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Determination of 14.6.2007

Broadband Wireless Access (BWA)

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1. INTRODUCTION

Broadband Wireless Access is a term used to describe new broadband wireless technologies that involve mobile, nomadic and fixed applications.

Growing demand for bit stream access to provide multimedia services at fixed locations has led the industry to develop new technological solutions capable of surmounting the technical hurdles involved, with more efficient modulation techniques that have added mobility.

ANACOM has been following the course of discussions in various international forums on the introduction of this type of technology. This debate has looked at both the technical issues involved (e.g. technical solutions, the spectrum and standards) and at a regulatory framework for this technology, with the aim of achieving harmonisation in the adopted solutions.

At the same time, it should be noted that several market players have expressed an interest in bringing this technology to Portugal, and that several requests have been received to make part of the spectrum available for BWA technical trials with WIMAX type systems.

In view of this growing interest, ICP-ANACOM launched a public consultation on the introduction of BWA in Portugal, taking into account the positions which have been debated in the European Union (EU), especially at the level of the European Commission (EC), and in the European Conference of Postal and Telecommunications Administrations (CEPT), and further taking into account the results of the public consultation launched by ICP-ANACOM on FWA in order to reformulate usage rights.

As part of the consultation contributions were received from the following nineteen parties:

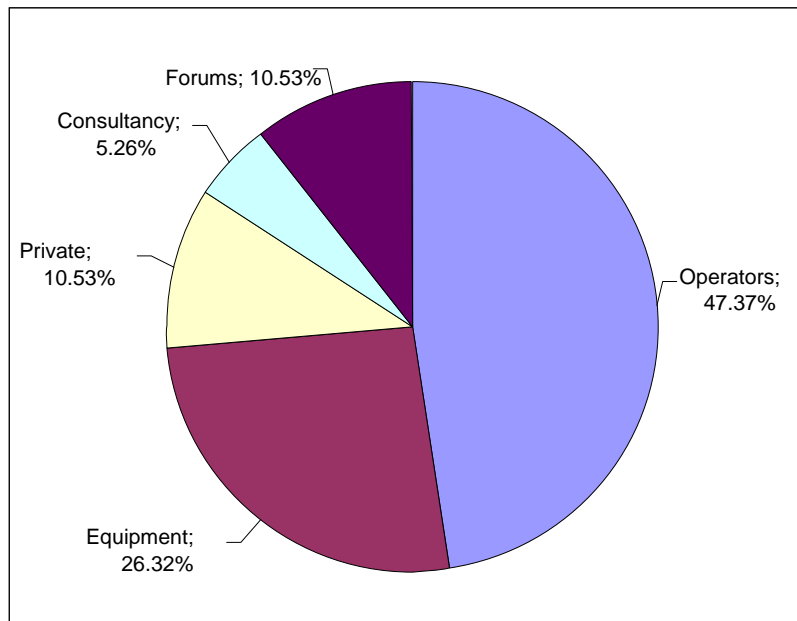
- Mr António Ferreira
- Alcatel - Lucent
- Cabo TV Madeirense
- EMACOM
- Ericsson
- Grupo PT (common position of the companies Portugal Telecom SGPS, PT Comunicações, PT Multimédia SGPS, PT Prime, PT Wi-Fi and TMN)
- Grupo SGC Telecom (representing its subsidiaries WTS and AR-Telecom)
- Mr Hugo Cunha
- Intel Corporation
- Manuel de Azevedo, U. Lda (in its own name and representing its partner Shortcut – Consultadoria e Serviços de Tecnologias de Informação, Lda)
- Neuvex – Telecomunicações, Marketing e Informática, Lda.
- Onitelecom
- Radiomóvel Telecomunicações, S.A.
- Samsung Electronics UK
- SAP/REG (Satellite Action Plan Regulatory Group)
- Sonaecom, SGPS, S.A.
- Vodafone Portugal - Comunicações Pessoais, S.A.
- WiMAX Forum
- ZTE Corporation

Of these contributions (see graph below) nine were made by companies (or their representatives¹) registered and authorised to provide electronic communication services for public use (of which six hold rights to use the spectrum for FWA operation), five are companies connected to equipment (manufacturers or their representatives), one is connected to consultancy, two are non-profit making organisations (WiMAX and SAP/REG forums), and a further two contributions were received from private individuals.

It should be noted that ICP-ANACOM made an extra effort in publicising this Public Consultation. Besides the traditional means of announcing the consultation, advertisements were taken out in national newspapers with large circulation.

It must be stressed that, despite this extra effort, no contributions were received from any party related with the protection of consumer interests (residential or corporate) or from the academic world. Such contributions would have been useful from the perspective of a public consultation that better reflected the interests of the market and of society.

¹ Grupo PT represents the position of the companies Portugal Telecom SGPS, PT Comunicações, PT Multimédia SGPS, PT Prime, PT Wi-Fi and TMN; Grupo SGC Telecom represents its subsidiaries WTS and AR Telecom. As such the responses given by these 9 organisations represent the position of a total of 15 companies.



Chapter 2 of this reports describes the background to the introduction of BWA, describing in particular developments at a national and international level.

The summary of the responses received is made in Chapter 3, which reports the most noteworthy point of the arguments presented. The conclusions of this consultation and action plan can be found in Chapter 4.

2. BACKGROUND

As part of the i2010 initiative, the European Commission, in recognition of the importance of broadband communications, conferred a mandate upon CEPT², with the aim to identifying the technical conditions in respect of the operating frequency bands deemed more appropriate and harmonized for BWA purposes and with consideration to such issues as technological neutrality and possible licensing regimes.

It is noted that, in line with the current regulatory framework for electronic communications, no technological system is identified in this mandate. The response to the mandate, prepared by the CEPT's *Joint Project Team – JPT BWA*, was completed very recently.

Key to this EC mandate is the issue of BWA spectrum harmonisation. This issue is crucial for spectrum management, bringing as it does, a range of benefits from a reduction in equipment development costs (economies of scale), interoperability, and faster development and introduction times for solutions that benefit the user.

The choice of harmonised frequency bands could be key for the success of new technologies and associated services. Therefore, whenever possible, harmonised bands should be chosen over “one-off” solutions. Accordingly several frequency bands were studied for the introduction of BWA systems. It should be noted that it is the BWA application in general that is under consideration and not any specific technology system (not limited to nor excluding WiMAX type systems or other technologies already operating in the market).

²http://forum.europa.eu.int/Public/irc/infos/radiospectrum/library?l=/public_documents_2005/mandate_bwadatedpdf/_EN_1.0_&a=d

The work accomplished to date has led to the conclusion that the priority bands for BWA applications are the 3.6 GHz and 5.8 GHz bands. Concretely, the JPT BWA is studying the technical and regulatory framework for BWA systems in these bands as follows:

- Decision CEPT/ECC(07)02 which governs BWA applications in the 3.6 GHz (3400 - 3800 MHz) frequency bands. It should be noted that BWA applications encompass fixed, nomadic and mobile technologies, allowing the inclusion of a mobility component.
- Recommendation CEPT/ECC(06)04, approved in December 2006, which envisages BFWA systems (Broadband Fixed Wireless Access) in the 5.8 GHz (5725 - 5875 MHz) frequency bands.

In order to get an overall picture of the BWA issue, it is important to emphasise the most recent activities that ICP-ANACOM has been involved in and that could impact any decision that may be adopted.

First of all, considering that one of the bands under discussion is the 3400 - 3800 MHz frequency band, it should be noted that ICP-ANACOM has concluded a public consultation on Fixed Wireless Access Systems (FWA), in accordance with the action plan set out by Administrative rule no 1062/2004 of 25 August. As a result, the rights to use frequencies for FWA were reconfigured and allocated to operators (Stage I).

It should be further noted that, as set out in the Determination of 23 February 2006, this Authority intends to commence the allocation of additional spectrum (Stage II), starting by submitting the 24.5 – 26.5 GHz frequency bands to the regime of full accessibility, given that:

- According to the received responses, interest in additional spectrum is generally focused on Zones 1, 2 and 3, with a requested amount of 2x56 MHz per zone;
- the recovery of the rights of frequency use results from Stage I;
- Spectrum was released further to the cancellation of TELEWEB, S.A.'s license;
- A certain amount of spectrum was foreseen for network expansion in the scope of the FWA licenses granted in 2000.

As a result, by determination of 21 April 2006 of the Board of Directors, ICP-ANACOM allocated the right to additional frequencies in the 24.941-24.997GHz/25.949-26.005GHz band to Vodafone.

3. SUMMARY OF RESPONSES

Before giving the summary of the responses to the questions raised in the Public Consultation, presented below are some general, relevant comments on some of the parties and a summary of contributions received whose content is not directly connected to the questions posed in the consultation document.

Beside the considerations made in respect of the classification of BWA as an innovative technology that brings benefits to the market in terms of capacity and range of services, there are a number of points that bear highlighting:

- The private contributions made emphasise the important role that ICP-ANACOM has in the introduction of BWA, with two of the respondents referring to certain aspects of the project (personnel) for the supply of access to broadband services based on a BWA (WiMAX) infrastructure; in this contribution it is further suggested that the Municipal Councils should implement and/or exploit WiMAX networks, allowing a real expansion of broadband services for their citizens, making it more appealing, competitive and arousing the interest of potential investors in the Council;
- The possibility of extending the use of BWA applications to the 2.3 and 2.5 GHz band was also indicated, especially for WiMAX type applications. It should be noted that one of parties with usage rights for the operation of MMDS in the 2.5-2.7 GHz frequency bands, Cabo TV Madeirense, indicated its intention to operate with WiMAX at 3.6 GHz, in order to complement existing broadband services especially with respect to mobility and at the same time providing the same access conditions in rural areas as are currently enjoyed by urban areas.
- One of the parties, SAP/REG, concerned above all with issues related to possible interference of BWA application with the fixed satellite service (FSS), emphasised the recommendations on compatibility requirements made in the CEPT report. SAP/REG further stressed that in Portugal, FSS is allocated exclusively in the

3600 - 4200 MHz frequency band and, with the knowledge that FSS stations (reception only) are exempt from licensing (in accordance with ERC/DEC(99)26)), that there was a need for careful planning in respect of band allocation for BWA applications;

- The active participation of the interested parties in the operation of BWA applications is envisaged, in respect of the phase of drawing up strategic plans for the development of national radiocommunications, under the guidance of ICP-ANACOM;
- Grupo PT considers that the decision that ICP-ANACOM is taking on the framework governing the introduction BWA applications in Portugal cannot be isolated from the results and decisions to be adopted within the scope of and following the 2006 Review process, which the European Commission is conducting and where the definition of a new spectrum management model as it affects electronic communications assumes particular importance.

3.1. BWA FRAMEWORK

- a) *Define and describe the technologies covered by BWA, indicating positive aspects and possible fragilities.*

The majority of respondents to the Public Consultation considered that BWA applications fulfilled an important and positive role in the development of alternative infra-structures – contributing to a reduction in barriers, with special relevance to access networks – in the offer and provision of bit stream data services, in the offer of multimedia services and in broadband internet access.

Reference was made to several different systems and platforms, based on different technologies, whose application is dependent on use (fixed, nomadic or mobile), performance and intended coverage requirements.

However, in defining the type of technologies encompassed by BWA, there were notable differences in the responses. Of the thirteen parties that responded directly to the question:

- a) Some associate all technologies currently capable of supplying broadband services with BWA, apart from those derived from IEEE standards. Neuvex, in particular, defines BWA as any technology that provides bit stream wireless access (greater than 1.5 Mbps) over a wide geographical area and which operates with a bandwidth of over 1 MHz;
- b) On the other hand, two parties did not specify particular technologies and/or standards. One of these, Vodafone, even considers that it does not make sense at this stage to advance with particular characteristics of each technology, especially because these are dependent on the equipment supplier. Vodafone considers that it would be premature to advance with the characteristics of a specific product of a given equipment supplier, since in the future the

corresponding solution may be unavailable or more interesting solutions may have been developed in the meantime. The company therefore considers that the principle of technological neutrality should prevail and that it should be down to each operator to make a choice according to the technology (or range of technology) that it considers most suitable.

- c) The remaining six parties (of which four are connected to equipment manufacturers) identified the standards developed within the IEEE (standards IEEE 802.16-d and IEEE 802.16-e; IEEE 802.20) and ETSI (HIPERMAN-High Performance Radio Metropolitan Area Network) as being BWA technologies.

An analysis of the information presented on the definition of BWA type technologies, reveals differences with respect to the comparison and/or identification of positive aspects and possible fragilities.

Below is a summary of the aspects emphasised by the various parties:

3.1.1. BWA applications in general

Positive aspects:	Fragilities:
<ul style="list-style-type: none"> • They are a central component in the pursuit and realisation of the objectives of the Information Society expressed in the Lisbon Agenda and in the i201 Initiative. 	<ul style="list-style-type: none"> • The need for tight control of the technical and operational characteristics of the systems which may operate on a basis of radio licensing exemption;
Positive aspects (cont):	Fragilities (cont):
<ul style="list-style-type: none"> • They fulfil an important and positive role in the development of alternative infrastructures – contributing to a reduction in barriers, with special relevance to access networks – in the offer and provision of bit stream data services, in the offer of multimedia services and in broadband internet access. 	<ul style="list-style-type: none"> • The fact that the exploitation conditions are not yet defined and stabilised. Another fragility of BWA technologies is the complexity of interoperability testing. The mandate conferred on CEPT by the European Commission is testament to this fragility.

3.1.2. At a technological level

The BWA technologies identified by the parties were as follows:

- Those used in the frequency bands 3.6 GHz, 5.8 GHz (BFWA); 24.5 GHz and 27.5 GHz;
- Within the scope of 3G: GSM (EDGE); WCDMA; HSDPA; HSUPA; CDMA2000 and 1xEVDO;
- Wi-Fi (802.11x), including meshed Wi-Fi; IEEE 802.16d (IEEE 802.16-2004); IEEE 802.16e (or IEEE 802.16-2005); IEEE 802.20 (Mobile Wi-Fi); WiBro;
- ETSI HIPERMAN (High Performance Radio Metropolitan Area Network);
- Flash-OFDM, iBurst, T-MAX, UMTS-TDD; RipWare; IPWireless;
- Point-to-point systems in the frequency bands of 60/70/80/90 GHz and FSO;
- UWB systems (modulation by dispersion);
- In the future, SDR (Software Defined Radio);
- For some of the above technologies and frequency bands, the parties pointed out positive aspects and fragilities, including:

3.6 GHz Frequency Band

Positive aspects:	Fragilities:
<ul style="list-style-type: none">• Greater degree of practical use• More mature associated technologies• Far more favourable propagation characteristics• In conjunction with the availability of more powerful transmitters, it allows the implementation of networks with a greater coverage radius (a few dozen kilometres), which makes these bands especially suitable for rural areas with low density and/or for services with NLoS (Non Line of Sight) and mobility	<ul style="list-style-type: none">• Need to use spectrum that is fragmented• Greater sensitivity to interference phenomena between sectors and multi-path effects, requiring greater care in planning, in virtue of capacity, consistent with the penetration and geographical reach of each station.

24.5 GHz or 27.5 GHz Frequency Bands

Positive aspects:	Fragilities
<ul style="list-style-type: none">• Greater bandwidth available	<ul style="list-style-type: none">• Less standardisation• Propagation more influenced by atmospheric conditions (rain)• Little or no tolerance of obstacles, requiring LOS (Line Of Sight)

5 GHz Frequency Bands

Positive aspects:	Fragilities
	<ul style="list-style-type: none">• Susceptible to inevitable interference, incompatible with a top quality service

Positive aspects and fragilities of WiMAX

Positive aspects WiMAX identified

- Continuous integration between fixed and nomadic service customers over existing mobile and fixed network architecture
- Greater bit rates and traffic flow per user and per cell, good spectrum efficiency and low latency
- CAPEX optimisation, allowing achievement of desired financial levels
- Functionalities that deal with undesirable phenomena connected to propagation
- Meets rapid internet access needs in large geographic area, for mobile and fixed services, at a low cost and with flexibility.
- Possibility of meeting the requirements of wireless access platforms, especially the need of band management in function of the type of services required by terminals and applications (QoS), as well as the need for greater radio bandwidths per terminal and per base station
- Possibility of combining current wire and wireless networks, providing large bandwidths at great distances, with coverage ranging from metres to kilometres; possibility of providing a large number of services such as wireless DSL, VoIP, video, multimedia applications, etc.;
- Association of IP transport advantages for all the services with QoS management, the possibility of introducing Multicast services, a more efficient use of the spectrum, both through codification rates and through scalable segmentation of available band, making it an extremely promising technology for responding to the needs of present and future implementation of fixed, nomadic and mobile access BWA, promising interoperability with other current and future networks and compatibility with existing terminals (with Ethernet e Wi-Fi interfaces)
- IEEE 802.16-d technology, specifically, allows achievement of desirable bit rates in data services, and at the same time allows reconciliation of voice service in a dual play perspective
- Presents other advantages, of which the most important is the fact that it sits in a native all-IP architecture, providing the advantages of IP technology as far as costs, scalability and flexibility are concerned
- Simple network architecture
- IEEE 802.16-d, in particular, allows reduced coverage in environments without line of sight, with a view to access technology use, and high latency/jitter levels with a view to the use of technology with transmission networks for 2nd and 3rd generation networks (in its current version)

Fragilities WiMAX identified

- Development of IEEE 802.16e standard is only recent, concluded only at the end of 2005 and the industry has not yet developed products with sufficient maturity
- Harmonisation of 3.5 GHz frequency bands not yet completed at CEPT level,
- With regards to spectrum harmonisation for access to BWA services in the European Union, the CEPT report is expected in March 2007, with a decision of the Commission expected in November 2007, after WRC-07
- Lack of practical experience, given that it is a recent technology; it is hoped that certified equipment will appear in 2007

- b) *Define the radio parameters of the technologies mentioned above, including:*
- i. *Power;*
 - ii. *Channels;*
 - iii. *Duplex mode (TDD/FDD);*
 - iv. *Modulation;*
 - v. *Standard applicable (if existing);*
 - vi. *Coexistence of various technologies and variations of the same technology;*

The majority of the parties that responded to this question made reference to some characteristics of the technology which were presented in the previous question, making a comparison between them.

It should be noted that three parties (Ericsson, Grupo PT and Radiomóvel) considered that the radio parameters should respect the provision set forth in the Decisions and Recommendations of ITU-R and the CEPT. One of them, Radiomóvel, also emphasised the new methods established by the CEPT for the definition of channels (where guard bandwidths are not envisaged, as long as determined criteria are complied with), which, it considers, will provide operators with greater flexibility in the choice of channel bandwidth and at the same time make the introduction of technologies with different bandwidths easier and more flexible.

Sonaecom stated that currently certified equipment, based on the IEEE 802.16 standard, only covered the 3.4 – 3.6 GHz frequency band. It also emphasised that in the meantime there was indication from the manufactures of availability for the 3.6 – 3.8 GHz frequency bands but according to the needs of the market.

c) *What type of use is best suited to BWA technologies: connection to end user, transmission network or both?*

Some of the parties did not respond to this question and others either did not reply directly or were unclear, referring to the response on the applications. The majority of parties that did respond presupposed the use of a determined BWA technology, especially WiMAX.

Therefore, in general terms, considering the parties that provided some response to this question, the following is stated:

- Seven parties (Alcatel-Lucent, Ericsson, Mr Hugo Cunha, Intel Corporation, Onitelecom, Manuel de Azevedo and ZTE) stated that the connection to end user would be the preferred or more suitable use for BWA applications, or associate these applications essentially with end users.
- Three parties (Grupo PT, Grupo SGC Telecom, Radiomóvel) also considered that BWA applications should be earmarked first of all for connection to end user, but went on to say that in certain situations BWA could be more suited to the establishment of transmission networks connections or to connections between operators of the “backhaul” type;
- Four parties (Samsung Electronics UK, Sonaecom, Vodafone, WiMAX Forum) stated that BWA technologies could be used with connection to end user as much as they could be used with transmission network/backhaul;
- Neuvex stated that the most suitable use for BWA technologies depended on the objectives for which the various standards that support the technologies were developed. It stated that there were technologies that only envisaged final connection to the customer (as in the case of 3G technologies) and others that could be used as much in the transmission network as in the connection to the final customer (as in the case of WiMAX technology, based on the IEEE 802.16 standard).

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- Video-On-Demand (VOD);
- Broadcast TV (2 to 6 Mbps);
- Interactive TV(> 3 Mbps);
- Mobile TV;
- Multicast;
- Telematics;
- Home automation or security services.

Grupo SGC Telecom further specified the frequencies which they saw as being best suited to each type of service, indicating the 3.6 GHz band for final customer access (in virtue of its range, NLoS capability and mobility) and for what it calls last meter (vertical distribution) in buildings/blocks, 12 GHz to 18 GHz band for point-to-point applications (due to the bandwidth) and the 24 GHz to 32 GHz band for applications, both with distribution to the final customer in sparsely populated areas where the capacity/range relation is economically favourable, and with backhaul to services of distribution to the final customer in lower frequencies with BWA or other technologies.

As far as the spectrum needs are concerned, most of the parties consider the consignment of a minimum of 2×21 MHz to be sufficient for the supply of the services identified above, possibly rising to 2×25 MHz (in both cases including guard bands). Nevertheless, one of the parties presented calculations based on specific presuppositions, and in this way defined the spectrum that it considers to be necessary as 2×30 MHz (or 2×28 MHz, with an additional 2 MHz guard band). The spectrum needs presented is, among other things, in accordance with the version of the technology implemented by the operator as well as with the radio parameters used in network planning.

e) *What is the target market and how big is the market envisaged for the technologies/services offered?*

Most of the responses to this question were general. They neither considered a detailed discussion on technology nor were they sufficiently specific on its size, with most of parties considering services for the final user as being the target market (in residential and corporate segments). The positions of the various parties on this subject, which are summarised below, reveal some differences, related mostly to the positions that the parties have in the market, as well as their respective strategies for the application/use of BWA technologies.

- a) Manuel de Azevedo, U Lda. considers that “The type of target market that could use this type of technology would be the domestic market whose final customers, as well as having typical broadband internet access, could have access to new services, “video-on-demand”, interactive television (...)”.
- b) Grupo SGC Telecom considers that BWA would allow the provision of services, with national coverage, in urban and rural areas, essentially directed at Households, SMEs, with the view of BWA as a platform that could compete with copper and cable, which could attain market shares of between 10% and 30% and could contribute to competition in the sector supported by a more balanced and dynamic infrastructure. It also believes that the size of the market corresponds to the sum of Portuguese families and companies.
- c) The Intel Corporation considers that BWA would allow the provision of mobile wireless service, increasing competition. The company says that initially the services could be based on fixed and/or nomadic type applications, but that mobile services could be accessed once compatibility studies have been completed.
- d) Radiomóvel states that the segment which encompasses the services listed in the previous point is made up of users of broadband service who value flexibility in

use and that the basis of this market, which consists of computer users who need broadband connectivity, is formed by users of portable computers, who today account for the majority of sales in our country.

- e) Vodafone considers that the target market will consist of the totality of the national population with need of internet access, with particular emphasis on specific customer groups, especially companies, technology centres (corporate and university) and local communities with communication service needs that are out of the ordinary, or whose needs are insufficiently met by the capabilities of technologies in use, either for technical reasons or due to a lack of economic viability.
- f) Neuvex considers that, in relation to 3G technologies, the target market is the stand-alone user, owing to the characteristics of the technology. The company forecasts that its evolution in terms of market will be in line with that of GSM, with its trend of migration from this system to the 3G system. In relation to WiMAX technologies, it states that their flexibility allows an identical user to 3G but also in the market of small and medium companies, so competing with the products currently being offered by cable operators.
- g) Onitelecom considers that WiMAX technology could compliment the offers of fixed operators with new possibilities in global terms of typical voice and data services in the small and medium sized corporate markets, offering new services, especially the possibility of nomadic use as a way of “delocalising” employees. The company adds that, being a medium range radio network, it could also complement the offers of the new operators outside the more dense areas and enhance the reliability of services when proposed to customers as redundancy to the traditional physical means. Finally it considers that the residential market could be addressed by these technologies, if the technological development, the regulatory framework and total exploitation costs show themselves more favourable and allow competition with the costs currently achievable in copper networks.

h) Sonaecom considers that in the case of fixed access BWA technologies, especially that defined by the IEEE 802.16d standard, the target market is that of transmission services, both in terms of self-supply and in wholesale offering to third parties. Secondly it states there is a potential market at a retail level (residential and corporate), but that in practise this market should be considerably more limited, being dependent on the synergies which the licensed operators would be able to achieve with the networks in their possession. It further states that the target retail market should be that of telecommunication services in areas that are currently poorly served by fixed access networks, with the potential value of this market being considerably lower than that existing in more populated areas and already well served by fixed networks. Even in urban areas it considers that BWA would be a difficult alternative for new operators who desire to enter the market or even for existing operators who don't have an existing network to which BWA would bring significant synergies. It also states that, in the case of BWA technologies that allow nomadic access, especially as a result of the implementation of the 802.16-e standard and despite the need for an in-depth economic feasibility study that goes further than this consultation, it considers that the market with a view to an implementation solely of mobile applications is currently limited. Finally the company adds that, notwithstanding the technological potential described, the uncertainty associated with the growth of the costs underlying this mobility prevents the identification of a commercial opportunity which does not go beyond a complement of 3G technologies, ensuring supplementary capacity in high-traffic zones and ensuring potentially higher bit streams with which the same operator can offer a credible fixed-mobile convergent offer and with sufficient capacity to support the expected increase in consumer needs (which result, for example and among other factors, from the changing trend in internet usage from browsing to the frequent use of audio and video streaming).

3.2. FREQUENCY USE

a) *What comments do you have on the content of the CEPT/ECC decision and recommendation in Annex?*

Most of the respondents agreed with the approach of the Decision and Recommendation. Below are some of the views put forward:

- a) AR-Telecom states that the content of the Recommendation represents an opportunity, if some conditions considered relevant are encompassed, in terms of spectrum and available technologies. It considers however that the proposed harmonisation should not be carried out over the short term, in light of the fact that the difficulties of migration and of tidying up and putting the existing spectrum in order are substantial and vary from country to country.
- b) Vodafone considers that the approval of the Decision and the Recommendation, as presented at the time of the public consultation point to a flexibility in the use of the spectrum allocated to licensed bodies;
- c) Onitelecom considers that the Recommendation expresses the limitations existing in each country and the difficulty in selecting spectrum suitable for harmonisation at a European level of BWA offers.
- d) Grupo PT emphasised that in the ITU's Radio Regulation (RR), the radiocommunications services that operate in the band and which are addressed in the draft Recommendation (5.8GHz) have to accept any harmful interference that may be caused by ISM applications.

Grupo PT further states that the draft Recommendation envisages the opening up of the 5.8 GHz band to BWA systems/applications ensuring, at the same time, the protection of assignments made on a primary basis.

It further considers that, although the Recommendation is important for the promotion of a single market of BWA applications, it will only be possible to

ensure the commercial offer of services with the minimum of quality and continuity in particular situations, to be assessed on a case by case basis.

- e) Ericsson presented comments specific to the Decision, stating that Decides 1 should include mention of the availability of bands for mobile BWA applications. Likewise it affirms that Decides 2 is unclear when it affirms that equivalent specifications may be used in respect of compliance with the R&TTE Directive.

Ericsson also presented a series of considerations about the benefits of technological neutrality versus the fragmentation of technologies used, which might give rise to a scenario of difficulties in consolidating the different technologies (in terms of electromagnetic compatibility/coexistence requirements), causing spectrum inefficiency owing to the multiple channels/consignations allocated, noting finally the need for caution in prioritising allocation of spectrum for mobile applications at an international level.

- f) Sonaecom likewise presented comments on the Decision, stating that mesh type solutions are explicitly excluded, when there are already solutions currently available in the market, resulting in a lack of definition as to the possibility of using self-backhaul type solutions, such as the use of WiMAX technology as backhaul of the WiMAX system itself while access network.

Sonaecom further stressed the potential incongruity between points b) and d) of the considerations set out on page 4 of the Decision in respect of the 3400-3800 MHz frequency bands, especially in that point b) states that the 3400-3800 MHz band should be allocated to mobile type services in the second instance in ITU region 1 (which includes Portugal), while point d) states that the same band should be allocated to mobile type services in the first instance within the “*European Common Allocation Table*” (ECA). As such it states that it is important to clarify the priority of this band for the offer of mobile type services with WiMAX IEEE802.16-e.

Finally the company emphasises the importance given to the fact that there were BWA solutions that operate 4-3.6 GHz, stating further that the 3.6-3.8 GHz frequency band is considered an alternative for this purpose.

ICP-ANACOM is grateful for the comments received. In the particular case of comments on the Decision it should be underlined that:

- Decides 1 mentions BWA applications, since the definition of BWA covers fixed, nomadic and mobile applications as referred to in considering c)
- Decides 2 is a text that was included in order to bring any mention of harmonised standards into line with the Directive.
- The explicit removal of mesh networks is due to the fact that this type of network has not been analysed in the compatibility studies, owing to the lack of parameters, as pointed in the conclusions of such studies³.
- There is no potential incongruity between points b) and d) of the considerations, since considering d) states that the European Common Table indicates the primary basis allocation of the frequencies concerned for mobile applications limited to SAP/SAB applications.

³ See ECC REPORT 33

b) Under what conditions do you consider that an operator authorised to operate FWA in the 3.5 GHz and/or 24.5 GHz or 27.5 GHz bands could expand their services, changing their current technology to use BWA technology?

The responses received were generally not very specific, and although they put forward a range of positions and arguments arising most of all from the different interpretations of the question, they do allow it to be concluded that the majority of the parties consider that an operator authorised to operate FWA could expand their services using BWA technology. The responses do however reveal a difference of views, including the following:

a) With reference to the need to alter installations:

- Neuvex considers that to extend the offer of services, altering the technology currently supporting them in order to use BWA technologies, an FWA operator should replace all control and radio equipment, as well as all receiver equipment of current customers;
- Likewise Samsung Electronics UK states that to support standard//WiMAX services new installations will be necessary in the 3.5 GHz band.

b) Indicating the situation in which they consider that an FWA authorised operator would have advantages, in giving examples of the forms of BWA technology use, and in the presentation of arguments on the reuse of base infrastructure and in the experience already obtained by these operators:

- Manuel de Azevedo, U. Lda, responded that where the services used and allocated geographical coverage areas are the same, the alteration of technology would allow an improvement in the exploitation of the service, allowing increased quality and benefiting final customers;

- Ericsson pointed out that the extension of the offer would only be possible depending on the development of services available to users, allowing them the benefit of using terminals at a lower cost;
- ZTE states that the operators are using WiMAX to provide xDSL type services in suburban and rural areas of Western Europe, North America and parts of Asia (such as South Korea) and Australia, while in Central and Eastern Europe, the Middle East and Africa, and in Latin America and Asia/Pacific, WiMAX is being used to substitute fixed network infrastructure, also providing basic PSTN services. It adds that many of the incumbent operators have become “competitive local exchange carriers (CLECs)” in neighbouring countries, especially in Central Europe and Eastern Europe and the Middle East and Africa, using WiMAX to provide broadband internet access and voice over IP (VoIP) in a single package of competitive services.
- Onitelecom, giving the question a technological slant, considers it important to bear in mind the strong investment that licensed operators have made in FWA technologies with a view to exploiting telecommunications services. These have been based on business models which have not always been suitable for the evolution of the market and have involved long term commitments that have not been realised into profitable businesses. The company added that the diversity of technology and the specific architecture on which the FWA networks were developed, and which have not seen improvement in the meantime, leads to the belief that there will not be synergies capable of making reuse of the investments made in the technological component.
- To the contrary it considers that the reuse of base infrastructure should be a strong argument for the concession of licences for the exploitation of next generation radio networks, because with the WiMAX specification in particular, in many cases the geometry of the installation points of the base stations coincides with the needs of coverage (potential market zones, necessary bandwidth, simplicity of termination installation, etc).

In this context it is concluded that there is a new technological scenario in concert with past expectation, in which BWA can guarantee a new opportunity for operators that invested and had a stake in FWA, irrespective of the frequencies previously allocated to them, by which it is set out that the frequencies currently held by an FWA operator should not have bearing on access to WiMAX licensing.

- Vodafone asserts that the sum of experiences of an operator authorised to operate, not only of an FWA system (as the inherent knowledge acquired in surmounting the difficulties of this technology) but also of all the other systems at its disposal, puts that operator in a privileged position in respect of surmounting possible barriers to the implementation of BWA more rapidly and with better results.
- c) In the indication of the requirements and general of conditions of a regulatory character which they consider should be respected by FWA licensed operators for the purposes of permission for the migration of services/technology:
- Grupo PT considers that current and future holders of FWA frequency usage titles should have the possibility of extending the offer of services and of altering/substituting the technology of systems being exploited for BWA services/technology covered by such title.

The group also considers that the migration of services/technology should only be permitted:

- In accordance with prior authorisation of ICP-ANACOM;
- Ensuring compatibility with other systems operating in the same region (in the coverage zone), in the same band and/or adjacent bands;
- Provided that, and while there are active FWA systems, BWA uses have secondary “status”, in that, they do not benefit from protection from FWA systems;

- That BWA equipment respects the provisions of the R&TTE Directive (Decree Law no 192/2000) and the standards accepted and/or adopted at a European level;
 - The rights of final users is assured until such time as they are served by other systems and/or technologies.
- Radiomóvel considers that the current FWA operators should offer BWA services with the spectrum at their disposal, provided that the services for which they were originally licensed are assured in line with the principle of technological neutrality and of the maintenance of obligations previously assumed in public tender. It is also the company's position that if this offer implies the alteration of technology resulting in a reduction in the amount of spectrum needed, surplus spectrum should be returned.
- d) In the indication of regulatory and technical conditions considered desirable and/or necessary:
- ZTE considers that unlicensed frequencies would produce more interference;
 - Alcatel-Lucent and the WiMAX Forum consider that where an operator desires to upgrade its network using the most recent mobile WiMAX technology (supported only in TDD), this would be feasible if the blocks of licensed spectrum were typically 2x25 MHz, in the case of the 3.5 GHz band. (The WiMAX Forum does not currently support the use of the 24.5 or 27.5 GHz frequency bands for WiMAX, and did not therefore issue an opinion on these bands).

Additionally Alcatel-Lucent considers that the use of licensed frequencies, in being subject to determined regulatory conditions (especially in respect of protection from interference, as opposed to non-licensed spectrum), ensures that any operator using this spectrum gives continuity to the same guideline, in terms of services provided and economic rationale.

It further considers that the use of spectrum subject to usage rights allows the regulator to clearly define certain conditions under the terms of the regulatory framework, especially as regards the definition of activity, coverage, geographical scope of the license, permitted or prohibited services, license validity. However, the company emphasises that these conditions should be weighted and adapted according to the specific demographics and to the objectives of the economic development of the country, without losing sight of the viability of the operator business model.

- Grupo SGC Telecom argues that for the creation of truly competitive wireless platforms with the potential of creating value for the country's consumers, it would be necessary to have a set of three key factors:
 - Suitable frequencies for each application (urban/rural, LoS/NLoS);
 - Sufficient bandwidth for the provision of multimedia services;
 - Availability of standard access platforms suitable for the market service/segment;

The group further considers that, in this context, it would not be enough to alter the access technology to the new BWA standards (e.g. 802.16a), but also to amend the license to the real spectrum needs for the provision of truly competitive multimedia services.

- e) On the other hand, from a technological perspective, although different to the previous ones, Sonaecom considers that FWA operators holding frequencies in the 3.5 GHz band would be technically capable of extending the offer of services. However, this extension is, according to their understanding, constrained by the synergies that it could extract with a network that it already holds, where the existence of a mobile network assumes particular importance.

In this context, it further considers that in Portugal, the only operator in a position to benefit from this extension is PTC, in that it is the only undertaking holding frequencies in the relevant band (3400-3600 MHz).

c) *Which frequency bands do you consider suitable for the provision of BWA, taking into account such factors as international harmonisation, the state of technological development and the costs involved, the type of authorisation (with waiver or not of radio license), as well as the need for coexistence with other technology systems? Please state reasons.*

The open nature of this question permitted a very diverse range of comments to be received, including the following key opinions:

a) 2300 – 2400 MHz frequency band:

Ericsson stated that although this band is harmonised for BWA use outside CEPT countries, it is forecast that it will be a band with usage rights for other applications, particularly IMT-2000.

b) 2500 – 2690 MHz frequency band:

The Intel Corporation states that at the moment this band is allocated to the 3G mobile service, affirming that in the ITU IMT-2000 was defined as being a set of radio interfaces for wireless mobile services which support a particular model of networks and services; IMT-2000 includes WCDMA, CDMA-2000, TD-SCDMA, DECT and EDGE, with it not being possible to encompass new technologies for the mobile service, such as WiMAX;

Ericsson stated however that this band is harmonised for IMT-2000/UMTS, and that coexistence with BWA TDD would give rise to interference risks;

Samsung Electronics UK considers that this band is available for BWA services in other regions and is a good opportunity for global harmonisation, offering economies of scale; the company further indicates that WiMAX will commence in 2007.

Various parties manifested interest and support for the provision of this band for the offer of BWA services, with basis in the principle of technological neutrality;

c) 2700 – 2900 MHz frequency band:

Ericsson states that this band was extensively assessed for the preparation of WRC-2000, where MT-2000 was introduced, and that the coexistence with the radiodetermination is considered possible, with there being a possibility of operation but in Downlink;

d) 3400 – 3800 MHz frequency band:

Ericsson states that this band will be harmonised over time and is appropriate for licensed operations due to the existences of other uses, such as FSS;

The Intel Corporation, WiMAX Forum, Grupo SGC Telecom, Neuvex, and Radiomóvel are unanimous in considering this band for the implementation of BWA due to the potential provided by its bandwidth (also for *backhauling*). Neuvex further states that the decision of the ECC (ECC/DEC(06)04) will contribute to harmonisation across Europe and enhance consistency in terms of technical conditions and licensing;

The factors mentioned that suggest this band for the implementation of BWA can be summarised as follows:

- Available bandwidth;
- Propagation conditions;
- Adoption by the community of equipment manufacturers which develop more systems for operation in this band;
- Flexibility of use, in accordance with the Decision and Recommendation of the ECC, in annex to the consultation document:
- Licensed band, which allows operators to control the quality of provided services.

Samsung Electronics UK states that this band is the least attractive for the implementation of mobile services due to propagation phenomena.

e) 3800 – 4000 MHz frequency band:

Ericsson points to this band, indicating that it is a candidate for IMT-2000 exploitation, with commercialisation expected in around 2014.

f) 5.8 GHz (5725-5850 MHz) frequency band:

Neuvex states that this band, having greater bandwidth per channel than the 3.5 GHz band and being exempt from licensing, has become suitable for the provision of BWA provision, but with limitations of power and some restriction on the level of coexistence with other systems operating at the same frequency with consequences for the supply of service at long range.

On the other hand, the majority of respondents did not consider this band suitable for the provision of quality services to final customers.

A range of comments received by some of the parties is given below:

a) A Onitelecom considers that irrespective of the possible national difficulties that may need to be taken into account, special priority should be given to the frequency bands harmonised with the rest of Europe, given that the BWA service will initially be for the exploitation of fixed and nomadic access services and will only expand to services of a mobile or roaming character in the second phase.

The company further considers that the usage plans should be managed by the operators themselves, due to the large bandwidth needed per channel, the needs of radio planning (which should be left to the criteria of the operators in respect of effectively attained markets) and the needs of coherent development of networks and spectrum management.

Regarding the guarantee of coexistence with adjacent third party services and other technological systems, Onitelecom argues that this should be promoted by the operators who hold obligatory radio licensing in determined bands.

Finally the company considers that the development of BWA networks with WiMAX technology is heavily dependent on the investment capacities of the

operators to be licensed, on respect for good spectrum management and its use and technological harmonisation at the level of terminals, a factor which will only make sense if the gains from scale at a European level are compatible with the regulation defined for Portugal.

- b) Grupo PT argues that any band would be suitable for the provision of BWA, provided that compatibility with other systems/services is assured and that the priorities of allocation, established at an ITU and European level are respected. The group highlights the 2.5 GHz as being the most appropriate, where propagation characteristics allow good performance to be achieved in terms of coverage/capacity, reflecting positively at a cost level.
- c) Radiomóvel considers that 802.16 systems cover three different modes of operation: fixed, nomadic and mobile. It considers that, in light of the propagation conditions, for any one of these modes only the frequency bands between 1 GHz and 4 GHz have all the conditions necessary for the economic viability of an operational plan based on NLoS.

It further affirms that taking the European scenario into consideration, the bands that have the harmonisation conditions for the implementation of BWA services are those between 3.4 GHz and 3.8 GHz, or between 2.5 GHz and 2.69 GHz, the latter being commonly known as the “IMT-2000 Extension band”. It also states that it believes that in order that it may be possible to attract the consumer, there should be no restrictions in respect of the technologies available.

- d) Sonaecom states that the majority of suppliers refer the appearance of WiMAX products operating in the 3.6 – 3.8 GHz band to the “needs of the market”, despite some having presented products operating in this band. Even presupposing a future regulation of this band for the functioning of this type of system, the company’s position is that there is a risk in clearly favouring operators who come to hold licenses for operation between 3.4 – 3.6 GHz, insofar as they could use the advantages resulting from a greater choice of equipment, and at the same time that they could acquire such equipment at a reduced cost, due to

greater competition between suppliers in this band and the differential of production volumes. As a consequence of these factors, it considers that any licensing process should take account of the differences between the two bands and the respective impact on operator business plans.

3.3. BWA IMPLEMENTATION IN PORTUGAL

a) *Do you consider that access to BWA frequencies should be restricted to certain bodies? If so, please indicate which ones, and give reasons who you consider it necessary to put such restrictions in place.*

Of the responses received, the following are highlighted:

a) The position of Grupo PT is that the decision on the introduction of BWA in Portugal should take account of the following situations:

- Free access: Regime applicable to all bands which, at a European and/or national level, come to be designated as being for common use. In these bands all entities must be allowed access, without restriction, on condition that they are committed to respecting the technical conditions and conditions of use and exploitation which have been established in each case. Grupo PT considers that this regime should be applied to the 5.8 GHz frequency band;
- Limited access: Regime applicable to all bands whose use is subject to the allocation of rights, irrespective of the form of allocation. Grupo PT considers that this regime should be applied to the 3.6 GHz frequency band.

Finally Grupo PT considers that in certain bands access should be limited, because BWA has significant potential to cause harmful interference, and that if conditions were not imposed, the regular function of other systems and services could be put at risk.

b) Onitelecom states that the undertakings to be licensed should have the technical competence for the progressive execution and continuity of their investments, with solid economic basis, in line with suitable opportunities and the existence of investment protection mechanisms (similar to what occurred with the development of GSM networks).

It is the position of this entity that access to BWA frequencies should be limited to operators who do not hold their own universal access platforms (cable and copper incumbent fixed networks) and GSM/UMTS/CDMA mobile networks, giving privilege to the development of new access platforms, to the detriment of operators who have already made their investments and would be more interested in getting profit from assets that they have already constructed in the access network.

In this context, Onitelecom concludes that the operation of these resources should be covered by operators who do not have alternative means at their disposal that allow them to offer similar services in direct form or in which they control, without resource to offers of the market, the indices of quality to be practised.

c) Emacom, Grupo SGC Telecom, Sonaecom and Vodafone, likewise stated their position in the following terms:

- Because BWA is a technology that allows the development of bit stream access networks (*last mile*), and because there are operators in the market in possession of other physical means for the development of these networks, such as cable and copper, priority should be given in BWA frequency access to telecommunications operators who use this technology in their core business. In this way this technology could create a competitive environment for the provision of telecommunications services (Voice, Data and Video) that would benefit the final user (Emacom);
- *Wireless* should not be allocated to holders of significant copper or cable infrastructure, in order to avoid the cannibalisation of its respective potential (Grupo SGC Telecom);
- Sonaecom stated that, while the copper and cable networks were under the control of one operator, it was fundamental for the development of the national

market that this operator did not have access to BWA frequencies. Such an exclusion, it considers, would not be a precedent in Europe, adding that:

- ◆ In Spain, in 2000, Telefónica was excluded from the tender for the allocation of licenses for use of BWA, with basis in the fact that point-multipoint radio access constitutes an alternative to copper, coaxial cable or fibre optic connection;
- ◆ In Norway, NPT decided to exclude companies controlled by Telenor from the 3.5 GHz band frequency auctions, with basis in their respective dominant positions in the associated markets;
- ◆ In Italy, the regulator took a similar course; although not excluding the incumbent *ab initio*: Telecom Itália was authorised to participate in the auctions of the 210 Wireless *Local Loop* licenses in 2002, but was restricted in the provision of such services for the following 4 years;

The company also added that any undertaking which, possessing copper and cable access networks and which does not make a solid commitment to separate one of these networks within a period defined by the regulator, should not be permitted to enter the tender for the licensing of these frequencies.

It further argues that privilege of access to these frequencies should be given to mobile operators because it is these undertakings that are best placed to use them efficiently and with the best results insofar as increasing competitiveness in market is concerned. However it considers that the application of a broader criteria for the allocation of licenses for these frequencies (including other undertaking that are not mobile operators), may have reflexes on the licensing conditions of 3G frequencies, insofar as it would lead to unfair completion, given the incomparability of the associated obligations;

- Vodafone considers that right of preference should be given to undertakings not Grupo PT or any other undertaking dominant in the provision of broadband services, thus contributing to the creation of solid competing offers by alternative operators.

Additionally, this company considers that the protection and creation of a competing market leads it to believe that access to BWA frequencies should not be restricted. However, such frequencies should only be conceded to undertakings that demonstrate that they are technically and financially prepared to invest in the infrastructure necessary for the establishment of a BWA network and the consequent offer of services through this system.

d) Radiomóvel, although in a more mitigated form, aligns itself with this position, affirming:

- That preference should be given to interested parties which intend to offer innovative and competitive services, and which do not have sufficient spectrum to offer such services;
- That access to BWA frequency bands should be denied to current UMTS operators, which already hold sufficient spectrum for this type of application and equivalent technology (HSDPA and, in the near future, HSUPA).

e) Neuvex, in a less restrictive posture in terms of access, considers that access to BWA frequency bands should not be restricted but that restrictions should be imposed in respect of the services that will be exploited through BWA.

f) Finally, and although not having a specific position on this issue, it is worth noting the concern of the WiMAX Forum (also mentioned by Alcatel-Lucent and by the Intel Corporation) over possible excessive spectrum fragmentation, as a result of the frequency allocation process.

b) Do you consider that BWA services should be offered nationwide or would it be more suitable to limit them geographically (in which case please give details of the geographic location(s) you consider the service should be limited to)

Opinions were divided on this question, although there was a tendency, specifically among the manufacturers, to favour nationwide operations, a solution considered the most suitable by eight of the fourteen parties that gave a position on this issue.

Five parties manifested opinions in favour of operations with a more regional character, or at least in favour of the possibility of breaking down an operation into geographical areas, in particular:

a) Sonaecom considers that this option could constitute an opportunity, specifically by way of incentives to operators through regional weighting factors, bringing broadband services to areas where the technological and financial conditions needed to ensure the economic viability of an operation are not in place.

The operator also mentions bringing the cost of licensing more in line with the profitability which the authorised undertaking might achieve, taking into account that such cost represents a factor (as demonstrated with FWA) that constrains the capacity of operators to launch commercial operators, especially in respect of a technology which is not yet stable and whose commercial success is still not certain.

b) Emacom considers that in respect of the geographical coverage of services to be provided with BWA, analysis should be made of the particularities of the Autonomous Regions of Madeira and the Azores.

It further notes that, in respect of the Autonomous Region of Madeira, even though the liberalisation of the telecommunications market has allowed various

operators to appear at a national level, the number of operators present in this region is very small, with the result that prices for telecommunication services are higher and that there has been weak implementation of new technologies and services already available on the mainland, such as VoIP or IPTV.

The company emphasises the example of the use of FWA frequencies, where despite usage licenses having been issued for this technology to various operators, just one is using it in the region, with coverage limited to the town of Funchal and for the service only of corporate customers.

The company therefore concludes that in the case of Autonomous Regions, the offer of BWA services delimited to regional territory would provide essential impetus in the creation of a new dynamic in the telecommunications market.

c) Grupo PT considers that:

- In respect of the limited access bands, especially in the 3.6 GHz frequency bands, the most suitable way forward would be to establish a geographical delimitation for the offer of BWA services. This delimitation could be the same or of the type adopted for the resizing of FWA titles, with interested parties being authorised to obtain licenses in one or more regions, including the totality of regions so as to allow national coverage.

d) Likewise, Onitelecom proposes that the geographic delimitations of licensing should follow a similar model to that defined for FWA or in some way differentiate by market, where the distinct residential/corporate and urban/rural components could be distinguished.

It further suggested that the division of the offer of services to be made by operators will necessarily have to be made by geographical areas adjustable to the progressively profitable business models and which are adjusted in an economically differentiated way by type of service and market, with levels of profitability which geographically affect the periods of implementation in accordance with the economic zones and their population density.

The parties which advocate the nationwide offer of BWA services base their position specifically:

- a.) In the existence of problems of roaming, interconnection and coverage, which they consider would be caused by regional operations;
- b.) In the potential infeasibility of the business model of geographically divided operation;
- c.) In the need to ensure great flexibility of use, irrespective of physical location, catalyst of new broadband services, which would require national networks, which maximise this type of opportunity and provide economies of scale;
- d.) In the possibility, even in a national operation, of operators, at any given moment, analysing the opportunities in each region's market, seeking to bring its offers to all customers wherever this has technical and economic basis.

The positions of the respondents who advocated a nationwide approach to BWA are summarised as follows:

- a) The position of Vodafone is that to facilitate and provide impetus to the successful launch of BWA services, these should be nationwide without any geographical delimitation, an option justified by the launch and publication of more attractive proposals able to satisfy the needs to the target customer and broaden the range of services provided.
- b) Grupo PT, in respect of the free access bands, especially in respect of the 5.8 GHz frequency band, considers that the offer of BWA services could be nationwide.
- c) Radiomóvel, Neuvex, Grupo SGC Telecom and the WiMAX Forum give similar positions:

- Radiomóvel and Neuvex, with consideration to the size of the country, the size of the Portuguese market and the geographical distribution of potential customers, have the position that the allocation of spectrum for the offer of BWA services should be done on a nationwide basis.
 - The WiMAX Forum, although not manifesting preference in respect of the licensing process, considers that the possibility of services being offered at a national and worldwide level, allowing roaming, would be advantageous. It further adds that, roaming, interconnection and issues of coverage constitute challenges, in the event that titles of authorisation are at a regional level, which despite being an opportunity for smaller operators should also take into account the viability of business as well as the evolution of the market as far as secondary spectrum trading and consolidation operations are concerned.
 - Grupo SGC Telecom, although not responding directly to the question, claimed that the allocation of these frequencies to Grupo SGC Telecom had the potential of creating a real second operator with national coverage. It also states that licenses with suitable spectrum would allow a provision of services with national coverage in urban and in rural areas, essentially directed at households and SMEs.
- d) The positions set out by the equipment producer companies (Ericsson, Samsung Electronics UK, the Intel Corporation and Alcatel-Lucent) are in a similar vein.

c) *What type of procedures do you consider most suitable for the allocation of rights/selection criteria for BWA systems in the bands mentioned in the Annexes?*

In general the respondents expressed a preference for an allocation of spectrum through public tender, with only the considerations of the models proposed varying, with the following responses standing out:

a) Grupo PT considers two situation:

- In respect of spectrum that has already been allocated: the undertakings holding FWA titles should be able to install and exploit BWA systems with basis in the allocated titles. It does not consider a new allocation of right justifiable and consequently does not envisage any selection process.
- In respect of available spectrum: it considers that the holding of a tender for the allocation of rights constitutes a possible scenario. However, it considers that the conditions necessary for its successful execution are not yet in place, in particular because:
 - ◆ The conditions of BWA exploitation are not yet stable
 - ◆ The technical specifications that the equipment and systems must adhere to are not fully defined or stable.
 - ◆ Equipment and systems do not currently exist in the market that would allow a harmonised and efficient management of the available spectrum and would guarantee the interoperability of systems.

In these circumstances Grupo PT considers that ICP-ANACOM would face great difficulties in preparing a tender regulation and realistic tender specifications.

As an alternative (which it considers to be the most suitable procedure), it states that the allocation of rights could be performed according to the requests of duly authorised interested parties and with basis in concrete projects evaluated, in chronological order, by ICP-ANACOM according to previously quantified and defined criteria and where the efficient use of resources, innovation and the target population could constitute important selection factors. The transparency of the process could be ensured subjecting the draft decision of ICP-ANACOM to a market consultation, as has already been done with other services/projects.

Finally, this company, in view of the characteristics of the Portuguese electronic communication market, does not consider it suitable to allocate rights in a process that involves the auction of frequency blocks, the adoption of which would imply an alteration to applicable legislation.

b) Onitelecom considers that the selection criteria and the allocation of frequency band usage rights should be made by tender, with the proposals presented being evaluated against objective criteria of technical and economic capability on the part of the operators and giving weight to the capability of these operators to demonstrate the viability of their respective projects, as well as suitability of the proposals in terms of the needs for progressive development of services in respect of:

- Quality of service;
- Spectrum management;
- Guarantee of interoperability with other operators

Onitelecom further considers that it is relevant that the experience which the bidders have in the broadband telecommunications market be taken into account, along with their transmission capacities at a national and regional level, in order that the transmission needs demanded by WiMAX technology can be met.

- c) Radiomóvel argues for the adoption of a procedure which would combine the publication of rules and conditions governing the frequency allocation procedure (pre-requisites, spectrum blocks, allocation criteria), stipulating a deadline by which operators, in view of these conditions, could confirm whether they are interested or not, with an auction process, in case of a shortage of spectrum, among undertakings that meet the pre-requisites.
- d) Sonaecom argues for a so-called “beauty contest”, putting forward, in terms of criteria, two aspects which from the offset are seen as relevant: efficient use of the available spectrum and diversity in the offer range.

It further mentions a number of factors which it considers important, such as technological and business know-how, as well as financial sustainability.

d) *What type of requirements, as regards coverage obligations, quality of service, interoperability or other, do you consider should apply to usage rights?*

Opinions on this question are divided between those that consider that there is a need for requirements and those that consider that a minimum of requirements should be imposed.

Of the answers whose views indicated the existence of restriction, the following positions are highlighted:

a) Onitelecom argues for the fixing of obligations arising from short and medium term coverage forecast plans to be presented by the bidders (together with a clear indication of the respective capacity in terms of existing transmission network and backbone) as part of their participation in the tender for the allocation of BWA usage licenses, which should also be linked to the patterns of business development (in order to avoid economic blockage or the profitability of infrastructure not adherent to the market).

It further considers that a set of measurable quality of service parameters should be set which reflect the commitment of the operators, with basis in the capacity of BWA technology and its integration in the network. These parameters should be developed by the bidders, with basis in technical field studies and tests.

Finally, with respect to interoperability, it argues that the operators should guarantee interoperability, insofar as it is technically possible, with all fixed, mobile and similar networks (possibly regulated, insofar as it is technically feasible).

b) Sonaecom considers that the obligation associated with the licenses should be derived from the proposals which win the licensing tender, and that the *ab initio* imposition of obligations should be avoided at all costs, except in respect of the

principle elements such as interoperability and the protection of integrity of public electronic communication networks.

It points out that in the current regulatory framework the services covered by the licenses which will be issued for BWA are already subject to obligations in respect of quality of service and statistical reporting. As such it argues that the definition of new obligations in these areas would not have relevant impact on consumer protection and would merely constitute an additional operational cost for the licensees.

In respect of the payment of spectrum usage fees, Sonaecom mentions two factors, which in its opinion, require attention:

- Priority should be given a cost flexibility in line with the penetration of the service, so that the negative impact in the launch phase of these offers is minimised;
 - While the administrative costs of managing the spectrum should be reflected, there should only be a conservative reflection of the economic value of the spectrum (so that this does not become an obstacle to the development of offers supported by this technology, given the technological uncertainty that still exists and the competitive pressures exerted by competing offers).
- c) Grupo PT considers that, in the event that the allocation is made by selection tender, the titles should set out all the relevant requirements and parameters of the specifications, upon which the tender is based, as well as the relevant commitments and conditions of offer and exploitation according to the project presented by each successful candidate.

Alternatively, in the event that the selection process is performed according to the requests of duly authorised interested parties and with basis in concrete projects evaluated, in chronological order, by ICP-ANACOM according to previously valued and defined criteria, it considers that the requirements referred to in this question should be included in the titles, along with all the commitments, relevant

technical parameters and conditions of offer and exploitation which were set out in the presented projects.

The positions given by parties that argued for the imposition of a minimum of requirements are set out below, with emphasis given, in particular, to the arguments used for the non-imposition of determined obligations:

- a) Radiomóvel considers that the imposition of requirements should be limited to the number of base stations and the obligation to use the spectrum over a determined period of time.

It further considers that the operator has the obligation to report, to the final customer and to the Regulatory Authority, on the quality of service levels offered on its network, which levels could vary according to the type of service and tariff. However it considers that these will be dictated by market demand, by competitiveness in a scenario of free competition and by the innovation of the services offers, and that in the initial phase, any obligation at this level could constitute a barrier to the development of a viable business plan and to success, both for the consumer and for the operator.

As regards interoperability, it considers that this must be ensured at the level of the IP networks, specifically as far as interconnection with other networks is concerned.

- b) Vodafone considers that the regulator should not impose any obligation in respect of coverage and/or installation of a minimum number of base stations, and that the licensee should, at any time, be able to define the coverage necessary in view of the expectations of demand and attempting to satisfy the needs of its customers, in each geographical area, thus leaving the onus of the decision in the hands of market and competition forces.

The company further considers that any spectrum fees charged by ICP-ANACOM should be defined in an objective and transparent way, in accordance with the

administrative costs incurred through its management control and the application of the general authorisation regime, in order to not constrain the return on investment in stations and, as a result, limit the dynamism of the product and/or service offers based on this technology.

Finally it considers that the criteria associated with the effective use of the frequency should be carefully defined in order to avoid interference between entities using adjacent bands.

- c) Neuvex argues against special obligations in respect of coverage criteria, given that the emerging BWA technologies are based on IP which already has national distribution and that the quality of service criteria should be the same as those demanded for existing broadband services (for example VoIP, IPTV, etc.).
- d) Alcatel-Lucent argues a broader position, proposing that it should be left to the operators to decide on issues related to technology, services and applications, according to their adopted business models, without altering the terms of the license. It admits, however, the possibility of the regulator defining some conditions associated with the use of licensed spectrum frequencies, recommending (as part of its response to question 2.b) that the license conditions should be adapted to the geographical specification and the economic development objectives of the country, without losing sight of the viability of the operators' business models.
- e) The Intel Corporation further emphasised that the spectrum should be consigned in a fair and proportional way, in order to avoid situations where spectrum is retained but not used.

e) *Do you consider that BWA services will complement or coincide with other existing or future technologies (in operation or planned) in the same or other frequency bands?*

From the responses to this question it can be seen that the majority of the parties (eight to be exact), consider that the offer supported by BWA will complement the offer associated with other technologies. Accordingly, their position is that by doing so it will provide a widening of the zones covered, a strengthening of the capacity, and as a consequence, of the offer of services, according to the location of the user and the type of services desired in each case.

The offers identified as being potentially complemented by BWA include those supported by Wi-Fi, DSL, 2G e 3G, with the following being pointed out:

- The potential of WiMAX for *IP-based*, bit stream wireless broadband communication, which could be used to strengthen the data component of a 3G network (while one of the parties explains that in urban areas, the large number of stations needed, in view of the need for line of sight (LoS) connections, and the complexity involved in obtaining authorisations from condominiums and municipalities implies such a large investment that the potential of BWA to compete effectively would be minimised in areas where the fixed broadband technologies are well implanted);
- The possibility of BWA, in a first phase, of providing not only broader coverage through its own means, but also addressing new segments of the market, thanks to the ease of installation and development of coverage without the need for physical networks of third parties and, in the second phase, the implementation of changing location functionalities and the development of nomadic services, maintaining characteristics typical of fixed services, and the

potential application of WiMAX for backhaul applications, both for Wi-Fi hotspots and for cellular networks.

Some of the parties also considered that BWA technologies would contribute, in the long term, to the convergence of services, especially as the industry evolved towards 4G and advanced IMT technologies, as Samsung Electronics UK explained, as referred to in the development of the a new IEEE project on the 802.16m standard.

It is important to also point out that three of the parties cited the relevance of the role that BWA could play in the provision of services in rural and remote areas, less well served by other broadband technologies such as cable or DSL.

Emphasis should be given to the position of Sonaecom which also considers that in urban areas BWA would be a difficult alternative for new operators who desire to enter the market or even for existing operators who don't have an existing network to which BWA would bring significant synergies. As such it mentions that the mobile operators seem well positioned, given the synergies that they could obtain.

Four other parties considered that the offer of BWA supported services would complement and at the same time compete with the offer associated with existing technologies. Of these parties, emphasis should be given to the position of Neuvex which sets out which offers it considers to be complementary, stating that "the offer of BWA supported services may complement other existing technologies as in the case of wireless operators (GSM, UMTS, CDMA2000, etc.) and work in competition in the case of fixed operators (fixed telephone service, cable broadband, etc.)".

Manuel de Azevedo, U. Lda, emphasises the competing character between technologies, arguing that "the service supported by BW in areas of coverage could easily compete with the services of cable through its mobility and with other services for example 2.5 e 3G through its bandwidth". The same party also states that it envisages that "BWA could compete with other services owing to the low cost of its data equipment".

Reference should also be made to the suggestion of Onitelecom for the need to making pilots viable in real time, with a view to testing the technical performance of BWA networks and the compatibility between systems and services.

3.4. INTRODUCTION OF BWA SYSTEMS IN THE MARKET

a) *What conditions do you consider important for the successful implementation of BWA technologies?*

The responses received allow the conditions considered important for the successful implementation of BWA to be divided into three categories: technological aspects, regulatory issues and market conditions.

a) In respect of the technological aspects it should be noted that five parties clearly specified the minimum consignment of spectrum that they considered suitable, although they did not agree on the values. Three of the parties also considered it important that there should be standardisation of equipment in order to promote interoperability. Two parties also cited the need for harmonisation of work bands.

The lack of technological constraints, the possibility of operators determining and managing the guard bands so as to allow maximum spectrum efficiency, the guarantee of the possibility of expansion through spectrum reservation, the availability of terminal equipment at low cost and integration of the WiMAX chipset in portable computers, as well as the operation of NLoS are other technological factors individually cited by various parties.

b) Regarding regulatory issues, the non-imposition of restrictions on the usage model was emphasised by five parties. Three respondents are supporters of flexibility in the terms of licensing and the regulatory framework. The following positions were also stressed:

- Licenses should be awarded for realistic periods of time (15-20 years);
- The rules of allocation and the costs inherent in the licenses have great importance;

- Operator obligations should be as unrestrictive as possible;
- Regulation is needed in the area of antenna installation (BS and terminals) in municipalities and condominiums, in order to harmonise and simplify current procedures and bring about a reduction in costs;
- The intellectual property rights associated with the technologies should be controlled and enforced.

c) With respect to coverage, there is a difference of opinion: of the parties that gave a position on this subject in the context of this question (which is specifically covered in question 3.b)), two considered national coverage to be suitable, while two others argued for a licensing model that allowed regional and national licences' in accordance with the business plans presented.

Other regulatory issues were also raised by different parties:

- The provision of spectrum on a fair and equitable basis;
- The allocation of licenses to operators which present the best business plans and best use of the spectrum for the offer of wireless broadband services;
- The guarantee of interconnection between different operators;
- The frequency allocation process being ruled by neutrality of technology and services.
- Ease of access and swift licensing of sites;
- The timely allocation of spectrum;
- The lack of regulatory constraints;
- The allocation of frequencies in the 3.4 GHz – 3.6 GHz band;
- The costs associated with the reduced rights of spectrum use;
- The need to review ITED legislation.

- d) Regarding market conditions, it is noted that two parties cite, as an important factor for the successful implementation of BWA technology, the involvement and level of awareness among the general public as to the framework and control of correct use of radio technologies, especially in respect of the risks and impact for public health.

b) When do you consider that BWA technologies will have the necessary conditions for successful implementation in the Portuguese market?

In response to this question the majority of parties consider that only a few of the BWA technologies identified in question 1.a) already meet the necessary conditions for their successful introduction in the Portuguese market. Sharing another view, three of the parties consider that the conditions needed for the introduction of BWA in our market already exist. One other party also stated that, through IMT-2000/UMTS, the services associated with BWA were already available.

The remaining parties that gave a position on this subject, a total of four, indicated the beginning of 2008 for the effective implementation of BWA services in Portugal. They stated, however, that the success of the introduction and the spread of this technology depends unequivocally on the technological, regulatory and market conditions which are created and provided in the Portuguese market.

c) *In what way would you be interested in using and eventually commercialising BWA technologies?*

Of the operators who responded to the consultation, eight showed an interest in using BWA technology:

- a) Emacom *“as a telecommunications operator is interested in using BWA as a way of complementing, at an access network level, the “Backbone” of fibre optic, which it has in A.R.M., being able therefore to turn itself into an operator of services, especially of “triple play””;*
- b) Neuvex considers that the *“use of BWA (WiMAX) (...) technologies, with the authorisation of the regulator for the supply of ISP services, Fixed Telephone Services and VoIP, would allow an independent connection with the final customer, making it therefore an interesting business model for a new operator in the market and so benefiting the final customer (for example by reducing costs, improving response times, etc.) REDVO (NEUVEX) considers the use and/or provision of backhauling using a BWA technology to be an interesting prospect”;*
- c) Onitelecom *“considers that BWA technologies, attractive in the short term in the corporate market, could constitute a business opportunity, provided that a number of parameters that are essential for its viability are complied with, especially:*
 - *Validity of the expectation of price erosion in the first commercial version, comparatively to the current technologies supported by LLU;*
 - *Development of terminal equipment that supports traditional voice and data services;*
 - *Compatibility/Interoperability between the equipment of different manufactures;*

- d) Grupo PT *“is interested in using all technologies, especially BWA, that permit the broadening of its commercial offer range and contribute to the development of the Information Society”*;
- e) Radiomóvel *“manifests the upmost interest in the use of BWA technologies, considering the development of an innovative and flexible operator to be viable, given the growing demand and effective existence of a market for innovative access services to wireless broadband”*;
- f) Sonaecom *“has a clear interest in the use of BWA technologies, which it will in the meantime have to validate through in-depth research in respect of the tender for spectrum allocation, with attention to the conditions governing the execution of such a tender, as well as (i) to the structural limitation of the market that can be targeted by these technologies and (ii) the important technological and business risks (...)”*;
- g) Vodafone *“considers that these new technologies could complement its broadband offer and could be a strong impetus for broadband penetration in Portugal. Accordingly, provided that the technical and economic rationale of the license process is ensured, Vodafone would be interested in its use and commercial exploitation”*;
- h) Grupo SGC Telecom indicates that *“...the allocation of frequencies to Grupo SGC creates the potential of having a real second operator, with national coverage, fundamentally wireless and with an integrated alternative structure.”*

3.5. OTHER RELEVANT POINTS

A number of additional considerations were presented, in particular:

- a) The position is expressed that ICP-ANACOM should take the following factors into consideration in choosing the regulatory framework for the introduction of BWA in Portugal:
 - Level of international harmonisation of frequency bands;
 - The extensive use of the bands under consideration;
 - Duration and cost of spectrum consignment;
 - Needs of future spectrum availability;
 - Technological neutrality;
 - Interoperability and roaming as essential factors for success on a large scale;
 - That the transmission of title of usage rights is an issue of spectrum secondary trading which is a complex and high risk process which, to be successful, depends on the participation and actions of all interested parties including ICP-ANACOM;
- b) Given that discussions on the subject being analysed in this consultation are still at an early stage, some of the parties consider that the market should be heard out again prior to the allocation of frequency usage rights, at which time the market will be in a position to make an assessment which is more considered and which has more basis in the potential of BWA, the availability of equipment and the additional information of manufacturers;

4 CONCLUSIONS AND ACTION PLAN

Broadband Wireless Access (BWA) is a term that describes new wireless broadband technologies, encompassing fixed, nomadic and mobile type applications.

In light of the growing interest in this area, ANACOM has launched a public consultation on the introduction of BWA in Portugal, taking into account the positions that have been debated in the European Union (EU), especially the European Commission (EC) and the European Conference of Postal and Telecommunications Administrations (CEPT), as well as the results of ANACOM's own public consultation on Fixed Wireless Access (FWA), which resulted in a reformulation of FWA usage rights. It should be noted that it is the BWA application in general that is under consideration and not any specific technology system (not limited to nor excluding WiMAX type systems or other technologies already operating in the market).

ICP-ANACOM notes with pleasure the interest that the consultation has stirred in a wide range of participants, and would like to highlight the positive and constructive nature of the majority of responses.

ICP-ANACOM takes all the comments received in the present public consultation into due consideration, having in the meantime carried out its own assessment from the perspective of the objectives of regulation as defined by Electronic Communications Law and having in due consideration the positions of the respondents in the context of the communications market.

In line with other situations in which public consultations have been carried out, it is the position of ICP-ANACOM that it should clarify that the principle objective is to hear the opinion of a range of market stakeholders, in order that it may formulate its own decision. While the comments received will be taken into consideration, this does not mean however that the position of ICP-ANACOM will be defined in accordance with the majority of responses, given that the public consultation is not an exercise in choice but a hearing.

In this context and taking the comments received into careful consideration, ICP-ANACOM has reached a more comprehensive reflection on the topics connected to BWA, also taking into account recent national and international developments. It was therefore possible from that moment to identify the key issues underlying the process of spectrum allocation for BWA applications, as well as the position adopted by ICP-ANACOM on these subjects.

The principle conclusions reached by ICP-ANACOM in this area are set out below.

4.1 FREQUENCY BANDS, TECHNOLOGIES AND TYPES OF USE

In terms of the international framework, it is appropriate to mention the recent developments at an international level, especially of the EC and CEPT. In response to the EC mandate on BWA, requesting the study, in particular, of the current degree to which bands are harmonised for BWA in Europe and of the frequency bands that are most suitable for the introduction of BWA applications, the CEPT concluded essentially that:

- The development of BWA applications in the 3400-3600 MHz and 3600-3800 MHz is practicable, enabling flexible modes of spectrum use (fixed, nomadic and mobile mode)⁴, based on the principle of technological neutrality, provided that it is tied to the application of a minimum set of technical parameters;
- The 5725 – 5875 MHz may be provided for the development of BWA, with basis in the principle of technological neutrality, provided that there is

⁴ The terms “fixed”, “nomadic” and “mobile” correspond to the definitions set out in Recommendation ITU-R F.1399-1.

compliance with the technical and operational limitations, with use of frequencies being limited to fixed and nomadic modes.

On the other hand, it should be highlighted that the CEPT recently approved⁵:

- Decision CEPT/ECC/(07)02 on BWA applications in the 3400-3800 MHz frequency bands⁶. In conformity with the above, this Decision envisages the use of BWA applications in “flexible mode”, i.e. fixed, nomadic and mobile, taking into account the technical considerations, duly explained in this Decision, in order to allow the implementation of this “flexible mode”;
- Recommendation CEPT/ECC (06)04⁷ on the use of the 5725-5875 MHz frequency band for Broadband Fixed Wireless Access (BFWA). This Recommendation sets out the technical parameters for guaranteeing the coexistence between the various radiocommunications systems existing in these bands. It should be noted that the modes of use in question do not include “mobile mode”.

In respect of the national framework, it should be remembered that following publication of Administrative Rule no 1062/2004 of 25 August and the consultation carried out of FWA operators for the manifestation of interest in using frequencies, a two stage action plan was defined (Stage I and Stage II).

⁵ See www.ero.dk

⁶ “on availability of frequency bands between 3400-3800 MHz for the harmonised implementation of Broadband Wireless Access systems (BWA)”

⁷ “use of the band 5725-5 875 MHz for broadband fixed wireless access (BFWA)”

In Stage I, having heard companies holding FWA licenses, ICP-ANACOM proceeded with the reformulation of spectrum usage rights in accordance with the model set out in the abovementioned Administrative Rule and with the interest and needs duly demonstrated by the companies. Additional spectrum requests were not considered at this stage.

In Stage II, in light of the spectrum available and the undertakings interested in it – which included undertakings already in possession of FWA usage rights as well as other undertakings not yet in the market - ICP-ANACOM will thereby define its mode of allocation.

In this context, taking into account the above and the majority of the responses received, ICP-ANACOM intends to make the 3400-3600 MHz, 3600-3800 MHz and 5725-5875 MHz frequency bands available for BWA, but with the use of the latter limited to fixed and “nomadic” mode⁴.

It should be noted that in line with Administrative Rule no 1062/2004 of 25 August, it will enable the use of allocated frequency bands with support for the respective transmission networks, provided that the technical conditions are adhered to and, in line with the responses received, ICP-ANACOM will not restrict their use to specific technology (WiMAX or any other), but subject to the concerns of minimising adjacent channel interference, especially through Block Edge Mask (BEM).

In the case of 3600-3800 MHz frequency bands, the fact that these are also allocated to the Fixed Satellite Service (FSS), especially for space-earth connections, in accordance with NFAP⁸, gives rise to a need for the adoption of specific measures⁹,

⁸ such as in the Radiocommunications Regulation of the International Telecommunication Union

⁹ For example the need for advance coordination prior to the installation of BWA exchange stations

not applicable to the 3400-3600 MHz frequency bands, in order to ensure coexistence between BWA and FSS applications.

4.2 METHOD OF SPECTRUM ALLOCATION

4.2.1 24.5-26.5 GHz AND 27.5-29.5 GHz FREQUENCY BANDS

It should be remembered that the 24.5 – 26.5 GHz frequency bands, under Stage II of the process of FWA reformulation have already been submitted to a full accessibility regime, as identified in the National Frequency Allocation Plan (NFAP). On the other hand it is clear from this consultation that the 27.5 – 29.5 GHz band does not yet have the conditions that enable the exploitation of BWA applications in a harmonised way, although ANACOM will keep this under close review.

4.2.2 5725-5875 MHz BAND

As mentioned above, in accordance with the recent CEPT determinations, this band will be available for BWA applications (excluding “mobile mode”) but subject to determined technical and operational limitations for spectrum use. It should be noted in particular that, the standards which aim to ensure compatibility between the various systems in operation in this frequency band are still in development.

Taking into account the studies carried out in the CEPT, ICP-ANACOM considers that use of this band shall be in regime of full accessibility with the application, specifically, of a regime of radio licensing exemption being set out.

Various tests for verifying the technique of *Dynamic Frequency Selection* – DFS are currently underway at an international level, an essential requirement for guaranteeing coexistence between the various radiocommunications services operating in this band. The results of these tests will be essential for reaching a final decision on the solution to be adopted in terms of radio licensing. It should also be noted that it is the intention of the European Commission to confer a mandate on

CEPT with a view to verifying the compatibility conditions between these application and existing technologies in the same band.

4.2.3. 3400-3600 MHz AND 3600-3800 MHz FREQUENCY BANDS

Given the high number of manifestations of interest in the use of these bands, according to the responses received, and view of the need to (i) guarantee an efficient use of frequencies, (ii) maximise benefits for users and (iii) facilitate the development of competition, ICP-ANACOM envisages the possibility of associating each right of frequency use with a 2x28 MHz quantity of spectrum, noting that this is the value currently consigned to FWA operators.

In this context, consubstantiating with the start of Stage II of the FWA process for the 3400-3800 MHz frequency band, 2 blocks of 2x28 MHz will be made available for each sub-band, with a total of 4 blocks (i.e. 2 blocks in the 3400-3600 MHz sub-band and the other 2 blocks in the 3600-3800 MHz sub-band).

Additionally, it is the position of ICP- ANACOM that priority will be given to a model of allocation of usage rights by zones and, in this context, maintain in relation to the block of frequency whose allocation regime it is now intended to define, the territorial division set out in Administrative Rule no 1062/2004.

Accordingly, while the arguments in favour of national allocation have been carefully considered, ICP-ANACOM accepts the opinions of the parties that favour an approach based on the allocation of spectrum by geographical zone and considers that this is the model which best (i) ensures flexibility in terms of the offer of BWA services, (ii) promotes BWA in “info-excluded” zones and (iii) contributes to a greater degree of competition.

4.2.3.1. CONDITIONS OF ACCESS

In respect of the frequency usage rights allocation procedure, particularly in the 3400-3800 MHz band, the majority of the responses received pointed to a selection method based on tender, which takes into account criteria based on the technical and economic capacities of the bidders.

Nevertheless, some of the respondents to the public consultation warned of the difficulties associated with the execution of the tender regulation and specifications in a realistic manner, in view of the fact that the conditions of BWA exploitation and the technical specifications to which the technical equipment must adhere are not yet stable.

Under the terms of article 31 of Law no 5/2004 of 10 February, it is only permissible to limit the number of frequency usage rights for allocation where such is necessary for ensuring the efficient use of frequencies, with particular consideration to be given to the need of maximising benefits to final users and encouraging the development of competition.

Such a decision is subject to the general consultation procedure, by which users and consumers shall be heard.

In these situations ICP-ANACOM must publish a decision, with due basis, to limit the allocation of usage rights, and at the same time define the allocation procedure, which may be selection by competition or comparison, namely auction or tender.

In any circumstance, when the number of frequency usage rights is limited, the selection procedures and criteria shall be objective, transparent, non-discriminatory and proportional, taking into account the objectives set out in article 5 of the Law¹⁰.

¹⁰ As defined in paragraph 4 of article 31 of the Law of Electronic Communications.

Among these objectives, of key relevance for the question being discussed are the provisions of point a) of this article, which stipulate that an objective of regulation shall be “to promote competition in the provision of electronic communications networks, electronic communications services and associated facilities and services”, with the detail set out in paragraph 2 of article 5:

- “To ensure that users, (...) derive maximum benefit in terms of choice, price, and quality”;
- “To ensure that there is no distortion or restriction of competition in the electronic communications sector”;
- “To encourage efficient investment in infrastructure, and to promote innovation”;
- “To stimulate efficient use and to ensure the effective management of radio frequencies and numbering resources”.

Accordingly, limiting the allocation of rights to use the 3400-3600 MHz and 3600-3800 MHz frequencies appears to be a clear option, taking into consideration the spectrum available and the interest manifested within the scope of this public consultation.

In the process of defining the draft determination on the procedure of allocating the usage rights for these frequencies, ICP-ANACOM, taking the contributions received through the public consultation into careful consideration, gives particular importance to two of the points raised:

- The need to allocate frequencies from a perspective of technological neutrality;
- The emergent character of BWA and the relative instability of some of the components associated with the provision of related services,

With consideration to the desired flexibility of implementation – among others, the possibility (i) of operation in different modes (fixed, nomadic, mobile), (ii) of using

different technologies (maintaining the principle of technological neutrality) and (iii) of distinct operation in different geographical zones, as well as being accordance with a range of minimum technical requirements -, to the emergent character of this type of operation in particular, and to the need to bring the value of the spectrum in question close to the reality of the market, it is considered that the most suitable selection procedure, for the purpose of selecting the undertakings to whom frequency usage rights is to be allocated, shall be the auction process.

The choice of this process is seen in this case as being the form of allocation that has the most transparency for all interested parties, that causes less of an interference to the operators' business plans and creativity (given that specific obligations are not set in terms of coverage and services, among others, and the operators can react with more agility to competition and trends in demand, technology and the market in general), stimulating the efficient use of the spectrum by the bidders, and further reducing motivation for the request of spectrum where there is no intention of use.

In addition, as argued by some of the respondents to the public consultation, it would be difficult to carry out the parts of the tender with rigour, an observation that is equally applicable to the drawing up of the bids themselves, which would be little more than expression of intention by the bidding companies.

In the meantime it is the position of ICP-ANACOM that the introduction of BWA should be equally viewed as an opportunity to promote competition in the offer of electronic communication services and networks, permitting the entry of new operators into the market.

Accordingly it is considered that, in the first phase, restrictions on access to the frequencies concerned could be imposed on operators already installed in the market with competing offers. At a later date, and in the event that new proposals are not seen to appear on the market, and in order to guarantee the operation of BWA, non-attributed frequencies will be auctioned. This is seen as the best form of contributing,

in a way that is completely transparent and proportional, to the increase of competition in the market.

In this content, and with consideration to the regulatory framework in force, in respect of the method and conditions for the allocation of spectrum in the 3400-3600 MHz and 3600-3800 MHz frequency bands for BWA, ICP-ANACOM is considering:

- Holding an auction, to be carried out in two stages and with pre-qualification conditions;
- In the first stage of the procedure (*Stage A*) access will be denied to undertakings which:
 - Already hold rights to use frequencies in the 3400- 3800 MHz frequency bands;
 - In analysis of the market, have been designated as being holders of significant market power in the market of the wholesale provision of broadband access (market 12);
 - Have at their disposal rights to use frequencies for the provision of the public terrestrial mobile service.
- In a second stage of the auction (*Stage B*), in the event that there is available spectrum remaining after the first stage, access will be permitted to all undertakings, without exception, with the amount of spectrum to be placed in the market being evaluated at this opportunity, according to criteria of contestability.

In this context ICP-ANACOM is to set, for undertakings that obtain frequency usage rights, a period following the date on which spectrum usage rights are allocated, during which spectrum trading is prohibited, in order to guarantee that the undertakings, to whom frequency rights usage are allocated, enter the market with the clear objective of providing electronic communication services, seeking to obtain

a return on the investment made in the acquisition of spectrum usage rights through the provision of these services, and so avoid behaviours that are merely speculative.

It is further considered that in Stage B of the auction, the allocation of spectrum could be subject to the limitation of the “mobile mode” being implemented only following a determined waiting period after the date on which rights were allocated in Stage A (where these are allocated) in order to safeguard the existence of effective conditions of competition in the market, in view of the fact that in Stage B, operators with competing technology already installed in market will be able to access remaining spectrum and that such operators will have a competitive advantage over those operators that obtained the spectrum in the previous stage (Stage A). Accordingly, in order to define a global framework containing the issues intrinsic to the selection procedure, ICP-ANACOM will submit the limitation on the number of rights for allocation and the selection procedure to the general consultation procedure.

4.2.3.2. FREQUENCY USAGE RIGHTS ALLOCATED IN 3400-3800 MHZ FREQUENCY BAND AND THE FWA PROCESS

As part of the process of reformulating the usage rights in respect of frequencies for the exploitation of the FWA system, the following were maintained in the titles of Novis Telecom SA (Novis) and of PT Comunicações SA (PTC) respectively: a block of 2x28 MHz, corresponding to the 3633-3661 MHz and 3733-3761 MHz frequency bands, for geographical zones 1, 2, 3, 4 and 7, and a block of 2x28 MHz, corresponding to the 3410-3438 MHz and 3510-3538 MHz, for geographical zones 1, 3, 5, 6 and 7¹¹.

The qualifying titles so issued restrict the use of these frequency bands to the exploitation of the Fixed Wireless Access (FWA) system, with the use of technological systems based on the IEEE 802.16 (WiMAX) standards, and subject to the decision taken by ANACOM in respect of the introduction of BWA, taking into account in particular, the promotion of competition in the offer of electronic communications networks and services and of the efficient and effective use of frequencies¹².

It is important to now set out the regime applicable to these situations, since it is certain that the alteration of usage rights will always be subject to the procedures set out in article 20 of Law no 5/2004.

In this context, considering on the one hand the need to promote frequency use that respects technological neutrality, as well as the flexible use of the spectrum and, on the other, to ensure sound competition in the markets, it is the position of ICP-ANACOM that these undertakings may, under the frequency usage rights which they hold, use the spectrum in fixed and nomadic mode.

¹¹ Frequency Usage Rights ICP-ANACOM no 8/2006 and 7/2006, respectively.

¹² Articles 2 and 8 of the qualifying titles.

In the event that such is their position and this is required, ICP-ANACOM may allow “mobile mode” use following the elapse of a “waiting period” (i.e. the time elapsed subsequent to the allocation of rights as result of Stage A – where these are allocated – until such time as the use of “mobile mode” is permitted by undertakings that currently possess frequency usage rights in this band) in respect of the allocation of the spectrum as part of Stage II for this band.

4.3 CHRONOGRAM

In view of the above, although there are several issues that require further consolidation, the following is an envisaged timeframe for making the 3400-3600 MHz and 3600-3800 MHz and 5725-5785 MHz frequency bands available:

