

Spectrum and licensing in the mobile telecommunications market

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Overview

- Main tasks in spectrum regulation and –management
- Licensing
 - Types of licenses
 - Awarding processes of individual spectrum licenses
 - Licensing policy for individual spectrum licenses
 - Spectrum license fees
- Some regulatory topics
 - Spectrum trading
 - License modification
 - Digital dividend
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Spectrum is regulated by Government for two key reasons:

- co-ordination of radio emissions so to avoid radio interference;
- allocation of scarce radiofrequency spectrum between competing uses.

Radiofrequency signals do not stop at the border, meaning that cross-border interference disputes arise, requiring an international solution.

Modern spectrum regulation therefore involves the following key tasks:

- international co-ordination of frequency planning;
- national frequency planning, typically giving effect to the agreed international standards;
- licensing for intentional emissions
- regulations and standards to minimise unintentional emissions;
- policing and enforcement against e.g. piracy use
- procedures to resolve any remaining interference disputes.



International spectrum planning

The first radio regulations were concluded in Berlin in 1906.

The current “Radio Regulations” are a legally binding intergovernmental treaty of the International Telecommunication Union (ITU).

- The Radio Regulations incorporate the Final Acts of the World Radiocommunication Conferences, essentially meetings between all nations to agree binding resolutions and non-binding recommendations.
- The Radio Regulations define, among other matters:
 - the allocation of different frequency bands to different services;
 - procedures for the coordination and notification of frequency assignments by national governments; and
 - mandatory technical parameters to be observed by transmitters



National spectrum planning

Within the international framework, spectrum has to be managed on a national level to ensure its *rational, equitable, efficient and economical* use by all radiocommunication services and users, taking into account that:

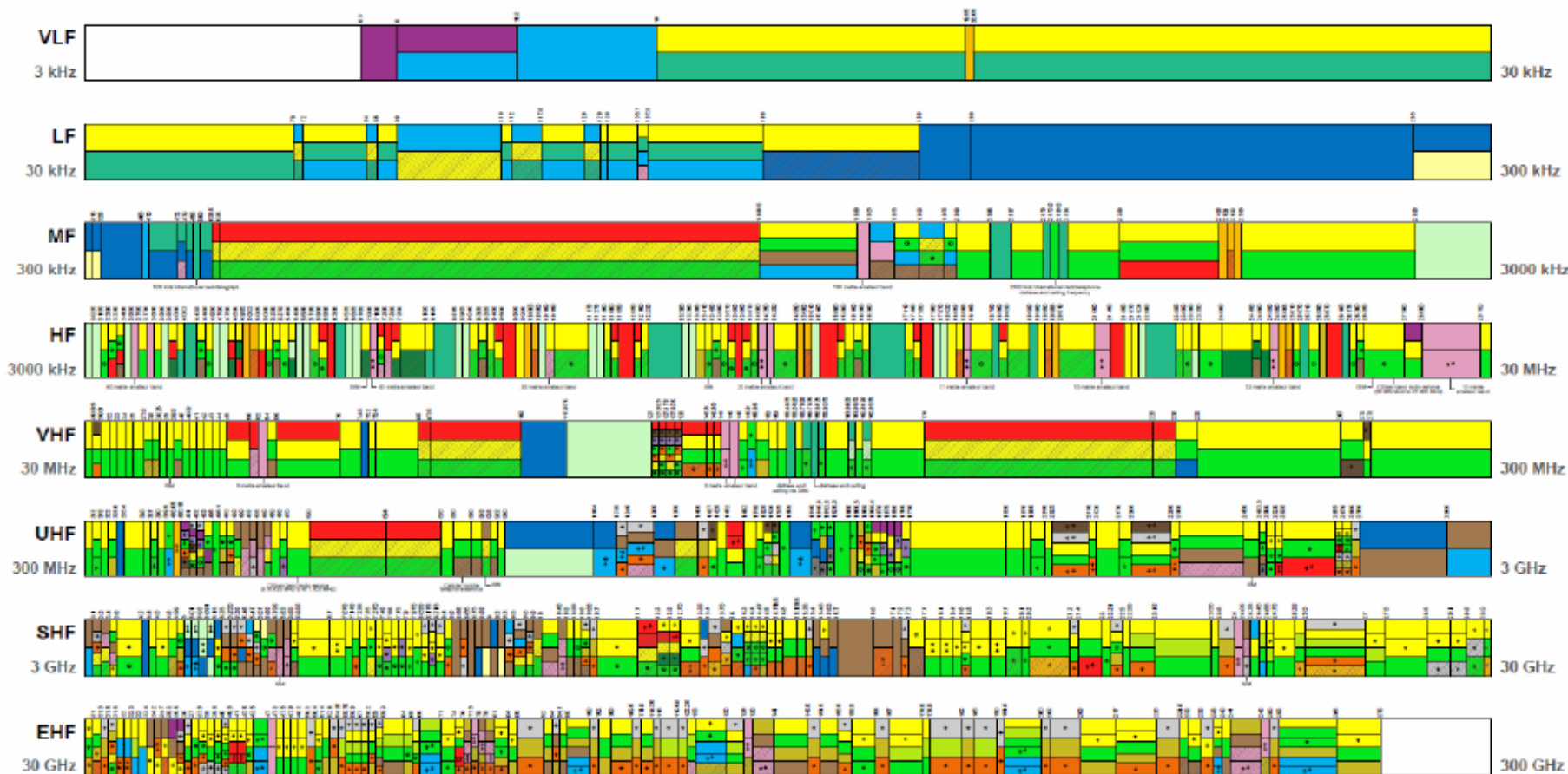
- Radio spectrum is a scarce/finite resource in terms of instant capacity, although it is inexhaustible when used over time.
- New and new applications mean ever growing demand for new spectrum access opportunities.
- Because frequencies differ in what they can do, there is an optimisation problem of matching them to particular uses
- Spectrum can be in short supply in areas of high demand – there is a need for rationing its use and giving priority to more important applications or forcing users to invest in efficiency improvements or move to other frequencies

These are not regulatory decisions, but political choices. Hence the task to make the National Frequency Plan is a task for the government. The frequency plan ideally would be drafted according to a transparent procedure, which includes the consultation of interested parties.



National spectrum planning

LEGEND	AERONAUTICAL MOBILE	AMATEUR	EARTH EXPLORATION SATELLITE	INTER-SATELLITE	NAVY/MARINE MOBILE	METEOROLOGICAL AID	MOBILE	RADIO DETERMINATION	HYPERNAVIGATION	SPACE RESEARCH	NOT ALLOCATED	<ul style="list-style-type: none"> ↑ SATELLITE (Earth-to-space) ↓ SATELLITE (space-to-Earth) ↕ SATELLITE (space-to-space) ○ except Aeronautical Mobile ● active ● passive * Deep space
	AERONAUTICAL RADIONAVIGATION	BROADCASTING	FIXED	LAND MOBILE	MARITIME RADIONAVIGATION	METEOROLOGICAL SATELLITE	RADIO ASTRONOMY	RADIOLOCATION	SPACE OPERATION	STANDARD FREQUENCY AND TIME SIGNAL	secondary services	



Interference management and monitoring/policing tasks

Interference is caused between radiocommunications systems unless sufficient isolation from each other is provided:

- in frequency: by careful planning of frequency allocation to avoid interference
- in distance: usage in different, non-overlapping geographic areas
- in time: usage at different, non-overlapping periods of time

Therefore there is a need to ensure spectrum use is well coordinated between various users. This is a *regulatory* task.

Ultimately, the frequency allocations must be protected against unintentional or unlawful (piracy) use and measures for avoiding interference must be enforced. These are *regulatory* tasks.



Licensing

When allocating spectrum to a specific usage, the government will also have to decide on the mechanism of allocating usage rights to individual users through licensing. Licensing can be implemented by the government or the regulator.

Typically there are three types of licenses:

- Class licenses
- Apparatus licenses
- Exclusive spectrum licenses

Non-scarce frequencies should be made licence-exempt wherever possible or converted into registrations



Class licenses

- Class licensing is communal use licensing e.g. for: airport body scanning machines; industrial, scientific and medical equipment; radio frequency identification (RFID) for stock control and monitoring; bluetooth and Wi-Fi transmitters
- Registration may involve payment of a minimal registration fee.
- The class license will typically set out requirements regarding the permitted radiofrequency emissions and the permitted maximum power of those emissions.
- In some jurisdictions, class licensed frequency bands may also be referred to as ‘unlicensed’ bands.



Apparatus licenses

- Apparatus licensing - particular equipment spectrum licensing – is issued for a particular transmitter at a particular location for a particular use.
- The license gives ‘first in time’ priority to the holder of the license against any other entity in relation to any disputes over interference.
- Apparatus licenses are normally acquired ‘over the counter’ and tend to be short term in nature, typically between 3 and 5 years.
- An administrative pricing arrangement usually applies, often in the form of annual fees plus an up-front application fee. These fees may involve a scarcity premium as well as administrative cost recovery.
- Apparatus licenses do not confer exclusivity, so have little intrinsic value (except providing a right to operate a particular transmitter).



Individual spectrum licenses

- Individual spectrum licenses give the holder of the license the exclusive right to use and manage the frequency band in a pre-determined geographic area – these are typically for mobile networks.
- These licenses are long-term in duration, 15 - 25 years. They are intended to correspond with the expected life of a mobile network.
- An exclusive spectrum license normally confers various rights and obligations on the licensee. However, the licensee normally has a reasonable amount of flexibility regarding the use of the band.

An exclusive spectrum license for a mobile operator may be combined with the license to enter the market (if required) or may be separately awarded.

We will now focus on individual licenses only



Individual license awarding processes (1)

When the number of licenses available is less than the anticipated demand from licenses, some form of selection is necessary. Selection processes may take the form of a competitive selection (so called “beauty contests”) or an auction. Both types of selection process attempt to ensure that the most appropriate bidder receives the license.

For both auctions and beauty contests there will be a set of minimum requirements to ensure that the bidders are “qualified” (as per e.g. legal, technical, financial, minimum roll out requirements). For example, if the new license is issued to enhance competition any entity related to existing operators should be excluded from bidding.



Individual license awarding processes (2)

Beauty contests are aimed at selecting the bidder or bidders who best meet a set of criteria. The criteria typically include:

- the time to launch services
- the coverage of networks
- the prices at which services will be offered
- innovation in services and products
- wider economic benefits such as employment and investment in the country.

Bidders are required to submit a “bid book” which usually takes the form of a detailed business plan including descriptions of the technical plan, financial forecasts and the marketing plan. The bids from each of the qualified bidders are converted into a “score”.

The promises of the winning bidder must be rigorously enforced otherwise the beauty contest results could have been different.



Individual license awarding processes (3)

Auctions award licenses to the bidder who is willing to pay the highest amount for the license, either in the form of an up front payment or a series of royalty payments. The rationale is that the bidder who will use the license most efficiently will generate the highest economic value and therefore be willing to pay most for the license.

There are many options for the design of the auction. Each option has different characteristics and risks. E.g. it may consist of a single “sealed bid” round or a multi-round auction with bidders submitting (typically increasing) bids, often electronically through sophisticated software, until a single highest bidder remains. A minimum reserve price is normally set for the auction.

According to economic theory the auction costs can not lead to higher rates for end users if the market is sufficiently competitive.



Individual license policy

Particularly for individual spectrum licenses it is extremely important that a government formulates a licensing framework policy stating

- How soon after the award of licenses, new licenses will or may be introduced and how they will be awarded
- How the government will handle the expiry of licenses – will there be a right of renewal or a new open awarding procedure; and what license renewal fee will be required

Such policies should normally not be changed after being adopted, because they determine the value of a license and are extremely important for the business case of a mobile operator. Changes may lead to damage claims.

In most cases, a license, once granted, will carry a right, or at least an expectation, of renewal at the end of the first term and perhaps again at the end of any subsequent term (subject to paying the required renewal fee). A government will often reserve the right to deny renewal but usually this right applies only if the licensee has been materially or persistently in breach.



Spectrum license fees

Spectrum license fees can be based on different pricing methods:

- A one-off administrative fee may be charged for the recovery of license awarding costs
- Annually recurring administrative fees may be charged for covering the costs of the regulation activities
- The third component of the fees may reflect the economic value of the spectrum used. This can be determined either by
 - The auction, based on the assumption that the fee offered by the highest bidder reflects the economic value
 - A spectrum valuation decision, in which the regulatory authority determines the value of the spectrum license based on a calculation of the business case of a theoretical user.



Spectrum trading

- The right to use part of the spectrum represents a certain value in the accounts of a company. Companies may therefore want to sell a right of use that has been granted to them, or buy a right of use from a company that has been granted a right of use. Such transfers may have a negative effect on the development of competition.
- If the national legislation allows for ‘spectrum trading’, it is recommended that this is only allowed under the condition that the intention to trade spectrum is notified to the national regulatory authority and that the transactions take place according to predefined procedures, that should allow the national regulatory authority to ensure that the buyer would have been eligible for acquiring the spectrum in the first place and the development of competition is not impeded by the intended transfer of the right of use.



License modification

- Where a license is intended to remain in force for a long period, perhaps 15 to 25 years, it is likely that the NRA or the licensee will want at some point to modify one or more of its conditions.
- Particularly if the license was obtained by auction or beauty contest, modification of the license can be very tricky because the amendment to the license could have led to another outcome of the awarding process.
- A general and unconstrained right to modify a license is equally unattractive to licensees and their bankers. It allows excessive regulatory discretion and adds to the licensee’s risk: therefore the value of the license could be eroded.
- The framework within which licenses may be amended will be set out in the Law or the license itself.
- To avoid political problems or legal claims any amendment must be preceded by a thorough justification of the grounds for changes and an extensive public consultation.



Digital dividend

Analogue broadcasting technologies (radio and television) have traditionally used substantial spectrum in bands 174 - 230 MHz (VHF) and 470 - 862 MHz (UHF). These bands provide greater coverage and high building penetration.

Digital broadcasting technologies use much less spectrum. More digital channels can be offered and some of the spectrum can be reallocated for other purposes.

The ITU redesignated the 700MHz frequency band in 2007 so that it could be used for either mobiles or broadcasting. As the digital switchover from analogue to digital television occurs, the digital broadcasters will use different spectrum and 700MHz will be free.

The ability to auction the 700MHz spectrum has provided Governments with a so-called ‘digital dividend’. The 700MHz spectrum is particularly valuable. Some countries have used the revenues of auctions of these frequencies for universal service policies expanding broadband connectivity in rural areas.



Future capacity issues

1. As consumers use more and more data on their mobile devices lack of capacity is increasingly becoming an issue, even with the benefits of 4G.
2. Spectrum will therefore become, if anything, even more important because using more spectrum increases the required capacity on a mobile network.
3. The other way to improve capacity is to build a more dense network – ie have more base stations and antennae. This is expensive, and will generate more environmental issues and resistance.
4. It will become increasingly important to move away traffic from mobile to fixed networks as quickly as possible.
6. Newer technologies may facilitate dynamic sharing of spectrum between operators’ networks according to demand – though we are quite a few years away from being able to do this in real time. This will facilitate whole new business models in the telecoms sector – eg a wholesale-only spectrum owner could automatically auction spectrum to the highest bidder in each area continuously, leading to much more efficient use



Thank you

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