



MINISTERIO  
DE INDUSTRIA, TURISMO  
Y COMERCIO

SECRETARÍA DE ESTADO  
DE TELECOMUNICACIONES  
Y PARA LA SOCIEDAD DE  
LA INFORMACIÓN

# **Workshop on LTE frequency allocations and the development of broadband mobile networks**

## **Spain: Spectrum measures for a Digital Society**

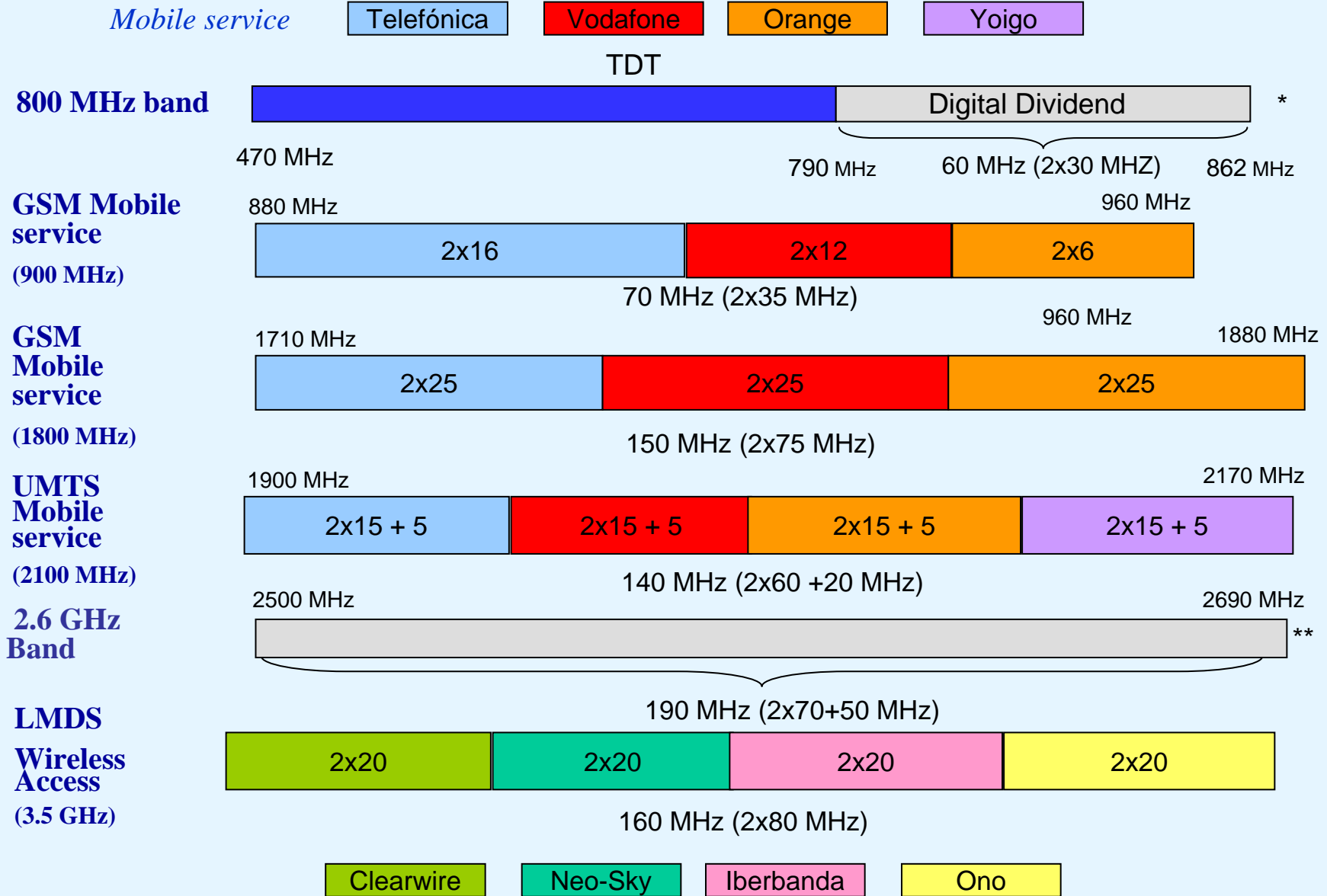
**Rome, 1st december 2011**

- **Introduction: Previous situation of spectrum and mobile market in Spain**
- 2011 spectrum measures package
- Mobile broadband extension (3G, 4G)
- Coexistence of digital terrestrial television and new services in the 800 MHz band
- Release of the digital dividend in Spain

# Radio spectrum and mobile operators in Spain

- Four of the **main European operators** of mobile communications have presence in the **Spanish market**, (by market share November 2010):
  - ✓ **Orange (20%)**
  - ✓ **Telefónica (42%)**
  - ✓ **Vodafone (30%)**
  - ✓ **Yoigo (Telia-Sonera, 4%).**
- The **revenues** of the operators making use of the spectrum (**mobile telephony and audiovisual** services) exceeded **€ 22 bn in 2010**, accounting for more than half of total telecommunications and audiovisual sector revenues in Spain.
- **The transition to the DTT** was completed on **April, 2, 2010**.
  - ✓ **Terrestrial TV is received in 98% of Spanish households.**
- The Spanish government decided, by way of a Royal Decree, the use of the 800 MHz band (**digital dividend**) to provide electronic communications services.
  - ✓ **Royal Decree 365/2010, establishes that, before 1st January 2015, 790-862 MHz band will be available for electronic communication services other than broadcasting, e.g. mobile broadband.**

# Frequency bands: previous situation



\* Available during 2014

\*\* Available now

# Mobile telephony extension plan (2006-2008)

## Spectrum award used to increase 2G coverage

- The Ministry of Industry, Tourism and Trade put out for public **tender GSM** frequency blocks in 2005, assessing **investments in underserved areas** of public interest
- The winners of the award were **Telefonica** (1 block) and **Orange** (2 blocks)
- The goal was to reach a mobile telephony **coverage of 99% in terms of population** by **December 2008**.

## Operators investments in areas of public interest: €551 M

### Breakdown by area type:

- **Rural areas** (population centres of less than 1.000 inhabitants): €451 M
- **Strategic interest areas**(e.g. nuclear power plants): €30 M
- **Highways and railways**: €70 M



# Global results of the GSM Extension Plan

- **5,014 base stations** installed in areas of general interest
- **1,125,000 inhabitants** benefitted
- GSM coverage of **99 % of the population** achieved

*Distribution of the villages included in this Plan*



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# Objectives of the 2011 spectrum measures for a digital society

- Promotion of **competition** and increasing **coverage** and **uptake** on 3G and the future 4G mobiles services.
- Make a contribution to the **objectives** established in the “**Digital Agenda for Europe**”, in particular those related to the broadband coverage and the use of radio spectrum.
- To contribute in **bringing down the cost** of including **1 Mbps** broadband access in the **Universal Service**, through the early use of 900 MHz spectrum for 3G deployments (refarming)
- Encourage the **effective and efficient use of the radio spectrum**, by making use of the innovation and the flexibility in the use of all frequency bands.
  - **Technology and service neutrality** and **secondary trading** are effectively allowed
  - The frequency blocks are **adjusted** to allow more technological efficiency (5 MHz ).
- To give **legal certainty and predictability** to all stakeholders.
- To establish a **stable and future proof framework** which allows **investment** planning and definition of business models.

## High amount of spectrum involved

- The **actions carried out** have involved a total of **460 MHz**:
  - Actual refarming and tendering in the 900 MHz and 1800 MHz bands
  - Tendering for the 800 MHz band (Digital Dividend)
  - Tendering for the 2.6 GHz band.
- A total of up to **300 MHz** of spectrum has been tendered
  - **30 MHz** in the **900 MHz** band: 2x5 MHz given back by the operators in the process of refarming and 2x10 MHz whose license expires in 2015.
  - **30 MHz** in the **1800 MHz** band (given back by the operators during the process of refarming)
  - **60 MHz** in the **800 MHz** band (digital dividend)
  - **180 MHz** already available in the **2.6 GHz** band.
- The **new spectrum** made available (800 MHz and 2.6 GHz bands) represents approximately **70% of the spectrum** previously allocated to the **mobile operators** (900 MHz, 1800 MHz and 2.100 MHz bands).

## Overview of the availability of frequencies that have been tendered

Band	Spectrum awarded	Size and number of blocks awarded	Scope	Effective availability
<b>800 MHz</b>	2x30 MHz	6 of 2x5 MHz	National	During 2014
<b>900 MHz</b>	2x15 MHz	3 of 2x5 MHz	National	2011 -2015 *
<b>1800 MHz</b>	2x15 MHz	3 of 2x5 MHz	National	2011
<b>2.6 GHz</b>	2x70 + 40 MHz (TDD)	4 of 2x10 MHz 1 of 2x10 MHz 3 of 2x5 MHz 1 of 2x5 MHz 3 of 10 MHz (TDD) 1 of 10 MHz (TDD)	National Regional National Regional National Regional	2011 2011 2011 2011 2011 2011

\* 2x5 MHz available in 2011, the rest in 2015

## Main Features of the awarding process

- The principles of **technological and service neutrality** apply, and **secondary trading** is allowed.
- The expiry date for spectrum awarded is **31<sup>st</sup> December 2030**.
- Measures to promote competition:
  - ✓ **Setting of limits to the spectrum hoarding (spectrum caps).**
  - ✓ **Telefónica and Vodafone, as holders of 2x10 MHz or more spectrum in the 900 MHz band, were not allowed to participate in the tender for the 2x5 MHz block in this band available in 2011.**
  - ✓ **Orange, Telefónica and Vodafone, as holders of 2x20 MHz or more spectrum in the 1,800 MHz band, were not allowed to participate in the tender for the frequencies given back in this band.**
- **Revenues** in the whole awarding process have been aprox. **2,000 M€**

# DETAILS OF THE TENDERING PROCESS

## 800 MHz band

Band	Spectrum awarded	Size and number of blocks awarded	Scope	Effective availability
800 MHz	2x30 MHz	6 of 2x5 MHz	National	End of 2014

Bidding procedure: Auction.

Band	Blocks	Starting price of each block	Minimum guaranteed incomes
800 MHz	6 of 2x5 MHz	170 M€	1.020 M€

# DETAILS OF THE TENDERING PROCESS

## 900 MHz band

Band	Spectrum awarded	Size and number of blocks awarded	Scope	Effective availability
900 MHz	2x15 MHz	3 de 2x5 MHz	Nacional	2011-2015

Bidding procedure: Beauty contest (Criterion for assessment: investment)

Band	Blocks	Excluded operators	Mínimum investment (2011-2013)	Incomes
900 MHz (2011)	1 of 2x5 MHz	Telefónica y Vodafone	126 M€ Coverage extensión < 5.000 habs.	126 M€

Bidding procedure: Auction

Band	Blocks	Starting price of each block	Minimum guaranteed incomes
900 MHz (2015)	2 of 2x5 MHz	169 M€	338 M€

# DETAILS OF THE TENDERING PROCESS

## 1.800 MHz band

Band	Spectrum awarded	Size and number of blocks awarded	Scope	Effective availability
1.800 MHz	2x15 MHz	3 of 2x5 MHz	National	2011

Bidding procedure: Beauty contest (Criterion for assessment: investment)

Band	Blocks	Excluded operators	Mínimum investment (2011-2013)	Incomes
1.800 MHz (2011)	3 of 2x5 MHz	Telefónica, Vodafone and Orange	60 M€ (20 M€ each block)	42 M€ (14 M€ each block)

# DETAILS OF THE TENDERING PROCESS

## 2.6 GHz band

Band	Spectrum tendered	Size and number of blocks awarded	Scope	Effective availability
2.6 GHz	2x70 + 40 MHz (TDD)	4 of 2x10 MHz	National	2011
		1 of 2x10 MHz	Regional	2011
		3 of 2x5 MHz	National	2011
		1 of 2x5 MHz	Regional	2011
		3 of 10 MHz (TDD)	National	2011
		1 of 10 MHz (TDD)	Regional	2011

**Bidding procedure: Auction**

Band	Blocks	Starting price of each block	Minimum guaranteed incomes
2.6 GHz (2011)	Equivalent to 14 blocks of 2x5 MHz and 4 de 10 MHz	5 M€(*)	90 M€

(\*) Price for the national scope. For regional scope proportional to population of the specific region 15

# RESULTS OF THE BEAUTY CONTEST

## ➤ 900 MHz

- ❖ Licence fee = 126.000.000 €
- ❖ Investment commitment: The operator awarded exceeded the minimum investment requirement in 307.000.000 €

## ➤ 1.800 MHz

- ❖ Licence fee = 42.000.000 €
- ❖ Investment commitment: The operator awarded exceeded the minimum investment requirement in 240.000.000 €

	Frequency bands	Operators excluded (set asides)	Lots	Scope	Licence fee	Investment required	Investment offered by the operator	Operator
1	900 MHz	Telefónica Vodafone	2x5 MHz	National	126.000.000 €	126.000.000 €	433.000.000 €	FranceTelecom
2	1.800 MHz	Telefónica Vodafone FranceTelecom	2x5 MHz 2x5 MHz 2x4,8 MHz	National	42.000.000 €	60.000.000 €	300.000.000 €	Yoigo
					168.000.000 €	186.000.000 €	733.000.000 €	

# RESULTS OF THE AUCTIONS (I)

➤ **First auction:** 29/06/2011 – 29/07/2011

➤ **Second auction:** 10/11/2011

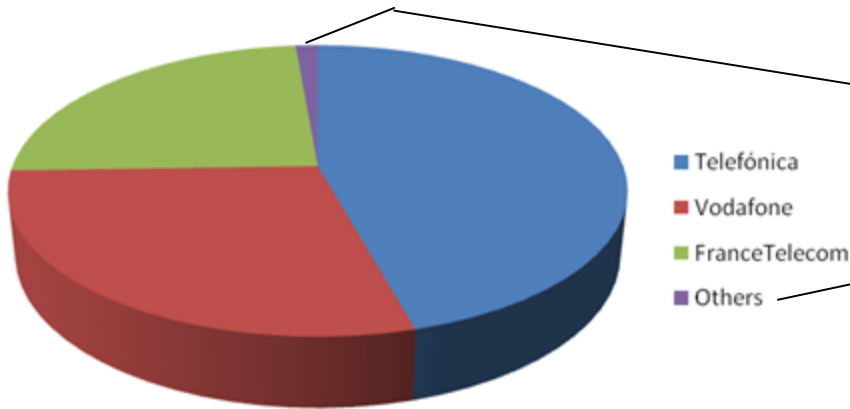
	Categories and frequency bands	Block	Frequency range	Bandwidth	Scope	Starting price (€)	Final price paid (€)	Operator
1	A1 – 800MHz	A1	791-796 MHz 832-837 MHz	2x5 MHz	Estatal	170.000.000,00 €	170.000.000,00 €	France Telecom
2	A2 – 800 MHz	A2_i	Abstract	2x5 MHz	Estatal	170.000.000,00 €	221.941.101,49 €	France Telecom
3		A2_ii	Abstract	2x5 MHz	Estatal	170.000.000,00 €	229.986.412,85 €	Vodafone
4		A2_iii	Abstract	2x5 MHz	Estatal	170.000.000,00 €	226.335.974,79 €	Telefónica
5		A2_iv	Abstract	2x5 MHz	Estatal	170.000.000,00 €	228.532.549,77 €	Telefónica
6		A2_v	Abstract	2x5 MHz	Estatal	170.000.000,00 €	228.532.549,77 €	Vodafone
7	B1 – 900MHz	B1	Abstract	2x5 MHz	Estatal	169.000.000,00 €	169.000.000,00 €	Telefónica
8	B2 – 900MHz	B2	Abstract	2x4,8 MHz	Estatal	169.000.000,00 €	169.000.000,00 €	Telefónica
9	C1_i – 2,6 GHz	C1_i	Abstract	2x10 MHz	Estatal	10.000.000,00 €	22.214.957,56 €	France Telecom
10	C1_ii – 2,6 GHz	C1_ii	Abstract	2x10 MHz	Estatal	10.000.000,00 €	22.881.406,33 €	France Telecom
11	C1_ii – 2,6 GHz	C1_iii	Abstract	2x10 MHz	Estatal	10.000.000,00 €	21.791.815,55 €	Telefónica
12	C1_iv – 2,6 GHz	C1_iv	Abstract	2x10 MHz	Estatal	10.000.000,00 €	22.646.315,95 €	Telefónica
13	C2_i – 2,6 GHz	C2_i	Abstract	2x5 MHz	Estatal	5.000.000,00 €	9.811.903,54 €	Vodafone
14	C2_ii – 2,6 GHz	C2_ii	Abstract	2x5 MHz	Estatal	5.000.000,00 €	9.789.654,33 €	Vodafone
15	C2_iii – 2,6 GHz	C2_iii	Abstract	2x5 MHz	Estatal	5.000.000,00 €	10.150.456,89 €	Vodafone
16	D1 – 2,6 GHz	D1	Abstract	2x10 MHz	Estatal	10.000.000,00 €	24.077.171,03 €	Several regional operators
17	D2 – 2,6 GHz	D2	Abstract	2x5 MHz	Estatal	5.000.000,00 €	29.322.856,78 €	Vodafone
18	E1_i – 2,6 GHz	E1_i	Abstract	10 MHz TDD	Estatal	5.000.000,00 €	5.201.500,00 €	France Telecom
19	E1_ii – 2,6 GHz	E1_ii	Abstract	10 MHz TDD	Estatal	5.000.000,00 €	5.253.515,00 €	Vodafone
20	E1_iii – 2,6 GHz	E1_iii	Abstract	10 MHz TDD	Estatal	5.000.000,00 €	5.151.505,00 €	Vodafone
21	E2 – 2,6 GHz	E2	Abstract	10 MHz TDD	Estatal	5.000.000,00 €	801.442,64 €	Several regional operators*
							<b>1.832.423.089,27 €</b>	

Highlighted in blue the lots auctioned in the second process.

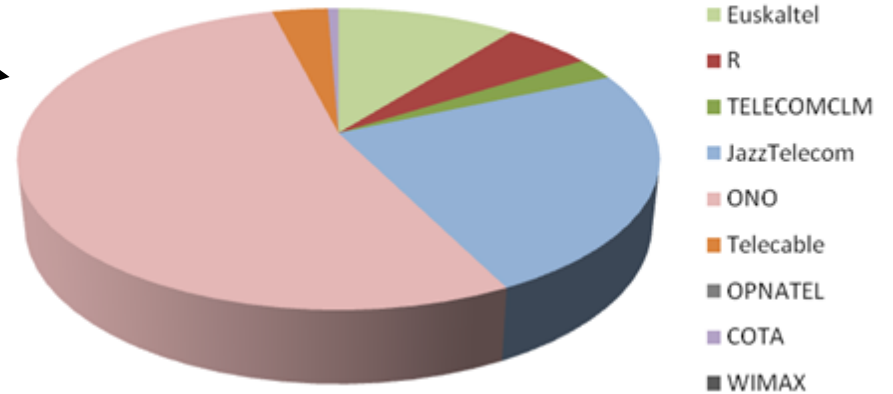
\* Only some of the regions where awarded.

# RESULTS OF THE AUCTIONS (II)

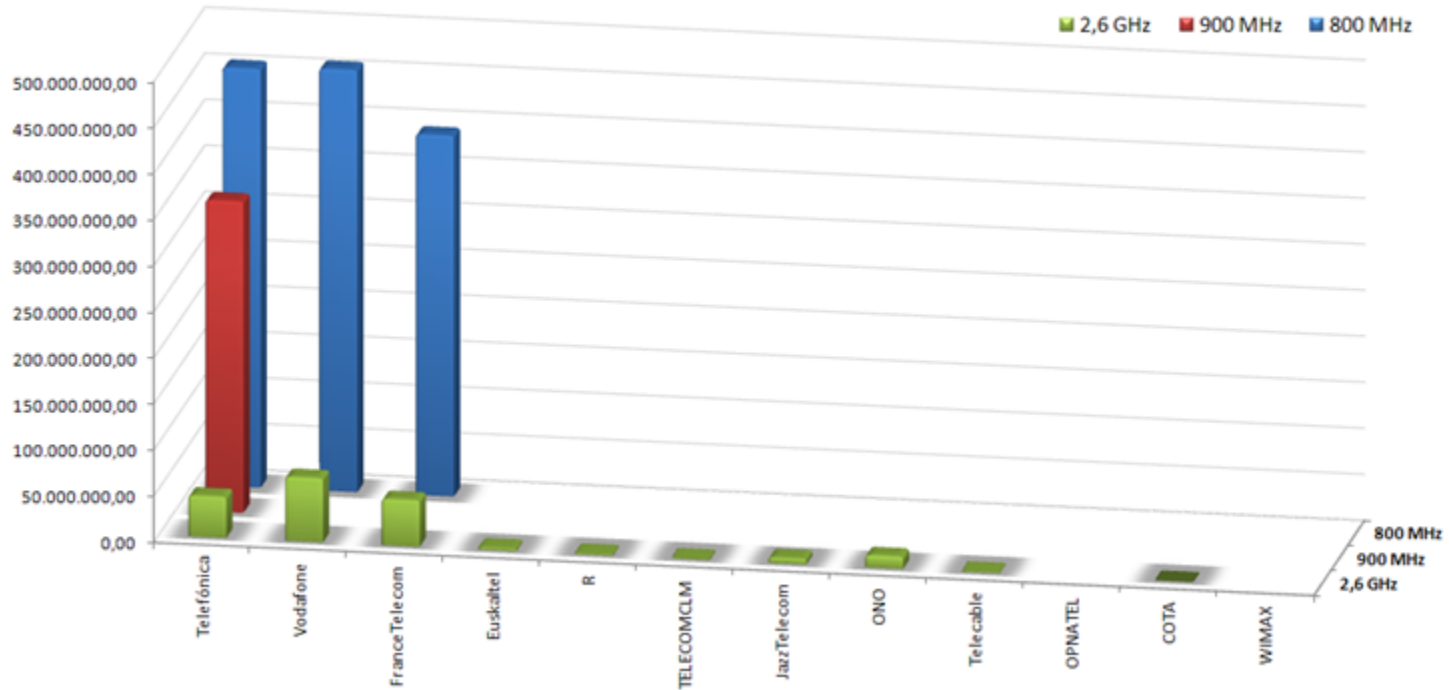
## RESULTS BY OPERATOR (I)



## RESULTS BY OPERATOR (II)



## RESULTS BY BAND

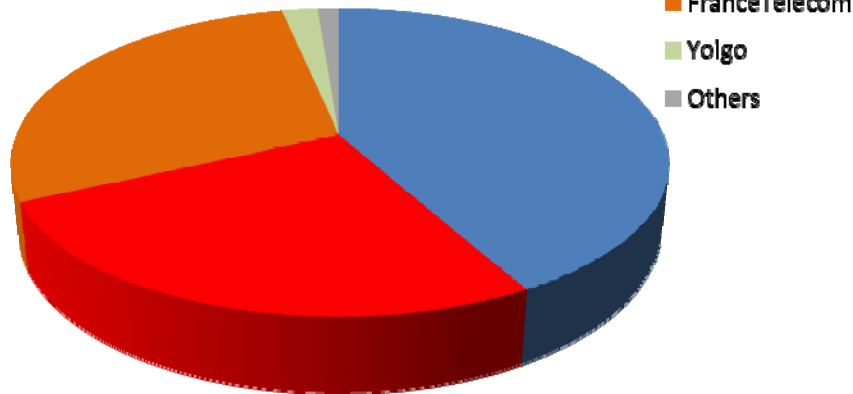


# FINAL RESULTS: BEAUTY CONTEST + AUCTIONS

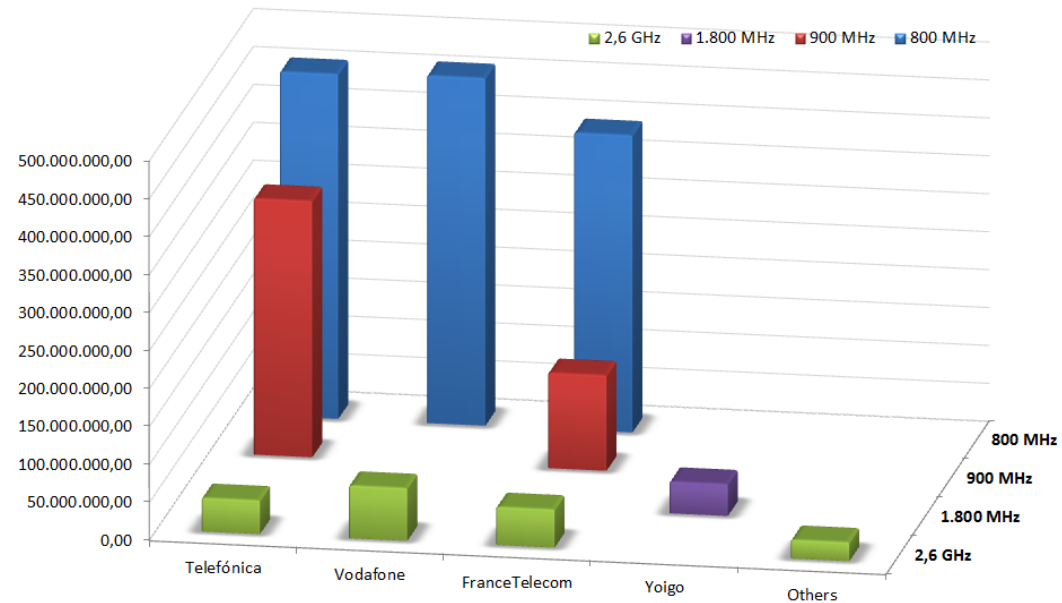
Considering all the processes run in 2011, the total results are:

<b>BEAUTY CONTEST</b>	168.000.000 €
<b>AUCTIONS</b>	1.832.423.089,27 €
<b>TOTAL</b>	<b>2.000.423.089,27 €</b>

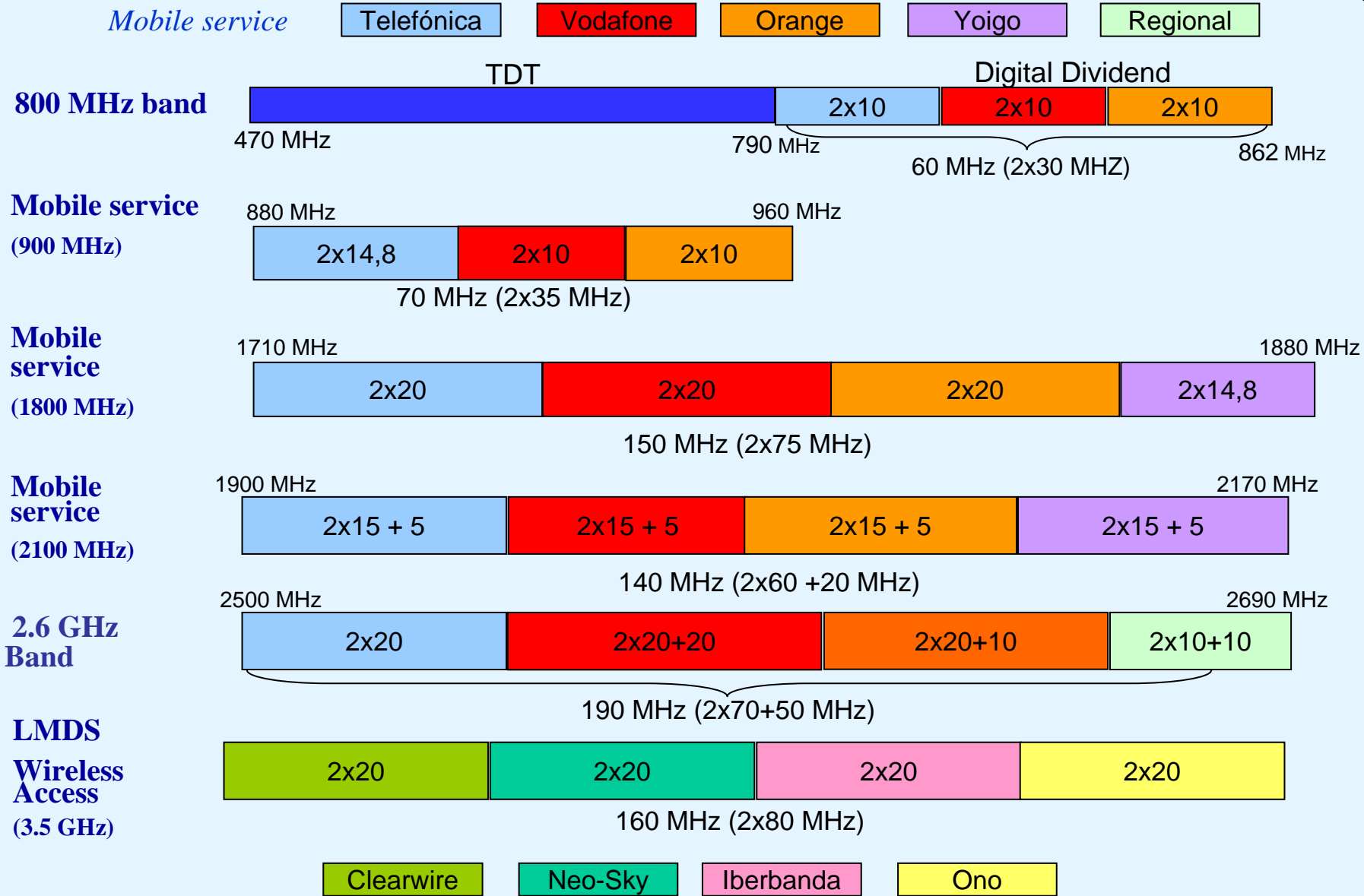
**BEAUTY CONTEST + AUCTIONS:  
RESULTS BY OPERATOR**



**BEAUTY CONTEST + AUCTIONS: RESULTS BY BAND**



# Frequency bands: Spectrum distribution from 2015



- Introduction: Previous situation of spectrum and mobile market in Spain
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## Investment obligations related to Refarming in 900 MHz

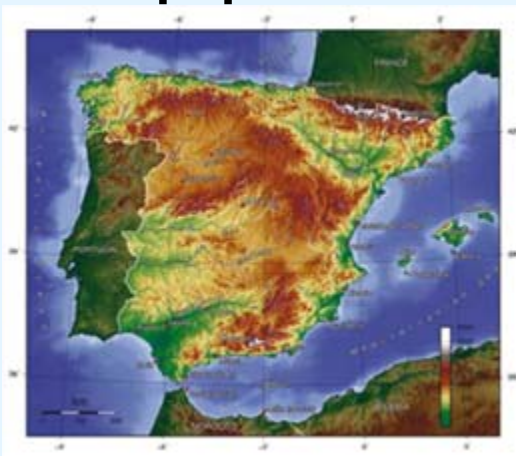
- As a compensation for the increase in value of their licences due to refarming, **Telefonica and Vodafone** are obliged to **invest in coverage in rural areas** (population centres of less than 1,000 inhabitants), deploying **UMTS** (or higher) technologies
- Requirements estimated from **cost analysis**, taken into account **departure situation of each operator** (deployment of base stations) and **expiry date of licences** (end of term for Telefonica in 2015 and for Vodafone in 2025)
- Investments are to be made **before 31<sup>st</sup> December 2013**
- Operators are allowed to choose:
  - **Telefonica:** investment of **80 M€** or new coverage in population centres jointly reaching **500,000 inhabitants**
  - **Vodafone:** investment of **160 M€** or new coverage in population centres jointly reaching **1,000,000 inhabitants**

## Investment commitments in the 900 MHz tender

- A **2x5 MHz block** in 900 MHz band **available in 2011** has been awarded through open **tender** where **competition** between offers takes place exclusively on **investment commitments**.
- The goal is to maximize the deployment of **UMTS** (or higher) technologies **using the 900 MHz band**, in population centres of **less than 5.000 inhabitants**.
- **Assessment of offers** took into account **investment commitments** before 31<sup>st</sup> December 2013 in population centres of **less than 5.000 inhabitants**. The operator awarded with this block (France Telecom) is committed to invest **433 M€** before 31st December 2013.

## Investment commitments in the 800 MHz auction

- **Six 2x5 MHz** blocks in 800 MHz band **available in 2015** have been **auctioned in July 2011**.
- **Operators holding 2x10 MHz** or more in this band (Telefónica, Orange and France Telecom), **are jointly committed to coverage obligations** according to the following:
  - Ensure, by 1st January 2020, broadband coverage of **30 Mbps to 90 % of citizens** living in population centres of **less than 5.000 inhabitants** (equivalent to **98 % of the whole population** in Spain)
  - To this purpose, the **Ministry** of Industry, Tourism and Trade will **approve an Extension Plan**
  - **Focus** will be set on areas where services of **30 Mbps are not available** (regardless of the technology or spectrum band used)



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## Harmonization of the 800 MHz band for mobile service

**CEPT report 30**: Identification of common and minimal (least restrictive) technical conditions for the 790-862 MHz for the digital dividend in the European Union.

**Commission Decision 2010/267/EU**: on harmonised technical conditions of use in the 790-862 MHz frequency band for terrestrial systems capable of providing electronic communications services in the European Union.

**Band  
plan  
FDD**

790-791	791-796	796-801	801-806	806-811	811-816	816-821	821-832	832-837	837-842	842-847	847-852	852-857	857-862
Guard band	Downlink						Duplex gap	Uplink					
1 MHz	30 MHz (6 blocks of 5 MHz)						11 MHz	30 MHz (6 blocks of 5 MHz)					

### Harmonized channeling arrangements of the 790-862 MHz

## Harmonization of the technical parameters

**CEPT report 30**: Identification of common and minimal (least restrictive) technical conditions for the 790-862 MHz for the digital dividend in the European Union.

**Commission Decision 2010/267/EU**: on harmonised technical conditions of use in the 790-862 MHz frequency band for terrestrial systems capable of providing electronic communications services in the European Union.

Case	Frequency range of out-of-block emissions	Condition on base station in-block E.I.R.P., P (dBm/10MHz)	Maximum mean out-of-block EIRP	Measurement bandwidth
A	For DTT frequencies where broadcasting is protected	$P \geq 59$	0 dBm	8 MHz
		$36 \leq P < 59$	(P-59) dBm	8 MHz
		$P < 36$	- 23 dBm	8 MHz
B	For DTT frequencies where broadcasting is subject to an intermediate level of protection	$P \geq 59$	10 dBm	8 MHz
		$36 \leq P < 59$	(P-49) dBm	8 MHz
		$P < 36$	-13 dBm	8 MHz
C	For DTT frequencies where broadcasting is not protected	No condition	22 dBm	8 MHz

**Commission Decision 2010/267/EU: on harmonised technical conditions of use in the 790-862 MHz frequency band for terrestrial systems capable of providing electronic communications services in the European Union.**

- ❑ **The Annex states the technical conditions in the form of frequency arrangements and block-edge-masks (BEMs)**
- ❑ **The Decision recognises the possible need for national measures to deal with harmful interferences:**

***“BEMs shall be applied as an essential component of the technical conditions necessary to ensure coexistence between services at national level. However, it should be understood that the derived BEMs do not always provide the required level of protection of victim services and additional mitigation techniques would need to be applied in a proportionate manner at national level in order to resolve any remaining cases of interference”.***

## Interference issue. Situation in Spain

- **Royal Decree 458/2011 establishes that electronic communications services provided on the 790-862 MHz band will not cause any interference to DTT services.**
  - **This band has been awarded to mobile operators by auction and they should be able starting using this band before 1st January 2015.**
  - **Licensees will have to comply with the technical conditions stated in the Annex of Decision 2010/267/EU and additional measures have been imposed in the licences.**
    - ✓ **Licensees have to take the necessary measures to avoid interferences to DTT service and they also have to face the economic cost of the modification of the users reception installations when it is required.**
- 
- ❑ **Secretary of State for Telecommunications and Information Society will decide on any interferences issue.**
  - ❑ **A Working Group is going to be established to study in depth the interference issue and to identify the necessary mitigation techniques to be applied.**

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## RELEASE OF 790-862 BAND. KEY ASPECTS (I)

- ❑ **After analog TV switch off** on april 2010, digital TV is the sole system of terrestrial broadcasting in Spain, with a total of **11 DTT Multiplexes available** and more than 98,5% of the population covered by the deployment of around 4.700 transmission stations.
- ❑ Radio **channels between 790 and 862 MHz** are used for DTT since the early 90s. and a total of **around 4 Multiplexes** are currently using these frequencies.
- ❑ Royal Decree 365/2010 establishes that, starting in 2015, **790-862 MHz** band will be available for **electronic communication services** other than broadcasting, e.g. mobile broadband.
- ❑ **790-862 MHz band has been awarded** in 2011 to mobile operators (Telefónica, Vodafone, France Telecom) through an SMRA auction. They have the right of using this band from 1st January 2015, so it is **necessary to release the band** before this date.
- ❑ The **European Union** (RSPP draft) is going to establish as a **deadline** for the whole process the **first of January of 2013**. **Spain**, because of their special complexity (topography, population dispersion, international coordination, etc...) **will request for a specific derogation until the first of January 2015**.

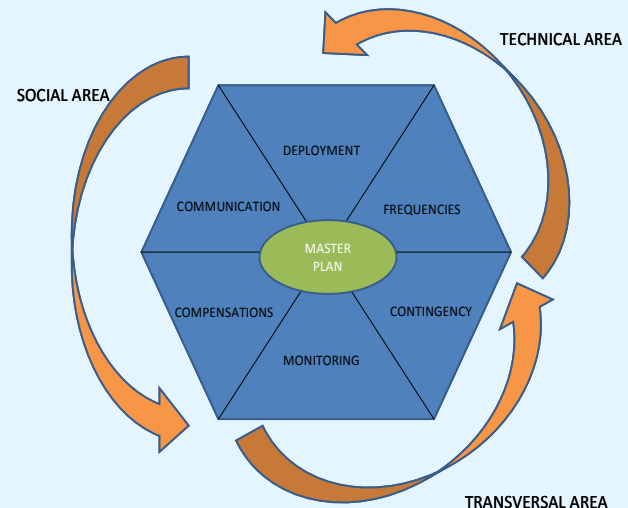
## RELEASE OF 790-862 BAND. KEY ASPECTS (II)

- ❑ The free up of the Digital Dividend doesn't imply any benefits for agents related to TV broadcasting. On the contrary, the release of the Digital Dividend is going to benefit the provision of electronic communication services.
- ❑ The move from currently used radio spectrum channels above 790 MHz means costs for broadcasters and end users.
- ❑ Compensation measures are needed to achieve an effective and smooth transition from higher channels (61 to 69) to lower channels (21 to 60).
  - ✓ **Guaranting the continuity of TV service and minimizing the possible impact to citizens and broadcasters as a consequence of this pan European process of spectrum refarming.**
- ❑ Necessity of maintaining simultaneous emissions (simulcast) in order to allow the citizens to adapt their aerials to receive the new channels. The following lines of action need to be considered:
  - ✓ **Compensation of costs due to the simulcast period.**
  - ✓ **Adaptation of user reception installations to receive the new radio channels.**

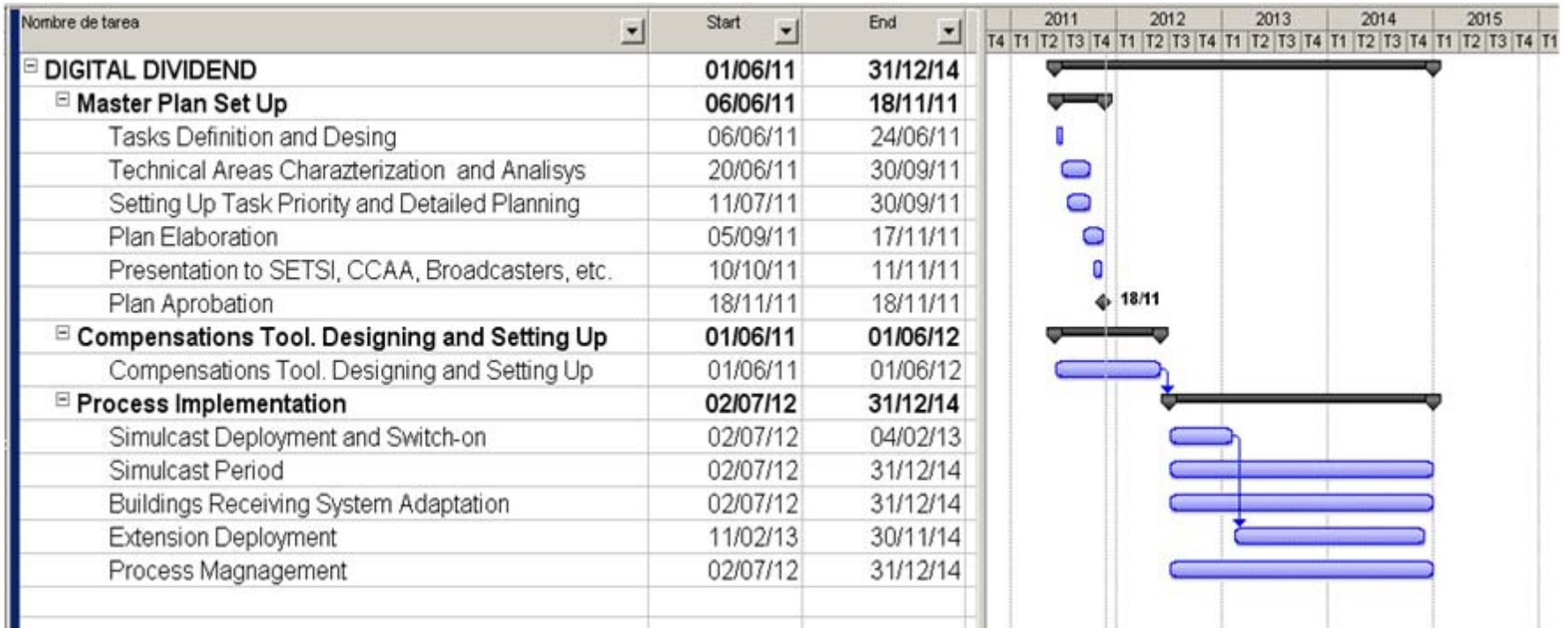
# RELEASE OF 790-862 BAND. MASTER PLAN OF ACTIONS FOR FREEING UP THE DIGITAL DIVIDEND

- ❑ The Sustainable Economy Law, in its article 51, establishes that the costs resulting from the spectrum reorganization that is needed in order to free up the 790 a 862 MHz sub-band, shall be covered by the Administration with the incomes obtained auctioning this band.
- ❑ The planning and execution of all these activities is the origin of the **Master Plan of Actions for Freeing up the Digital Dividend** that has been approved by Spain Ministers Council on the 18th of November. This Plan identify six strategic areas of action:

- **Frequency Plan.**
- **Deployment Plan.**
- **Monitoring and Control Plan**
- **Population Communication Plan.**
- **Risk Management and Contingencies Plan.**
- **Compensations Plan.**



# MASTER PLAN OF ACTIONS FOR FREEING UP THE DIGITAL DIVIDEND SCHEDULE



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**Ministerio de Industria, Turismo y Comercio  
Secretaría de Estado de Telecomunicaciones y para la  
Sociedad de la Información**

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