GUIDELINES

With elements of technical solution depending on the nature of radiocommunication service

Technical solution within the application form for the issuance of an individual licence for the use of radio-frequencies is given in the technical documentation, which shall be submitted with the application form as an integral part thereof.

I. TECHNICAL DOCUMENTATION

Technical documentation shall be drafted by an undertaking and/or other legal entity or entrepreneur holding an appropriate licence for drafting technical documentation, and/or a person holding an appropriate licence issued by the Chamber of Engineers of the Republic of Serbia, which covers the area of electronic communications (telecommunications, energy and traffic).

I.1. GENERAL

For all natures of radiocommunication services:

a) Technical documentation shall be drafted in accordance with:

1. Law on Electronic Communications (*Official Gazette of the RS*, no. 44/10);
2. Law on Spatial Planning and Construction (*Official Gazette of the RS*, no.72/09, 81/09, 64/10-CC);
3. Law on Environmental Protection (*Official Gazette of the RS*, no. 36/09);
4. Law on Environmental Impact Assessment (*Official Gazette of the RS*, nos. 135/04 and 36/09);
5. Radio Frequency Bands Allocation Plan (*Official Gazette of the RS*, nos. 112/04 and 86/08)

b) Technical documentation shall include the following:

1. Cover page;
2. Information on the investor from the appropriate register;
3. Information on the responsible project designer and/or project organisation;
4. Relevant legal provisions applied in the case concerned;

5. Statement on the design of the documentation, signed by the responsible project designer;
6. Project task;
7. Antenna position (on the mast) and transmitter position (in the building);
8. Technical solution;
9. Statement substantiating the implementation of prescribed measures for protection at work;
10. Decision of the responsible authority substantiating that the project does not require an environmental impact assessment and/or a decision of the responsible authority approving the study on the environmental impact assessment;
11. Impact assessment for the operation of other radiocommunications systems
12. Relevant necessary calculations;
13. Accompanying graphical documentation.

c) An original copy of the technical documentation shall be submitted in bound form, stamped and signed by the person who was in charge of drafting the technical documentation and by the investor. The aforementioned documentation shall be accompanied by an electronic copy thereof.

II. BROADCASTING SERVICE

II.1. Technical documentation

In addition to the requirements referred to in item I herein, the technical documentation for the broadcasting service shall be drafted in accordance with:

1. Frequency/location assignment plan for terrestrial analogue FM and television broadcasting radio stations for the territory of the Republic of Serbia (*Official Gazette of RS*, nos. 74/07, 27/08 and 2/10);
2. Rules on radio stations which could be installed in cities and towns (*Official Journal of SFRY*, no. 9/83);
3. Rules on radio corridors within cities and towns (*Official Journal of SFRY* ", no. 72/90);
4. Rules on technical and exploitation conditions for the use of broadcasting stations for emitting black and white and colour television programmes (*Official Journal of SFRY*, no. 8/78);
5. Rules on technical and exploitation conditions for FM broadcasting stations (*Official Official Journal of SFRY*, no. 57/75);
6. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R P.1546-4 – Method for point-to-area predictions for terrestrial services in the frequency range 30 MHz to 3000 MHz;

7. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R P.526-11 – Propagation by diffraction;
8. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R BT.417-5 – Minimum field strengths for which protection may be sought in planning an analogue terrestrial television service;
9. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R BS.412-9 – Planning standards for terrestrial FM sound broadcasting at VHF;
10. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R BT.1368-8 – Planning criteria for digital terrestrial television service in the VHF/UHF bands;
11. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R BS.1660-3 – Technical basis for planning of terrestrial digital sound broadcasting in the VHF band.

Technical documentation shall be drafted for a television channel an/or an FM radio-frequency obtained in the Public Tender for the issuance of licences for television and radio programme broadcasting and shall adhere to technical and other parameters and data stipulated in Frequency/location assignment plan for terrestrial analogue FM and television broadcasting radio stations for the territory of the Republic of Serbia (*Official Gazette of RS*, nos. 74/07, 27/08 and 2/10).

Technical details for the drafting of the documentation for digital terrestrial television shall be defined separately.

II.2. Technical solution

Technical solution for broadcasting service shall include:

1. Propagation model

The application of the statistical method, as given in ITU-R P. 1546-4, and the deterministic method, as given in ITU-R P. 526-11, is recommended. The application of the empirically determined correction factors is acceptable only if in accordance with the character of the method applied. The documentation shall include only the methods used in the case concerned.

2. Terrain profile in relation to broadcasting location

For radiated powers under 1 kW (VHF) and/or 10 kW (UHF), a profile of a 50km-distance shall be submitted and effective heights (h_{eff}) in 36 directions - every 10^{o} starting from True North, shall be calculated. For radiated powers over 1 kW (VHF) and/or10 kW (UHF), a profile of

at least 50km-distance shall be submitted and effective heights (h_{eff}) in at least 120 directions - every 3^{o} starting from True North, shall be calculated.

3. Coverage calculation

In directions for which the terrain profiles have been drafted, the distance, calculated according to the appropriate method, at which the level of field strength equals the minimum usable field strength, or usable field strength if available according to the appropriate Recommendations ITU-R BT. 417-5 and ITU-R BS. 412-9. Coverage calculations are performed in accordance with the real antenna pattern.

4. Information on antenna:

- antenna description and characteristics,
- disposition of individual antennas and antenna power supply system,
- antenna pattern and antenna system gain in relation to half-wave dipole,
- calculated transmission losses.

6. Coverage area

Coverage area shall be drawn on the geographical map of the appropriate representative fraction (RF), of at least 1: 200 000, and/or 1: 100 000 for low-power transmitters (the size of the drawing shall not be less than A3 paper format). The representative fraction and the scale shall be obligatory elements of the drawing.

6. Information on equipment

The description and the technical characteristics of equipment used for obtaining the proposed antenna pattern and radiated power shall be provided.

7. A filed-in coordination request for FM radio stations and a coordination request for a television radio station as well as the application form for the issuance of a licence for the use of radio-frequencies for a radio station.

Coordination request for broadcasting stations shall be filled in online. Once filled in, the coordination request shall be written on a floppy disc or CD and submitted along with the technical documentation. All requested fields in the request MUST be filled in. Geographic coordinates shall be given in WGS84 system (WGS84 coordinates should be accurate and

determined with the aid of GPS). Filled-in application form for the use of radio-frequencies for radio stations shall be enclosed with the technical documentation.

III. MOBILE SERVICE:

III.1. Technical documentation for mobile service

In addition to the requirements referred to in item I, the technical documentation for the mobile service shall be drafted in accordance with:

1. Radio-frequency Allotment Plan for GSM/DCS 1800 radio system (*Official Gazette of RS*, no. 17/08);
2. Radio-frequency Allotment Plan for UMTS/IMT-2000 radio-system (*Official Gazette of RS* , no. 17/08);
3. Individual radio-frequency allotment plans for individual services (health care, fire brigade, electric power industry services, power distribution services, anti-hail protection services, etc.);
4. Rules on radio stations which could be installed in cities and towns (*Official Journal of SFRY*, no. 9/83);
5. Rules on radio corridors within cities and towns (*Official Journal of SFRY*, no. 72/90)
6. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R P.1546-4 – Method for point-to-area predictions for terrestrial services in the frequency range 30 MHz to 3000 MHz;
7. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R P.526-11 – Propagation by diffraction;
8. Rules on technical and exploitation conditions for the use of radio stations for FM and PM radio-telephone broadcasting (*Official Journal of SFRY*, nos. 28/81, 42/82 and 64/86).

III.2. Technical solution

Technical solution for the mobile service must include the following:

1. User's need for radio-connection (except for public mobile):

shall include the operation procedure of the user that needs radio-link establishment. The following shall be defined within the operation procedure: the entities between which the information is exchanged via radio-link, the nature and type of information, the number and the average duration of information, the number of pieces of information to be exchanged simultaneously, as well as the territory covered by the type of service concerned.

2. Draft radio-connection system solution (except for public mobile):

shall define the types of radio networks (simplex, semi-duplex, duplex, integration of several radio networks, etc.) and shall include the schematic presentation of the radio-system and the

estimated traffic density. The draft radio-link system solution should meet the specified needs for radio networks as well as the rational use of the allocated radio-frequencies and provide the technical and technological unity of the radio-link system within the scope of the activity (if necessary).

3. Base station propagation model:

The application of the statistical method, as given in ITU-R P. 1546-4, and the deterministic method, as given in ITU-R P. 526-11, is recommended. The application of the empirically determined correction factors is acceptable only if in accordance with the character of the method applied. The documentation shall include only the methods used in the case concerned. Coverage calculation shall be pertinent to the minimum usable field strength, according to the appropriate rules, and in accordance with the real radiation pattern of the antenna system. The propagation model shall be tabular (except for public mobile) and given on the geographical map of the appropriate representative fraction (RF) which shall be adapted to the size of the base station coverage area, and/or the size of the radio network which is being presented. The representative fraction and the scale are considered as obligatory elements of the drawing. The coverage zone should be drawn on A3 paper format or larger in case of radio networks of regional and national importance.

4. Terrain profiles in relation to the broadcasting location (except for public mobile):

drawn for a 50-km distance, and effective heights (h_{eff}) in 36 directions – each 10^{o} starting from True North shall also be calculated.

5. Antenna system:

information on antenna: type of antenna, polarization, antenna gain, directivity, azimuth of maximum radiation, angular beamwidth of main lobe, elevation angle, front-to-back ratio, etc. For directional antennas, the antenna pattern and antenna system gain should be given in both graphic and numerical formats in relation to the half-wave dipole.

6. The analysis of the potential mutual interferences between radio stations within the proposed system (except for public mobile).

7. Radio link error performance:

for a single-channel microwave link between two base stations and for radio networks between base radio station and fixed radio station (except for public mobile).

8. The operation mode of radio stations within the radio network (except for public mobile):

1) The operation procedure and the manner of establishing radio networks (PL tone, selective call, identification, conversation time limit), as well as all special conditions necessary for the simultaneous operation of several radio stations on one micro-location;
2) number of radio stations in radio networks according to their class and technical characteristics.

9. Filled in application form for the issuance of a licence for the use of radio-frequencies for a radio station

A filled in application form for the use of radio-frequencies for radio stations shall be submitted as part of the technical documentation. All requested fields in the application form MUST be filled in. Geographic coordinates should be given in WGS84 system (WGS84 coordinates should be accurate and determined with the aid of GPS).

IV. FIXED SERVICE

IV.1.1. Technical documentation for fixed service (microwave links)

In addition to the requirements referred to in item I herein, the technical documentation for fixed service (microwave links) shall be drafted in accordance with the following:

1. Rules on radio stations which could be installed in cities and towns (*Official Journal of SFRY*, no. 9/83);
2. Rules on radio corridors within cities and towns (*Official Journal of SFRY*, no. 72/90)
3. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R P.530-13: Propagation data and prediction methods required for the design of terrestrial line-of-sight systems;
4. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R P.676-8: Attenuation by atmospheric gases;
5. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R P.838-3: Specific attenuation model for rain for use in prediction methods;
6. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R P.525-2: Calculation free-space attenuation;
7. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R F.1668-1: Error performance objectives for real digital fixed wireless links used in 27500 km hypothetical reference paths and connections;
8. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R F.1703: Availability objectives for real digital fixed wireless links used in 27500 km hypothetical reference paths and connections;
9. Guidelines on designing digital microwave systems (*PTT Gazette*, no. 16/87).

IV.1.2. Technical documentation for fixed service (public FWA network)

In addition to the requirements referred to in item I herein, the technical documentation for fixed service (public FWA network)) shall be drafted in accordance with the following:

1. Radio Frequency Allotment Plan for Radio Systems in the Frequency Bands 410-420/420-430 MHz (*Official Gazette of RS*, no. 8/09);
2. Radio Frequency Allotment Plan for FWA Systems in the Frequency Bands 3410-3600 MHz and 3600-3800 MHz (*Official Gazette of RS*, no. 17/08);
3. Rules on radio stations which could be installed in cities and towns (*Official Journal of SFRY*, no. 9/83);
4. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R P.1546-4 – Method for point-to-area predictions for terrestrial services in the frequency range 30 MHz to 3000 MHz;
5. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R P.526-11 – Propagation by diffraction;

IV.2.1. Technical solution for fixed service (microwave links) shall include the following:

1. Purpose of the microwave link/links;
2. Geographic data on the location for every radio station (geographic coordinates, altitude of site above sea level, height of antenna above ground);
3. Path profile;
4. Basic technical data on each microwave link (capacity, configuration, frequency band, path length);
5. Basic technical characteristics of microwave devices;
6. Basic technical characteristics of the antenna (gain, type, manufacturer, radiation pattern);
7. Short description of the error performance method in accordance with the proposed error performance and availability objectives for the microwave link in question;
8. Error performance method and microwave link availability along with the statement substantiating compliance with the prescribed norms and link availability time (the results of calculations should be tabular and given for each path length);
9. Filled in application form for the issuance of the licence for the use of radio-frequencies for radio stations
10. Geographic coordinates shall be given in WGS84 system (WGS84 coordinates shall be defined accurately with the aid of GPS).

IV.2.2. Technical solution for fixed service (public FWA network) shall contain the following:

1. Coverage calculation method for fixed/base radio station:

The application of the statistical method, as given in ITU-R P. 1546-4, and the deterministic method, as given in ITU-R P. 526-11, is recommended. **The application of the empirically determined correction factors is acceptable** only if in accordance with the character of the method applied. The documentation shall include only the methods used in the case concerned. Coverage calculation shall be pertinent to the minimum usable field strength, according to the appropriate allotment plan, and in accordance with the real radiation pattern of the antenna system and it shall be given

on the geographical map of the appropriate representative fraction (RF) which shall be adapted to the size of the base station coverage area, and/or the size of the radio network which is being presented. The representative fraction and the scale are considered as obligatory elements of the drawing. The coverage area should be drawn on A3 paper format or larger in case of radio networks of regional and national importance.

2. Antenna system:

information on antenna: type of antenna, polarization, antenna gain, directivity, azimuth of maximum radiation, angular beamwidth of main lobe, elevation angle, front-to-back ratio, etc. For directional antennas, the antenna pattern and antenna system gain should be given in both graphic and numerical format in relation to the half-wave dipole.

3. filled in application form for the issuance of the licence for the use of radio-frequencies for radio stations:

filled in application form for the issuance of the licence for the use of radio-frequencies for radio stations shall be enclosed with the technical documentation. All required information in the application form MUST be filled in. Geographic coordinates shall be given in given in the WGS84 system (WGS84 coordinates shall be accurately identified with the aid of GPS).

V. SATELLITE SERVICE

V.1. In addition to the requirements referred to in item I herein, the technical documentation for radio stations in satellite service shall be drafted in accordance with the following:

1. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R S.521-4: Hypothetical reference digital paths for systems in the fixed satellite service;
2. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R S.524-9: Maximum permissible levels of off-axis e.i.r.p. density from earth stations in geostationary-satellite orbit networks operating in the fixed satellite service transmitting in the 6 GHz, 13 GHz, 14 GHz and 30 GHz frequency bands;
3. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R S.579-6: Availability objectives for hypothetical reference circuits and hypothetical reference digital paths when used for telephony using pulse code modulation, or as part of an integrated service digital network hypothetical reference connection, in the fixed-satellite service operating below 15 GHz;
4. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R S.614-4: Allowable error performance for a hypothetical reference digital path in the fixed-satellite service operating below 15 GHz when forming part of an international connection in an integrated services digital network;
5. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R S.1062-4: Allowable error performance for a satellite hypothetical reference digital path operating below 15 GHz;

6. ITU Radiocommunication Bureau (RB) Recommendation: ITU-R P.618-9: Propagation data and prediction methods required for the design of earth-space telecommunication systems;
7. ITU Radiocommunication Bureau (RB) Recommendations for VSAT: ITU-R S.725, ITU-R S.726-1, ITU-R S.727-2.

V.2. Technical solution for radio stations in satellite service shall include the following:

1. technical documentation containing the information on the description of operation (purpose, block diagram, network topology, etc.);
2. geographic data on the site of the earth radio station (geographic coordinates, altitude of site above sea level, height of antenna above ground level);
3. name and the satellite orbit position;
4. technical characteristics of the device (transceiver);
5. basic technical characteristics of the antenna (gain, type and manufacturer);
6. filled in ApS 4/III form, coordinate contours (in accordance with Appendix 7) when the earth radio station operates as a receiver and as a transmitter in accordance with ITU Radio Regulation, Article 11, Section III;
7. short description of the error performance method along with the adopted initial technical parameters for the devices and accompanying equipment
8. calculation of the necessary transmitter power and radiated power along with the satellite uplink and downlink path budget. (path budget results shall be provided in tabular form);
9. filled in application form for the issuance of the licence for the use of radio-frequencies for radio stations
10. geographic coordinates given in the WGS84 system (WGS84 coordinates shall be accurately identified with the aid of GPS).