Consultation Paper:

The 2.5 GHz Spectrum Band

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Forward

The 2.5GHz band (2500 – 2690 MHz) provides 190 MHz of valuable spectrum and is considered by many to have a significant economic potential. Worldwide it is currently utilised for a wide-range of services, mainly depending on the region under consideration. Further developments in a number of standards have also made high-speed quadruple-play services (Video, broadband access, fixed and mobile telephony) possible in this frequency range.

During 2006 substantial developments have taken place concerning this band, most significantly the announcement in the US by Sprint Nextel, Intel and Motorola, of their intention to deploy a nationwide WiMAX network starting sometime in 2007[1]. Subsequently, a number of leading equipment manufacturers, for example Nokia, have declared their plans for equipment deployment in 2.5GHz band. In fact, Sprint has eventually announced that Nokia will be one of their major suppliers. In addition, at the 21st meeting of ITU's WP 8F (Working Party on IMT-2000 and systems beyond IMT-2000) in January 2007, the IEEE in conjunction with the WiMAX Forum submitted a proposed new IMT-2000 terrestrial interface for inclusion in the IMT-2000 family of interfaces. The proponents have referred to this proposed new radio interface for IMT-2000 as "IP-OFDMA"[2]. This application was approved at the ITU Radiocommunication Assembly held in October 2007.

The fast-paced technological developments and the societal dependence on ICT services, as well as the increased relevance gained by wireless systems, led a number of countries, including European member states, to revisit their spectrum policies concerning the said band. Significant debate has so far surrounded these policy developments with the main issue centred upon the concepts of spectrum harmonisation and liberalisation.

The Maltese Government is aware that these developments could significantly impact the local industry. As muted in the 'Strategic Framework for the Management of Radio Spectrum 2007-2010'[3] published in September 2007 this band is one of the prime candidates for consideration in the short term, so as to benefit from a revised policy. Moreover, this discussion on the 2.5 GHz band has to be considered in the light of the developments taking place in other spectrum

[1] This network was soft launched in December 2007 in a number of major US cities

[2] http://www.itu.int/md/dologin_md.asp?lang=en&id=R00-SG08-CIR-0153!!MSW-E

[3] http://www.mca.org.mt/infocentre/openarticle.asp?id=1119&pref=28

bands, for example the 900 MHz and 1800 MHz[4], and as muted in the policy review, government will be considering and consulting on these bands in the near future.

This consultation paper outlines the current views on the subject and elicits feedback from interested parties that should serve as valuable input to the drafting of a final policy document on the allocation and assignment of the band.

[4] **Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - Rapid access to spectrum for wireless electronic communications services through more flexiblity -** http://eur-lex.europa.eu/Notice.do?list=443168:cs,&pgs=10&hwords=&val=443168:cs&lang=en&nbl=1&pos=1&page=1. Further information is available in Annex C.

1 Background

1.1 International Scenario

On an international level, work on the 2.5GHz band started way back in 1997. At the time, the major future application envisaged for the band was IMT-2000. During the 2000 ITU World Radiocommunication Conference, the 2.5GHz band (2,500 – 2,690 MHz) was identified for the use of IMT-2000, without precluding other uses in the said band:

> *"The bands, or portions of the bands, 1 710-1 885 MHz and 2 500-2 690 MHz, are identified for use by administrations wishing to implement International Mobile Telecommunications-2000 (IMT-2000) in accordance with Resolution [COM5/24] (WRC-2000). This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations."*[5]

In fact the 2.5GHz band is currently allocated to a wide variety of services. In the US this spectrum was assigned for broadband wireless access services. Investment decisions taken by the main licence holders in this band indicate that WiMAX will be the technology of choice for these network deployments.

In Canada the band is also used for broadband wireless access but was originally restricted to fixed operation. In 2006 the Canadian authorities issued a decision that permitted a less restrictive use of the band in question. In practical terms this decision allowed the licensed operators in this band to provide mobile services. Moreover the authorities have embraced a technology neutral approach.

Operators in some of the main countries in South America, namely Brazil and Mexico, have also opted to deploy pre-WiMax networks. A similar situation can be found in Asiatic countries where a number of WiMax trials have taken place. On the other hand, in Africa we have a number of UMTS TDD deployments.

Meanwhile in Australia and New Zealand the band is currently utilized for fixed links by broadcasters. However, the authorities have declared a moratorium on

[5] Provision S5.AAA of WRC-2000: http://www.itu.int/newsarchive/wrc2000/IMT-2000/2500-2690.html#S5.AAA; This is also a footnote to the Articles of the Radio Regulations (5.384A) and is referenced in our National Frequency Plan. The relevant excerpt from the NFP is documented in Annex A.

future assignments and are considering future usage of this band. In New Zealand the concept of technology neutrality was also actively considered in an auction held in December 2007.

1.2 European Dimension

In Europe this band is currently used for a variety of services. Sometimes similar services are provided using different technologies; for example, in some countries (ex. Germany) broadband wireless networks are deployed using UMTS TDD in others (ex. Russia) WiMAX is being used.

In 2002 and 2004 CEPT[6] issued two decisions that designate the 2.5GHz band for IMT-2000 and outline a possible channelling plan. In the meantime, the European Commission is working on a wider concept in terms of spectrum assignments, which focuses on technology and service neutrality, widely known as WAPECS[7]. The Commission is also actively advocating protection of terrestrial services in these bands from satellite networks[8]. This protection will now be enshrined in the ITU Radio Regulations as a result of the work carried out at the World Radio Conference 2007.

However, the global scenario has and is bound to change. New assignment processes have taken place or are being announced at the time of writing that will impinge on the future usage of this band. Of particular interest is the auction that took in Norway in November 2007, as well as the announcements made by the UK, Germany, Netherlands and Sweden of the upcoming assignments in this band.

1.3 Potential Technologies for this Band

All these developments reflect the fact that in recent years a number of standard development organisations, as well as the industry itself, have eyed this band with particular interest.

In fact, this band that so far has been mainly used for fixed services, has been lately considered a valuable band for the deployment of a number of technologies which give network operators the possibility to deploy quadruple play services i.e. voice, data, video and mobility, at considerable speed.

UMTS TDD: UMTS TDD is a packet data implementation of the international 3GPP Universal Mobile Telecommunication System (UMTS) standard.

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[6] See Annex B
[7] See Annex C
[8] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0371:FIN:EN:DOC

One of the largest benefits of using TDD is that it supports variable asymmetry, meaning an operator can dictate how much capacity is allocated to downlink versus uplink. As the traffic patterns for data typically heavily favour the downlink, this results in better use of spectrum assets and higher efficiency.

The non line-of-sight characteristic of UMTS TDD allows access at times when direct view of the tower is not available including indoors. The standard supports tower-to-tower handoff and continuous connections for customers moving up to speeds of 120 km/h and over. Cell radius can be as small as a microcell or as large as 29km.

The majority of deployments and trials were performed in the following bands: 1900-1920 MHz, 2010–2025 MHz, 2.5GHz and the 3.5GHz bands. Despite the fact that most UMTS assignments included a TDD band in the 1900-1920 few deployments have taken place so far.

WiMAX: WiMAX is a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to wired broadband like cable and DSL. WiMAX provides fixed, nomadic, portable and mobile wireless broadband connectivity without the need for direct line-of-sight with a base station.

In a typical cell radius deployment of three to ten kilometres, WiMAX Forum Certified™ systems can be expected to deliver capacity of up to 40 Mbps per channel, for fixed and portable access applications. Mobile network deployments are expected to provide up to 15 Mbps of capacity within a typical cell radius deployment of up to three kilometres.

It is expected that WiMAX technology will be incorporated in notebook computers and PDAs by the end of this year, while mobile phones with WiMAX functionality are expected as early as mid-2008.

The main WiMAX standards are widely known as:

- 802.16d (which provides fixed operation) and
- 802.16e, which is expected to support mobile connectivity.

The standard specification applies across a wide swath of the RF spectrum. However the most popular bands for deployment are the 2.3GHz, 2.5GHz, 3.5GHz and 5GHz bands.

High-Speed Packet Access (HSPA): This is a collection of mobile telephony protocols that extend and improve the performance of existing UMTS protocols. Two standards HSDPA and HSUPA have been established and a further standard HSOPA is being proposed.

The two existing standards (HSDPA and HSUPA) in the family provide increased performance by using improved modulation schemes and by refining the protocols by which handsets and base stations communicate. These improvements lead to a better utilization of the existing radio bandwidth provided by UMTS.

HSDPA provides improved down-link performance of up to 14.4 Mbit/s theoretically. Existing deployments provide up to 7.2 Mbit/s in down-link. Up-link performance is a maximum of 384 kbit/s. HSUPA provides improved up-link performance of up to 5.76 Mbit/s theoretically. In Singapore, a service provider announced a 1.9 Mbit/s HSUPA Service as part of its new MaxMobile plan in 1 August 2007.

Originally these standards were deployed in the Core UMTS bands i.e. 2.1GHz band but recently a leading manufacturer has announced that it will be making available to the market HSPA gear operating in the 2.5GHz band.

Long Term Evolution (LTE): 3GPP LTE is the name given to a project within the Third Generation Partnership Project (3GPP) to improve the UMTS mobile phone standard to cope with future requirements. The goal is to develop a new release of the UMTS standard that will be the basis of the so called 4th Generation Mobile Communications technology, essentially a wireless broadband Internet system with voice and other services built on top.

The aim is to improve efficiency, lower costs, improve services, make use of new spectrum opportunities, and better integration with other open standards. Some specific targets for the project are:

- Download rates of 100 Mbit/s, and upload rates of 50 Mbit/s for every 20 MHz of spectrum
- Sub-5ms latency for small IP packets
- Optimal cell size of 5 km; 30 km sizes should provide reasonable performance, and up to 100 km cell sizes supported with acceptable performance
- Co-existence with legacy standards

A large amount of the work is aimed at simplifying the architecture of the system, as it transitions to an all-IP system.

The LTE group was expected to come up with concrete recommendations by September 2007. However, to date, despite a number of tests being carried out by industry the standard has not been finalised yet.

LTE is expected to have both FDD and TDD flavours though preliminary information on the subject shows that preference will be given to FDD deployments. A number of frequency bands are also being considered including

900MHz, 1800MHz, 2.5GHz and the IMT-core bands, though it is expected that certain bands will be preferred over the others at least in the initial stages of deployment.

So far these technologies were considered distinct and in some instances, as outlined earlier on, this distinction was also reflected in the regulatory regimes adopted by the various jurisdictions. However, with time these differences are becoming increasingly blurred mainly as a result of merging technologies. For instance, lately it is being muted that future releases of LTE and WiMAX will eventually converge.

Moreover, there were also administrative developments such as the inclusion of 802.16 standards in the IMT family. This would immediately make a substantial amount of spectrum currently reserved for IMT available to WiMAX. This is thought to be particularly significant for the 2.5GHz band.

The main advantage of these technologies lies in their wireless nature, which intrinsically leads to faster deployment timelines. The main bottleneck for the deployment of a number of innovative services is the access speed. These technologies could in effect prove valuable in providing end-users with the necessary high-speed data pipe that would enable access to new products being marketed. Such developments could also make a direct impact on the quality of life of the citizens both in terms of bridging the digital divide as well in making healthcare, education and other essential elements more accessible.

2 Local Situation

In 2005, the MCA granted a number of rights of use in the 2.1GHz and 3.5GHz bands for the deployment of Third Generation Mobile Networks (3G) and Broadband Wireless Access (BWA) networks respectively.

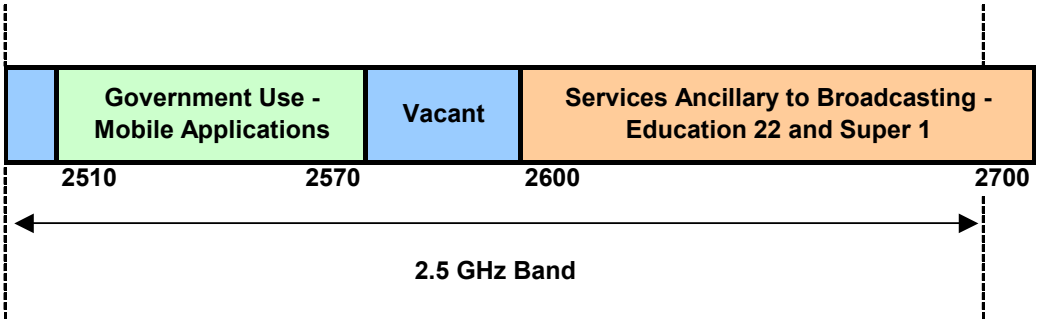
The first 3G network was launched in summer 2006 while the second network was launched in 2007. These deployments have enabled customers of both licensees to start enjoying the new services made possible by this innovative technology. A third 3G licence was awarded in August 2007.

Despite the fact that the 3.5GHz band was assigned on a technology neutral basis all interested parties have from the very start voiced their preference for WiMAX as the technology of choice. In July 2007 the first BWA network based on the 802.16d standard was launched by one of the licensees.

In view of these developments, the 2.5GHz band could prove a valuable resource for investors to further provide innovative and comprehensive services to the Maltese end-users.

2.1 In-Band Allocations

At the time of writing, the band usage is as follows[9]:



As reflected in the relevant entries of the National Frequency Plan (NFP) published in July 2007 there is currently a moratorium on further assignments in the band.

[9] Government Use – 75 MHz; Education 22 – 50 MHz; Super 1 - 50 MHz

> *"No future assignments for SAB services in this band. Under consideration for terrestrial UMTS/IMT-2000 (ECC Dec (02)06 & (05)05)"*[10]

In fact, this consultation paper is an integral part of the process that will define any future modifications in the designation and assignment of the band.

2.2 Adjacent Bands

Any development in the 2.5 GHz band will have to take into account any deployments (both existing and future potential uses) in the neighbouring bands.

In order to provide as comprehensive a picture possible the deployments currently in place in the range of 2450 – 2900 MHz together with their potential allocations (see Annex A) were analysed.

It resulted that in the lower end of the 2.5 GHz band, there is the ISM band, which is populated by services operating on a non-interference, non-protection basis. On the other hand, in the upper bands there is 10 MHz band reserved for radio astronomy, which is currently unutilised, as well as 200 MHz of spectrum used for radionavigation services.

Given the nature of the above-mentioned services these reservations were done by the ITU and apply internationally. As a result, the local situation on this end is very similar to that of other jurisdictions and no particular restrictions will apply to local deployments in the 2.5 GHz band.

Local monitoring campaigns have shown that there are no interference signals from our neighbouring countries on these frequencies.

Further information on the allocation and utilisation of spectrum both locally and in neighbouring European countries can be found on the ERO Frequency Information System[11].

2.3 Migration Process

Given the technological developments previously discussed it is expected that in the near future the MCA will need to migrate existing users of the 2.5 GHz band to other equivalent bands so as to allow local market players to benefit from such

[10] Relevant extract from NFP;
http://www.mca.org.mt/newsroom/openarticle.asp?id=340&source=2
[11] http://www.efis.dk/search/general

innovation. To this effect initial talks are already underway in an effort to develop an adequate migration plan.

2.4 Further Authorisations

It is important to note that in line with spectrum assignments held in recent years, this grant of rights of use will not limit the MCA in assigning other spectrum bands for the purpose of providing similar services in the future.

Moreover, the current state of play, as well as any assignment process undertaken in the near future, does not preclude the Government's right to consider allowing the 2.5 GHz band to be used without the need to obtain a licence. For example, lately a Radio Spectrum Decision was published by the European Commission authorising the operation of UWB equipment in a wide range of frequencies including the band under consideration[12].

It is also possible that the Government may be required to alter its stance and issue further decisions relating to the licensed or licence-exempt use of the spectrum in order to comply with eventual and unforeseen international obligations.

[12] http://eur-lex.europa.eu/LexUriServ/site/en/oj/2007/l_055/l_05520070223en00330036.pdf

3 Implementation Issues

As can be inferred from the discussion thus far, quite a number of issues surround a hypothetical spectrum assignment and subsequent deployment in the 2.5 GHz band. The MCA therefore needs to assess the impact such an assignment could have on the market, so that the subsequent policy addresses any potential pitfalls and maximises the benefits for the Maltese society.

3.1 Technology Neutrality

As outlined earlier in this document, despite the current designation of the 2.5 GHz band for IMT-2000 by WRC-2000 and CEPT, industry developments could lead to other technologies being deployed in this band.

Other European NRAs have obtained proposals/wishes to use both UMTS TDD and WiMAX technology in this band. In this phase, the MCA does not wish to exclude any technical solution but would prefer to view the band as open for all technologies. This is even more so as the distinctions between the various technologies is becoming increasingly blurred.

In line with previous spectrum assignments that, where possible, specifically avoided any pre-emptive choice between the various technologies, the MCA is of the opinion that rights of use allocated in this band are, as far as possible, technology-neutral within the technical frames set by the frequency blocks, in line with the WAPECS concept.

1. **Do you agree that the concept of technology neutrality should be applied to spectrum assignments in this band?**

3.2 Service Neutrality

As outlined earlier on, independently from the technology of choice, a number of services are deemed possible in the 2.5 GHz band. One of the main objectives of the MCA is to foster competition and greater consumer choice. As a result the concept of service neutrality was, in the main, endorsed in all the competitive spectrum assignments held thus far.

The MCA is therefore of the view that any rights of use for spectrum in the 2.5 GHz band should not include any constraints on the type of services that are offered over the resulting networks.

2. Do you agree with the proposal for service neutrality?

3. Do you already have any indications on the possible services to be deployed in the band?

3.3 Assignment Process

A number of assignment methods exist ranging from first come/first served to comparative or competitive processes. Administrative assignment on a first come/first served basis is considered only in those instances where there is sufficient spectrum to meet the market demand.

Where demand for the available spectrum exceeds supply, comparative (i.e. beauty contest) or competitive (such as auctions) selection processes tend to be used, in order to determine which entities will be granted spectrum rights of use. Comparative and competitive processes answer different regulatory requirements and are discussed in detail in the 'Strategic Framework for Management of Radio Spectrum 2007-2010' published in 2007.

The MCA is of the view that an auction would be an adequate assignment mechanism in this case, if demand exceeds supply. However, the MCA is also aware of the need to stimulate investment by new entrants while at the same time giving existing operators the possibility to further enhance their portfolio of services. As a result it is being proposed that one of the bands being assigned is reserved for new entrants[13] ONLY while the other bands are open for ANY bidder.

4. Do you agree with MCA's preference for an auction? Justify.

5. Do you agree that a block of spectrum is reserved for any new entrants? Justify.

[13] A new entrant is defined as a natural or legal person with no shareholding interests in undertakings currently authorised as network providers under the ECRA.

3.4 Spectrum Assignment Block

3.4.1 Channelling Plan

Choosing channel bandwidths or the number of frequency blocks is closely related to the services being implemented as well as the capabilities of the equipment available now and foreseen for the future. The channel bandwidth and a paired/unpaired allocation could affect the technology adopted and therefore the services offered by the successful applicants. There are three main modes of operation for the channels in this band:

Time-division duplex (TDD) refers to duplex communications links where the uplink is separated from the downlink by the allocation of different time slots in the same frequency band.

Frequency division duplex (FDD) is a technique in which one frequency band is used to transmit and another used to receive.

In the case of Frequency Division Duplex (FDD), systems will need to be licensed for a frequency channel consisting of an upper and lower frequency (e.g. 2 x 28MHz in the 2.5GHz band). Time Division Duplex systems (TDD) will need to be licensed for one half of the FDD channel as outlined above (e.g. 1 x 28MHz in the 2.5GHz band).

In the third mode of operation part of the band is used as an **FDD Downlink** channel coupled with an uplink channel operating in an external band.

As highlighted in Annex B, in ECC Dec (05)05, CEPT have proposed a channelling plan based around 5 MHz channels. However, in the US and Canada a channelling plan based on 5.5 MHz spacing is in place. The MCA is of the view that a 5MHz channel spacing is adequate.

6. Do you agree with the 5 MHz channel spacing? Justify.

7. Do you prefer a paired or unpaired allocation? Justify.

3.4.2 Spectrum Requirements

In any successful wireless deployment, spectrum is bound to be the most crucial element. On the other hand, spectrum is a scarce resource and needs to be

appropriately managed. Therefore the size of an assigned band, as well as the number of bands assigned, has to strike the right balance between providing the industry with adequate resources to foster innovation and the need to foster competition by allowing as many operators in the band as is technically feasible.

The size of the assigned band can either be set a priori (ex. a block of 20MHz) or else the assignment process is designed in a way that operators can apply for the individual channels. The latter methodology would lead to an optimal spectrum assignment however it can also lead to one organisation acquiring an extensive portion of the spectrum.

Therefore in this case the MCA recommends the implementation of a spectrum cap. This gives the possibility to all participating parties to acquire sufficient spectrum to enable them to effectively deploy new technologies that complement their other operations, while at the same time preventing as much as possible any spectrum hoarding.

8.	**How much spectrum does your organisation need for an effective nationwide deployment in this band? Justify.**
9.	**How many bands should be assigned?**
10.	**Do you prefer the size of the assigned bands to be pre-established?**
11.	**Do you agree with the concept of spectrum caps? Should there be different spectrum caps for existing and new wireless operators? What would you consider to be an adequate spectrum cap? Justify**

3.4.3 Guard Bands and Spectrum Masks

All wireless operations are legally bound not to create any undue interference to other networks. There are several methods used to control the unwanted emissions namely guard bands and spectrum masks.

Guard bands imply that useful spectrum is left unassigned to act as a buffer between different undertakings operating in the same band. On the other hand, spectrum masks are used to define reduced power levels allowed within critical border channels also known as restricted channels.

ECC Dec (05)05 does not impose any guard bands or spectrum masks. Research conducted by other institutions has shown that the requirements for restricted channels or guard bands, depends on the different implementations adopted by the different licensees i.e. whether they opt for an FDD or TDD deployment.

12. Do you prefer to use spectrum masks or guard bands? Justify.

3.5 Spectrum Pricing

Spectrum pricing can have a significant impact on the subsequent network deployment and could affect the market's competitiveness. On the other hand, spectrum gives the possibility to the rights holder to provide numerous services, and can, in some cases (depending on the bands under discussion) be a scarce resource.

Moreover one has to factor in the pricing for other bands capable of offering similar services. Therefore one needs to determine a satisfactory price point that on the one hand favours sustainable investments while at the same time reflects the real value of the spectrum.

International benchmarks in this band are very limited however initial indications show that a price in line with recent local spectrum assignments for comparable spectrum should be an adequate price.

13. Do you consider the proposed price floor as adequate for spectrum in the 2.5GHz band? Justify.

3.6 Spectrum Trading

Technology innovation has resulted in different standards being developed in the same bands, leading to diverse efficiencies amongst the various deployments. Spectrum trading provides a means for interested parties to acquire rights of use on the secondary market as opposed to the current structure whereby organisations can only acquire spectrum rights directly from Government.

Currently rights of use issued by the Maltese Government are not tradable however as muted in the 'Strategic Framework for the Management of Radio Spectrum 2007-2010' this is one of the issues that need to be considered in depth in the coming months. As a result, rights of use for the 2.5 GHz could eventually be considered as eligible for secondary trading.

14. Would you consider favourably the possibility of being allowed to trade 2.5 GHz rights of use on the secondary market? Explain.

3.7 Conditions of Rights of Use

The MCA's goal is that the assigned spectrum is used to offer publicly available electronic communications services. In order to achieve this goal, the MCA considers that it is important to set clear demands on the development of infrastructure and the offer of services.

3.7.1 Licence Obligations

In line with Government's vision for ubiquitous access to multiple infrastructures and to avoid the creation of a digital divide in any technological area, clear conditions will be included in the rights of use.

The MCA considers that:

- A 36-month timeframe from the grant of rights of use is adequate to deploy a nationwide network in the 2.5GHz band.

15. Do you agree with the licence conditions stipulated above? Justify.

3.8 Other Issues

The MCA would be pleased to receive proposals on any other relevant issues.

4 Proposed Timelines

As discussed throughout this paper, the market and technological developments that have taken place in the past year, call for an appropriate regulatory action. However any policy has to reflect local industry's needs so as to bear the desired fruits. Moreover any action taken at national level needs to be in line with any EU position on the subject.

This consultation is being published with a view to assess the situation of the local market and its views on the subject. Feedback received following this consultation will provide the Authority the necessary information to design an assignment process, if at all required, and determine the timeframes in the best interests of the market and the consumers.

5 Consultation Framework

The MCA invites comments from interested parties regarding this Consultation Paper. The consultation period will run until 16:00pm on Friday 29th February 2008. Comments should be sent to:

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Written representations will be made public by the MCA subject to the MCA's Internal Guidelines on Confidentiality published on 16 December 2004.

Joseph V Tabone

Chairman
15 January 2008

Annex A: Allocations in 2450 – 2900 MHz

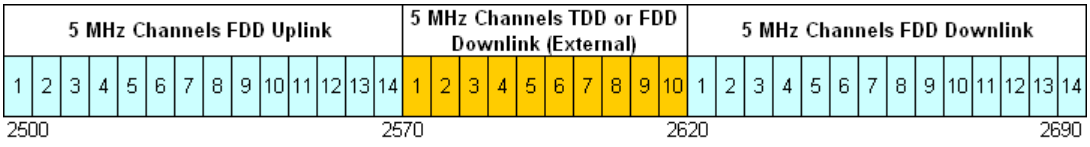
Frequency Band (MHz)	ITU Allocation (relevant to Malta)	National Allocation	Usage
2450 – 2483.5	FIXED MOBILE Radiolocation 5.150	FIXED MOBILE	SRDs & ISM applications: - Non-specific SRDs - WAS/R-LANs - Equipment for detecting movement and alert - RFIDs
2483.5 – 2500	FIXED MOBILE MOBILE-SATELLITE (s-E) 5.351A Radiolocation 5.150 5.371 5.398 5.399 5.402	FIXED MOBILE MOBILE-SATELLITE (s-E)	Mobile-satellite applications ISM applications
2500 – 2520	FIXED 5.409 5.410 5.411 MOBILE except aeronautical mobile 5.384A MOBILE-SATELLITE (s-E) 5.351A 5.403 5.414	MOBILE Fixed	Mobile applications: Government use
2520 – 2655	FIXED 5.409 5.410 5.411 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.339 5.403 5.417C 5.417D 5.418B 5.418C	FIXED MOBILE except aeronautical mobile	SAB applications: broadcasting links Mobile applications: Government use
2655 – 2670	FIXED 5.409 5.410 5.411 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.347A 5.413 5.416 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.420	FIXED MOBILE except aeronautical mobile Radio astronomy	SAB applications: broadcasting links
2670 – 2690	FIXED 5.409 5.410 5.411 MOBILE except aeronautical mobile 5.384A MOBILE-SATELLITE (E-s) 5.351A Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.419 5.420	FIXED MOBILE except aeronautical mobile MOBILE-SATELLITE (E-s) Radio astronomy	SAB applications Mobile-satellite applications
2690 – 2700	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)	
2700 – 2900	AERONAUTICAL RADIONAVIGATION 5.337 Radiolocation 5.423	AERONAUTICAL RADIONAVIGATION Radiolocation	Radionavigation applications

Annex B: CEPT Position

In 2002 CEPT issued a decision ECC Dec (02)06 designating that:

- The 2500-2690 MHz frequency band shall be available for IMT-2000 systems by 1st January 2008.
- 2520-2670 MHz shall be used by land-based (terrestrial) systems.
- Channelling plans and details regarding the use of 2500-2520/2670-2690 MHz should be determined by the end of 2004.

Following a mandate from the European Commission, CEPT studied possible channelling plans and in 2004, ECC Dec (05)05 was issued. The latter decision designated the whole band for terrestrial IMT-2000 and determined that the spectrum had to be made available by 1st January 2008 upon request. This decision also proposed a channelling plan for the whole band as follows:



The channelling plan has two main features:

- 5 MHz channel bandwidth
- 120 MHz channel spacing between uplink and downlink channels for FDD operation.

However, according to the ECC Rules of Procedure, edition 4, Cascais, October 2005.

> *Decisions that "designate" a frequency band for a harmonised application do not inhibit radiocommunication equipment meeting different standards from operating in an identified frequency band provided it offers the same spectrum use and application as specified in a Decision for the band and is placed on the market in conformity with the essential requirements i.e. it makes effective use of the spectrum allocated to terrestrial/space radiocommunications so as to avoid harmful interference.*

This means that in those countries where the market demonstrates an interest for uses other than the harmonised purpose, the regulators may determine whether it is appropriate for the band to be utilised accordingly. Moreover adoption of CEPT decisions is voluntary.

Annex C: WAPECS Concept

In line with the European Commission's objectives outlined in the i2010 Strategy, policy development is currently underway to facilitate spectrum access through market mechanisms. A fundamental underlying concept for such a system to be implemented is **Wireless Access Platforms for Electronic Communication Services** (WAPECS).

In the RSPG Opinion[14] published in November 2005, WAPECS is defined as:

> *'A framework for the provision of electronic communications services within a set of frequency bands to be identified and agreed between European Union Member States in which a range of electronic communications networks and electronic communications services may be offered on a technology and service neutral basis, provided that certain technical requirements to avoid interference are met, to ensure the effective and efficient use of the spectrum, and the authorisation conditions do not distort competition[15]'*.

Work is currently underway in a number of European committees to develop this concept, particularly the Radio Spectrum Policy Group (RSPG), the Radio Spectrum Committee (RSC) and the Communications Committee (COCOM). In July 2006 the European Commission has issued a mandate[16] to CEPT to investigate the possibility of implementing WAPECS in a number of bands including the 2.5GHz. The final report on the subject was finalised in December 2007 and should provide valuable input to the policy development process concerning this band. In 2008 the European Commission is expected to develop further this concept particularly in the light of the results achieved through the CEPT mandate.

[14] http://rspg.groups.eu.int/doc/documents/meeting/rspg8/rspg_05_102.pdf

[15] This is without prejudice to the services pursuing identified general interest objectives. See for example recital 6 of the Framework Directive.

[16] http://europa.eu.int/information_society/policy/radio_spectrum/docs/current/mandates/ec_to_cept_wapecs_06_06.pdf#search=%22EC%20Mandate%20WAPECS%22