elements, including: antennas, stages and directions of emission; height of the phase centre in relation to the site altitude; distances between individual antenna elements; antenna branches; track of the main feeder; length of the connecting and matching cables.

6. Layout plan of the antenna mast with disposition of the antenna system.

7. Map of the zone of radio visibility and the service area with clearly marked settlements and exact location of the station – in suitable scale and marked median value of the EMF intensity at the border of the service area.

8. Information on the EMC of the radio equipment on the site – a form of the technical requirements for operation of the Terrestrial Broadcasting service.

9. Assessment made by the Ministry of Health for the sanitary zone of Radio stations with points of emission located in populated territories as per Ordinance 9.

Table with calculations of parameters of a broadcasting station in all directions at each 10° in azimuth sectors 0° ÷ 350°

Pos. No.	Azimuth	Effective height of the antenna for $d \geq 15$ km (h eff)	Effective height of the antenna for $d < 15$ km (h 1)	Distance of direct visibility at the level of phase centre (d)	Required effective radiated power (ERP)	Actual area of service			
						horizontal pattern of the antenna	effective radiated power	effective radiated power	Zone at level ... dB (μ V/m)
	(deg)	(m)	(m)	(km)	(W)	(dB)	(dBW)	(W)	(km)
1	2	3*	4*	5	6	7**	8	9	10***
1	0								
2	10								
3	20								
4	30								
5	40								
6	50								
7	60								
8	70								
9	80								

10	90								
11	100								
12	110								
13	120								
14	130								
15	140								
16	150								
17	160								
18	170								
19	180								
20	190								
21	200								
22	210								
23	220								
24	230								
25	240								

26	250								
27	260								
28	270								
29	280								
30	290								
31	300								
32	310								
33	320								
34	330								
35	340								
36	350								

Notes:	
*	The values in columns 3 and 4 are defined in accordance with item 3 of Annex 5 to the latest revision of Rec. ITU-R P.1546.
**	Horizontal antenna pattern (decay in relation to emission at the maximum of the pattern).
***	The definition of the actual service area is done for the value of intensity of the EMF according to Appendix 11.

INFORMATION							
about the electromagnetic compatibility of the radio facilities located in							
.....,							
(name of site)					city:		
Location:							
Geographic coordinates:N..... /E.....; site altitude: m							
1. Information about the undertaking's facility:							
Station name	Frequency (MHz)		Permitted/ calculated power at the output of the transmitter (W)	Maximum effective radiated power (ERP)		Polarization	Azimuths of the directions of maximum emission from the antenna (deg)
	Of reception	Of transmission		(dBW)	(W)		
2. Information about other facilities located on the site:							
* Other transmitters connected to the antenna system:							

Station name	Frequency (MHz)	Permitted/ calculated power at	Maximum effective radiated	Polarization	Azimuths of the directions of maximum
--------------	-----------------	--------------------------------------	----------------------------------	--------------	---

		the output of the transmitter (W)	power (ERP) (dBW)	(W)	emission from the antenna (deg)
	Of reception	Of transmission			

* Stations in networks of the Broadcasting Service:					
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
* Stations of networks of the Fixed Service:					

1.			
2.			
3.			
4.			
5.			
* Stations of networks of the Mobile Service:			
1.			
2.			
3.			
4.			
5.			
Date:			Representative of the undertaking:

5

Basic parameters of filters/filter-multiplexers.

Depending on the particular situation at a site the following should be installed:

- * for configuration of one transmitter and one antenna – a double circuit band pass filter;
- * for configuration of two or more transmitters on one antenna – filter-multiplexers of the star type or directive filter type with double circuit band pass filters. The broadband input of filter-multiplexers of the low frequency band type can be used only in case the transmitter is connected to a double circuit band pass filter.

Requirements to parameters of filters and filter-multiplexers (combiners) (the parameters are to be measured at temperature $20 \pm 5^\circ \text{C}$):

1. Adjustable frequency band: 87.5 – 108 MHz;
 2. Input and output impedance in the operational band: 50 Ω ;
 3. Voltage standing wave ratio (VSWR): ≤ 1.15 or return loss: - 23.1 dB;
 4. Attenuation between inputs and between any input and the output: > 26 dB for frequency distance ± 2 MHz from the operational frequency; frequency distance mask > ± 2 MHz: monotonously increasing attenuation, and for ± 4 MHz and higher the attenuation is > 40 dB;
 5. Number of resonators in each filter – minimum 2 (Dual Resonator Filter);
 6. Bandwidth at -3 dB: from 350 kHz to 650 kHz; characteristics of the bandwidth: maximal flat (Butterworth);
 7. Insertion loss in the bandwidth: ≤ 0.6 dB;
 8. Input power-continuity - not less than the maximum specified power for the transmitter connected to the respective input;
 9. Operational temperature range from -10 $^\circ\text{C}$ to +40 $^\circ\text{C}$; indoor operation;
 10. Temperature dependency:
 - maximum variation of the central frequency (f_0) within the operational temperature range ± 25 kHz;
 - maximum variation of the bandwidth for the operational temperature range $\pm 10\%$.
- The parameters in items 1 ÷ 4 and 6 ÷ 7 should stay within the required limits in the entire operational temperature range.
11. Mechanical structure – resistant to mechanical shock and vibration – 3g/15 min, 10-50 Hz (regarding being not tuned and parameters);
 12. Cooling – air, natural.

Basic parameters of directional couplers

The parameters of the directional couplers (DC) required for VHF-FM broadcasting sites are:

1. Frequency range of the DC – minimum 87.5 – 128.5 MHz;
2. Input and output impedance of the main line of DC -50 Ω ;
3. Voltage standing waves ratio (VSWR) in the main line: ≤ 1.2 (87.5 - 128, 5 MHz) or

(return loss): 21 dB;

4. Insertion loss in the main line ≤ 0.25 dB;
5. Maximum input power continuity – higher or equal to the power of transmitters connected to the DC;
6. Admissible peak power in exceptional cases (up to 3 min) – not less than three times the power continuity;
7. Coax connectors: compatible with the line in which they will be used – N; 7/16; EIA;
8. Measurement output impedance: 50 Ω ;
9. Voltage standing waves ratio (VSWR): ≤ 1.25 (87.5 – 128.5 MHz);
10. Coax connectors to the measurement outputs – BNC (f) or N (f);
11. Transmission ratio: from -20 to -40 dB (87.5 – 128.5); for the purpose of measuring of type A1 IP3, the transmission ratio of the DC should be:
 - from -20 to -30 dB for power at the transmitter's output up to 100 W;
 - from -26 to -33 dB for power at the transmitter's output from 100 W to 1.0 kW;
 - from -30 to -40 dB for power at the transmitter's output above 1.0 kW;
12. Directivity of DC's: ≥ 26 dB;
13. Unsteadiness of AFP in the range 87.5 – 128.5 MHz: ≤ 3 dB;
14. Separate outputs for direct and return wave of the directional connectors;
15. The DC should have calibration curve of the transmission ratio for the frequency range (item 13) with inaccuracy less than 0.25 dB.

Annex 6 to Art. 10

Operation and maintenance of electronic communications networks of the Terrestrial Broadcasting Service

1. The prophylactic maintenance of the electronic communications networks shall be performed at least once a year and the CRC and the audience should be warned in advance. The protocol of the prophylactic maintenance must be submitted to the CRC.
2. Any changes of the location of a broadcasting station and/or basic technical parameters of the electronic communications networks, covered by Annex 1 to the authorization, shall be done following a substantiated request by the undertakings, submitted to the CRC in the form of application for change and/or addition.
3. If there is need of change of the technical parameters of electronic communications networks, which are not included in the basic parameters of the network (Annex 1 to the authorization), the undertakings should immediately notify the CRC about the type and parameters of the new equipment. The change shall be done only with permission from the CRC.
4. Any changes affecting the interaction between individual radio equipment on the same site shall be done after permission is given by the CRC.
5. Should any interference occur in the frequency ranges of the Aeronautical Radio Navigation service, Aeronautical Mobile service or the communication services of the Ministry of Interior, the CRC may alter the parameters of electronic communications networks in order to eliminate such interference.
6. The control over the provision of electronic communications through networks of the Broadcasting Service and the equipment, connected to such networks, shall be exercised by authorized employees of the Commission in accordance with Chapter 20 of the ECA.

Annex 7
to Art. 11

Frequency ranges for operation of electronic communications networks of the Broadcasting Service

The National Plan for Radio Frequency Spectrum Allocation defines the following frequency ranges, allotted for use by the Broadcasting Service:

1. Frequency range 148.5 – 283.5 kHz:
 - a) long waves, for monophonic audio broadcasting with amplitude modulation (LW-AM);
 - b) audio broadcasting – digital (DRM).
2. Frequency range 526.5 – 1606.5 kHz:
 - a) medium waves, for monophonic audio broadcasting with amplitude modulation (MW-AM);
 - b) audio broadcasting – digital (DRM).
3. In certain frequency bands of the range 3950.0 – 26100.0 kHz:

3950—4000	15100—15800
5900—6200	17480—17900
7200—7450	18900—19020
9400—9900	21450—21850
11600—12100	25670—26100
13570—13870	

- a) short waves, for monophonic audio broadcasting with amplitude modulation (SW-AM);
 - b) audio broadcasting – digital (DRM).
4. Frequency range 87.5 – 108.0 MHz – very high frequencies, for stereophonic audio broadcasting with frequency modulation (VHF-FM).
5. Frequency range 174.0 – 230.0 MHz (metre band):
 - a) television broadcasting (frequency band III) – analogue and digital (DVB-T);
 - b) audio broadcasting (216.0 – 230 MHz) – digital (T-DAB).
6. Frequency ranges 470.0 – 582.0 MHz and 582.0 – 862 MHz (decimetre band) – television broadcasting (IV and V bands) – analogue and digital (DVB-T).
7. Frequency range 1452.0 – 1479.5 MHz (decimetre band) – audio broadcasting – digital (T-DAB).
8. Frequency band 40.5 – 42.5 GHz – multipoint video distribution systems (MVDS).

Annex 8
to Art. 13

.....

Frequency bandwidth		
Type of electronic communications networks		Value, kHz
I. Analogue networks		
1.	Double band audio broadcasting on long and medium waves	9
2.	Single band audio broadcasting on short waves	5
3.	Double band audio broadcasting on short waves	10
4.	Audio broadcasting in the VHF range with maximum frequency deviation ± 75 kHz and distance between channels 100 kHz	300
5.	Television broadcasting in ranges III, IV and V with maximum frequency deviation ± 50 kHz	8000
II. Digital networks		
1.	Audio broadcasting (DRM):	
	a) in the long waves range	4.5; 9
	b) in the medium waves range	9; 18
	c) in the short waves range	5; 10; 20
2.	Audio broadcasting (T—DAB):	
	a) in the 216.0 – 230.0 MHz range	1750
	b) in the 1452.0 – 1479.5 MHz range	2000
3.	Television broadcasting (DVB—T):	
	a) in range III	7000
	b) in ranges IV and V	8000

to Art. 14

Permissible frequency deviation		
Type of electronic communications networks		Value, Hz
I. Analogue networks		
1.	Audio broadcasting in the long, medium and short wave ranges	10
2.	Audio broadcasting in the VHF range	2000
3.	Television broadcasting in ranges III, IV and V	500
II. Digital networks		
1.	Audio broadcasting (DRM):	1.0×10^{-6}
2.	Audio broadcasting in the 216.0 – 230.0 MHz and 1452.0 — 1479.5 MHz (T—DAB) ranges	0.5×10^{-6}
3.	Television broadcasting in ranges III, IV and V (DVB—T)	0.5×10^{-6}
4.	Television broadcasting in the 40.5—42.5 GHz range	1.0×10^{-7}

Annex 10
to Art. 15

Maximum allowed level of out-of-band emissions			
Type of equipment	Norm (Note 1) Average power (dBm) or attenuation (dBc) of the out-of-band emission related to the power of the main signal at the antenna input		
Transmitters for frequencies lower than 30 MHz	Note 2 50 dBc, but not higher than 17 dBm		
Transmitters for frequencies higher than 30 MHz	Note 2, 3		
	-36 dBm for		$P \leq 9 \text{ dBW}$

		75 dBc for	9 dBW <	$P \leq 29 \text{ dBW}$	
		-16 dBm for	29 dBW <	$P \leq 39 \text{ dBW}$	
		85 dBc for	39 dBW <	$P \leq 50 \text{ dBW}$	
		-5 dBm for	50 dBW <	P	
Note 1:	These norms are applicable to frequency range: 1 kHz for transmission frequencies from 9 kHz to 150 kHz; 10 kHz for transmission frequencies from 150 kHz to 30 MHz; 100 kHz for transmission frequencies from 30 MHz to 1 GHz; 1 MHz for transmission frequencies higher than 1 GHz.				
Note 2:	The frequency range in which the out-of-band emissions are measured is shown in the following table:				
Frequency range of the main emission			Frequency range of the out-of-band emissions		
9 kHz - 100 MHz			9 kHz - 1 GHz		
100 MHz - 300 MHz			9 kHz – 10 th harmonic		
300 MHz - 600 MHz			30 MHz - 3 GHz		
600 MHz - 5.2 GHz			30 MHz – 5 th harmonic		
5.2 GHz - 13 GHz			30 MHz - 26 GHz		
13 GHz - 150 GHz			30 MHz – 2 nd harmonic		
150 GHz—300 GHz			30 MHz—300 GHz		
Note 3	In the frequency range 108-137 MHz, in addition to the norms in the table, the maximum norm - 16 dBm (25 μV) should not be exceeded.				

Annex 11
to Act. 16, para 3

Median value of the electromagnetic field intensity

Type of electronic communications networks		Value, dB (μ V/m)
Analogue networks		
1.	Audio broadcasting in the long waves range	77
2.	Audio broadcasting in the medium waves range	
	a) day time ground wave	63
	b) night time ground wave in sparsely populated areas	71
	b) night time ground wave in densely populated areas	77
3.	Audio broadcasting in the short waves range	43
4.	Audio broadcasting in the VHF range:	
	a) for a settlement with population up to 30 000	54
	b) for a settlement with population more than 30 000, settlement in the 20 km border zone and settlement on the sea shore, except Varna and Burgas	66
	c) for Sofia, Plovdiv, Varna and Burgas	74
5.	Television broadcasting	
	a) in band III	55
	b) in band IV	67
	c) in band V	72
	d) for sparsely populated areas	
	- band III	49
	- band IV	58
	- band V	64
Digital networks		
1.	Audio broadcasting under 30 MHz (DRM):	
	a) mobile reception	34

	b) portable reception outdoor/in a building	48
2.	Audio broadcasting in the range 216.0-230 MHz (T-DAB):	
	a) mobile reception	59
	b) portable reception outdoor/in a building	70
3.	Audio broadcasting in the range 1452.0-1479.5 MHz (T-DAB):	
	a) reception with external antenna	54
	b) mobile reception	67
	c) portable reception outdoor/in a building	74
4.	Television broadcasting in the band 174.0-230.0 MHz (DVB-T):	*as per the table shown below
5.	Television broadcasting in the range 470.0-862.0 MHz (DVB-T):	

Table* of the minimum median values of the field intensity (dB(μ V/m)) of the various DVB-T variants depending on the type of reception: fixed (on top of building), portable outdoor reception, portable indoor reception and mobile reception of two reference frequencies – 200 MHz (for television band III) and 500 MHz (for television bands IV and V)

System variants	Modulation	Code rate	Reference frequency (MHz)	Median value of the EMF intensity dB(μ V/m)			
				fixed reception	portable outdoor reception	portable indoor reception	mobile reception
A1, D1	QPSK	1/2	200.0	34.90	56.10	66.10	59.10
A2, D2	QPSK	2/3	200.0	36.90	58.20	68.20	61.20
A3, D3	QPSK	3/4	200.0	38.10	59.50	69.50	62.50
A5, D5	QPSK	5/6	200.0	39.30	60.80	70.80	63.80
A7, D7	QPSK	7/8	200.0	40.30	61.90	71.90	64.90
B1, E1	16-QAM	1/2	200.0	40.60	61.80	71.80	64.80

B2, E2	16-QAM	2/3	200.0	43.10	64.40	74.40	67.40
B3, E3	16-QAM	3/4	200.0	44.70	66.10	76.10	69.10
B5, E5	16-QAM	5/6	200.0	45.90	67.40	77.40	70.40
B7, E7	16-QAM	7/8	200.0	46.50	68.10	78.10	71.10
C1, F1	64-QAM	1/2	200.0	46.20	67.40	77.40	70.40
C2, F2	64-QAM	2/3	200.0	48.50	69.80	79.80	72.80
C3, F3	64-QAM	3/4	200.0	50.20	71.60	81.60	74.60
C5, F5	64-QAM	5/6	200.0	51.70	73.20	83.20	76.20
C7, F7	64-QAM	7/8	200.0	52.70	74.30	84.30	77.30
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

Note. The following formula is used for other frequencies:

$$E_{med}(f) = E_{med}(f_r) + \text{Corr}$$

* for fixed reception - $\text{Corr} = 20\log_{10}(f/f_r)$,
where f is the actual frequency and f_r is the reference frequency for the respective range in the above table;

* for portable and mobile reception - $\text{Corr} = 30\log_{10}(f/f_r)$,
where f is the actual frequency and f_r is the reference frequency for the respective range in the table.