

**ASSESSMENT OF THE MOBILE ELECTRONIC COMMUNICATIONS MARKET  
UNDER ARTICLE 39 OF THE MULTIBAND AUCTION REGULATION**

**DECISION**

August 2014

# ASSESSMENT OF THE MOBILE ELECTRONIC COMMUNICATIONS MARKET UNDER ARTICLE 39 OF THE MULTIBAND AUCTION REGULATION

## CONTENTS

<b>A. LEGAL FRAMEWORK.....</b>	<b>3</b>
1. Auction Regulation	3
2. GSM Directive	6
3. Electronic Communications Law	8
<b>B. MOBILE ELECTRONIC COMMUNICATION SERVICES IN PORTUGAL.....</b>	<b>9</b>
4. Active operators – Allocated rights of use for frequencies	9
5. Technologies and Services	14
6. Availability and use of the mobile broadband service in Portugal	16
<b>C. SCOPE OF THE REASSESSMENT OF RIGHTS OF USE FOR FREQUENCIES.....</b>	<b>21</b>
7. Market under analysis	21
8. Measures that may be imposed	23
<b>D. REASSESSMENT OF RIGHTS OF USE FOR FREQUENCIES.....</b>	<b>24</b>
9. Measures already taken to ensure the protection of competition and of consumers	24
10. Analysis of possible competitive distortions	27
10.1. Technical benefits that may be associated to the operation of some frequency bands	28
10.2. Possible competitive distortions that may result from technical benefits associated to some frequency bands	30
10.3. Possible competitive distortions with impact on other bodies	33
<b>E. CONCLUSION.....</b>	<b>36</b>

# ASSESSMENT OF THE MOBILE ELECTRONIC COMMUNICATIONS MARKET UNDER ARTICLE 39 OF THE MULTIBAND AUCTION REGULATION

## A. LEGAL FRAMEWORK

### 1. Auction Regulation

Regulation no. 560-A/2011 of 19 October (hereinafter, "Auction Regulation"), defined the auction procedure for the allocation of rights of use for frequencies in the 450 MHz, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz and 2.6 GHz bands (hereinafter, "Multiband Auction"), specifically:

- a) 455.80625 - 457.45 MHz/465.80625 - 467.45 MHz (450 MHz);
- b) 790 - 862 MHz (800 MHz);
- c) 880 - 890 MHz/925- 935 MHz (900 MHz);
- d) 1710 - 1785 MHz/1805 - 1880 MHz (1800 MHz);
- e) 1900 - 1910 MHz (2.1 GHz);
- f) 2500 - 2690 MHz (2.6 GHz).

Under article 39 of the Auction Regulation, ICP - Autoridade Nacional das Comunicações (ICP - ANACOM) was required to undertake an assessment of the mobile electronic communications market<sup>1</sup>, as follows:

*"1 - ICP - ANACOM must undertake, pursuant to provisions in Council Directive 87/372/EEC, of 25 June, as amended by Directive 2009/114/EC of the European Parliament and of the Council, of 16 September 2009, and Law No. 5/2004, of 10 February, as amended by Law No. 51/2011, of 13 September, an assessment of the mobile electronic communications market in order to find out whether any competitive distortions exist and whether the adoption of appropriate measures to eliminate them are required, under its spectrum management powers, namely those provided for in articles 20 and 35 of Law No. 5/2004, of 10 February.*

*2 - The assessment referred in the preceding paragraph must take place within at the most two years from completion of the auction."*

---

<sup>1</sup> On this subject, *vide* the Public Consultation Report on the Draft Regulation for the allocation of rights of use for frequencies in the 450 MHz, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz and 2.6 GHz bands, available at <http://www.anacom.pt/render.jsp?categoryId=343181>.

When preparing the Regulation, the issue of the analysis of potential distortions in the mobile communications market arose, namely in the scope of the Memorandum of Understanding concluded on 17 May 2011 between the Portuguese Government and the International Monetary Fund (IMF), the European Central Bank (ECB) and the European Commission (EC) (hereinafter, the “MoU”)<sup>2</sup>.

Among other matters concerning the Multiband Auction, the MoU version reviewed on 1 September 2011 provided as follows, as regards the analysis of possible distortions in the mobile electronic communications market:

*“The Government will:*

*5.17. Facilitate market-entry by (...) launching the auction for the assignment of further radio frequencies (i.e. auction of spectrum) for broadband wireless access [Q4-2011]. In designing the spectrum auction rules, it will be ensured that they adhere to the legal principles of the EU framework and that potential new entrants are not placed at a competitive disadvantage. In particular, the auction tender will:*

*i. announce the commitment to an ex-post assessment, to be carried out by the regulator, of possible competitive distortions, covering the electronic communications mobile markets for which the spectrum is to be used as well as the commitment to, where justified and proportionate, the implementation of remedies to redress any resulting situation considered anti-competitive;”*

In the context of the monitoring of measures provided for in the MoU as far as the Multiband Auction is concerned, the European Commission, in comments addressed to ICP - ANACOM on 29 July 2011, urged this Authority to carry out the assessment imposed under the GSM Directive, as follows:

*“While the obligation to carry out such an assessment arose already when the refarming of the 900 MHz band took place in Portugal in 2010, an effective assessment of potential distortions will be even more necessary in light of the present auction. While it is up to the national regulator to decide if the assessment is carried out before or after the auction, an ex-post assessment may be the appropriate choice in the present situation and in light of the adjustments that may be required in relation both to the application of spectrum caps and the implementation of access obligations referred to below.*

*In this way, in the light of the results of the competitive assessment and where justified and proportionate the regulator should address any competitive distortions in accordance with Article 14 of the Authorisation Directive. Given that there would therefore exist a possibility of ex-post measures to redress any anticompetitive situation resulting from refarming and the present auction, it would be important to signal in the tender that there will be such an ex-post assessment and that remedies to redress a resulting situation*

---

<sup>2</sup> Available in the English and Portuguese versions, at <http://www.portugal.gov.pt/pt/os-ministerios/primeiro-ministro/secretarios-de-estado/secretario-de-estado-adjunto-do-primeiro-ministro/documentos-oficiais/memorandos.aspx>.

*considered anti-competitive could possibly be taken. While the application of such an assessment of possible distortions to all the bands to be auctioned can be considered as best practise arising from the GSM Directive, it is the view of the Commission services that this is in any event an obligation under the GSM Directive as regards the existing 900 MHz holdings and their implications for the mobile market, including their impact in combination with other holdings that have been acquired, including those in the 800 MHz band and the associated 1800 MHz, 2 GHz and 2.6 GHz bands*<sup>3</sup>.

Both provisions in the MoU and comments from the European Commission, set forth above, were taken into consideration in the scope of the drafting and approval of the Auction Regulation, having been defined as a follow-up a set of measures, including in particular an assessment of the mobile electronic communications market (article 39).

Having the Multiband Auction been concluded with the issue of unified certificates of rights of use for frequencies for terrestrial electronic communications services to the companies TMN – Telecomunicações Móveis Nacionais, S.A (hereinafter, “TMN”; today, MEO – Serviços de Comunicações e Multimédia, S.A., hereinafter, “MEO”), Optimus Comunicações, S.A., (hereinafter, “Optimus”; today, NOS Comunicações, S.A., hereinafter “NOS”) and Vodafone Portugal – Comunicações Pessoais, S.A. (hereinafter, “Vodafone”), approved by decision taken by ICP - ANACOM on 9 March 2012, this Authority will now examine the mobile electronic communications market, in compliance with article 39 of the Auction Regulation.

This document thus consists of ICP - ANACOM’s analysis of the mobile electronic communications market, and it aims to find out whether any competitive distortions exist and whether the adoption of appropriate measures to eliminate them are required. Under paragraph 1 of article 39 of the Auction Regulation, this analysis must be undertaken in compliance with:

- a) On the one hand, provisions laid down in Council Directive 87/372/EEC, of 25 June 1987, *“on the frequency bands to be reserved for the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community”*, as amended by Directive of the European Parliament and the Council, of 16 September 2009 (hereinafter, “the GSM Directive”); and
- b) On the other hand, provisions established in Law No. 5/2004, of 10 February, as amended and republished by Law No. 51/2011, of 13 September, and subsequently amended by Law No 10/2013, of 28 January, and Law no. 42/2013, of 3 July (hereafter, “Electronic Communications Law”).

---

<sup>3</sup> These comments were included in Annex 2 to the Public Consultation Report on the Draft Regulation for the allocation of rights of use for frequencies in the 450 MHz, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz and 2.6 GHz bands, available at

<http://www.anacom.pt/render.jsp?categoryId=343589&channel=graphic#horizontalMenuArea>.

This analysis was approved, as a draft decision, on 15.05.2014, having then been submitted to public consultation, under article 8 of the Electronic Communications Law, and also, in compliance with article 100 and 101 of the Administrative Procedure Code, to the prior hearing of interested parties, in both cases for a 20-working-day time limit.

On 05.06.2014, further to a request from an interested party, the public consultation deadline was extended for five working days, having ended on 25.06.2014.

In the scope of the referred procedures, contributions from four bodies, including operators who had been awarded rights of use for frequencies in the scope of the Multiband Auction, were received. The respective contributions are summarized and assessed in the report on the consultation and prior hearing procedures, which is attached hereto and which is deemed to be an integral part hereof.

## **2. GSM Directive**

In its original version, the GSM Directive (Directive 87/372/EEC) reserved the use of part of the 900 MHz band for access technologies based on the GSM (Global System for Mobile) standard, namely for the terrestrial mobile service. In 2009, this Directive was amended by Directive 2009/114/EC of the European Parliament and of the Council, of 16 September 2009, to allow the use of the 900 MHz band for the provision of quicker pan-European services (including the band known as the GSM “extension band”), such as mobile Internet, while simultaneously ensuring the continuity of other GSM services. This greater flexibility was aimed at allowing the provision of other pan-European services, especially UMTS systems, as from the moment it was demonstrated that these systems could coexist with GSM systems. In particular, this sought to enable a quicker and wider implantation of wireless broadband services, promoting competition.

In this context, recital 6 of Directive 2009/114/EC must be stressed, which reads: *“The liberalisation of the use of the 900 MHz band could possibly result in competitive distortions. In particular, where certain mobile operators have not been assigned spectrum in the 900 MHz band, they could be put at a disadvantage in terms of cost and efficiency in comparison with operators that will be able to provide 3G services in that band. Under the regulatory framework on electronic communications, and in particular Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services (Authorisation Directive), Member States can amend and/or review rights of use of spectrum and thus have the tools to deal, where required, with such possible distortions”*.

Recital 7 of the same Directive adds that Member States should determine *“whether the implementation of this Directive could distort competition in the mobile markets concerned. If they conclude that this is the case, they should consider whether it is objectively justified and proportionate to amend the rights of use of those operators that*

*were granted rights of use of 900 MHz frequencies and, where proportionate, to review these rights of use and to redistribute such rights in order to address such distortions.”*

This need for Member States to assess the mobile communications market, mentioned in the above-mentioned recitals of Directive 2009/114/EC, is specified in paragraph 2 of its article 1, which lays down that, in the scope of its implementation, Member States must “*examine whether the existing assignment of the 900 MHz band to the competing mobile operators in their territory is likely to distort competition in the mobile markets concerned and, where justified and proportionate, they shall address such distortions*” in accordance with Article 14 of the Authorisation Directive<sup>4</sup>.

The so-called refarming process, which took place in Portugal in 2010, and which resulted, in addition to the implementation of the (amended) GSM Directive, in the implementation of Decision 676/2002/EC of the European Parliament and Council, of 7 March 2002<sup>5</sup> and of Commission Decision 2009/766/EC, of 16 October 2009<sup>6</sup> (subsequently amended by Decision 2011/251/EU, of 18 April 2011), was primarily reflected in two measures<sup>7</sup>:

- a) The amendment of the National Frequency Allocation Plan (NFAP)<sup>8</sup>, so as to remove technological restrictions initially imposed on the use of the 900 MHz and 1800 MHz frequency bands for the terrestrial mobile service (TMS), as well as to suppress the distinction between technologies and frequency bands used for the provision of the referred service (principles of technological and service neutrality); and
- b) The unification in the same certificate of rights of use for frequencies allocated to mobile operators, covering both the 900 MHz and 1800 MHz frequency bands and the 2.1 GHz (UMTS) band<sup>9</sup>, including the establishment of specific conditions in the scope of the respective rights of use, allowing coverage obligations, both for

---

<sup>4</sup> Transposed to the national legal system via article 20 of the Electronic Communications Law.

<sup>5</sup> On a regulatory framework for radio spectrum policy in the European Community (Radio Spectrum Decision).

<sup>6</sup> On the harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community.

<sup>7</sup> The GSM Directive covers only the 900 MHz band, however the 1800 MHz band is also included in the scope of these Decisions, given that in the meantime the GSM system was also successfully harmonized in that band.

<sup>8</sup> Determination of 31 March 2010, through which ICP - ANACOM approved the National Frequency Allocation Plan (NFAP) for 2009/2010, as well as the report on the respective public consultation, launched on 23 December 2009. Available at <http://www.anacom.pt/render.jsp?contentId=1019286>.

<sup>9</sup> Determination of 8 July 2010, through which ICP - ANACOM decided, in the context of the 900/1800 MHz spectrum refarming, to unify in a single certificate the conditions applicable to the exercise of the rights of use of frequencies allocated to Optimus, TMN and to Vodafone Portugal for the provision of the terrestrial mobile service, in accordance with GSM 900/1800 and UMTS technologies, and approved the report of the prior hearing of interested parties and of the general consultation procedure to which the corresponding draft decision was submitted, further to determination of 31 March 2010.

voice services, and for data services, to be complied via either systems (GSM or UMTS), or any other systems authorized in the future.

Taking into account that (i) the adoption of these measures was preceded by two public consultations, in the scope of which operators and consumer associations had the opportunity to state their views on the subject, and that (ii) the three active mobile operators held an equivalent amount of spectrum in the 900/1800/2100 MHz bands, ICP - ANACOM did not identify any competitive distortion situation in the mobile market.

In fact, in the scope of the refarming process additional frequencies were not allocated, nor were new rights of use assigned to existing mobile operators, rather the principle of technological neutrality was applied in the scope of the respective certificates, in the light of the provisions of relevant Community Decisions.

Notwithstanding, before holding the Multiband Auction in 2011, and in view of the imminence of the provision of an amount of spectrum of a high economic value, namely in the 800 MHz and 900 MHz bands, a measure with a structuring and decisive impact on the future of the mobile electronic communications market, ICP - ANACOM, taking into account consultations carried out and statistical data available, laid down in the Auction Regulation measures intended to promote competition in the mobile market, as will be shown below.

### **3. Electronic Communications Law**

In addition to the GSM Directive, article 39 of the Auction Regulation imposes that the assessment of the mobile communications market is carried out in compliance with provisions of the Electronic Communications Law, specifying that measures aimed at removing any competitive distortions must be framed by the Authority's spectrum management powers, namely those provided for in articles 20 and 35 thereof.

In particular:

- a) Article 20 of the Electronic Communications Law provides for the possibility of amending conditions, rights and procedures applicable to rights of use for frequencies, in cases of objective justification and in accordance with the principle of proportionality; and
- b) Article 35 of the Electronic Communications Law puts an obligation on ICP - ANACOM to ensure that the flexibility in the use of frequencies as well as the accumulation of rights of use for frequencies do not lead to competitive distortions, and for this purpose proportionate, non-discriminatory and transparent measures may be adopted, namely:

- i) Imposing conditions attached to the rights of use for frequencies, pursuant to article 32 of the same statutory instrument, including the setting out of deadlines for the effective exploitation of the rights of use by the respective holder;
- ii) Ordering a holder, in a specific case, to transfer or lease its rights of use for frequencies; or
- iii) Limiting the amount of spectrum to be allocated to the same holder in procedures for the allocation of rights of use for frequencies.

It is also pointed out in this opportunity that, in 2012, after the Multiband Auction process was concluded, the Multiannual Radio Spectrum Policy Programme (RSPP)<sup>10</sup> came into force, article 5 of which, and corresponding explanation in recital 15, must be pointed out, as the issue of (possible) competitive distortions is raised, among others, in the scope of the allocation of rights of use for frequencies.

## **B. MOBILE ELECTRONIC COMMUNICATION SERVICES IN PORTUGAL**

### **4. Active operators – Allocated rights of use for frequencies**

The terrestrial mobile service was launched in Portugal in 1989, by an operator constituted by a consortium of Correios e Telecomunicações de Portugal, E.P (CTT) and Telefones de Lisboa e Porto, S.A (TLP), which later resulted in TMN (whose name changed into MEO on 27 January 2014). The service provided at the time was based on the C-450 analogue technology.

In 1991, a call for tender was conducted for the allocation of a GSM (Global System for Mobile Communications) license (in the 900 MHz band), which was awarded to Vodafone<sup>11</sup>, the operation of which started in October 1992. In March 1992, MEO also took up the activity of 2<sup>nd</sup> generation mobile network operator (GSM in the 900 MHz band), a GSM license having been granted for this purpose.

In July 1997, a new call for tender was launched for the allocation of a third GSM license, in the 900 MHz and 1800 MHz. The license was allocated to Main Road, S.A., the sole tender candidate, which started its commercial activity on the following year under the name Optimus - Telecomunicações S.A. (currently NOS).

---

<sup>10</sup> Approved by Decision No. 243/2012/EU of the European Parliament and of the Council of 14 March 2012 (<http://www.anacom.pt/render.jsp?contentId=1121896>).

<sup>11</sup> The license was at the time granted to Telecel, operator which in the meantime was acquired by Vodafone Group PLC.

Further to the grant to Optimus of this license, MEO and the then Telecel were allocated frequencies in the 1800 MHz band. By the end of October 1999, MEO, the sole operator providing the analogue terrestrial mobile service, abandoned this technology, further to ICP - ANACOM's decision of 16 April 1999<sup>12</sup>.

In August 2000, a public tender was launched for the allocation of four licenses for International Mobile Telecommunications Systems (IMT2000/UMTS). Licenses were allocated to operators that already held licenses for the provision of the terrestrial mobile service (MEO, Optimus and Vodafone) and also to a fourth operator (OniWay – Infocomunicações S.A. (OniWay)).

OniWay's UMTS license was later revoked, at the request of the company, by order of the Minister for Economy<sup>13</sup>, of 13 January 2003. Further to this decision, the spectrum which had been allocated to this company (1 block of 5 MHz (UMTS TDD) and 3 blocks of 2 x 5 MHz (UMTS FDD) in the 2.1 GHz frequency band), was redistributed among remaining operators in market (MEO, Optimus and Vodafone), except for the UMTS TDD block which was recovered by ICP - ANACOM. As such, each operator became the holder of 4 blocks of 2 x 5 MHz in the 2.1 GHz FDD and 5 MHz in the 2.1 GHz TDD band.

Until 2009, the amount of spectrum over which mobile operators (MEO, Optimus and Vodafone) held rights of use was the same (the sole difference being that Optimus held one 200 kHz channel less in the 900 MHz band).

By determination of 4 February 2009<sup>14</sup>, and following a waiver presented by Optimus, ICP - ANACOM decided to revoke the respective right to use the block of 5 MHz TDD UMTS frequencies, corresponding to 1900-1905 MHz frequencies, which had been allocated for the purpose of UMTS system operation, and to undertake its recovery.

In 2010, and as referred above in point A.2, ICP - ANACOM determined, in the scope of the radio spectrum refarming process in the 900 MHz and 1800 MHz frequency bands, to unify in a single certificate the conditions applicable to the exercise of rights of use for frequencies allocated for the provision of the terrestrial mobile service, according to GSM 900/1800 and UMTS technologies, in compliance with the GSM Directive, as well as with Commission Decision 2009/766/EC, of 16 October.

Accordingly, before the Multiband Auction took place, mobile operators held rights of use for frequencies for the following spectrum:

---

<sup>12</sup> Determination available at <http://www.anacom.pt/render.jsp?categoryId=6445>.

<sup>13</sup> Order No. 1758/2003 of 13 January.

<sup>14</sup> Vide <http://www.anacom.pt/render.jsp?contentId=839081>.

**Table 1 - Rights of use for frequencies of mobile operators in the period immediately prior to the Multiband Auction**

Band Designation	MEO	NOS (then Optimus)	VODAFONE
900 MHz	2 x 8 MHz	2 x 7,8 MHz	2 x 8 MHz
1800 MHz	2 x 6 MHz	2 x 6 MHz	2 x 6 MHz
2.1 GHz – FDD	2 x 20 MHz	2 x 20 MHz	2 x 20 MHz
2.1 GHz – TDD	5 MHz	---	5 MHz

In 2011, in the scope of the Multiband Auction, free spectrum in the various frequency bands was made available. In this context, attention must be drawn to the provision of spectrum in the 900 MHz band (known as “Extended GSM”) as well as in the 800 MHz<sup>15</sup> band, considered to be particularly relevant for the design of coverage solutions, complementing higher frequency bands, namely in the 1800 MHz, 2.1 GHz and 2.6 GHz<sup>16</sup>, which were also made available, and which in general are preferably used to implement capacity solutions.

The provision of the spectrum under consideration came within the possibility of development of other technologies such as LTE (Long Term Evolution).

As such, in the scope of the Multiband Auction, the following spectrum was made available, in lots of the specified size:

**Table 2 – Spectrum made available at the Multiband Auction**

Band Designation	Amount of spectrum	Lots
450 MHz	2 x 1.25 MHz	1 lot of 2 x 1.25 MHz
800 MHz	2 x 30 MHz	6 lots of 2 x 5 MHz
900 MHz	2 x 10 MHz	2 l lots of 2 x 5 MHz
1800 MHz	2 x 57 MHz	9 lots of 2 x 5 MHz and 3 lots of 2 x 4 MHz
2.1 GHz	2 blocks de 5 MHz	2 lots of 5 MHz
2.6 GHz FDD	2 x 70 MHz	14 lots of 2 x 5 MHz
2.6 GHz TDD	50 MHz	2 lots of 25 MHz

Final results of the Multiband Auction were as follows:

<sup>15</sup> By determination of 16 December of 2010, ICP - ANACOM approved the final decision on the designation and availability of 790-862 MHz sub-band for the provision of electronic communication services, in accordance with Decision 2010/267/EU (<http://www.anacom.pt/render.jsp?contentId=1051784>).

<sup>16</sup> By determination of 17 June 2009, ANACOM approved the report of the public consultation on the allocation of rights of use for frequencies in the 2500-2690 MHz frequency band (also known as the 2.6 GHz band) (vide <http://www.anacom.pt/render.jsp?contentId=959127>).

**Table 3 – Spectrum allocated at the Multiband Auction**

Band Designation	MEO	NOS (then Optimus)	VODAFONE
450 MHz	---	---	---
800 MHz	2 x 10 MHz	2 x 10 MHz	2 x 10 MHz
900 MHz	---	---	2 x 5 MHz
1800 MHz	2 x 14 MHz	2 x 14 MHz	2 x 14 MHz
2.1 GHz	---	---	---
2.6 GHz FDD	2 x 20 MHz	2 x 20 MHz	2 x 20 MHz
2.6 GHz TDD	---	---	25 MHz

In January 2012, Optimus (currently NOS), requested the return of a block of 2 x 5 MHz in the 2.1 GHz FDD band (spectrum which had been allocated prior to the Multiband Auction), and in 2013, Vodafone and MEO returned the 5 MHz held in the 2.1 GHz TDD (spectrum which had been allocated prior to the Multiband Auction).

It follows from the above that mobile network operators currently hold the following rights of use for frequencies:

**Table 4 – Rights of use for frequencies held by mobile operators**

Band Designation <sup>(1)</sup>	MEO	NOS	VODAFONE
800 MHz (MB Auction)	2 x 10 MHz	2 x 10 MHz	2 x 10 MHz
900 MHz (prior to MB Auction)	2 x 8 MHz	2 x 7,8 MHz	2 x 8 MHz
900 MHz (MB Auction)	---	---	2 x 5 MHz
1800 MHz (prior to MB Auction)	2 x 6 MHz	2 x 6 MHz	2 x 6 MHz
1800 MHz (MB Auction)	2 x 14 MHz	2 x 14 MHz	2 x 14 MHz
2.1 GHz FDD (prior to MB Auction)	2 x 20 MHz	2 x 15 MHz	2 x 20 MHz
2.6 GHz FDD (MB Auction)	2 x 20 MHz	2 x 20 MHz	2 x 20 MHz
2.6 GHz TDD (MB Auction)	---	---	25 MHz

(1) "MB Auction" refers to rights of use allocated at the Multiband Auction.

"Prior to MB Auction" refers to rights of use allocated before the Multiband Auction took place.

#### 4.1. MVNO and resellers

In addition to MEO, NOS and Vodafone, there are several mobile virtual network operators (MVNO) <sup>17</sup> who are qualified to provide mobile telephone services.

---

<sup>17</sup> MVNO operators currently entitled by ICP - ANACOM are: ACP - Comunicações Electrónicas, Sociedade Unipessoal, Lda., CTT - Correios de Portugal, S.A., Lycamobile Portugal, Lda., Mundio Mobile (Portugal) Limited, Média Capital - Editora Multimédia, S.A. and G9SA - Telecomunicações, S.A.

While there are several types of economic operations which may be included in the MVNO designation<sup>18</sup>, the common denominator between all these operations is the fact that operators do not hold rights of use for frequencies, sustaining themselves on radio means provided by network operators who hold the respective rights of use for the provision of services to final users.

In Portugal, the first virtual mobile operation took place at the end of 2007, having been launched by CTT – Correios de Portugal, S.A. (CTT), which is sustained on MEO's network. In 2008, a new operation emerged, carried out by ZON TV Cabo Portugal, S.A. (ZON), sustained at the time on Vodafone's network. As from 18.12.2013, ZON started to operate sustained on Optimus' network, until it merged into the latter, on 16.05.2014, having then terminated its virtual mobile operation.

In September 2012, a third MVNO started operating in Portugal, Lycamobile Portugal, Lda. (Lycamobile), sustained on Vodafone's network, and, in early 2013, Mundio Mobile (Portugal) Limited (Mundio) entered the market, sustained on NOS' network.

There are also resellers of mobile telephone services or of short data traffic services in the market, such as HEARTPHONE – Comércio de Telecomunicações, Lda., Let's Call – Comunicações, Lda. and Go4mobility – Tecnologia e Serviços para a Mobilidade, Lda.

#### **4.2. BWA in the 3.4-3.8 GHz band**

For its potential relevance for this analysis, it must also be referred that, in 2009, ICP - ANACOM decided to allocate rights of use for frequencies for Broadband Wireless Access (BWA), in the 3400-3600 MHz and 3600-3800 MHz frequency bands, distributed over 9 geographic areas. Wireless broadband technologies comprise fixed, nomadic and mobile applications. For this purpose, ICP - ANACOM launched an auction selection procedure ("BWA Auction").

In the scope of the BWA Auction, the rules of which were established in Regulation No. 427/2009, of 29 October<sup>19</sup>, care was taken to establish conditions leading to the promotion of the entry of new operators in the broadband market, having been decided that the

---

<sup>18</sup> There is no legal definition for MVNO. However, on 09.02.2007, ICP - ANACOM approved the framework for the activity of MVNOs (available at <http://www.anacom.pt/render.jsp?contentId=454500>), having stated as follows: "There are many economic operations which can be included under the designation MVNO, which however have as a common denominator the fact that these operators do not use rights of use for frequencies and are consequently not provided with their own radio access network infrastructures, being thus required to sustained themselves on radio means supplied by network operators who hold the respective rights of use."

More recently, in the scope of the Multiband Auction, and for the purpose of the Regulation of that Auction, it was deemed that an MVNO is "a body that in its virtual mobile operation does not use rights of use for frequencies and consequently self-owned infrastructures associated to the radio access network, being sustained on radio means provided by network operators who hold the respective rights of use. Different types of operations may be deemed to be MVNO operations, according to whether they use more or less self-owned infrastructures and systems".

<sup>19</sup> Available at <http://www.anacom.pt/render.jsp?contentId=988225>.

allocation of rights of use for frequencies in bands under consideration would take place in two different stages.

As such, in a first stage, bodies that already held rights of use for frequencies in the frequency bands concerned, bodies that held rights of use for frequencies for the provision of a publicly available terrestrial mobile service (including MEO, NOS (then Optimus) and Vodafone) and bodies that were providers of broadband services with significant market power, were excluded from taking part in the auction.

As a result of the BWA Auction, in the course of 2010, rights of use for frequencies in the 3400-3800 MHz bands were allocated to Bravesensor – Unipessoal, Lda. (which later, in December 2010, changed its name to Zappwimax – Unipessoal, Lda.) and to Onitelecom – Infocomunicações, S.A. (ONI), which later, in April 2011, transferred them to F300 – Fiber Communications, S.A. More recently, in 2014, ICP - ANACOM authorized the transfer of those rights back to ONI, which in the meantime requested their revocation of ICP - ANACOM, request which was approved on 15.05.2014.

It must be highlighted that spectrum in these bands still remains from the BWA Auction.

Note also that the European Commission approved Implementing Decision of 2 May 2014, amending Decision 2008/411/EC on the harmonisation of the 3 400 - 3 800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community, in order to foster the use of the referred frequency bands for the deployment of dense and high-speed wireless broadband networks, which will allow the provision of innovative electronic communications services, namely allowing the development of LTE-based networks.

In this context, and given these developments, namely the referred Implementing Decision, ICP - ANACOM intends to promote shortly a public consultation to collect perspectives of the various players on the market as far as this band is concerned.

## **5. Technologies and Services**

A very wide range of offers have been made available by mobile operators at retail level, sustained originally on the GSM technological system, but at the same time they are also quite homogeneous, in the sense that products launched by an operator are quickly replicated by other market players.

At the level of telephone service, over the last decade, there were several commercial launches of an innovative nature, which contributed for the development of the market.

In this scope, it should be mentioned that in 2005, the so-called low-cost or no-frills products were launched, some of them with their own brands. These products have as their target segment customers that privilege low-cost voice and SMS communications

and value the simplification of tariff systems, given that there are no differences between prices of calls according to the destination network.

A while later another type of offer became available, also of an innovative nature, which has secured high market acceptance, which corresponds to the so-called “on-net subgroup” or “tribal” products. These are pre-paid products with a tariff structure close to the one that previously existed, where calls to the same network are differentiated from calls to other networks. However, in addition to this differentiating element, there is also an additional breakdown within calls to the same network. As such, calls to customers with the same tariff/product are free, and calls within the same network, but to customers with different tariffs, are charged.

More recently, bundled offers have been made available, integrating several services, from the telephone service provided at a fixed location to the distribution service of cable or optical fibre television, or the fixed broadband Internet service, and in some cases also the mobile telephone service and the broadband Internet access service. Some of these offers have been advertised as including unlimited calls and SMS, although they are subject to a fair use policy.

As regards broadband Internet access offers, it is stressed that the UMTS commercial operation started only in 2004, after several postponements<sup>20</sup>. In the meanwhile, the development of standards such as the HSDPA (High Speed Downlink Packet Access) and the HSUPA (High-Speed Uplink Packet Access) standards leveraged a significant increase of maximum download and upload speeds, compared to those achieved in the initial UMTS version.

In Portugal, mobile broadband Internet access offers, namely accesses sustained on PCs (PCMCIA cards, USB cards, modem USB, PC-card, PC USB card, among others), registered a relevant increase as from 2007. The adoption of public programmes, such as e-school, e-teacher and e-opportunities, also contributed to this development, as they granted access to laptops with broadband Internet connection at favourable conditions to different segments of the population. More recently, the increase in the number of smartphone users must be highlighted.

Just like mobile telephone service offers, mobile broadband Internet access offers are also part of multiple play packages. For example, in 2012, most triple play packages made available by main providers offered free 100 MB mobile broadband traffic, for the purchase of a pen.

In addition to offers provided at retail level, attention should be drawn to several wholesale offers which have been made available. In this context, the provision of the call termination service must be stressed (subject to *ex-ante* regulatory obligations imposed

---

<sup>20</sup> Further to requests from licensed operators, the launch was postponed to 31 December 2002, and later to 31 December 2003. ICP - ANACOM decided in the meantime that on 1 January 2003 the conditions for starting the UMTS commercial operation had been met, having however admitted a pre-commercial stage, after which the UMTS commercial offer was required to start, on 1 July 2004.

on operators with significant market power), which corresponds to the service whereby an operator and/or provider terminates on its own network a call to a terminal point of its network that has been conveyed by another operator.

Mobile network operators currently provide also wholesale network access services to MVNO, which enable the provision by MVNO of several retail services, such as voice services, SMS, and possibly broadband Internet access.

Wholesale call origination services are also provided, allowing the provision of special services by third parties using non-geographic numbering.

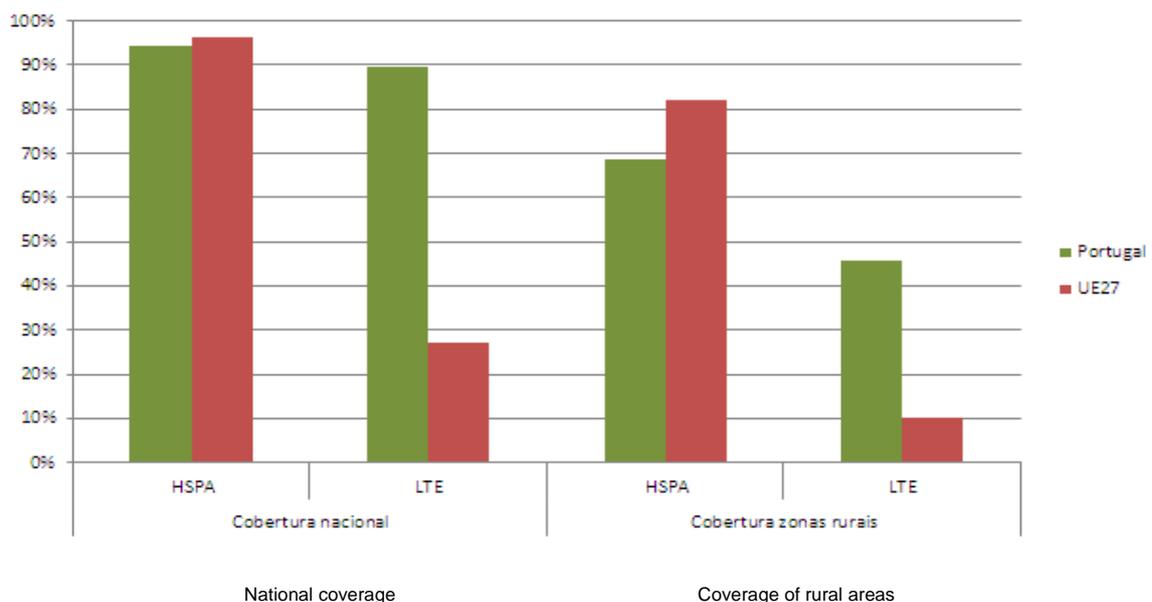
## 6. Availability and use of the mobile broadband service in Portugal

According to EC data (Broadband Coverage in Europe 2012), Portugal had, by the end of 2012, 94.4% of HSPA network coverage, which compares to the EU27 average of 96.3%. LTE coverage in Portugal was also quite high, almost 90% of the national territory, compared to the 27% average coverage in EU27.

At the level of rural areas also, the degree of LTE coverage in Portugal must be stressed, as by the end of 2012 almost half the national territory was covered, while at EU27 level that level merely reached 10%.

Note that mobile network operators started the commercial operation of 4G services between March and April 2012.

**Chart 1 – Coverage levels of mobile broadband networks in Portugal and in EU27, in 2012**



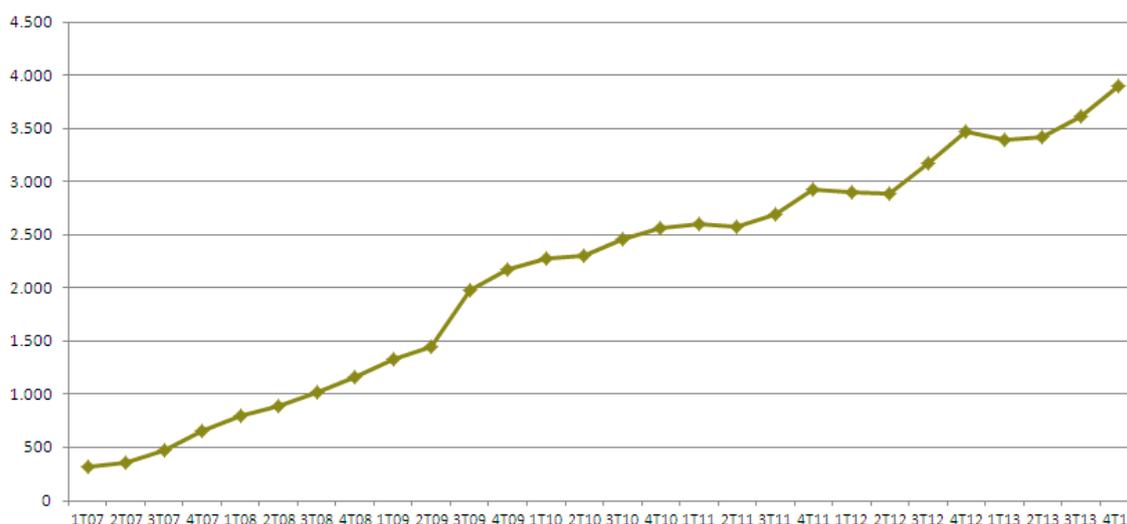
Source: Digital Agenda, EC, "Broadband coverage in Europe in 2012".

The use of broadband services, in Portugal, has grown steadily over the last 7 years. The number of users qualified to use mobile broadband services reached around 11.9 million by the end of 2013, representing an increase by 3.9% compared to the end of 2012.

Of these users, around 4.7 million effectively used broadband services, such as video telephony services, broadband data transmission services, mobile TV, 6% more than the number registered in 2012.

Among accessed broadband services, the use of mobile broadband Internet access services must be highlighted. In this specific case, the number of active users with effective use amounted by the end of 2013 to 3.9 million, as illustrated in the following chart, representing an increase by 12.2% compared to the end of 2012.

**Chart 2 – Number of users who effectively accessed mobile broadband Internet**



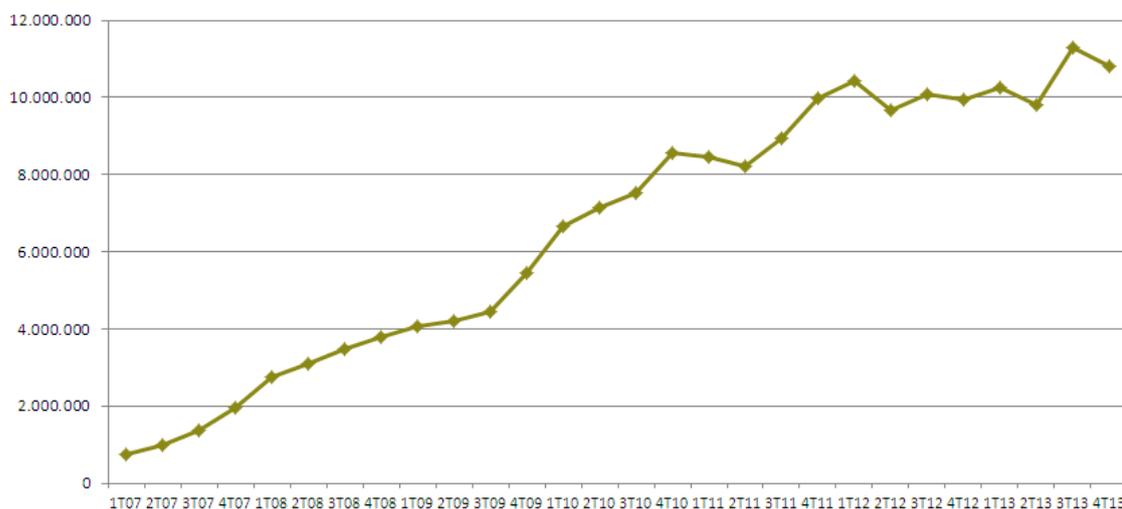
Source: “The Communications Sector 2012”, available at <http://www.anacom.pt/render.jsp?contentId=1168316> and ICP - ANACOM quarterly statistical reports, available at <http://www.anacom.pt/render.jsp?contentId=1181790>.

Mobile broadband Internet access is the service which in the last years has promoted the increase in the number of users of mobile broadband services, especially access via mobile phones (resulting from the increase in the number of smartphone users), as the number of cards/modem users has shown a decrease.

By the end of 2013, there were around 759 thousand effective users connected to the Internet via cards /modem.

As regards (packet switched) traffic generated by mobile broadband users in the Internet access service, in 2013 it amounted to 42 million GB, 5% more than traffic generated in 2012.

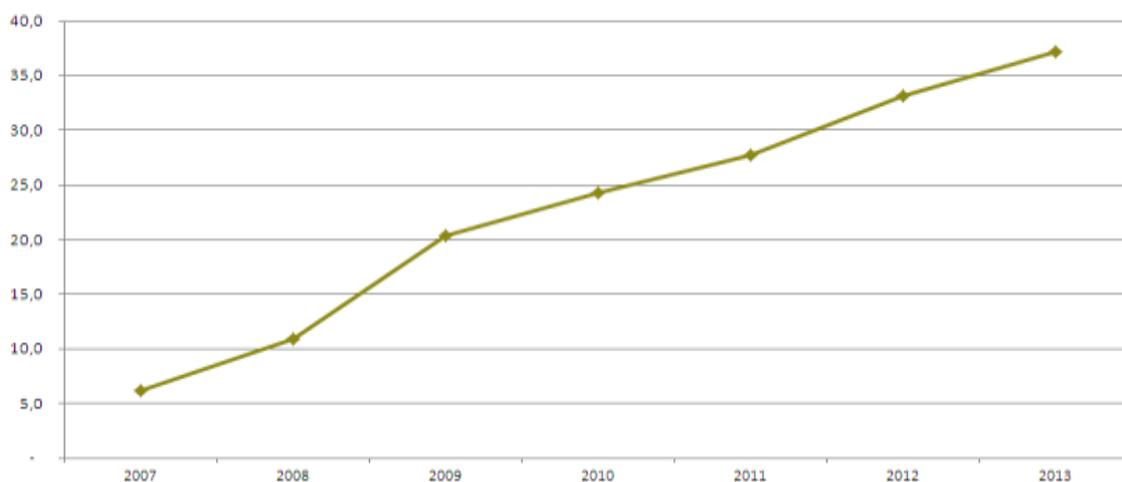
**Chart 3 – Volume of PDP (Packet Data Protocol) traffic sessions for Internet access (APN Internet - Internet Access Point Name), measured in thousand MB**



Source: “The Communications Sector 2012”, available at <http://www.anacom.pt/render.jsp?contentId=1168316> and ICP - ANACOM quarterly statistical reports, available at <http://www.anacom.pt/render.jsp?contentId=1181790>

The following chart shows the penetration evolution of mobile broadband service for Internet access, which represented by the end of the 4<sup>th</sup> quarter of 2013, 37.2 effective users per 100 inhabitants, around 9% more than the value registered by the end of 2011.

**Chart 4 – Effective users of the mobile broadband Internet access service, per 100 inhabitants**

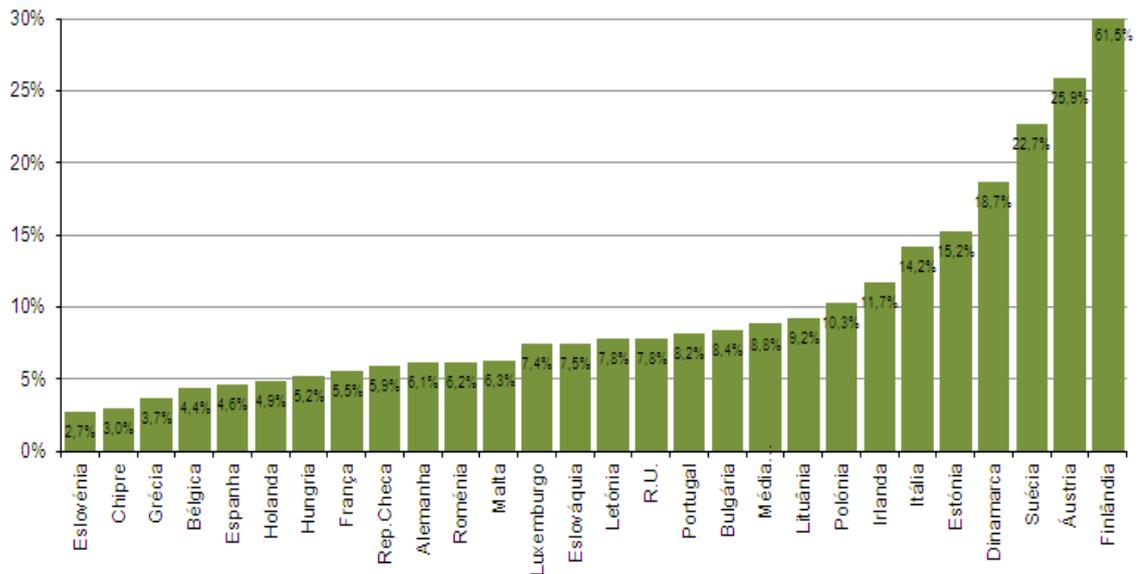


Unit: active users per 100 inhabitants

Source: “The Communications Sector 2012”, available at <http://www.anacom.pt/render.jsp?contentId=1168316> and ICP - ANACOM quarterly statistical reports, available at <http://www.anacom.pt/render.jsp?contentId=1181790>

Penetration of the mobile broadband Internet access service through cards/modem shows a lower record, however compares very favourably with other countries of the European Union, as demonstrated by the following chart.

**Chart 5 – Penetration of mobile broadband via PCMCIA cards or USB modems, in EU27 - 2Q2013**



Slovenia Cyprus Greece Belgium Spain The Netherlands Hungary France Czech Republic Germany Romania Malta Luxembourg Slovakia Latvia United Kingdom Portugal Bulgaria Average Lithuania Poland Ireland Italy Estonia Denmark Sweden Austria Finland

Unit: cards/modem per 100 inhabitants

Source: EC, COCOM July 2013 (provisional data).

As regards available Internet access offers for Internet mobile broadband, they are very diversified and present different prices that depend on the service support equipment (mobile telephone, tablet and cards/modem), on the download speed associated to the offer and the included traffic limit.

**Table 5 – Mobile broadband prices (2013)**

	Minimum price	Minimum traffic included	Average price	Average traffic included	Maximum price	Maximum traffic included
<b>Mobile phone Internet</b>						
Daily	1.1 €	15 MB	1.1 €	28 MB	1.1 €	30 MB
Weekly						
Standalone	1.4 €	30 MB	2.0 €	72 MB	3.0 €	200 MB
Package – MB+MTS	1.8 €	200 MB	2.9 €	900 MB	4.3 €	2 GB
Monthly						
Standalone	3.0 €	60 MB	13.2 €	2.7 GB	30.0 €	Unlim.**
Package – MB+MTS	6.2 €	150 MB	25.0 €	1.2 GB	69.9 €	Unlim.**
Package MB+MTS +FB+FTS+TV	41.2 €	30 MB	55.8 €	120 MB	73.3 €	200 MB
<b>Tablets</b>						
Monthly	11.6 €	1 GB	20.7 €	7.3 GB*	33.7 €	Unlim.**
<b>Cards/modem</b>						
Monthly	5.00 €	360 MB	20.5 €	6.8 GB*	40.0 €	Unlim.**

Prices in Euro (VAT included)

\* Average traffic of offers including unlimited traffic offers, the fair use policy of which imposes a traffic limit (15 GB).

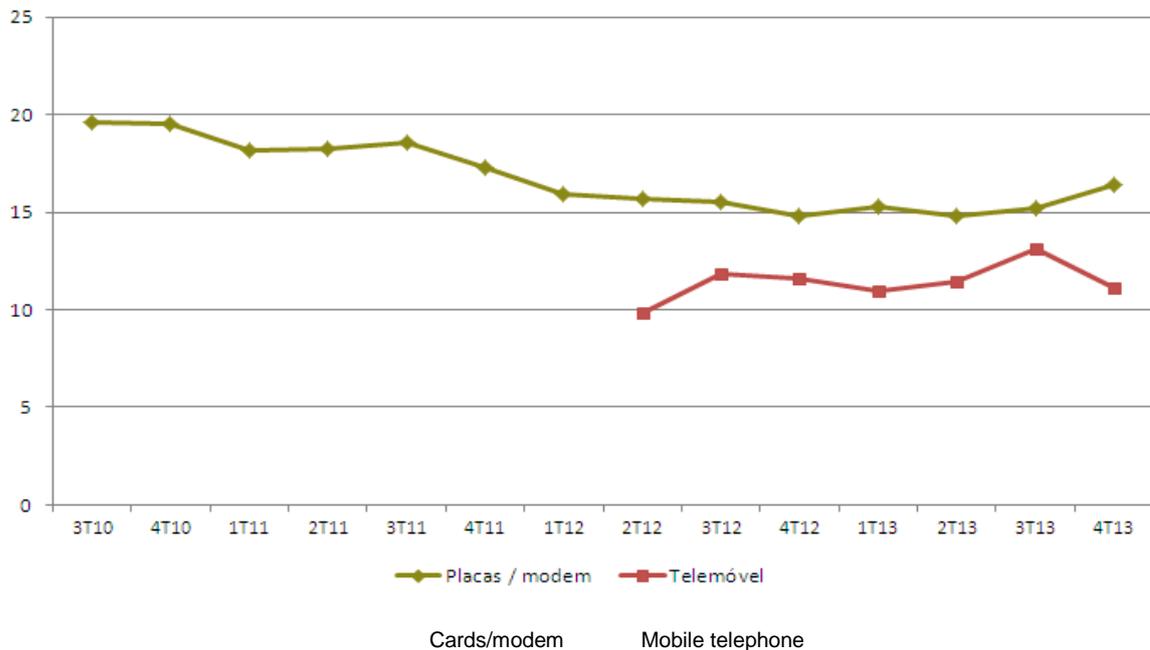
\*\* Unlimited traffic offers are subject to a fair use policy which imposes a broadband traffic limit (15 GB).

Source: websites of Internet access service providers.

Maximum download speeds have shown an increase. In 2013, speeds for these offers varied between 1 Mbps and 1.50 Mbps, in 4G/LTE. As regards traffic included in offers made available, most of them include monthly limits. Some offers have been advertised as including unlimited traffic, although their use is subject to a fair use policy.

According to Marktest Telecommunications Barometer, the average monthly cost of customers of the mobile internet access service has been decreasing, having reached 11.1€ by the end of 2013, a reduction by 4.3% compared to the same period of the preceding year. As regards access via cards/modem, the monthly charged was around 16.4€ by the end of 2013.

**Chart 6 - Average monthly cost of customers of the mobile internet access service per type of access equipment (cards/modem)**



Unit: Euro

Source: “The Communications Sector 2012”, available at <http://www.anacom.pt/render.jsp?contentId=1168316>, Marktest Telecommunications Barometer, 3Q2010 to Q2012.

Base: Total number of individuals over fourteen years of age provided with standalone voice electronic communications service.

Lastly, also according to a Marktest study, it is stressed that the degree of overall satisfaction of users with the mobile Internet access provider, in 2013, reached 7.5 (in a scale from 1 to 10) in the case of cards/modem broadband and 7.4 in the case of mobile phone broadband. This level of satisfaction is slightly lower as regards prices, reaching 7.0 and 6.9, respectively for cards/modem broadband and mobile phone broadband.

## C. SCOPE OF THE REASSESSMENT OF RIGHTS OF USE FOR FREQUENCIES

### 7. Market under analysis

In the light of the existing obligation to undertake “an assessment of the mobile electronic communications market in order to find out whether any competitive distortions exist and whether the adoption of appropriate measures to eliminate them are required”, it is relevant to delimit the scope of the market to be analysed.

At the level of the sector regulatory framework for electronic communications, the so-called market assessment procedure, provided for in articles 55 *et seq.* of the Electronic Communications Law, involves the definition of the product market, as well as of the geographic market, in compliance with competition law principles.

The process of product market definition consists in identifying all products/services that are sufficiently interchangeable or substitutable, not only in terms of their objective characteristics, by virtue of which they are particularly suitable for satisfying the needs of consumers, but also in terms of their prices or intended use.

As far as the geographic market is concerned, it involves the definition of the area in which companies concerned participate in the supply and demand of relevant products or services, in which area the conditions of competition are similar or sufficiently homogeneous relatively to neighbouring areas.

In the scope of the legislation of the electronic communications sector, the market definition is not an end in itself, it rather has an instrumental nature, being intended to identify whether operators with significant market power exist.

In this context, it is concluded that in this case the objective of the analysis does not fit into this market sector analysis for an *ex-ante* regulation.

It could be weighted whether this analysis could exclusively focus on possible restrictions resulting from the development of networks and service provision on the basis of the 900 MHz frequency band, in the light of provisions of the GSM Directive. However, it is noted that, as the market assessment obligation (on mobile electronic communications) was included in the Auction Regulation, a broader analysis is required, including all frequencies the rights of use of which were made available in this context.

Moreover, operators are able to use a set of frequencies, for which rights of use are held, for the provision of several electronic communications services, due to the principles of technological and service neutrality, which would make an analysis focused on a single band difficult. The 900 MHz band, specifically, may be, and has been, used for the provision of narrowband services (namely voice services), but also for the provision of broadband services (such as Internet access services). Both services are also frequently provided over other frequency bands.

Lastly, it is stressed that end-users normally do not have any perception as regards frequencies being used for the provision of telephone services and broadband Internet mobile access, and for this reason also an analysis limited to the 900 MHz frequency band would not be appropriate.

Given the objective to “*find out whether any competitive distortions exist*”, and considering that this analysis involves several frequency bands potentially used for the provision of mobile electronic communication services, it is deemed that the market under analysis comprises services provided by mobile network operators, at retail level (such as voice

services, SMS, narrowband and broadband data services) and at wholesale level (termination, origination and MVNO network access), albeit in a perspective of competitive or sector analysis in the field of electronic communications, services under consideration may be deemed to be (and usually are) different product markets.

At the level of the geographic market, given that frequencies under consideration were allocated for use throughout the national territory, it is deemed that the scope of the analysis should focus on the entire national territory.

It follows from the above that this analysis will examine to what extent some frequency bands, namely the 900 MHz, show any technical advantage/disadvantage, compared to other frequency bands made available at the Multiband Auction, namely those resulting from the refarming process. It will also be assessed whether any existing advantages lead to competitive distortions. Lastly, it will be checked whether results of the Multiband Auction, in which only mobile network operators who already held rights of use for frequencies obtained new rights of use for frequencies, create distortions in the mobile market (in a wider sense, as referred above, including all services provided on the basis of frequencies allocated).

## **8. Measures that may be imposed**

Depending on the conclusions of the analysis, the adoption of measures intended to remedy any distortions that are identified may be required. In this context, it must be restated that such measures must be adopted under ICP - ANACOM's powers at the level of spectrum management, namely those provided for in articles 20 to 35 of the Electronic Communications Law.

On the one hand, article 20 qualifies ICP - ANACOM to amend conditions, rights and procedures applicable to rights of use for frequencies, insofar as such amendments are objectively justified and comply with the principle of proportionality.

It is in fact in the scope of this provision that the Community framework seems to integrate a possible action by ICP - ANACOM in this field, taking into account the reference to article 14 of the Authorization Directive - transposed into the national legal system precisely by article 20 of the Electronic Communications Law -, both in paragraph 2 of article 1 of Directive 2009/114/EC and in the above-mentioned comments addressed by EC to this Authority on 29 July 2011.

Note that at the time of the Multiband Auction several conditions were established which fit into the scope of articles 27 and 32 of the Electronic Communications Law, respectively concerning general conditions and conditions attached to rights of use for frequencies, as explained in more detail in the following chapter.

On the other hand, as far as article 35 is concerned, it is restated that it is incumbent on ICP - ANACOM to ensure that the flexibility in the use of frequencies as well as the accumulation of rights of use for frequencies does not lead to competitive distortions, and for this purpose proportionate, non-discriminatory and transparent measures may be adopted, namely:

- a) Imposing conditions attached to the rights of use for frequencies, pursuant to article 32 of the same statutory instrument, including the setting out of deadlines for the effective exploitation of the rights of use by the respective holder;
- b) Ordering a holder, in a specific case, to transfer or lease its rights of use for frequencies; or
- c) Limiting the amount of spectrum to be allocated to the same holder in procedures for the allocation of rights of use for frequencies.

#### **D. REASSESSMENT OF RIGHTS OF USE FOR FREQUENCIES**

#### **9. Measures already taken to ensure the protection of competition and of consumers**

First and foremost, it must be stressed that ICP - ANACOM, in the pursue of its regulatory objectives, has endeavoured to create conditions for the promotion of open and competitive markets and to ensure the protection of rights of users, based on tools available to it, namely those referred in section A.

In this context, and bearing in mind specific concerns as regards mobile markets, it is stressed that, on a preventive approach, several measures were introduced in the Auction Regulation, intended to simultaneously ensure that distortions at the level of competition between mobile network operators in the market were not introduced, and that the possibility of new providers entering the market was created.

ICP - ANACOM considered that the Multiband Auction, given the whole of the spectrum that was made available, would be a relevant opportunity to acquire rights of use for frequencies. Bearing in mind that not all interested parties would be able to obtain rights in the desired amounts and frequency bands, as bodies who already held these rights were also interested in acquiring more spectrum, ICP - ANACOM deemed it was essential to prevent such situations, namely by designing appropriate limits for the acquisition of spectrum, as well as by introducing coverage and network access obligations. Simultaneously, the Authority attempted also to prevent the risk of hoarding spectrum, associated to the adoption of market foreclosure strategies concerning new entrants.

In this context, ICP - ANACOM designed the auction so as to ensure balance in the regulatory approach for promotion of increased competitiveness levels in markets for

communication services and infrastructures, having been highlighted the importance of creating better competition conditions in the former markets, in particular in situations where investment and access to infrastructures proved to take more time, to be more costly and more difficult, and of creating the appropriate incentives for the promotion of competition in infrastructure markets.

There was thus a goal to ensure that any new entrants in markets of electronic communications networks and services were able to climb the various access steps ("investment ladder") to existing infrastructures of installed operators - given that such infrastructures are difficult to replicate in terms of costs - starting from levels (or steps) that do not involve high investment costs in infrastructures, up to the top of the ladder, which requires significant investments at the highest level of infrastructure for access. Without prejudice, it was acknowledged that in a mature market the presence of operators whose business models are based on the use of low levels of self-owned infrastructure would be positive at the level of market segmentation and static efficiency.

In this context, the following measures that were included in the Auction Regulation must be pointed out:

- a) Imposition of caps for spectrum which could be obtained by each company at the auction (paragraph 1 of article 8 of the Auction Regulation), according to the following terms:
  - 2 x 10 MHz in the 800 MHz band (a total of 6 lots of 2 x 5 MHz having been made available) - this limit allowed, in case the full spectrum was allocated, between three operations (each with 2 x 10 MHz) to six operations (each with 2 x 5 MHz) to emerge;
  - 2 x 5 MHz in the 900 MHz band, applicable only to bodies that already held rights of use for frequencies in that band (a total of 6 lots of 2 x 5 MHz having been made available) - this limit allowed, in case the full spectrum was allocated, and where at least one of the companies involved was an active mobile network operator, two operations (each with 2 x 5 MHz), and where none of the mobile network operators was involved, between one (with 2 x 10 MHz) and two operations (each with 2 x 5 MHz), to emerge;
  - 2 x 20 MHz in the 1800 MHz band, including spectrum already held in this band (a total of 9 lots of 2 x 5 MHz and three lots of 2 x 4 MHz having been made available) - this limit allowed, in case the full spectrum was allocated, multiple operations (up to a twelve operations) and a minimum of three operations to emerge, in case there were several parties interested in using up the imposed limits (several combinations in terms of amount of spectrum were possible in this situation); and
  - 2 x 20 in the 2.6 GHz band, applicable only to paired spectrum (a total of 14 lots of 2 x 5 MHz having been made available) - this limit allowed, in case the

full spectrum was allocated, at least four operations (several combinations in terms of amount of spectrum were possible, such as for example three of operations of 2 x 200 MHz and one operation of 2 x 10 MHz) up to a maximum of fourteen operations, to emerge;

- b) Imposition of an additional postponed limit, according to which holders of amounts of radio spectrum that further to the auction exceeded a limit of 2 x 20 MHz, taken the 800 MHz and 900 MHz bands together, were required, after 30 July 2015, and within 6 months from that date, to transfer any surplus to third parties or to return such spectrum back to ICP - ANACOM (paragraphs 2 and 3 of article 8 of the Auction Regulation);
- c) Concession of a 25% discount in the price of lots allocated in the 900 MHz band, exclusively for bodies that still did not hold any spectrum in that band (paragraphs 3 and 4 of article 25 of the Auction Regulation);
- d) Imposition of network access obligations, according to which bodies that after the auction held 2 x 10 MHz in the 800 MHz band or at least 2 x 10 MHz in the 900 MHz (in this case including spectrum held prior to the auction) were required to accept negotiating in good-faith and in conditions of non-discrimination agreements intended to allow access to their networks, through agreements concerning virtual mobile operation, mobile roaming and access and share of infrastructures (paragraph 2 a) of article 35 of the Auction Regulation);
- e) Imposition of a coverage obligation associated to each lot of 2 x 5 MHz in the 800 MHz band for a maximum of 80 parishes tending to require mobile broadband coverage (paragraph 2 b) of article 33 and article 34 of the Auction Regulation);
- f) Setting of a reasonable deadline for starting the commercial operation of services, in general within three years from the date of issue of certificates, without prejudice to restrictions on the operation of the 800 MHz band, and especially as regards the 900 MHz band, within 1 year from the same date, with a view to an effective and efficient use of spectrum (paragraph 2 c) of article 33 and article 36 of the Auction Regulation); and
- g) Setting of a minimum period of 2 years after the commercial operation of services has started, though the effective use of frequencies assigned, before rights of use for frequencies are allowed to be transferred or leased, except where a duly substantiated request, acknowledged as such by ICP - ANACOM, is presented (paragraph 2) of article 33 and article 37 of the Auction Regulation).

In this context, it is stressed that Vodafone is required to transfer or to return spectrum, after 30 June 2015 and within 6 months from that date, given that, further to the Multiband Auction and taken the 800 MHz and 900 MHz bands together, it became the holder of rights of use for frequencies for a total of 2 x 23 MHz, thus exceeding the referred 2 x 20 MHz limit.

In addition to the above, it is also stressed that, as a result of the Multiband Auction, access obligations referred above in point d ) apply to the three winning operators (MEO, Optimus and Vodafone as regards the 800 MHz band and Vodafone as regards the 900 MHz band). Coverage obligations referred above in point e), on their turn, apply also to MEO, NOS and Vodafone, each of these companies being obliged to ensure coverage of 160 parishes, identified in the meantime by ICP - ANACOM, through ICP - ANACOM determination of 9.11.2012<sup>21</sup>, and selected by each operator, under the terms defined in ICP - ANACOM determination of 22.08.2013<sup>22</sup>.

ICP - ANACOM objectives are regards competitive conditions of the mobile market have also been reflected in other contexts. For example, a progressive and continued decrease of mobile termination wholesale prices has been registered, which has been deemed to be a fundamental tool for the balancing of competitive conditions in the retail mobile market.

In addition to the reduction of wholesale termination prices, ICP - ANACOM has over the past few years also acted through the adoption of other measures intended to favour the entry into the market of new operators and to create larger benefits for final users, among which the following should be highlighted: i) the publicising of the regulatory framework of virtual mobile operators (MVNO) activity, in 2007, ii) the launch, in 2008, of the public tender for the allocation of rights of use in the 450-470 MHz frequency band for the provision of the terrestrial mobile service, in which mobile operators were prevented from participating; and iii) the allocation of rights of use in the 3400-3800 MHz frequency band for BWA applications, in 2010, where mobile network operators were also prevented from accessing rights concerned.

## **10. Analysis of possible competitive distortions**

Indicators that best contribute to examine the existence of competitive distortions resulting from the allocation of spectrum in frequency bands under analysis are those that relate costs of developing and operating a mobile network (which uses a given set of frequency bands) and costs of obtaining rights of use in the referred frequencies, as well as the respective annual fees, to the extent that it is this relation that determines the margin of action enjoyed by operators when setting a network with a view to the provision of a set of services to a specific target-public.

In this context, it is particularly relevant to assess which technical advantages are associated to each frequency bands allocated in the scope of the provision of mobile electronic communications services, and whether there are operators that, given the set of frequencies for which rights of use are held and the cost of acquisition of such

---

<sup>21</sup> Available at <http://www.anacom.pt/render.jsp?contentId=1142896>.

<sup>22</sup> Available at <http://www.anacom.pt/render.jsp?contentId=1171334>.

frequencies, have been placed in a situation of (dis)advantage compared to other operators in the mobile electronic communications market, with different combination of frequencies. Such advantages were taken into account by ICP - ANACOM during the definition of rules of the Multiband Auction, as well be explained in detail below.

It is also relevant to weight, in a broader analysis, whether distortions resulting from the existence of operators that compete in the same markets may exist, with a particular emphasis on mobile retail markets, where some operators are provided with rights of use for frequencies and others are not, being sustained on networks held by former operators.

Lastly, this assessment cannot be regarded separately from the strategy adopted by operators in relation to spectrum currently held and technologies sustaining services currently provided, given the availability and capacity of terminals in the access to the range of available services.

#### **10.1. Technical benefits that may be associated to the operation of some frequency bands**

In this regard, it is stressed that there are different potential ways of using frequency bands made available in the scope of the Multiband Auction as well as of the BWA Auction.

In fact, spectrum in the band of 450 MHz, 800 MHz and also 900 MHz involves a lower cost of developing wide coverage solutions (areas requiring low capacity per km<sup>2</sup>), such as for example rural areas, given their propagation characteristics.

Spectrum above 1 GHz is acknowledged to be the most appropriate for the development of increased capacity solutions. This aspect is particularly important where a network in an urban environment is to be developed, as capacity requirements are usually more demanding than in rural environments, which are less populated.

As such, in the scope of the development of a mobile network, in order to provide a service with the same level of coverage, the use of spectrum above 1 GHz involves a higher number of base stations than those required if spectrum below 1 GHz is used. Consequently, an operator that did not hold any spectrum below 1 GHz would bear higher investment costs to achieve an equivalent degree of coverage than it would obtain with that spectrum.

In any case, it should be mentioned that spectrum below 1 GHz has benefits mainly in situations where the capacity provided is sufficient for the service demand. As demand increases, increasing capacity requirements, it is necessary to make additional investments, providing base stations with spectrum above 1 GHz.

A proper combination of spectrum between frequency bands above and below 1 GHz thus depends on factors such as demand of services, population distribution, patterns of service use, user mobility and desired geographic coverage (namely indoors).

As specifically regards 900 MHz and 1800 MHz frequency bands, it must be stressed that since 2010, and in compliance with provisions in the GSM Directive, operators have the possibility of using those bands for the operation of the UMTS system - the so-called refarming, as well as of using them for GSM operation. Additionally, in 2012, operators were authorized to use LTE and WIMAX in addition to the referred technologies. Bearing in mind what was referred on the spectrum above and below 1 GHz, the refarming possibility entails an advantage for operators who hold rights of use in those frequency bands, as it allows them to provide services of a larger broadband at a lower cost, in terms of network development and operation, than if only spectrum in the 2.1 GHz band is used.

In general, network development costs thus affected by the spectrum package required for the type of commercial operation intended to be provided.

In this scope, spectrum acquisition cost is an essential factor. As such, the relationship between network development and operation costs v.s. spectrum acquisition costs determines the expense required to act in the market as a mobile network operator.

It is noted that in the scope of the Multiband Auction, reservation prices that were defined for each frequency band seek to reflect the different geographical coverage that corresponds to each frequency band, as this is a factor with influence on how spectrum is valued. In this scope, the highest reservation prices for the 800 MHz and 900 MHz bands took into account the fact that such bands allow lower network development costs compared, for example, to the 2.6 GHz band, more suited to support the increase of network capacity, namely in urban and densely populated environments.

Additionally, the setting of reservation prices aimed also to guarantee balance between the promotion of competition in the market, preventing such prices from becoming a barrier to entry and safeguarding principles of non-discrimination and proportionality, and the enhancement of a resource that is scarce, and which must be used under conditions of efficiency.

In this context, ICP - ANACOM, having acknowledged that particularly spectrum in the 800 MHz and 900 MHz could be fundamental for several interested parties, including for mobile operators in the market, determined, as referred earlier, a set of measures applicable to these frequency bands, including the imposition of spectrum caps, a postponed limit, a 25% discount applicable to bodies that still did not hold any spectrum in the 900 MHz band, and also the possibility of deferred payment over 5 of years, for whoever acquired spectrum in the 800 MHz and 900 MHz bands.

In the light of the above, reservation prices that were established are shown in the table below. Interested parties were required, having assessed network installation, operation and maintenance costs against the need to ensure coverage, bearing in mind demand evolution and capacity requirements, weighing the cost associated to each frequency block, to decide on the most appropriate set of frequencies to launch, develop or strengthen their own commercial operation.

**Table 6 – Reservation prices established in the Multiband Auction**

<b>Band Designation</b>	<b>Lots</b>	<b>Reservation price per lot</b>
450 MHz	1 lot of 2 x 1.25 MHz	2 million€
800 MHz	6 lots of 2 x 5 MHz	45 million €
900 MHz	2 lots of 2 x 5 MHz	30 million €
1800 MHz	9 lots of 2 x 5 MHz	4 million €
1800 MHz	3 lots of 2 x 4 MHz	3 million €
2.1 GHz	2 lots of 5 MHz	2 million €
2.6 GHz FDD	14 lots of 2 x 5 MHz	3 million €
2.6 GHz TDD	2 lots of 25 MHz	3 million €

Several scenarios resulting from the Multiband Auction were possible, from a scenario where a company only received spectrum below 1 GHz, allowing it to install a low cost network, with a good coverage, but possibly with a more limited capacity, to a scenario where a company would only be able to acquire spectrum above 1 GHz, enabling it to provide high-capacity spectrum, but with lower levels of coverage (or even the same levels of coverage, but at a higher cost than the preceding scenario), “mixed” scenarios being also possible, where companies would endeavour to acquire spectrum both above and below 1 GHz, to draw benefits from the different characteristics of each frequency band, and to promote productive efficiency.

#### **10.2. Possible competitive distortions that may result from technical benefits associated to some frequency bands**

As referred in the preceding paragraph, the Multiband Auction could have ended with very differentiated results for participating companies. In that case, it would be fundamental to weight to what extent technical advantages associated to certain frequency bands would have the potential to create competitive distortions, on account of the impact of such advantages on final users, namely if they perceived differences at the level of the quality of service resulting from the use of different frequency bands (such as the available level of speed), of the impact on competitors and of benefits in terms of productive efficiency resulting from the use of certain frequency bands to the detriment of others.

In any case, it is noted that even if there were bodies with very different spectrum packages, for example bodies without spectrum in the 900 MHz, this would not mean necessarily that disadvantages arising from this situation could not be overcome, both by resorting to other frequency bands or to alternative solutions aimed for the reinforcement of coverage, without entailing an important competitive disadvantage that justified regulatory intervention. In this context, it is recalled that it was explicitly provided for in the Auction Regulation that operators who acquired spectrum in the 800 MHz or 900 MHz

would be required to accept national roaming agreements with third parties holding rights of use for frequencies in bands above 1 GHz and not holding rights of use for frequencies for more than a total of 2 x 5 MHz cumulatively in the 800 MHz and 900 MHz bands.

In this scope, some aspects that are fundamental in the analysis of the situation in Portugal must be highlighted:

- a) Before the Multiband Auction, mobile network operators had practically the same amount of spectrum, and all held spectrum in the 900 MHz, 1800 MHz and 2.1 GHz;
- b) The 900 MHz refarming process covered the three mobile network operators at an equal level;
- c) As a result of the Multiband Auction, the three mobile network operators obtained a very close amount of spectrum (as can be seen from information in Table 3) having in the end maintained an almost symmetrical amount of spectrum (as set out in Table 4).

As far as this last item is concerned, it is stressed that the auction was designed to allow each interested party to acquire a combination of spectrum in order to ensure complete solutions in terms of capacity/coverage. In this context, mobile network operators that were active at the date of the Multiband Auction undertook a cost/benefit analysis and opted for a very close package.

Although Vodafone acquired additional spectrum in the 900 MHz, an option which other mobile operators chose not to take, not having bid for that spectrum, benefits which may arise from that band in terms of productive efficiency, will be practically eliminated or even non-existent where it is verified that all operators have a very similar frequency package, namely at the level of other frequency bands. Moreover, there is naturally an economic rationale in other operators' decision not to bid the 900 MHz spectrum, as they will have weighted the cost and benefits of that decision, and concluded that they would not be placed in a situation of competitive disadvantage for not having acquired that spectrum. The fact that there was spectrum left in this frequency band demonstrates that there was room for other decisions, which were not adopted. It is also relevant that Vodafone is required to transfer to another company or to return to ICP - ANACOM 2 x 3 MHz (in the 800/900 MHz) as from 30 June 2015, and within 6 months from that date, thus any advantage alleged to result from the acquisition of additional spectrum in the 900 MHz would be eliminated in the short/medium term.

Vodafone also acquired 25 MHz TDD in the 2.6 GHz, spectrum which no other operator bid on, possibly because it was not deemed to be essential for the development of other operators' business, further 25 MHz TDD in the same frequency band having failed to be allocated.

It may thus be concluded that there are no evidences that the type and amount of spectrum allocated to the three mobile network operators in Portugal may create some level of competitive distortion in the mobile market.

The following table shows the amount of spectrum acquired as a result of the Multiband Auction, as well as the final price paid by operators for the spectrum concerned.

**Table 7 – Spectrum allocated at the Multiband Auction and total price paid**

Operator	Band Designation	Amount of spectrum acquired	Total price paid
MEO	800 MHz	2 x 10 MHz	90 M€
	1800 MHz	2 x 14 MHz	11 M€
	2.6 GHz FDD	2 x 20 MHz	12 M€
NOS	800 MHz	2 x 10 MHz	90 M€
	1800 MHz	2 x 14 MHz	11 M€
	2.6 GHz FDD	2 x 20 MHz	12 M€
Vodafone	800 MHz	2 x 10 MHz	90 M€
	900 MHz	2 x 5 MHz	30 M€
	1800 MHz	2 x 14 MHz	11 M€
	2.6 GHz FDD	2 x 20 MHz	12 M€
	2.6 GHz TDD	25 MHz	3 M€

In this context, it could be the case that, although all operators held equivalent amounts of spectrum, the cost paid by each of them for rights of use for frequencies was very different, which could promote possible competitive distortions.

However, even if this situation had occurred, it could be argued that each company bid (and paid) up to a point for which it was considered that costs did not outweigh advantages expected to result from spectrum concerned.

It is noted anyway that there seem to be no differences in final spectrum values in the various frequency bands, thus the raised issue is merely theoretical.

In the light of the above, ICP - ANACOM considers that spectrum over which the three mobile network operators in Portugal hold rights of use does not represent for any of the operators under consideration a competitive advantage that may result in the creation or development of competitive distortions in the mobile market. As such, ICP - ANACOM takes the view that there are no grounds for any type of regulatory intervention.

### **10.3. Possible competitive distortions with impact on other bodies**

Although it may be considered that, in the context of this analysis, indicators that best contribute to assessing the existence of competitive distortions are those which were analysed in the preceding points, as they determine without doubt the margin available for operators to act, with direct impact on productive efficiency, and without prejudice to the conclusion that the market does not present distortions resulting from spectrum allocations occurred in the last few years, it is also important to assess whether there are distortions that affect bodies that already operated in the same market but without holding rights of use for spectrum.

As regards bodies operating in the market without any rights of use for frequencies - MVNO, CTT and ZON (which to date still ran a virtual mobile operation) - there is no evidence that the allocation of additional spectrum on mobile network operators, or before that the introduction of the refarming possibility, had any negative impact on the provision of their services. On the contrary, the acquisition of additional spectrum by network operators on which MVNO are sustained could be an advantage for MVNO and respective customers, given that the increase of diversified solutions sustaining the network will allow them to grow as well, namely in terms of access to mobile broadband Internet.

Nevertheless, this is an indicator that is also affected by other factors related to commercial and strategic options of MVNO themselves and possible characteristics of the market in question, and does not depend exclusively on whether host operators have acquired additional spectrum. In any case, there is no evidence that this spectrum allocation has damaged MVNO.

It must also be referred, in the context of the assessment of distortions resulting from the allocation of spectrum, that there is no report that customers of MVNO (CTT MVNO and also Lycamobile and Mundio MVNO) differentiate the service they provide, namely in terms of quality of service, compared to equivalent services provided by mobile network operators. This results from the fact that at contract level there is a guarantee of equal treatment of MVNO traffic and traffic of the network operator on which it is sustained.

Besides what was referred on active companies in the market, the Multiband Auction also created opportunities for other bodies to enter the market, acquiring rights of use for frequencies above and below 1 GHz. The Multiband Auction was designed to enable the participation of all potential interested parties, by making available a set of lots in several frequency bands, and sized so that each company could define the package most appropriate for their interests, in the light of the respective business model.

Some of the measures introduced - including limits imposed on the acquisition of spectrum (with a specific set aside for new operators in the 2.6 GHz band) as well as the postponed limit applied to the set of spectrum in the 800 MHz and 900 MHz - were explicitly adopted<sup>23</sup> in order to avoid that operators already active on the market could hold

---

<sup>23</sup> *Vide* article 8 of the Auction Regulation.

the whole amount of rights of use for those bands, thus preventing hoarding which would be incompatible with the need to ensure an efficient management of spectrum, as well as strategies leading to market foreclosure. ICP - ANACOM intended also to contribute, at a later stage, towards liquidity of the secondary market of radio spectrum, so that subsequently to the auction, new operators were given the opportunity to enter the market.

In this context too, it is stressed that a discount was provided for as regards the acquisition of rights in the 900 MHz, so as to level the competition playing field between possible new operators and those already on the market, as it was acknowledged that the latter would value marginal spectrum above the value given by other operators, and because it was considered that the band under consideration presented the highest potential for implementation, on the short-term, of voice and data services with a wide coverage, competing with offers of active mobile network operators.

Notwithstanding, only active mobile network operators and ZON III – Comunicações Electrónicas, S.A. (ZON III) took part in the auction, having the company voluntarily made a bid without selecting any of the lots under auction, which prevented it from taking part in subsequent rounds.

Moreover, the whole of the spectrum made available at the Multiband Auction was not allocated, as may be verified from information in Table 8, and there is still room for the release of spectrum (a minimum of 2 x 3 MHz in the 800 MHz or 900 MHz bands) on the part of Vodafone (which may transfer or return spectrum) as from 30 June 2015 and within 6 months from that date.

**Table 8 – Spectrum not allocated at the Multiband Auction**

Band name	Amount of spectrum not allocated
450 MHz	1 block of 2 x 1,25 MHz
900 MHz	1 block of 2 x 5 MHz
1800 MHz	3 blocks of 2 x 5 MHz
2,1 GHz	2 blocks of 5 MHz
2.6 GHz FDD	2 blocks of 2 x 5 MHz
2.6 GHz TDD	1 block of de 25 MHz

It is recalled that there still is spectrum left from the BWA Auction, in the 3.4 – 3.8 GHz band.

It must be recalled in this context that in the period preceding the Multiband Auction, and for over 10 years, mobile operators held 2 x 8 MHz in the 900 MHz band<sup>24</sup> and 2 x 6 MHz in the 1800 MHz band, in both cases at a time when that spectrum could only be used for

<sup>24</sup> A NOS detém 2 x 7,8 MHz na faixa de frequências dos 900 MHz.

GSM, and 2 x 20 MHz in the 2.1 GHz (paired spectrum) and 5 MHz in the 2.1 GHz band (unpaired spectrum), which was returned in the meantime.

As such, in the light of the above, it is deemed that conditions enabling a wide participation in the Multiband Auction were created, even as regards bodies that at the time it was carried out did not hold any rights of use for frequencies, or only held rights of use for some bands, and it may be inferred that the amount of spectrum made available in the scope of the auction did not represent a barrier to the entry in the market of mobile electronic communications for operators that intended to develop their own radio access network, given the conditions referred above.

Moreover, the amount of spectrum continues not to be a relevant limitation, as free spectrum is still available, at least for a new commercial operation, even if at a lower degree than spectrum held by those already present in the market.

In this context, it must also be referred that, even if the whole of spectrum had been allocated, there were conditions for whoever was not able to participate to pursue a commercial operation, although sustained on alternative business models that did not directly involve the need of spectrum, thus facilitating the entry in the market of new entities.

As such, the Auction Regulation included provisions introducing network access obligations, to the benefit of MVNO and operators only holding spectrum above 1 GHz.

The referred obligations were imposed on the three mobile network operators that took part in the Multiband Auction, and that acquired rights of use for frequencies in the 800 MHz and 900 MHz.

It is noted that even before the Multiband Auction, in the scope of other procedures, such as those related to BWA (3.4 – 3.8 GHz) and 450 MHz, conditions had been defined preventing mobile network operators active at the time from taking part in the referred selection procedures; as a result of such procedures, Zappwimax – Unipessoal, Lda. and F300 – Fiber Communications, S.A. obtained BWA spectrum.

Although new operations under obligations imposed in the Multiband Auction have not emerged so far, given that MVNO (Lycamobile and Mundio) which have recently appeared, negotiated this access before the conclusion of the referred auction, the imposition of the referred access obligations must still be stressed in order to facilitate the entry in the market of new bodies in the framework of the referred procedure for the allocation of frequencies, given that the mobile retail market is not subject to *ex-ante* regulation.

Any intervention on the mobile market would have to be justified, proportional, non-discriminatory and transparent, and on this issue it has already been concluded that there are no reasons for such an intervention. As such, it would have to be weighted whether advantages of measures to be adopted would exceed their costs. The most immediate

measure that, in a context of possible competitive distortions resulting from the allocation of spectrum, seems to be appropriate, would be the return of a part of spectrum by some or all operators entitled to use frequencies. However, this option would necessarily have high costs for such operators, namely at the level of network planning, with potential impact on final users, apart from being a measure that could create discrimination, especially if it was imposed on just one or a part of operators.

On the other hand, the release of spectrum would not necessarily have impact on the appearance in the market of new entities providing services on the base of that spectrum. In this scope, it is recalled what was referred earlier on spectrum that was left from the Multiband Auction, in addition to the acknowledgement of the fact that the participation in the auction by companies without any rights of use for frequencies was virtually nil. In addition, together with spectrum which was not allocated in the course of the Multiband Auction, Vodafone is required to release 2 x 3 MHz in the 800 MHz and 900 MHz frequency bands, so potentially the market will be provided with additional spectrum, without there being a need to impose the return, transfer or lease of spectrum.

As such, in the light of the above, it is deemed that the imposition of an obligation to release spectrum not only is not required at this stage, but it also would be disproportional and potentially discriminatory. It would also not be transparent, as objectives underlying that decision are not clear.

In view of the foregoing, ICP - ANACOM considers that the refarming process, as well as the allocation of frequencies in the scope of the Multiband Auction, did not contribute to create or to promote possible distortions as regards bodies already active on the market of mobile electronic communications, having also contributed, through the establishment of network access obligations, to create a framework that facilitates the entry in the market of new bodies with business models that do not involve the need for spectrum.

## **E. CONCLUSION**

In the light of the above, it is deemed that there is no question that there are advantages in operating some frequency bands rather than others, given that some are more appropriate for coverage solutions and other particularly appropriate for capacity solutions. However, as demonstrated, as spectrum combinations of mobile network operators are very similar, they do not lead to competitive distortions between the referred operators.

Likewise, the right granted to mobile network operators to benefit from the refarming process did not confer any advantage to active mobile network operators, given that all held rights of use for frequencies in equivalent amounts of spectrum in the 900 MHz and 1800 MHz. This is without prejudice to the fact that Vodafone holds some additional spectrum in the 900 MHz and in the 2.6 GHz, which, as referred earlier, and given the

associated context, is deemed not to entail any relevant advantage compared to other operators.

The allocation of rights of use in the scope of the Multiband Auction did also not contribute to create distortions compared to operators in the market and without rights of use for frequencies, allowing the establishment of a set of network access obligations, which fall on operators with rights of use for frequencies in the 800 MHz and 900 MHz, and which could facilitate the entry in the market of new companies.

As such, as there is no need to remedy imbalances resulting from the allocation of spectrum, ICP - ANACOM considers that there are no grounds at the moment for any regulatory intervention, namely in the light of assignments conferred by articles 20 and 35 of the Electronic Communications Law.

Notwithstanding, ICP - ANACOM considers that as there still is available spectrum, there are no reasons for the Regulatory Authority, at an appropriate time, not to sound out interest in the market as regards the provision of such spectrum, this initiative weighing spectrum that may be returned by Vodafone, in 2015 (in this regard, it recollected that the company is entitled to transfer such spectrum, in compliance with provisions in the Electronic Communications Law, so it may not be necessarily available for inclusion in a new allocation process). Other developments that may take place in the meantime shall also be weighted (for example, bearing in mind results of the next World Radiocommunications Conference, to be held in 2015 (WRC-2015)).

In any case, ICP - ANACOM will always have the possibility, in the framework of the Electronic Communications Law, to assess the efficient use of spectrum by mobile operations and the effectiveness of network access obligations which were imposed thereon (point 10 d)), which will only become fully effective after restrictions to the operation in the 800 MHz have ended.

Moreover, it is stressed that future Community decisions as regards spectrum shall also influence the analyses to be conducted by the Regulatory Authority.

## Chart Index

Chart 1 – Coverage levels of mobile broadband networks in Portugal and in EU27, in 2012 .....	16
Chart 2 – Number of users who effectively accessed mobile broadband Internet.....	17
Chart 3 – Volume of PDP (Packet Data Protocol) traffic sessions for Internet access (APN Internet - Internet Access Point Name), measured in thousand MB .....	18
Chart 4 – Effective users of the mobile broadband Internet access service, per 100 inhabitants .....	18
Chart 5 – Penetration of mobile broadband via PCMCIA cards or USB modems, in EU27 - 2Q2013.....	19
Chart 6 - Average monthly cost of customers of the mobile internet access service per type of access equipment (cards/modem).....	21

## Table Index

Table 1 - Rights of use for frequencies of mobile operators in the period immediately prior to the Multiband Auction .....	11
Table 2 – Spectrum made available at the Multiband Auction .....	11
Table 3 – Spectrum allocated at the Multiband Auction.....	12
Table 4 – Rights of use for frequencies held by mobile operators .....	12
Table 5 – Mobile broadband prices (2013).....	20
Table 6 – Reservation prices established in the Multiband Auction.....	30
Table 7 – Spectrum allocated at the Multiband Auction and total price paid.....	32
Table 8 – Spectrum not allocated at the Multiband Auction.....	34