An operator's view on the new telecom legislation

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Topics

- Execution of technology liberalisation through the use of Block Edge Masks
- Secondary use of frequencies
- SDR in the context of technology neutrality
- Cognitive radio and public mobile communication

Block Edge Mask

- Frequency licenses based on BEMs
- A prerequisite for technology and service neutrality
- Provides for efficient assignment and use of frequency spectrum (in economic terms – political target)

Definition of BEM

Block Edge Masks (BEM) are technical parameters that apply to the entire block of spectrum of a specific user, irrespective of the number of channels occupied by the user's chosen technology. These masks are intended to form part of the authorisation regime for spectrum usage. They cover both emissions within the block of spectrum (i.e. in-block power) as well as emissions outside the block (i.e. out-of-block emission). They are regulatory requirements aimed at managing the risk of harmful interference between neighbouring networks and are without prejudice to limits set in equipment standards under Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity [3] (the R&TTE Directive).

Block Edge Mask

- Frequency licenses to be based on BEMs
- A prerequisite for technology and service neutrality
- Old regime based on requirements laid down in the technical standard
- GSM1800 with in-built protection of GSM900 and vice versa
- BEMs to control interference between
  - independently developed systems providing basically the same services, egg. LTE and Wimax
  - systems providing entirely different services, e.g.. LTE and cordless microphones

Harmful interference

- Equivalent to ”unacceptable disturbance”?
- Quantifiable and operational definition
- Applicable to end users
- Unacceptable disturbance
  - Not the same to any type of service
  - Not the same to any technology providing the same services
- Parameter values set for BEMs should encourage use of spectrum for services being of high value to society
  - provide for same or better perceived quality ref. existing similar services
  - promote technology upgrade within existing (renewed) licenses
  - promote the use of spectrum trading

Secondary use of frequencies

Examples

- GSM on board airplanes
  - Control and traffic channels uncoordinated with ground below
  - ’Noise curtain’ in all frequency bands used for mobile comm.
- UWB
  - low transmitted power in a very large frequency bandwidth including those used for mobile networks

Risk of harmful interference

GSM on board airplanes

- On board and terrestrial systems isolated from each other provided that airborne system is in line with requirements
  - max. eirp outside airplane
  - minimum altitude for use
- Extremely difficult for mobile operators to link cause of customer complaints to planes passing by
- No mechanisms for policing violation or follow up on suspicions is in place
- Fair distribution of benefits and disadvantages?

Risk of harmful interference

UWB

- Supports interference mitigation techniques but not in traditional mobile frequency bands
- Use of mobile broadband modem in the presence of active UWB in same pc will be heavily impaired or impossible at the edge of radio cells
- UWB may disturb connections of other users in the same room
- In mobile broadband networks, suffering connections drains cell capacity at the expense of other users
- Fair trade-off between convenience of having cordless access to pc peripherals and the impairment of mobile services?

SDR and technology neutrality

- New legislative regime does not require a specific technology to be applied throughout the lifetime of a spectrum license
- Spectrum at low frequencies is a very scarce resource which is extensively used by 2G
- Need for gradual and cost efficient migration of customers to new technology in same frequency band

SDR cont'd

Migration steps

- build-up of e.g. 900 MHz WCDMA HSPA or LTE enabled customer population
- concurrent roll-out of 900 MHz WCDMA HSPA or LTE base stations at existing 2G sites if there is sufficient space
- in case of insufficient space or it turns out to be cost effective, exchange existing 2G base stations with SDR 2G - 3G/LTE base stations
- switch overnight to new technology when remaining 2G population is at a level where it can be accommodated in the remaining bandwidth

Cognitive technology in mobile networks

- Vast set of parameters for all mobile radio technologies
- Used to control (examples)
  - network selection
  - technology selection
  - network access
  - handover
  - output power
  - distribution of resources among users
- Each cell should ideally have its own settings as they are all different from each other
- Some parameters should even change over the day as traffic level and distribution changes
- But
  - manual planning would require every employee to be a radio network planner
  - dynamic changes would still not be reflected
- Therefore a fairly standard set of parameters is used

Cognitive technology cont'd

Cognitive technology is emerging in mobile networks

- LTE
  - coined SON - Self-Organizing / Self-Optimizing Network
  - supports automatic initial configuration of new cells and subsequent optimization based on RF-measurement and event history
  - expected to improve usage of resources as well as perceived quality
- Femto cell
  - would not work without its ability to 'sniff' the surrounding radio environment and adapt to it