# Consulta Pública sobre os Direitos de Utilização

# da Faixa de Frequências 2500-2690 MHz

## Intel Corporation® Response

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Intel Corporation (Intel) welcomes the opportunity to provide our views and comments in response to the "Consulta Pública sobre os Direitos de Utilização da Faixa de Frequências 2500-2690 MHz**".**

Intel's responses to this consultation can be seen in Annex 1.

Yours Sincerely,

Claude Pin
Wireless Standards and Regulations Manager
Intel Corporation SAS (France)

# Annex 1 – Questões

## 3.1 Disponibilização da faixa 2,6 GHz

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| 1. Concorda com a disponibilização em Portugal da faixa 2500-2690 MHz para serviços de comunicações electrónicas acessíveis ao público? |

*1) Would you agree with making 2500-2690 MHz available in Portugal for electronic communications (I assume "data services") accessible to the general public?*

Intel supports technology and service neutrality and believes that Operators are best able to determine the technology most suitable for their business model. This is a fundamentally important position which is maintained throughout this consultation report and influences the responses to the questions asked.

Currently IP and OFDMA based IMT-2000 standards such as LTE and WiMAX seem the most likely candidate technologies for the 2.6 GHz band.

Next Generation Mobile Network architecture is planned which will provide affordable and new innovative broadband services (lower cost per bit advantage).

Intel supports WiMAX based on IEEE 802.16e-2005 as our technology of choice for delivering this next generation fixed, nomadic and mobile personal broadband

WiMAX is the first IP and OFDMA based IMT-2000 standard. The OFDMA technology has become commonly accepted as the basis for the evolution of mobile technology towards 4G, as it can provide cost effective high data rate capability and excellent support for new features such as advanced antenna technologies to maximize coverage and the number of users supported by the network. OFDMA (specifically, the air interface designated "WirelessMAN-OFDMA" within IEEE 802.16) provides multipath and interference tolerance in non-line of sight (non-LOS) conditions to achieve ubiquitous broadband coverage in a wide range of operating environments and usage models, including full mobility.

## 3.2 Conjugação da faixa 2,6 GHz com outra(s)

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| 2. Qual a sua opinião em relação a conjugar o espectro a disponibilizar nos 2,6 GHz com alguma(s) outra(s) faixa(s) de frequências? P.f., indique de modo fundamentado que combinações considera apropriadas e como eles contribuem para os objectivos estabelecidos no nº2 do artº 15 da LCE. |

*2) What is your opinion regarding tying the spectrum to be made available in 2.6 GHz with other frequency band(s)? Please indicate what combinations would you consider appropriate and how would them contribute to the objectives defined in nº2 of artº 15 of LCE (Electronics Communications Law).*

Intel supports the EC Decision 2008/477/EC and in particular Article 2 which states that "No later than six months after entry into force of this Decision Member States shall designate and subsequently make available, on a non-exclusive basis, the 2 500- 2 690 MHz band for terrestrial systems capable of providing electronic communications service…."

Intel does not oppose aggregating 2.6 GHz spectrum with spectrum available in other bands, but such aggregation should not delay the assignment of the 2.6 GHz spectrum. Intel recommends Anacom to award the 2.6 GHz band as flexibly and as soon as possible to satisfy the growing demand for mobile broadband services.

### 3.3 Serviços e tecnologia

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| 3. Que tipo de serviços poderão ser desenvolvidos no âmbito da utilização de espectro desta faixa?<br>4. Quais as tecnologias disponíveis ou perspectivadas para a faixa?<br>5. Qual a sua opinião em relação à atribuição de direitos de utilização para a faixa 2500-2690 MHz numa base de neutralidade de serviços de comunicações electrónicas e de |

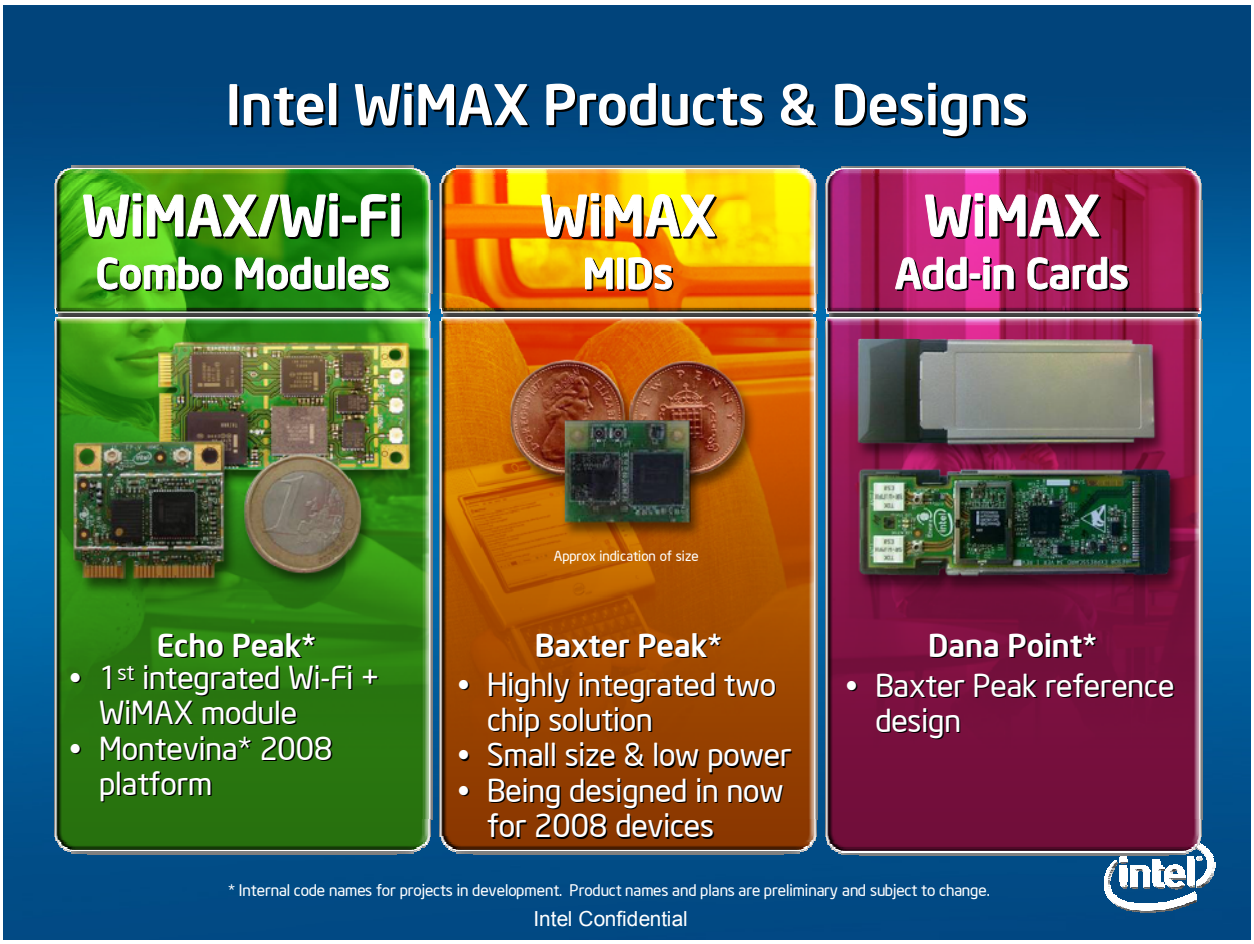
Intel fully supports Service and Technology Neutrality. We believe the 2.6 GHz band can deliver next generation mobile broadband services and in addition voice (via VoIP). We expect the broadband experience to be at least the same but in most cases significantly better than today's 3G (ITU, IMT-2000) with an expectation of providing 4G (ITU, IMT-Advanced) capabilities as technologies evolve.

Intel believes that improving rural area coverage and increasing access to mobile internet will benefit tourism in country and commercial industries such as shipping and leisure. Providing ubiquitous broadband coverage, whether wired or wireless, will also benefit the real estate market in Portugal and improve property acquisition. Introducing a wireless solution will provide consumers with an ADSL alternative for broadband access and thus foster competition which will in turn reduce end-user costs and increase penetration. Expanding broadband connection outside of the city will increase the trend to tele-work from home. This will reduce fuel usage and pollution. Moving from a fixed/nomadic type experience to a truly mobile broadband experience will make it possible to tele-work outside of the home. This is where broadband wireless connectivity is required.

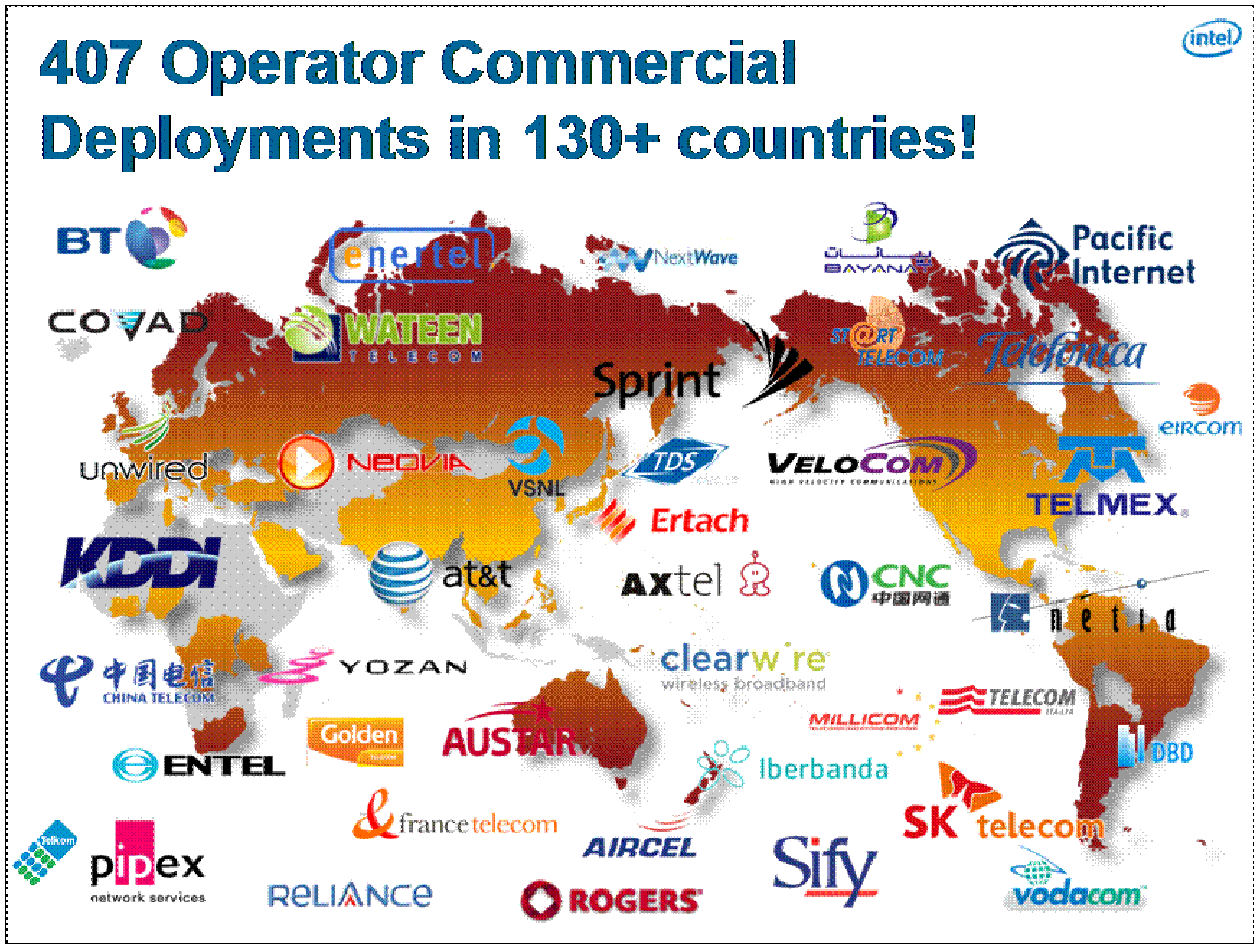
*4) What technologies are available or planed for the band?*

There is significant demand for a wireless mobile broadband experience from a consumer perspective as well as from an Operator perspective as can be seen from the activity across the whole of Europe and indeed globally.

Here is some example of real Intel products. More details on Intel product roadmap can be provided if required.



The diagram that follows indicates WiMAX trials and commercial deployments.




The WiMAX System Profiles and Currently Approved Certification Profiles applying to the 2.6 GHz band being the following.

| SYSTEM PROFILES | CERTIFICATION PROFILES | | |
|---|---|---|---|
| | Spectrum | Duplexing | Channel Width |
| **Mobile WiMAX** (IEEE 802.16e-2005, OFDMA) | 2.496 - 2.690GHz | TDD | 5, 10 MHz (dual) |

Currently **30 products** have been certified against the MP05 profile for the 2.6GHz band and are available today

For all bands of interest, the situation is reflected as follow.


The WiMAX Forum estimates that by 2011 there will be more than 1,000 Mobile WiMAX Forum Certified products found throughout the world.

*5) What is your opinion regarding the attribution of the rights to use the 2500-2690 MHz in an electronic communications service neutral basis and in a technological neutral basis (including IMT)?*

Intel fully supports Service and Technology Neutrality.

### 3.4 Âmbito de utilização

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| 6. Concorda com a atribuição de Direitos de Utilização de âmbito nacional para a faixa dos 2,6 GHz? |

*6) Would you agree with the concession of Usage Rights in a nationwide basis for 2.6 GHz?*

Intel prefers National licenses or large regional licenses that can be easily aggregated. Collaborative arrangements between Operators should be allowed to enable an improved business case and maximise coverage. Operator coordination should be encouraged and partnerships with Government could be useful.

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| 7. Considera que devem ser impostas obrigações de cobertura (área e/ou população)? Em caso afirmativo, com que faseamento?<br>8. Que outras condições considera necessário estabelecer no âmbito da atribuição dos direitos de utilização para a faixa dos 2,6 GHz? |

*7) Would you consider that coverage obligations should be imposed (area and/or population)? In case of yes, what should be the phasing/timeline?*

*8) What other conditions would you consider necessary to define regarding the rights to use the 2.6 GHz band?*

Intel believes that the greatest economic benefit comes from the sustained utilisation of the spectrum and we encourage its use rather than allowing spectrum to lie fallow. However, Intel does not recommend mandatory "roll-out conditions" because they can impose significant and unnecessary overhead costs. They can also disfavour new entrants.

Intel supports infrastructure sharing since this minimises capital expenditure and reduces time to roll-out networks. We recommend that the regulatory environment enables infrastructure sharing but not necessarily mandate it.

### 3.5 Canalização FDD/TDD

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| 9. Concorda que a partição de espectro FDD/TDD tenha como base a Decisão CEPT ECC/DEC/(05)05? Em caso afirmativo, das duas alternativas apresentadas nas Figuras 1 e 2, qual a utilização de espectro que considera mais adequada para os 50 MHz centrais da faixa dos 2,6 GHz? Justifique. |

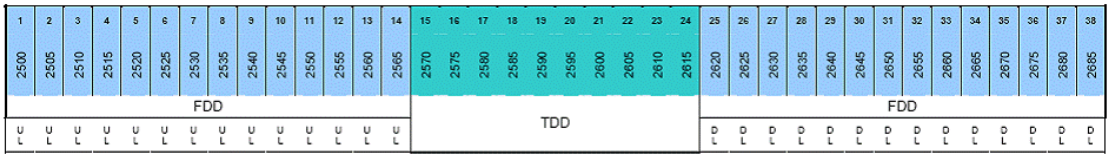



**Figura 1 – Alternativa 1 de canalização proposta na Decisão ECC/DEC/(05)05**

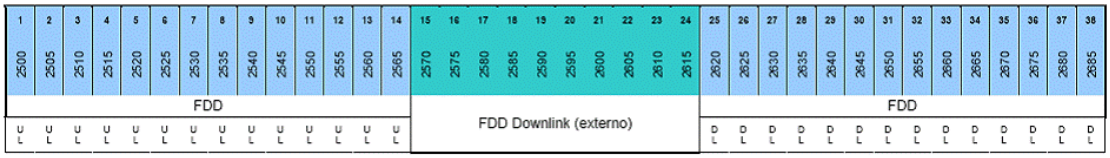



**Figura 2 – Alternativa 2 de canalização proposta na Decisão ECC/DEC/(05)05**

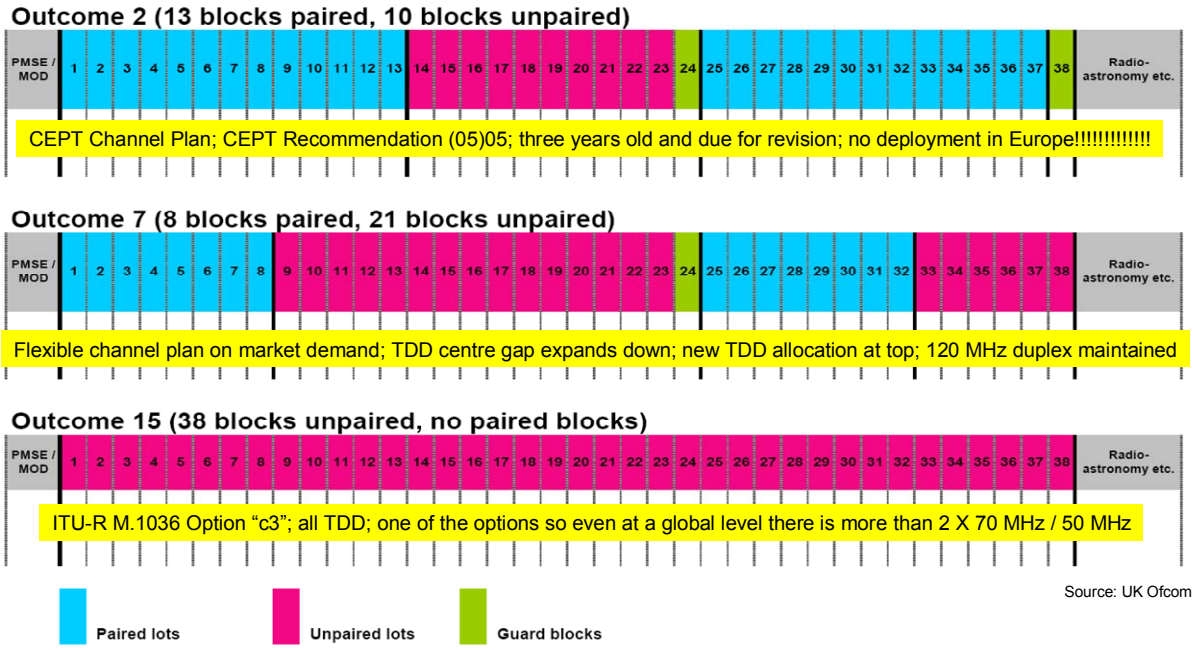
*9) Would you agree with the FDD/TDD partition of the spectrum as based on CEPT ECC/DEC/(05)05 decision? In case yes, considering the two alternatives presented in Figures 1 and 2, what spectrum utilization would you consider more suited for the 50 MHz center gap of the 2.6 GHz band? Justify.*

It is clear that the European Commission is empowering Administrations to take a more market-based approach to spectrum management and assignment which is fully aligned with Intel's position. This flexibility maximises the available spectrum based on Operator's requirements while still allowing for some FDD with a 120 MHz duplex spacing. This flexibility is exactly how the UK will be releasing the 2.6 GHz band in 2009

The diagram below highlights some possibilities for releasing the 2.6 GHz band which has been provided by UK Ofcom. There are many market-based options available and three are shown –

- Typical implementation based on ECC Decision(05)05 with 2 X 65 MHz paired with a 50 MHz unpaired allocation plus two 5 MHz co-ordination channels
- A theoretical example of a market-based approach to the paired / unpaired allocation in this instance showing 2 X 40 MHz paired with a 105 MHz unpaired allocation plus one 5 MHz co-ordination channel
- A 5 MHz raster as defined within ITU-R Recommendation M.1036 showing ultimate flexibility

# UK 2.6 GHz Auction; TDD/FDD Flexibility




"*Spectrum is critical to enabling next generation of converged services; major implications for* ***competition & innovation*** *in communications sector*"

*Source: UK Ofcom*

Intel suggests that not precluding the possibility of deploying TDD in paired spectrum can also assist to maximize the greatest chances of sustainable deployments.

Operators need sufficient spectrum to build a profitable and scalable network. Economic viability of a service provider's business case is highly sensitive to the size of the spectrum allocation license. Operators will not be able to offer affordable broadband services with insufficient spectrum and this in turn will adversely affect the range of services and service quality. In line with the European Commissions desire to increase flexibility in the 2.6 GHz band through their WAPECS initiative, Intel recommends that a market-based approach is employed to determine the paired / unpaired split. Following on from the WiMAX Forum recommendation on spectrum requirements per Operator which suggest a minimum of 30 MHz contiguous is required it is clear that if only the 50 MHz "centre gap" is made available for unpaired then only one fully efficient Operator would be enabled. Our recommendation excludes any co-ordination or guard band (restricted) requirements where necessary.

Intel acknowledges the importance of maintaining the 120 MHz duplex spacing for paired deployments but recommends sufficient unpaired spectrum is available for more than 1 Operator subject to market demand.

Intel suggests that the licence duration should be a rolling 20 years to provide Operators with a significant opportunity to build-out a network and achieve a return on their investment.

### 3.6 Condições técnicas de operação

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| 10. Qual a sua opinião em relação à implementação da limitação da potência máxima intrabloco para as Estações de Base a 25 dBm/5 MHz (incluído na "BEM de parâmetros mais restritivos") no espectro adjacente entre sistemas FDD /TDD e entre sistemas TDD não sincronizados?<br>11. Qual a sua opinião em relação à possibilidade de se poder incrementar a potência máxima intra-bloco das Estações de Base, de 61 dBm/5 MHz para 68 dBm/5 MHz, de acordo com as condições descritas em [4]? |

*10) What is your opinion regarding the implementation of the maximum intra-block power limits for Base Stations at 25 dBm/5 MHz (including at "Block Edge Mask - BEM of more restrictive parameters") in adjacent bands between FDD/TDD systems and between non synchronized TDD systems?*

Intel would encourage inter operator agreement rather than imposing a power limit. The power limit could apply in the absence of any bilateral agreement between the licensees…

*11) What is your opinion regarding the possibility of increasing the intra-block maximum power of Base Stations from 61 dBm/5 MHz to 68 dBm/5 MHz, according to the conditions described in [4] CEPT report #19?*

Intel would support an increase in BS power where it is appropriate and detailed in CEPT Report 019

### 3.6.2 Emissões fora de bloco

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| 12. Qual a sua opinião sobre a implementação de BEMs para Estações de Base e acordo com as condições mencionadas no Anexo da Decisão 2008/477/CE [5]?<br>13. Qual a sua opinião sobre a implementação de BEMs de parâmetros menos restritivos para Estações de Base de acordo com as condições mencionadas no Anexo da Decisão 2008/477/CE [5] ("relaxed" BEM)? |

*12) What is your opinion about the implementation of BEM for Base Stations following the conditions mentioned in the Annex of Decision 2008/477/CE [5]?*

*13) What is your opinion about the implementation of BEM with less restrictive parameters for Base Stations following the conditions mentioned in the Annex of Decision 2008/477/CE [5]? ("relaxed" BEM)?*

Intel supports the work undertaken by CEPT in response to the Commission mandate to develop the least restrictive technical conditions for frequency bands addressed in the context of WAPECS, in particular the Block Edge Masks (BEMs) which were subsequently codified for the EU in the Commission Decision of 13 June 2008[1].

### 3.7 Coordenação entre operadores

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| 14. Qual a sua opinião no que respeita à possibilidade de negociação dos parâmetros técnicos entre operadores, desde que os acordos alcançados não prejudiquem outras utilizações / serviços? |

*14) What is your opinion regarding the possibility of operators negotiating technical parameters amongst them, provided the agreements reached do not jeopardize other utilization / services?*

Intel fully supports inter-operator coordination as the best way to resolve coexistence issues and maximize the efficient utilization of the spectrum. This is recognized also in the EC Decision 2008/477/CE.

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| 15. Qual o seu parecer no que respeita a intervenção do ICP-ANACOM na gestão de interferência entre redes vizinhas quando satisfeitas as condições técnicas da BEM? |

*15) What is your perspective on ICP-ANACOM interventions regarding managing interference between neighbour networks when BEM technical conditions are met?*

[1] "on the harmonisation of the 2 500-2 690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community"

Intel would like to highlight two key points with regard to the EC Decision and the use of restricted blocks. First, the Commission deliberately departed from the suggestion of the earlier ECC Decision[2] regarding the band and did not mandate how the restricted blocks should be assigned. Moreover the Commission deliberately stated that the technical parameters were for application "in the absence of bilateral or multilateral agreements between neighbouring networks, without precluding less stringent technical parameters if agreed among the operators of such networks."

Taken together theses principles provide the framework for the most efficient use of the band. By allowing the restricted blocks to be assigned independently of the rest of the spectrum, and allowing operators to negotiate between themselves to determine alternate arrangements, they provide the incentive and opportunity for the market to make the most efficient use of the entire band. Indeed in many cases it will be possible for operators to coordinate their spectrum planning to keep adjacent bands sufficiently separated geographically, or use other mitigation techniques such as synchronization, so that the "restricted blocks" could be used without restrictions.

### 3.8 Número de direitos de utilização

16. Qual deverá ser o espectro mínimo por operador para viabilizar a operação nas subfaixas 2500-2570 MHz e 2620-2690 MHz (FDD), tendo em conta os serviços/mercado planeado? Fundamente.
17. Qual deverá ser o espectro mínimo por operador, tendo em conta os serviços/mercado, para viabilizar a operação na sub-faixa 2570-2620 MHz para cada uma das alternativas possíveis, TDD e FDD externo?
18. Qual deverá ser o espectro máximo FDD (e TDD, se for o caso) por operador que considera adequado na faixa dos 2,6 GHz?

*16) What should be the minimum amount of spectrum per carrier to make operations viable within 2500-2570 MHz and 2620-2690 MHz bands (FDD), considering the services / targeted markets? Provide rationale.*

Intel has no comment on this question.

*17) What should be the minimum amount of spectrum per carrier, considering the services / markets, to make operations viable within 2570-2620 MHz bands for each of the possible alternatives, TDD and external FDD?*

The WiMAX Forum has published an assessment of the spectrum requirements for widespread deployment of Mobile WiMAX systems in the WiMAX Forum white paper titled "A Review of Spectrum Requirements for Mobile WiMAX™ Equipment to Support Wireless Personal Broadband Services" from September 2007[3].

The white paper concludes that a minimum of around 30 MHz of usable spectrum per operator is likely to be sufficient for urban areas but highlights that this is not a unique answer. A range of scenarios needs to be considered and certain operators may require additional spectrum to establish a viable business case.

*18) What should be the maximum FDD spectrum (and TDD, if that is the case) per carrier that would you consider adequate for the 2.6 GHz band?*

Intel does not support any specific upper bound in this band as increased spectrum can be beneficial to encourage a truly broadband user experience and the development of new applications. However, policy makers should

[2] On harmonised utilisation of spectrum for IMT-2000/UMTS systems operating within the band 2500 – 2690 MHz" (ECC Dec. (05)05 from 18th March 2005)
[3] http://www.wimaxforum.org/documents/downloads/Spectrum_Requirements_for_Mobile_WiMAX_Sept2007.pdf

consider whether the acquisition of spectrum by a particular firm in a particular area would significantly lessen competition in the relevant service markets.

### 3.9 Modelo de atribuição

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| 19. Assumindo haver necessidade de limitar o número de direitos de utilização de frequências em relação à faixa dos 2,6 GHz, que modelo de atribuição considera adequado? Identifique as vantagens dessa opção face a outras. |

*19) Under the assumption of a need to limit the number of usage rights in the 2.6 GHz band, what should be a more adequate assignment process? Indicate the advantages of this option versus others.*

Intel does not comment on the detailed design of the award procedures but supports processes such as those proposed that facilitate a market based mechanism for the award. Intel supports a two phase approach with a preliminary phase to determine the relative interest in TDD and FDD allocations followed by bidding on defined sets of channels which have been assigned to minimize the number of guard bands. Allowing operators to bid on this basis in the pre-allocation phase gives a good indication of how the market sees the optimum allocation. Prior to the second phase, the Authority should decide on the best band plan that minimizes the number of guard bands needed. Furthermore, we believe that operator coordination should be allowed to minimize interference wherever possible.

### 3.10 Acesso ao espectro

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| 20. Considera que o acesso ao espectro nos 2,6 GHz deve ser aberto a todos operadores / prestadores? Em caso negativo, justifique e identifique as categorias de operadores / prestadores que considera que deveriam ser excluídos ou condicionados no processo de atribuição de espectro, nomeadamente à luz do nº2 do artº 15 da LCE. |

*20) Would you agree that the access to 2.6 GHz spectrum should be granted to all carriers / service providers? In case no, justify your answer and define categories of carriers / service providers that you would consider should be excluded or controlled (imposing conditions) in the process of spectrum assignment, considering nº2 of artº 15 of LCE.*

Intel has no comment on this question.

### 3.11 Calendário

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| 21. Qual a sua opinião em relação à realização do processo de selecção até ao terceiro trimestre de 2009? Caso considere adequar-se outra calendarização, queira p.f. indicar a mesma. |

*21) What is your opinion regarding the selection process happening up to the third quarter of 2009? In case you have a different suggestion, please inform.*

With reference to the above information, Intel believes that the mobile broadband market need for this spectrum exists today and therefore encourages the Portuguese administration to start award licenses as soon as possible. This approach would be consistent with EC Decision 2008/477/EC.