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The main activities, launched by the State Telecommunications Commission in relation to the management and effective use of the radio frequency spectrum, ensure the development of:

- new radio services to benefit the users;
- the domestic market and conditions for competition in radio equipment and services and in particular, pan-European and global systems;
- technological innovations in telecommunications sector;
- economic growth, creation of new workplaces and improvement in the living standard;

as well as protection of the Bulgarian interests in bilateral and multilateral negotiations, centered on the topic of radio spectrum.

These aims called for discussion of certain key problems, which if successfully resolved will ensure the effective use of radio frequency spectrum:

- availability of sufficient radio frequency resource for civilian needs;
- striking an appropriate balance between commercial and public interests in the allocation of radio frequency spectrum;
- economic assessment of the radio spectrum as scarce resource;
- legal backup for the radio spectrum and its use;
- transparent and objective procedures in support of the competitive provision of radio services and radio equipment;
- planning the effective use of radio frequencies;
- encouragement of competition and technological innovation by means of radio frequency spectrum regulation;
- assistance to the design and development of radio equipment in answer to customer needs, the new services and technology;
- conformity between the policy for radio spectrum management and the requirements laid down in standards.

1. *CONDITIONS FOR THE EFFICIENT AND EFFECTIVE USE OF RADIO FREQUENCY SPECTRUM*

The technological development, market trends and the enhancement of the policy/regulation process play a significant impact on the provision of radio frequency spectrum for civilian needs. The boosting demand for radio frequencies for new applications harasses the balance of interests in radio spectrum use. While a lot of those trends still unfold potential, in 2000 the following changes set in:

- The shared use of different services using the same radio frequency spectrum, and the development of new systems put under question the traditional classification of frequency resource users and the conditions for frequency resource access.
- The globalization of services and of the participants in market activities (through formation of associations and business development in international

scale) gave a new aspect to the policy for radio frequency spectrum management.

- The shared use of the spectrum for commercial applications demonstrated how in practice commercial use competes public interest for access to the radio spectrum. On the other hand, applications from different sectors compete for access.
- Any decisions in the sphere of radio spectrum affect multi-facetly both the participants in market activities, using the radio spectrum, and the users of radio and non-radio infrastructures. Decisions for the manner, in which radio spectrum shall be used, influence not only the access to it, but also cause substantial structural changes on the markets.
- The decisions for the use of radio spectrum affect the opportunities opening before society, not only in terms of economic impact, but increasingly more in respect of innovation solutions.

As seen on table 13, the radio frequency spectrum gives rise to a number of production activities in sectors, such as telecommunications, television and radio broadcasting, transport, scientific research and development activity and services of public importance.

Table 13. Sectors and activities using the radio frequency spectrum

Tele-communications	Telephony (GSM, DCS, DECT, S-PCS, IMT2000/UMTS, WLL, CB, DDE)
	Paging (ERMES, Pocsag, FLEX)
	Wireless multimedia/Internet (UMTS, Satellite broadband, MVDS)
	Data transmission (GSM, IMT2000/UMTS, Satellite broadband, VSAT, FS)
	PMR, TETRA
Television and radiobroadcasting	Public television (analog/digital television)
	Satellite television (analog/digital)
	Television MVDS
	Additional services (teletext and settlement from home, teleshopping for digital television)
	Radio (analog/digital)
Transport	Air transport (traffic control, navigation)
	Sea transport (GMDSS, PMR)
	Road transport (RTT systems, PMR)
	Railway transport and terrestrial water, positioning of location(GPS, PMR)
Government	Defense (communications and control, radar, PMR)
	Security (police, fire alarm service, PMR)
	Government (TETRA, PMR)
	Space applications
	Applications arising from obligations under international conventions (navigation help, positioning and time count, environment)
Scientific research	Terrestrial observatories
	Radio astronomy

According to the Telecommunications Act, the State Telecommunications Commission is responsible for the storage and proper use of that scarce natural resource of great economic importance. The decisions of the Commission for determining the priorities in relation to radio spectrum use and its customers depend to a large extent on the availability and adequate protection of the spectrum.

In 2000 a technical study was carried out for the provision of sufficient radio frequency spectrum for civilian needs. Based on experience gained from the working discussions on meetings with representatives from the Ministry of Defense and the Ministry of the Interior, the frequency band range for wide consumption was expanded. The number of channels for mobile connection in the updated National Frequency Plan went up to 10,000 versus only 2 in its former edition. Additional frequency resource was provided for the development of mobile connections pursuant to the GSM standard in the range of 900 MHz. The frequency ranges for ISM and the frequency bandwidths for satellite communication networks of the ICO Global type were allocated.

In its version update from 2000, the National Frequency Plan ensured additional frequency resource for development of the mobile connections in the 1800 MHz frequency range, which paved the path to the entry of a second GSM operator, tendered in the same year.

The allocation of radio frequency resource above 10 GHz was harmonized with the recommendations of the Conference of European Postal and Telecommunication Administrations (CEPT).

The frequency resource for construction of the networks for television and radio broadcasting with national coverage is provided based on the international agreements for construction of national networks for television broadcasting (the Stockholm'61 Plan) and radio broadcasting (the Geneva'84 plan).

Taking into account the need for additional frequency channels for the Bulgarian National Television and the Bulgarian National Radio, at the beginning of 2000 the STC assigned an expert task force to determine the necessary frequency resource for development of the two networks, respectively. The remaining frequencies set up the network of the first private national operator – Darik Radio.

In recent years the interest towards local coverage television and radio broadcasting networks grew progressively, in line with the need for timely and quality information in the various regions of the country.

As a result from the frequency planning, free frequency channels were released for the construction of new radio and television stations with local coverage. At the end of the year were held the auctions for the 8 largest regions in the country.

In connection with the review of licences, held by the two national mobile operators, for conformity with the requirements laid down in the Telecommunications Act, specialists from the State Telecommunications Commission together with representatives from Mobiltel, the Ministry of Defense and the Ministry of Transport and Communications, analysed the status of the

carrier network of Mobiltel and prepared a motivated written opinion for the separation of the network of Mobiltel from that of the Ministry of Defense. This decision came out in relation to fulfillment of Art. 2 from the Telecommunications Act treating the equality between the operators, and §10 from the Telecommunications Act for preservation of the monopoly of the BTC.

2. POLICY FOR MANAGEMENT OF THE RADIO FREQUENCY SPECTRUM

Certain factors in policy making call for a new approach in the radio spectrum management as a scarce resource. Some of the first priorities in this activity are, as follows:

- Agreeing the terms and conditions for access to radio frequencies for services, in accordance with the EC requirements and standards.

In this connection the STC made a detailed study for the possibility to provide a frequency resource for the third generation of UMTS mobile communications.

- Agreed and balanced approach with regard to all industrial sectors.

Following discussions with private consumer groups from the Bulgarian National Television, the Bulgarian National Radio, the National Electrical Company, taxi services, security companies, radio amateurs and others, the STC provided sufficient frequency resource satisfying their specific needs, with a precise balance between commercial and public interest in the radio frequency spectrum allocation.

- The radio frequency spectrum in the context of domestic market development.

The growing market integration imposes consideration, for the purposes of radio frequency spectrum management, not only in terms of technical requirements and solutions, but also of the features inherent to the domestic market, and above all, where the customers are global market players. One example for this strategy can be in the auction for the second GSM operator, where important factors were taken into account, such as competitiveness, market conditions for entry of mobile services and the public readiness to accept additional services.

3. STRATEGIC PLANNING

Issues, such as strategic planning and the required technical and technological main frame, play a key role in the context of the policy for radio frequency spectrum management.

For the State Telecommunications Commission, strategic planning is of decisive weight in the effective use of the radio spectrum. Strategic planning lies in the basis of the policy for future development of telecommunications services, taking into account a number of external factors, such as the pan-European services and the extent of harmonization with the EU. The STC launched implementation of a

software product, specialized for that purpose. The software model and the implemented digital modeling of the geographic terrain facilitated the frequency planning aimed at allocation of free channels for television and radio broadcasting. The free channels for radio broadcasting were assigned in the 87.5-108 MHz range. In the second half of 2000 a tender was held for 72 stations in 8 regions in the assigned frequency range. At the end of the year were delivered the new versions based on the used software product and a new software application for frequency design of mobile networks. Underway is a training course in handling the new software models.

4. ELECTROMAGNETIC COMPATIBILITY

The successful functioning of transmission radio equipment depends on the advance creation of conditions for electromagnetic compatibility (EMC). The process is interrelated with frequency planning, on one side, and with the international coordination and notification of assigned frequencies, on the other. For this purpose the STC designed a software product for monitoring and research of EMC of aircraft and for the establishment of a data base of sites with mounted on radio transmission devices.

5. HARMONISATION OF RADIO SPECTRUM ALLOCATION

The European Commission recommends harmonization of the radio frequency spectrum in all EC member countries. The economic consequences arising from this process will be of major influence in decision taking for harmonization. In certain instances continuous measures will be necessary to determine the criteria for realization of those decisions and the level of legal backup, required to implement those measures. Since the allocation of radio spectrum over 10 GHz has been harmonized, the State Telecommunications Commission initiated investigation of the possibility for harmonization of the spectrum allocations in the range of up to 10 GHz, which will be a subject of technical and economic analyses.

6. SPECIFIC DATA FROM THE ACTIVITY FOCUSED ON MANAGEMENT AND USE OF THE RADIO FREQUENCY SPECTRUM

6.1. Provision of a frequency resource for civilian needs by upgrading the National Frequency Plan (tables 14, 15, 16, 17 è 18))

Table 14. Frequency ranges for PMR, TRUNK and Microwave Links (ML) applications:

PMR, TRUNK and Microwave Links (ML) applications		
30.01 – 37.5 MHz	148 – 148.95 MHz	459 – 460 MHz
37.5 – 38.25 MHz	150.05 – 153 MHz	469 – 470 MHz

38.25 – 42.00 MHz	153 – 156.5125 MHz	10.0 – 10.3 GHz
44.00 – 46.475 MHz	156.5125 – 156.5375 MHz	10.50 – 10.68 GHz
58 – 60 MHz	156.7625 – 156.8375 MHz	25.25 – 25.50 GHz
63 – 74.80 MHz	156.8375 – 158.375 MHz	25.50 – 26.50 GHz
75.20 – 87.50 MHz	160.625 – 162.875 MHz	26.50 – 27.00 GHz

Table 15. Frequency ranges for GSM applications:

In the range of 900 MHz	
for ² GSM operator	890.2 – 894.8 MHz / 935.2 – 939.8 MHz
for ²² GSM operator	895.4 – 900.0 MHz / 940.4 – 945.0 MHz
additional	
For the territory of Sofia city	905.6 – 907.8 MHz / 950.6 – 952.8 MHz 908.0 – 910.2 MHz / 953.0 – 955.2 MHz
For the territory of Plovdiv city	903.0 – 903.8 MHz / 948.0 – 948.8 MHz 904.0 – 904.8 MHz / 949.0 – 949.8 MHz
For the territory of Burgas city	900.6 – 901.4 MHz / 945.6 – 946.4 MHz 901.6 – 902.4 MHz / 946.6 – 947.4 MHz
For the territory of Varna city	910.4 – 911.2 MHz / 955.4 – 956.2 MHz 911.4 – 912.2 MHz / 956.4 – 957.2 MHz
For the territory of Russe city	912.6 – 913.6 MHz / 957.6 – 958.6 MHz 913.8 – 914.8 MHz / 958.8 – 959.8 MHz
other	
for Sofia, till 1 March 2001 ã.	880.4 – 884.8 MHz / 925.4 – 929.8 MHz
for Plovdiv city, until the end of 2002.	905.6 – 910.0 MHz / 950.6 – 952.8 MHz
for Burgas city, until the end of 2003	910.4 – 914.4 MHz / 955.4 – 959.4 MHz
for Varna city, until the end of 2002	905.6 – 910.0 MHz / 950.6 – 952.8 MHz
for Varna city, until the end of 2003	908.0 – 910.2 MHz / 953.0 – 955.2 MHz
for Russe city, until the end of 2003	910.4 – 912.4 MHz / 955.4 – 957.4 MHz
For the entire country, until the end of 2001	887.8 – 890.0 MHz / 932.8 – 935.0 MHz
For the entire country, until the end of 2002	885.4 – 887.6 MHz / 930.4 – 932.6 MHz
For the entire country, until the end of 2004	890 – 915 MHz / 935 – 960 MHz
In the range of 1800 MHz	
Until the middle of 2001 ã.	1728 – 1733 MHz / 1823 – 1828 MHz
Until the end of 2001 ã.	1710 – 1735 MHz / 1805 – 1830 MHz
Until the end of 2002 ã.	1735 – 1755 MHz / 1830 – 1850 MHz
Until the end of 2003 ã.	1755 – 1785 MHz / 1850 – 1880 MHz

Table 16. Frequency ranges for ISM applications:

ISM applications		
26.957 – 27.283 MHz	2400 – 2483.5 MHz	24 – 24.25 GHz
40.660 – 40.700 MHz	5725 – 5875 MHz	120.06 – 126 GHz
433.050 – 434.790 MHz		241 – 248 GHz

Table 17. Frequency band for radio network ÒÀÒÒÀ

civilian ÒÀÒÒÀ radio network
411 – 414 MHz
421 – 424 MHz

Table 18. Frequency ranges for television broadcasting

television broadcasting		
470 – 478 MHz	494 – 502 MHz	510 – 590 MHz
614 – 646 MHz	686 – 726 MHz	758 – 766 MHz
814 – 822 MHz		

6.2. Activities aimed at effective and efficient use of the frequency resource

- Decision by the STC for determining the new channel spacing for the PMR frequency channels - 12.5 kHz for the new frequency assignments.
- Agreement with the Ministry of Transport and Communications for the order and terms for use of the frequency channels assigned to the Maritime Mobile Service by the Terrestrial Mobile Service on the inner territory of the country.
- Decision by the STC for allocation of frequency channels for PMR applications for security companies:
 - Per 1000 transducers of the Security Systems an additional simplex frequency is allocated;
 - Per 25 mobile stations for personal (bodyguard) security an additional simplex frequency is allocated;
- Decision by the STC for allocation of frequency channels for PMR applications for taxi drivers – per 60 transport vehicles an additional simplex frequency is allocated.
- Decision by the STC for allocation of frequency channels for PMR applications, under the conditions of a class licence (CL) and on a free regime (FR) (table 19):

Table 19. Frequency channels for PMR

	Range	Number of channels
Under a class licence and 10 W e.i.r.p.	38.45 – 38.5625 MHz	10
	77.7 – 77.8125 MHz	10

	146 – 146.1125 MHz	10
On a free regime and 5 W e.i.r.p.:	33.5 – 33.6125 MHz	10
	84.6 – 84.7125 MHz	10
	146.3 – 146.4125 MHz	10

- Harmonisation – by frequency assignment according to the new technologies and for frequency bands over 10 GHz.
- Frequency provision for the new technologies:
 - Preparation for the frequency allocations and assignment of the 1800 MHz range for II GSM operator;
 - proposals for frequency allocations for the national and regional TETRA radio networks for civilian needs;
 - preparation of the technical characteristics and parameters for licensing of three civilian territorial radio subscriber systems according to the DECT standard – an entirely new technology for the country;
- Checking EMC of radio equipment for the different types of radio services in connection with the provision of frequency assignments for PMR networks and radio broadcasting.

6.3. Proposals for upgrading the National Frequency Plan

- For release of frequency band 446.0 - 46.1 MHz for PMR446 applications.
- For provision of frequency resource to short range radio devices (SRD), in accordance with the ordinance for technical requirements.
- For provision of frequency resource for the Universal mobile telecommunications system UMTS/IMT2000.
- Allocation of 64th television channel for digital television
- Replacement of V television channel (Shumen city) for the region of Northeast Bulgaria with 56th channel.

6.4. Use of the radio frequency spectrum

- 30,025 - 42,000 MHz – 10 frequency channels allocated for registration under a class licence and 10 channels for registration on a free regime;
- 48,500 – 58,000 MHz – allocated for use by different institutions and companies (the National Electrical Company and the energy distribution plants all over the country, “Hailstorm Service” Executive Agency, the Roads Agency, Water Supply and Drainage on the territory of the entire country, the Union of the Bulgarian Automobile Drivers, the Bulgarian Telecommunications Company – for technological needs, transport companies);
- 63,000 – 87,500 MHz –10 frequency channels allocated for registration under a class licence and 10 channels for registration on a free regime. The operation is forthcoming;

- 146,000 – 148,000 MHz - 10 frequency channels allocated for registration under a class licence and 10 channels for registration on a free regime;
- 148,000 – 148,950 MHz - provided for use by different institutions and companies;
- 150,050 – 156,5125 MHz - allocated for use by different institutions and companies (Bulgarian Railways Company, Kozlodui Nuclear Power Station, Bulgargas, Maritza Iztok-2 heating power plant, taxi service and security companies), following agreement with the Ministry of Transport and Communications, the frequency channels of the Maritime Mobile Service are used on the territory of the country;
- 156,5375 – 156,7625 MHz - allocated for use by different institutions and companies, following agreement with the Ministry of Transport and Communications, the frequency channels of the Maritime Mobile Service are used on the territory of the country;
- 156,8375 – 158,375 MHz - allocated for use by different institutions and companies (the Ministry of Health – for emergency medical services), following agreement with the Ministry of Transport and Communications, the frequency channels of the Maritime Mobile Service are used on the territory of the country;
- 160,625 – 162,875 MHz - allocated for use by different institutions and companies (the Ministry of Health – for emergency medical services), following agreement with the Ministry of Transport and Communications, the frequency channels of the Maritime Mobile Service are used on the territory of the country;
- 440,000 – 459,000 / 460,000 – 469,000 MHz – allocated for shared use – for the needs of defense and security and for civilian needs (used by the Bulgarian Railways Company, the Ministry of Health – for emergency medical services, Sofia Airport, the Air Traffic Control, Global & Jordan Ltd., Kozlodui Nuclear Power Station);
- Allocation of frequency resource for re-licensing of 54 private radio stations and 15 private television stations;
- Allocation of frequency resource for the private national radio network;
- Allocation of frequency resource for the private national television;
- Allocation of frequency resource in 8 regions for 72 radio operators;
- Forwarded for international co-ordination are the technical data for 35 radio operators
- In the frequency range of 7GHz a limitation was made to the shared use of the 7 MHz and 28 MHz frequency frames on a different duplex spacing, and was endorsed an allocation with a duplex spacing of 161 MHz, compatible for the different bandwidths.
- A limitation was placed to the expansion in connections of the Fixed Service in the ranges up to 5 GHz, so as to leave adequate free resource for the new technologies in those ranges.
- Forwarded for international co-ordination are the technical data for 8 Bulgarian terrestrial stations.
- A frequency matching was made of 7 foreign satellite networks.
- The frequency ranges 25,25-25,50 GHz, 25,50-26,50 GHz and 26,50-27,00 GHz, designated for the needs of defense and security, received a statute for shared use.

- The frequency bandwidth 10,0-10,3 GHz is assigned to ENG/OB needs.
- The frequency bandwidths 10,3-10,44 GHz and 10,5-10,68 GHz are assigned for microwave transmission by cable operators and radios.

