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WAPECS: A method for flexible regulation of radio accesses in the European Union

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Dr. János GRAD

WAPECS

A method for flexible regulation of radio accesses in the European Union

Abstract

The presentation outlines one of the most important and most effective regulatory method in the radiocommunications, the principle of WAPECS (Wireless Access Policy for Electronic Communication Systems.)

WAPECS is based on the recognition, there are three radio services, namely the mobile service, the fixed service and the broadcasting service which and are near to each other by their physical properties. These similar radio services should be handled in the same way i.e. their regulatory rules should be the same. General requirements are imposed in the framework of physical-technical factors, service factors and how to acquire title to frequency utilisation. Most important regulatory requirements are the different neutralities (e.g. technology neutrality, service neutrality).

Frequency bands which are mandatory for WAPECS-use for member countries of the European Union:

- Subbands inside the band 470 – 862 MHz, where the exclusive broadcasting has finished (digital dividend bands),
- 880 – 915 MHz / 925 – 960 MHz (GSM-band),
- 1710 – 1785 MHz / 1805 – 1880 MHz (DCS-1800 band),
- 1900 – 1980 MHz / 2010 – 2025 MHz / 2110 – 2170 MHz
(UMTS-band, core-band for 3G),
- 2500 – 2690 MHz (4G core-band),
- 3400 – 3800 MHz (WiMAX-band).

Technical basic requirements – first of all the powers – are decided for each frequency band by Decisions of the European Commission. These decisions will be mandatory for the WAPECS-type radio applications in every member country of the European Union.

The WAPECS-type regulation of radiocommunications, prescribing minimal technical restrictions, has been based on a harmonized agreement of the 27 member state of the European Union. However, Hungary had significant role in the establishment of the structure. Hungary has introduced the principle of WAPECS for such frequency bands for that it was not imposed by the consensual regulation of the EU. Examples for additional WAPECS-regulated bands in Hungary are the mobile band of 2.3 GHz (2300 – 2400 MHz) and the band of 26 GHz (22.5 – 26.54 GHz) applicable for high capacity data transfer and connections between mobile base stations.

Keywords: flexible regulations, European Commission, radio regulations, technical neutrality

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WAPECS

A method for flexible regulation of radio accesses in the European Union

During the communications by radio, there will be created communications contact between a radio transmitter station and one or more radio receiver stations. The intended connection can be disturbed by parasitic signals of other radio links. The result of this phenomenon is the interference in the disturbed receiver what should be reduced to a possibly high degree (Figure 1).

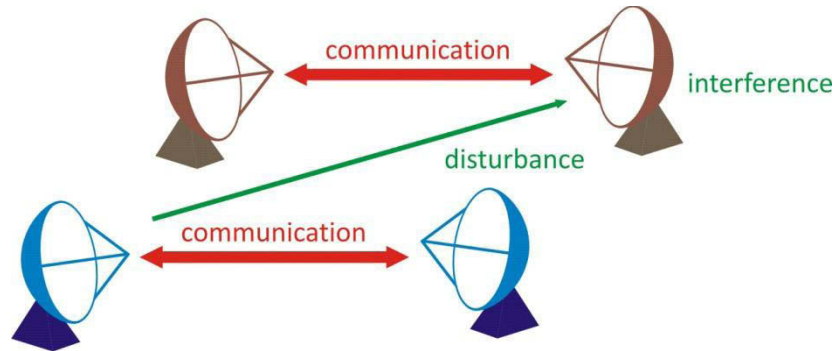


Figure 1
Radio connections and interferences.

An individual method for the reduction of interference is the planning. But there is a general method for that, this is the appropriate regulation. The object of this presentation is the regulations.

As it is well-known, the radio applications can be arranged in groups of radio services and the Radio Regulations operates on this level. The regulations become more difficult if a geographical area is divided into small parts by country borders. This is the typical situation in Europe, in the member countries of the European Union where the geographical division affects the radio regulations disadvantageously.

On the basis of a mandate issued by the European Union, an efficient regulatory method has been worked out for the reduction of the specific European difficulties of radio regulations. This is the **WAPECS Wireless Access Policy for Electronic Communication Systems**.

The policy WAPECS is based on the recognition that three economically important radio services are near to each other by their physical properties. These radio services are

- mobile service,
- fixed service,
- broadcasting service.

It is advantageous if these three radio services are handled in the same way i.e. their regulatory rules shall be the same. The requirements are given by the Communications Committee (COCOM) in the area of Information Society of the European Commission (EC-INFISO). The general requirements refer to

- physical-technical factors,
- services and
- acquisition of the right for frequency utilisation.

They include the next properties:

- Properties of physical-technical factors:
 - technology neutrality
(it means the applicable type of technology is not prescribed),
 - minimizing the imposed restrictions, i.e. the possibly less restrictions should be imposed for the avoidance of harmful interferences (e.g. output power and spectrum-power mask),
 - the actual regulations shall be defined in the individual frequency bands.
- Properties of service:
 - service neutrality
(it means the type of used service is not prescribed),
 - convergence among radio services.
- Properties of the acquisition of the right for frequency utilisation:
 - primary frequency distribution methods are auction or competition,
 - the provision of secondary spectrum trading is obligatory.

A network-user may build up a radio access system having a structure complies with its own intention and targets. This will be provided by the neutrality requirements. There are no directives decided in advance for the network structure and operational methods.

The Radio-Spectrum Committee (RSCOM) that is another committee inside the INFISO area has given proposals to frequency bands where the application of WAPECS-method is desirable. Proposed frequency bands for WAPECS are:

- Subbands inside the band 470 – 862 MHz, where the exclusive broadcasting has finished (digital dividend bands),
- 880 – 915 MHz / 925 – 960 MHz (GSM-band),
- 1710 – 1785 MHz / 1805 – 1880 MHz (DCS-1800 band),
- 1900 – 1980 MHz / 2010 – 2025 MHz / 2110 – 2170 MHz
(UMTS-band, core-band for 3G),
- 2500 – 2690 MHz (4G core-band),
- 3400 – 3800 MHz (WiMAX-band).

WAPECS-requirements are defined by different EC-Decision for each WAPECS frequency band. There is significant difference in the description of the necessary technical restrictions, e.g. at the definitions of maximal output powers or block-edge-masks (BEM).

Technical prescriptions regulating in a technology-neutral way and with minimal technical restrictions apply usually the principle of block-edge-mask (BEM) to minimize the interference. In case of block-allocation, frequency blocks can be used with any channel arrangements and with discretionary technology, only limitations are the power-characteristics inside and at the edges of the blocks (Figure 2).

If the power inside a block is below the defined power-limit furthermore the characteristic of the emitted power at the block-edges is below the defined block-edge-mask, interference between neighbouring blocks can't be expected even if the interferers and the disturbed systems are in the same area.

It shall be noted the power-type quantity in the block-edge mask characteristic is rather the power spectral density [dBW/MHz] or power flux spectral density [dBW/m²/MHz] than a simple power [dBW]. The characteristic value of the power may be either the direct output emission or its weighted value by the antenna gain. This latter is the EIRP (Equivalent Isotropically Radiated Power).

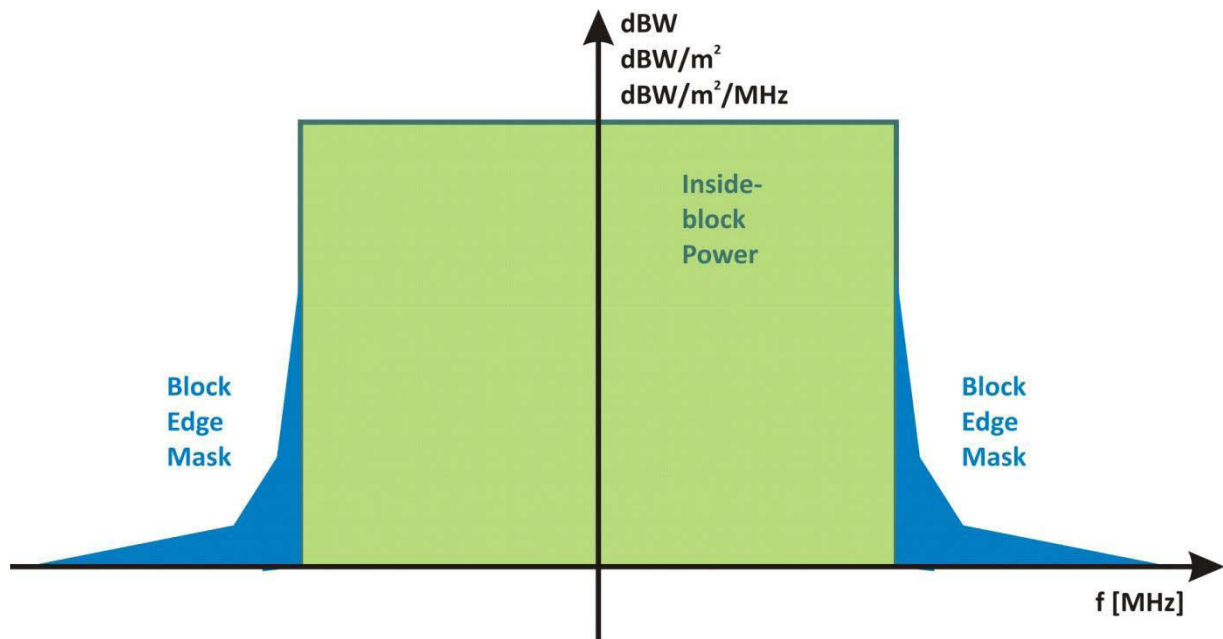


Figure 2
Characteristic powers of a frequency block.

The well elaborate requirements of WAPEX and the complete WAPECS regulations can be used not only for the frequency bands that are mandatory by prescriptions of the European Commission. By national scope, this flexibility method can be selected in other frequency bands, too. Beyond the above listed bands, the Hungarian National Media and Infocommunications Authority uses the WAPECS-policy to the following frequency bands:

- 2300 – 2400 MHz (worldwide harmonized IMT-band),
- 24.5 – 26.5 GHz (frequency band for very high capacity point-to-point and point-to-multipoint communications).

The WAPECS-type usage of the above frequency bands is not harmonized throughout Europe but it is restricted to the territory of Hungary.

References:

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- 2008/477/EC Commission Decision on the harmonisation of the 2 500-2 690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community;
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- COM(2007)50: Rapid access to spectrum for wireless electronic communications services through more flexibility.

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Since 1991: general advisor, Dept. Spectrum Engineering, National Media and Infocommunications Authority – Hungary,

Activity areas: Radio regulations on global and national level;

Participation in the work of European and worldwide organisations of radio regulations;

Hungarian implementation of radio regulations issued by ITU-R, European Union, ETSI and CEPT-ECC.

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1988: advisor, Ministry of Defence, New Delhi,

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1973 – 1991: scientific advisor, Research Institute for Telecommunications, Budapest;

1965 – 1973: head of High Power Laboratory, Tungstram Factory for Transmitting Tubes;

1960 – 1965: studies in the Budapest University of Technology.