



PUBLIC CONSULTATION REGARDING
THE INVESTIGATION TO GRANT
RIGHTS OF USE FOR RADIO FREQUENCIES
IN THE 2.6 GHz BAND

Intel Corporation® Response

To: EETT,
60 Kifissias Avenue,
15125 Maroussi, Athens,
Greece

Electronic mail address: 2.6GHz@eett.gr

Name of respondent: Claude Pin
Wireless Standards and Regulations Manager
claud.pin@intel.com
+33 6 8771 5817

Representing: Intel Corporation SAS
Address: "Les Montalets" - 2 rue de Paris - 92916 Meudon cedex - France

Date: Wednesday, 01 April 2009

Intel Corporation (Intel) welcomes the opportunity to provide our views and comments in response to the "Public Consultation regarding the Investigation to grant rights of use for radio frequencies in the 2.6 GHz band".

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

Yours Sincerely,

A handwritten signature in blue ink, appearing to be "CP", written over a light blue horizontal line.

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

Annex 1 – Questions

1. Introduction

Q1. Do you deem that there is interest for the acquisition of rights of use for radio frequencies in the 2.6 GHz band and the subsequent network development that will provide (broadband) electronic communication services?

Intel considers the 2.6 GHz band as a key global band for the deployment of mobile broadband. Therefore we supports the award of the 2.6 GHz spectrum at the earliest opportunity.

Currently IP and OFDMA based standards seem to be the most likely candidate technologies for the 2.6 GHz band. Mobile WiMAX is being deployed in the 2.6 GHz band around the world. More than 60 companies are developing silicon and end user devices, more than 40 companies are developing products for infrastructure. It is forecasted by the WiMAX Forum that more than 1000 WiMAX products will undergo testing by 2011.

Mobile WiMAX based on IEEE 802.16e-2005 is Intel's technology of choice for delivering the next generation fixed, nomadic and mobile personal broadband. LTE, another OFDM-based IMT-2000 system, is also being considered as a candidate by the UMTS community but is a couple of years behind WiMAX.

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.

Mobile WiMAX (specifically, the air interface designated "OFDMA TDD WMA" within IMT-2000 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.

Subject to the usual commercial agreements it is perfectly feasible that the spectrum would be used in a very short timeframe using readily available technology. Mobile WiMAX is a technology that exists today and is being deployed globally.

Q2. Which type of services and applications you deem that will be developed in the case that rights of use for radio frequencies in the 2.6 GHz band will be granted?

IP based technologies will allow consumers to benefit from a wide array of applications via fixed, nomadic and mobile broadband services. Rapid improvements in microprocessors are making possible radios that are smarter and more flexible. For example, low-cost, small form factors like Ultra-Mobile PCs (UMPCs) and Mobile Internet devices (MIDs) containing Intel's embedded Wi-Fi/WiMAX card combination solutions for broadband services, can provide ubiquitous communication.

The availability of ubiquitous radio communication will help to spread rapidly services/applications requiring real broadband like entertainment, e-commerce, e-education, e-health, e-government, security and different kind of new applications.

5. The Greek environment

Q3. Do you believe that the networks that will be deployed in the 2.6 GHz band will operate competitively, complementarily or as substitutes against the existing networks? Will they provide the same types of services, or are they expected to be differentiated in some terms? What could be their main competitive advantage?

Intel believes that the 2.6 GHz band can be utilized to deliver a wide range of next generation mobile broadband services including voice (via VoIP). We believe that ample spectrum can be made available in this band to provide a broadband experience significantly better than today's 3G with an expectation of providing even more advanced capabilities as technologies evolve.

The perception of whether any new innovative technology is complementary or competitive depends very much in the eye of the beholder. If one is a MNO without a vision to deploy a broadband overlay then it would be easy to see this opportunity as being competitive. If one accepts the potential to deploy a new broadband overlay then it would indeed be complementary. New operators are likely to see it either way depending upon their strategic business plans as they may plan to compete with an existing MNO or possible consider partnering.

The main competitive advantage is the ability to provide true broadband wireless services at lower cost.

Q4. Do you believe that the networks that will be developed in the 2.6 GHz band will be commercially viable, taking into account the late entry into the market, compared with other providers that are already active with networks operating in frequency bands where similar services can be provided?

Fixed broadband solutions in Greece show signs of saturation in the coverage of large cities (copper infrastructure) and economic deployment difficulties (fiber). The commercial results of WiMAX networks already deployed across the globe show that the 2.6 GHz band offers certainly a viable alternate enabling the growth of the PC market and the massive shift to mobility for the benefit of Greek citizens in getting access to broadband services.

Intel believes that there is demand for true broadband services. OFDMA technology, especially WiMAX, can provide substantial benefits to operators. The commercial viability of any network deployment depends upon many variables, including the opportunity to gain access to spectrum at a sensible cost and a regulatory structure that allows operators to offer a wide range of services.

6. Technical Issues

Q5. Do you agree with the most likely 2.6 GHz band uses as they are identified by EETT? Are there any other uses or technologies that should be reported?

Intel agrees with the uses of the band identified by EETT. We note that Mobile WiMAX (IEEE 802.16e-2005) can support voice (via VoIP) in addition to broadband data services

Q6. How much spectrum (in MHz) you deem that serves your business plans for the 2.6 GHz band (a) for TDD technology and (b) for FDD technology?

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 Commission 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. We provide further details in our response to Question 7 below.

Following on from the WiMAX Forum recommendation on spectrum requirements per Operator which suggest a *minimum* of 30 MHz contiguous spectrum per operator 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. Intel recommends excluding any co-ordination or guard band (restricted) requirements where necessary.

Q7. What is in your opinion the advisable spectral quantity for each awarded Right in the 2.6 GHz band, so that the probability of market success is maximized while ensuring the necessary competition?

Intel believes that the quantity of spectrum awarded so be based upon market demand. Furthermore, we believe that the amount of paired/ unpaired spectrum made available should also be based upon market demand.

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 –

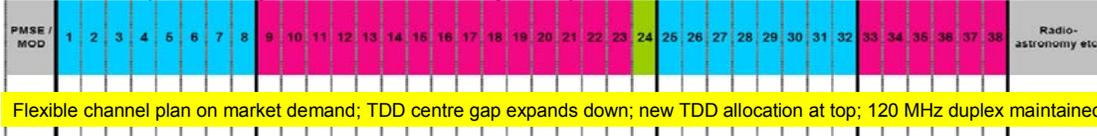
- Typical implementation based on ECC Decision(05)05 with 2 X 65 MHz paired with a 50 MHz unpaired allocation plus two 5 MHz co-ordination channels
- A theoretical example of a market-based approach to the paired / unpaired allocation in this instance showing 2 X 40 MHz paired with a 105 MHz unpaired 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

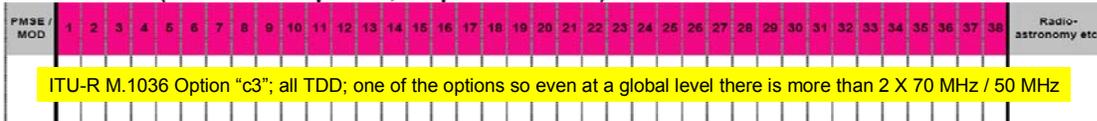
Outcome 2 (13 blocks paired, 10 blocks unpaired)



Outcome 7 (8 blocks paired, 21 blocks unpaired)



Outcome 15 (38 blocks unpaired, no paired blocks)



■ Paired lots
 ■ Unpaired lots
 ■ Guard blocks

Source: UK Ofcom

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

Source: UK Ofcom

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 Commission 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.

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. We believe that a two-round auction, such as the one proposed by Ofcom, offers the best opportunity to determine market demand for spectrum. The first round of the auction is used to determine the ratio of paired/ unpaired spectrum to be made available. The second round of the auction determines the actual allocation of spectrum blocks.

Q8. What is in your opinion the appropriate allocation of 2.6 GHz band apart from the 2 570-2 620 MHz sub-band?

- i. The channel plan of Decision ECC/DEC/(05)05 should be followed
- ii. Spectrum for TDD technology – in addition to the already allocated 50MHz – should be made available (determine the necessary additional spectrum)
- iii. The market should decide if there is any real need for additional spectrum for TDD technology (possibly via a competitive award process)

Intel supports option iii which allows market forces to determine the amount of paired/unpaired spectrum to be made available. 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 FDD operators to benefit from 120 MHz duplex spacing. This flexibility is exactly how the UK will be releasing the 2.6 GHz band in 2009.

Q9. Do you believe that the right holders should be given the possibility to modify (while the right is in force) the way of operation (FDD or TDD) in accordance with predefined, agreed rules?

Intel believes that consumers and businesses benefit most from technology and service neutral policies. We therefore support any initiative which enables greater flexibility in the terms of existing and new licenses. The licensee should have the freedom to deploy any technology, subject to minimal technical restrictions, that meets their business needs. Intel notes that the frequency band under consideration in this consultation is considered by the European Commission as WAPECS band. The EC has instructed the ECC to develop a set of least technical restrictive conditions to enable greater technology flexibility; Intel is fully supportive of this activity. These conditions have been completed for the 2500 – 2690 MHz and 3400 – 3800 MHz bands and conditions are under development for the so called digital dividend band.

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

7. Market Elements

Q10. Do you believe that the award of the 2.6 GHz band will contribute to the further development of electronic communication services in Greece and the enhancement of competition?

Yes, Intel believes that the award of the 2.6 GHz band will contribute to the further development of electronic communication services in Greece. We note that the amount of spectrum available in the 2.6 GHz band can enable operators to deliver a wide range of services including true broadband to Greek consumers.

Q11. Do you believe the 2.6 GHz band should be made available immediately for the deployment of electronic communications services or should its award be delayed (determine the time horizon) and why?

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...."

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

Furthermore, we note that the spectrum is currently not being used. Therefore, Greek consumers and businesses are not able to benefit from the services that could be made available today. Because spectrum is a non-depletable resource, there is no benefit in letting it lie fallow. The value that would be lost by delaying the award of the spectrum licenses cannot be recovered. At a 10 percent discount, one year's delay wastes approximately 9 percent of the net present value of the spectrum in question. Those benefits include both the foregone profits of the operator and benefit to consumers from lower prices, more minutes of use and new capabilities.

Q12. What is the expected time scale for the return on investment related to the development of networks and services in the 2.6 GHz band?

Intel would like to note that the amount of spectrum available to operators has a direct impact on the time scale associated with a positive return on investment (i.e. a sufficient amount of spectrum should be made available to enable an operator's business model).

Q13. Do you believe that the EETT should take measures that will accompany the award of the 2.6 GHz band and which should these be?

Intel has no other comment on this question. Intel supports technology and service neutrality and believes that Operators are best able to determine the conditions 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.

9. Non Technical Regulatory Issues

Geographical scope

Q14. What is in your opinion the optimum geographical scope of the rights of use for radio frequencies in the 2.6 GHz band, national or regional and why?

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.

Roll-out obligations

Q15. Under which preconditions do you deem that the award rights of use for radio frequencies in the 2.6 GHz band, can have a positive effect for the reduction of digital divide for the regions where broadband access does not currently exist?

Intel believes that Operator coordination should be encouraged and partnerships with Government could be useful.

Q16. Do you believe that the rights of use for radio frequencies in the 2.6 GHz band should be accompanied by roll-out obligations and if yes, which should these be?

Intel believes that market mechanisms such as spectrum trading can promote the most efficient use of spectrum.

Q17. Do you deem that the rights of use for radio frequencies in the 2.6 GHz band should be accompanied by coverage obligations for regions that are deprived today from other types of broadband access services?

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.

Q18. Do you believe that the rights of use for radio frequencies in the 2.6 GHz band should be accompanied by additional obligations (apart from the roll-out obligations) and relative terms, so that the competition is protected?

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.

Q19. What should be the appropriate procedure for the award of the rights of use for radio frequencies in the 2.6 GHz band?

Intel firmly believes that a market driven approach provides substantial benefits to consumers and businesses. Intel supports an auction process facilitating a market-based mechanism for the award.

In the specific case of the 2.6 GHz band, Intel supports a two-phase approach where the first phase is used to determine the relative interest in paired and unpaired allocations. During the second phase, bidding occurs on defined sets of channels. Allowing operators to bid on this basis in the pre-allocation phase gives a good indication of how the market sees the optimum allocation of paired and unpaired spectrum. After the first phase is completed, the Authority should decide on the band plan that best meets the market demand for paired and unpaired spectrum while minimizing the number of restricted bands needed. Furthermore, we believe that operator coordination should be allowed and encouraged to minimize interference wherever possible.