

Digital dividend in Europe

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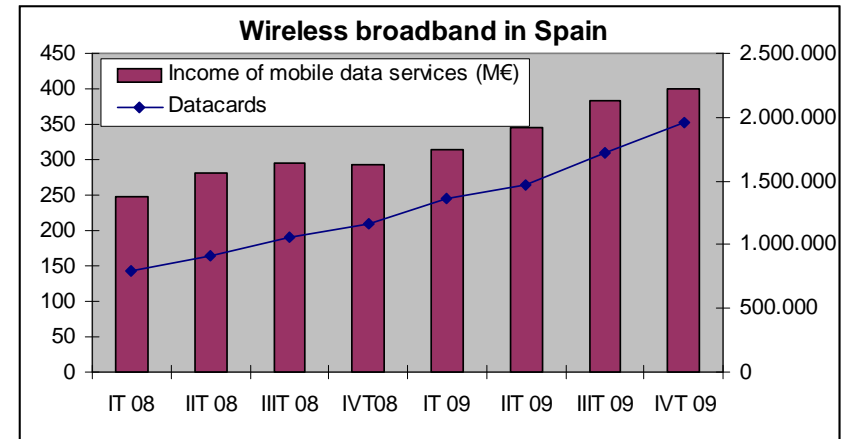
Florence, 16th April 2010

The Digital Dividend, an opportunity

- The digitalization of the UHF band (470-862 MHz), traditionally used for broadcasting, allows a more efficient use of the spectrum
 - ~4 standard resolution channels or ~2 HDTV channels fit in 1 analog channel (8 MHz)
 - The use of national or regional single frequency networks allows a more efficient use of the spectrum
 - It paves the way for increasing the number of TV channels while freeing capacity for other services
- Presently, the analog switch-off is completed in some countries: Denmark, Finland, Germany, Netherlands, US (full power stations), Spain, Sweden, etc.
- The excellent propagation properties of this frequency band make it specially suitable for electronic communications services
 - Large blocks of spectrum available
 - Higher coverage per station (it allows a reduction of more than 50% of stations with respect to the 2,1 GHz band to achieve the same coverage)
- The benefits of allocating spectrum to mobile broadband have been pointed out by different studies
 - Allocation part of the UHF band to mobile operators should result in a benefit of **€63bn and €165bn** at UE level over a 20-year period (source: spectrum/value partners study “Getting the most of the digital dividend”)
 - Using the UHF band for TV and wireless broadband applications could generate between **€150bn-€700bn** of total economic and social value across the UE over 15 years (source Analysys Mason, DotEcon and Hogan & Hutson study for the EC “Exploiting the digital dividend”)

More spectrum needed to support wireless broadband growth

- Demand for broadband data services is progressively increasing
 - Data traffic will overcome voice in mobile networks
 - Data applications are key for mobile operators to grow in front of mature voice revenues
- Data applications require increasing transmission rates and thus more spectrum
- Access to further spectrum is vital for sustaining growth of wireless broadband services
 - Low frequencies (< 1 GHz) key for extending coverage to rural/sparsely populated areas
 - Additional spectrum needed for capacity in dense areas (1800 MHz, 2.1 GHz, 2.6 GHz)
- Although it is possible to deploy LTE in small blocks (down to 1.4 MHz), large blocks are required to leverage the benefits of the technology (maximum data rates, etc.)



Frequency bands available for terrestrial ECS between 470 MHz and 3 GHz

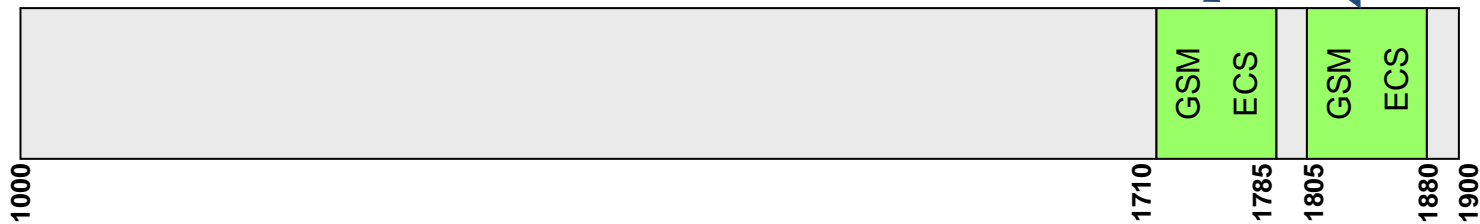
Available around 2011-2015 in most countries
Neutral conditions, LTE deployments expected

Heavily used for GSM
UMTS allowed according to amended GSM Directive

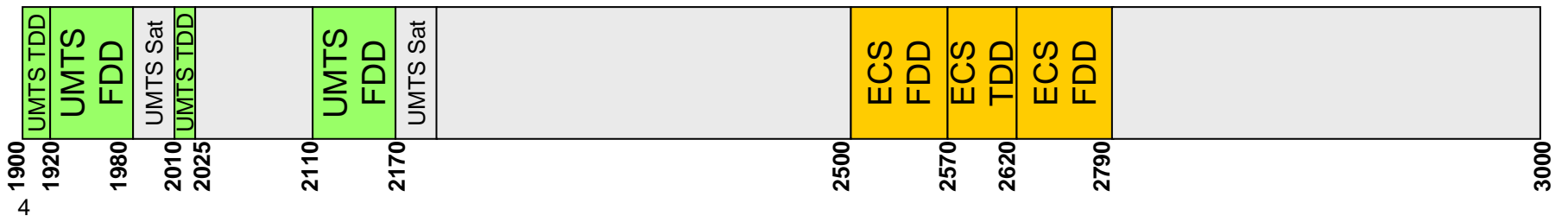


Key frequencies for extension of wireless broadband coverage

Presently used for GSM. UMTS allowed according to EC Decision 2009/766/CE



Upcoming awards (already awarded in some countries)
Neutral conditions; LTE (FDD), WiMAX or LTE (TDD) deployments expected



Frequencies in MHz

The Digital Dividend in Europe

- The digital dividend in Europe has been subject to different studies, communications and recommendations of the EU institutions
 - Communication (2009)586, “Transforming the digital dividend into social benefits and economic growth”
 - Commission Recommendation 2009/848/EC facilitating the release of the digital dividend in the European Union
 - “Exploiting the digital dividend – a European approach” study in 2009
 - Communication (2007)700, “Reaping the full benefits of the digital dividend in Europe: A common approach to the use of the spectrum released by the digital switchover”
 - RSPG opinion on digital switchover (2004) and on the Spectrum Policy Implications of the Digital Dividend (2007) and on the digital dividend (2009)
- EU action about the digital dividend has been focused in:
 - Complete the analog switch-off at European level by 2012
 - Ensure an European common approach about the digital dividend
 - Harmonized technical conditions: Draft EC Decision approved in Feb 2010 Radio Spectrum Committee
 - Promote the use of the 790-862 MHz frequency band for electronic communication services in a coordinated and non-mandatory basis
 - Facilitate cross-border coordination between EU countries
- There is an increasing number of countries that have indicated the will to dedicate the 790-862 MHz band to ECS (different than broadcasting): Denmark, Finland, France, Germany (**auction in progress**), United Kingdom, Sweden, Spain,...
- A wide adoption of the 790-862 MHz band by EU countries is key in order to
 - Achieve economies of scale at European level
 - Avoid cross-border interference issues between electronic communications services and broadcasting

The Digital Dividend in the United States

- The WRC-2007 identified the frequency band 698-806 MHz in Region 2 (Americas) for mobile (IMT) services
- The US completed the analog switch off by June 2009 (full power stations)
- The size of the dividend (108 MHz) is larger than in Europe (72 MHz) and most of it was already assigned in 2008:
 - 62 MHz for commercial use: 101 bidders won 1,090 licenses (AT&T and Verizon acquired around 70% of that spectrum)
 - 24 MHz reserved for public safety tied with a 10 MHz block for a public-private partnership were not awarded and should be re-auctioned.
- The FCC allowed in 2008 the use of unlicensed devices within the “white spaces” of the broadcasting bands (non interference is ensured with power and antenna height limitations and the need to implement sensing and geolocation)
- FCC’s National Broadband Plan:
 - It is acknowledged that the FCC has in inventory just a fraction of the spectrum that will be needed to match growing demand
 - Recommends to make available **500 MHz** of spectrum for broadband in 10 years (of which **300 MHz** below 3.7 GHz in 5 years)
 - Recommends mechanisms to make a more efficient use of the spectrum
 - Promotes the use of new access modes, such as opportunistic or unlicensed use of the spectrum

The Digital Dividend in Spain

- Spain has completed the digital TV switch-over (3rd April 2010), 2 years in advance of the recommendation of the European Union
- The recently approved Royal-Decree 365/2010 sets the rules for the allocation of DTT multiplexes after the digital switch-over
- Spain's position regarding the dividend evolved from planned use for additional broadcasting channels (local TV, additional national multiplexes) to decision to be used by electronic communication services. As a consequence, a further reassignment phase is needed (currently the 790-862 MHz is used by national broadcasters)
- The 790-862 MHz band will be freed by **1st January 2015 or earlier**, in order to be assigned to electronic communication services
- At the end of the process, the following DTT multiplexes should be planned
 - 2 national multiplexes for the public broadcaster RTVE
 - 6 national multiplexes for private broadcasters
 - 2 regional multiplexes
 - 1 multiplex for mobile TV
 - Multiplexes for local TV (to be redefined)

Refarming of the 900 MHz band

- The deployment of UMTS in the 900 MHz reduces significantly the deployment costs of mobile broadband thanks to its excellent propagations characteristics.
- However, it raises also different uses that have to be dealt:
 - Impact on competition in mobile markets due to asymmetric spectrum holding by mobile operators, particularly for broadband applications
 - For instances, in Spain 4 operators have spectrum for the provision of UMTS services (Telefónica, Vodafone, Orange and Yoigo), but only 3 have spectrum in the 900 MHz band
 - Migration of GSM traffic to other frequency bands and network redesign in case of release of spectrum or UMTS deployment in the 900 MHz band
- EU Directive 2009/114/CE amends Directive 87/372/EEC (“GSM Directive”) and establishes that
 - Member states shall make the 880-915 MHz and 925- 960 MHz frequency bands (the 900 MHz band) available for GSM and UMTS systems, as well as for other terrestrial systems
 - Member states shall examine whether the existing assignment of the 900 MHz band to the competing mobile operators in their territory is likely to distort competition and address such distortions
- Different ways to address these issue have been used at national level:
 - Modification of spectrum rights of use in the 900 MHz band: France, Italy, Sweden, Denmark, Finland
 - Spectrum caps in the 800 MHz auction: Germany, UK (BIS proposal)

Secondary Spectrum Trading

- A market-based approach should ensure a more efficient use of the spectrum. Its main paradigms are:
 - **Technology and service neutrality:** Holders of right of use have no restriction in the service and technology that can be used and in the technology deployed → Ensures best use of spectrum
 - **Secondary spectrum trading:** Rights of use can be transferred or leased between holders → Facilitates access to spectrum and promotes use of unused spectrum
- Implementation issues
 - Radio transmitters generate interference to users of the same band or in adjacent bands → Need to define minimum technical conditions to ensure compatibility of services
 - In Europe, these studies are usually carried out by CEPT on mandate of the European Commission
 - “Least restrictive conditions” have been defined by the European Commission for the 2.6 GHz band (Dec. 2008/477/CE) and 3.5 GHz band (Dec. 2008/411/EC) and are being defined for the 800 MHz, 900 MHz, 1800 MHz and 2,1 GHz frequency bands
 - However, practically the technical conditions may to some extent determine the services and technologies that can be deployed
 - For instances, requirements for sparse, high power services (such as broadcasting) and dense medium/low power services (such as mobile communications) are different.
- The Regulatory framework
 - A more flexible approach to spectrum management is promoted from the EC
 - Telecom Package 2009: Undertakings may transfer or lease of individual rights to use radiofrequencies (Art. 9 ter of the Framework Directive)
 - In bands designated by the European Commission through the regulatory procedure with scrutiny (except in bands used for broadcasting) and in other bands according to national legislation
 - National authorities shall ensure competition is not distorted by any transfer or accumulation of rights of use of radio frequencies (in those case they may mandate the sale or the lease of rights to use radio frequencies) (Art. 5 of the Authorisation Directive)
- Other issues: anticompetitive spectrum hoarding, spectrum fragmentation,...