Consultation Paper:

The Future of the 900 MHz and 1800 MHz Spectrum Bands

Malta Communications Authority
Valletta Waterfront, Pinto Wharf, Valletta FRN1913, Malta, Europe
Telephone: +356 21 336 840
Facsimile: +356 21 336 846
Web: http://www.mca.org.mt

Table of Contents

Foreword

The 900 MHz (880 – 915 MHz / 925 – 960 MHz) and the 1800 MHz (1710 – 1785 MHz / 1805 – 1880 MHz) bands provide 110 MHz of paired spectrum. Since 1994, a number of licences were assigned to local operators in these bands. These rights of use are due to expire in 2010 and 2011.

Given their inherent propagation characteristics these bands, particularly the 900 MHz band, are considered to have significant economic potential. Since the early 90s these bands were earmarked at an international level for the provision of mobile communication systems, with the GSM standard being undisputedly the most popular technology deployed in these bands. Today over two billion subscribers worldwide have a GSM connection.

With the increasing popularity of mobile services other technologies were developed to enable operators to deploy services other than the traditional voice and short messaging services (SMS). New standards were developed such as GPRS, EDGE and finally in 2003 we witnessed the first deployments of UMTS, the 3rd generation standard for mobile services. Today's UMTS networks are already being upgraded with the latest standards, namely HSDPA and HSUPA, to offer higher data rates which should ultimately result in a better mobile experience for the end users. All these technological developments have given mobile operators the possibility to offer not only voice and data services but also innovative multimedia services such as video streaming.

To date UMTS networks have been rolled out in the 2.1 GHz band (1920 – 1980MHz / 2110-2170 MHz). However, given the significantly superior propagation characteristics of the 900 MHz and 1800 MHz bands, numerous studies were carried out and a number of trials confirmed the possibility to deploy UMTS in both the 900 MHz and 1800 MHz bands. This was followed with the announcement towards the end of 2007 of the first commercial launch of UMTS in the 900 MHz band in Finland. More recently other commercial operators announced their intention of deploying UMTS in the 900 MHz band.

Technology is moving forward at a fast pace and 4th generation mobile technologies are already being developed. In this case, the potential of these bands was also recognised. In fact the Long Term Evolution (LTE) standard is expected to be initially developed for the 900 MHz and the 2.5 GHz bands, with the 1800 MHz band being earmarked for future releases of this standard.

Technological developments and the upcoming licence expiry could have a significant impact on the local industry. Moreover Government is cognisant of the

need to give the operators concerned adequate prior notice with respect to the future assignment of spectrum in these bands.

This consultation paper outlines the proposed assignment methodology and licence conditions for these bands and elicits feedback from interested parties that should serve as valuable input to the drafting of a final position.

1 Introduction

The upcoming expiry of the licenses in the 900 MHz and 1800 MHz bands requires the MCA to establish the procedure for the reassignment of these licences and presents an opportunity to revisit the terms and conditions linked to the rights of use of the spectrum in these bands.

This document reviews recent developments in Europe relevant to this spectrum, analyses the local scenario and puts forward for consultation the proposed terms and conditions to be attached to the rights of use of this spectrum once re-assigned and the relative assignment methodology.

2 Background

2.1 Technologies and Technical Characteristics

Apart from GSM which to date is the most popular mobile standard, other standards have been developed, such as UMTS and HSPA, and others are still being defined, such as LTE. An overview of these standards is provided in Annex C which also highlights the advantages offered by these technologies.

The main advantage of mobile technologies lies in their wireless nature. On the other hand, access speed when compared to fixed line solutions remains the main bottleneck for the deployment of a number of innovative services. New technologies that provide high-speed data wireless connections could in effect prove valuable in providing end-users access to new products. Such developments could also have a direct effect on the quality of life of the citizens both in terms of bridging the digital divide as well as in making healthcare, education and other essential elements more accessible.

The critical success factor for these technologies to be deployed is the availability of adequate spectrum. Today mobile networks operate primarily on three frequency bands: 900 MHz, 1800 MHz and 2.1 GHz bands, though other bands were earmarked to complement these for future use. These bands offer various advantages and disadvantages.

900 MHz Band

Of the three bands mentioned earlier the 900 MHz band presents the best characteristics in terms of propagation and indoor penetration. In practical terms, all other things being equal, in order to obtain the same coverage, less base stations are required in the 900 MHz band when compared to the 1800 MHz and 2.1 GHz bands. On the other hand this band is made up of only 35MHz of paired spectrum compared to 75MHz in the 1800 MHz band and has therefore very limited capacity in comparison. This means that operators are restricted in terms of the number of channels they can operate in this band. This negatively impacts the maximum access speed they can offer to their customers over these channels. However, its propagation characteristics make this band particularly useful and, in some cases, outweigh its disadvantages. In fact apart from GSM, UMTS networks have already been deployed in this band and in the near future LTE is also expected to be deployable in this band.

1800 MHz Band

The 1800 MHz band has a reduced performance in terms of propagation and penetration characteristics, though it is comparatively better than the 2.1 GHz band. On the other hand, the 1800 MHz band provides significant capacity and therefore operators are in a position to offer very high speed services through the aggregation of a larger number of channels. For example LTE is expected to be capable of delivering speeds up to 100Mbps however, this will only be possible over 20MHz of spectrum. In terms of technology, UMTS/HSPA deployments are also possible in this band and in future, the 1800 MHz band is also considered to be a candidate for LTE, although not in its initial phases of deployment.

2.1 GHz Band

The 2.1 GHz band is very similar in nature to the 1800 MHz band, with but with comparatively poorer propagation characteristics but very good capacity. It is currently the main band used for UMTS deployments and in the future it is considered to be a candidate for LTE, but not in its initial stages.

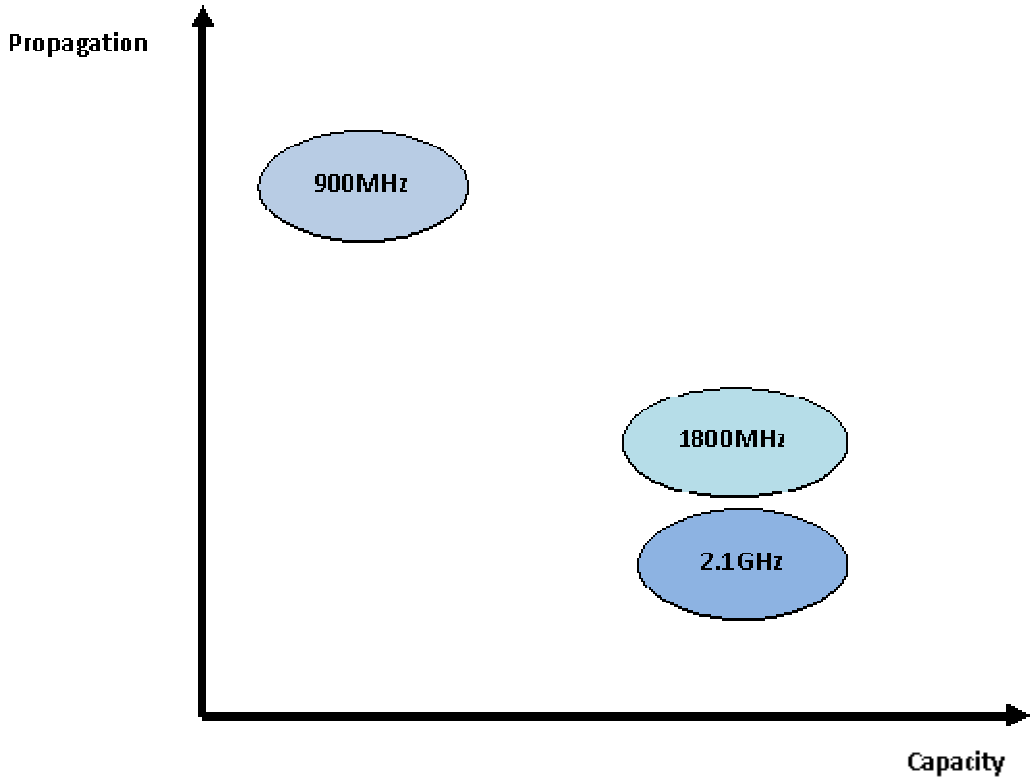


Figure 1: Outline of Physical Characteristics of these bands

These different characteristics play an important role when it comes to determine the optimal network design. For example in densely populated cities, the main concern is not coverage per se but the availability of sufficient capacity to service all the users. Therefore in this case it might result that it would be more efficient to use the 1800 MHz rather than the 900 MHz band. On the other hand, in rural areas where coverage is more important, then the 900 MHz band would be a better choice.

Therefore, particularly when national coverage is required the deployment of a hybrid network running over different frequency bands each utilised according to its characteristics makes for efficient use of spectrum. This optimisation leads to the use of fewer base stations resulting in lower cost of ownership for the operators and lower environmental impact for the consumers.

2.2 International Scenario

At an ITU level, since the early 90s, a number of decisions have been taken, primarily focused on identifying suitable spectrum where mobile services could be deployed, in an effort to ensure sufficient spectrum for GSM, UMTS and their future evolutions. Apart from the 900 MHz and 1800 MHz bands, a number of other bands, most notably the 2.1 GHz band[1] and the 2.5 GHz band are earmarked in the ITU Radio Regulations for terrestrial IMT[2] applications.

2.3 European Dimension

2.3.1 European Regulatory Framework

The European regulatory framework for electronic communications[3] sets out harmonised parameters including timeframes for the assignment of spectrum across the European Union with the main principles being: Objectivity, Transparency, Proportionality and Non-Discrimination.

[1] 2.1 GHz Band: 1900-2170MHz
[2] IMT stands for International Mobile Telecommunications; The IMT family of standards includes UMTS amongst others
[3] Framework Directive: http://eur-lex.europa.eu/pri/en/oj/dat/2002/l_108/l_10820020424en00330050.pdf; Authorisation Directive: http://eur-lex.europa.eu/pri/en/oj/dat/2002/l_108/l_10820020424en00210032.pdf

2.3.2 Relevant Spectrum Directives and Decisions

In addition to the regulatory framework a number of Directives and Decisions have been issued with respect to these specific frequency bands. These directives and decisions have the objective of ensuring a harmonised use of the spectrum in question and are outlined below.

In 1987, the 87/372/EEC Directive entered into force. This directive identified the 890-915 MHz paired with 935-960 MHz bands for public pan-European cellular digital land-based mobile communications services. As the GSM services became more popular, CEPT[4] published two decisions aimed at designating further spectrum for GSM namely the 1800 MHz band (ERC/Dec/(95)03) and the eGSM band i.e. 880-890 MHz paired with 925-935 MHz (ERC/DEC/(97)02).

In 2006, as a result of the technological developments that had taken place since 1987, the Radio Spectrum Committee requested CEPT to conduct studies on the use of the 900 MHz and 1800 MHz bands by technologies other than GSM. Based on the results of these studies, in 2007 the Radio Spectrum Committee agreed that new technologies, namely UMTS, could be deployed in the said bands, however in line with the technology neutral approach other technologies could be deployed as long as they did not cause harmful interfere to GSM and UMTS systems. An EC direction to this effect is expected to be adopted in the coming months.

2.3.3 Experience in other European States

In most European countries the GSM licences are not due for renewal prior to 2010. However, a few jurisdictions have already considered the approach they will be adopting in respect of the upcoming licence terminations. The following captures the salient decisions taken.

The Netherlands[5], granted a 3-year extension to licensees operating in the 900 MHz band so that the licences in the 900 MHz and 1800 MHz bands would have a common termination date. As part of this extension process the spectrum was also reshuffled slightly to provide some spectrum in the 900 MHz to the one of the operators that previously had no spectrum in this band. In fact KPN Telecom

[4] European Conference of Postal and Telecommunications Administrations
[5] http://www.ez.nl/content.jsp?objectid=151174&rid=149807

N.V.[6] agreed to transfer a block of 5MHz in the eGSM band to T-Mobile as of 1st September 2007. This process has allowed for the licences to have a common duration, now established for 2013 while the policy for reassignment is being defined.

In Finland[7], though the current licences were meant to expire at a much later date, the spectrum was reshuffled amongst the existing players so as to allow all operators the possibility to deploy UMTS services in the 900 MHz and 1800 MHz bands. The problem in Finland was that whilst the assignments in the 1800 MHz band were mostly contiguous, this was not the case for the assignments in the 900 MHz band. This presented a limiting factor for the operators who wanted to deploy UMTS in the 900 MHz band. Therefore, the assignments in this band were reshuffled so as to create contiguous blocks of spectrum while at the same time each operator kept the same amount of spectrum it originally had. This process did not impinge on the licence termination dates.

In France[8,9] existing licences were renewed for another 15 years since no expression of interest from new players was registered. In this assignment however a condition was included that should there be interest in spectrum from a new UMTS operator than the existing spectrum licences holders would be required to rescind some of the existing spectrum assigned in the 900 MHz and 1800 MHz band in favour of the new player.

In the UK[10], a consultation was published proposing that, despite the fact that there are currently two active licences in the 900 MHz, the spectrum assignments are re-farmed to allow a more homogenous access to the 900 MHz band amongst all interested market players. This was considered particularly important since

[6] KPN is the largest mobile network operator in the Netherlands with a market share of over 50%. It also operates a fixed line network.

[7] http://www.ficora.fi/en/index/viestintavirasto/lehdistotiedotteet/2007/P_10.html

[8]

http://www.arcep.fr/index.php?id=8571&L=1&tx_gsactualite_pi1[uid]=1020&tx_gsactualite_pi1[annee]=&tx_gsactualite_pi1[theme]=&tx_gsactualite_pi1[motscle]=&tx_gsactualite_pi1[backID]=26&cHash=e35ca34b02

[9] http://www.arcep.fr/uploads/tx_gspublication/consult-autogsm-bouygues-051006.pdf

[10] http://www.ofcom.org.uk/consult/condocs/liberalisation/

not all the UMTS operators have access to spectrum in the 900 MHz band, which in the NRA's view could lead to a distortion in the market. At the time of writing, OFCOM is still in the process of publishing its final decision.

In Norway[11], the spectrum held by the operators whose licence was due to expire in 2005, was made available to any interested party. Given that no operator other than the existing players expressed interest in the spectrum, the licences were renewed for another 12 years.

The Irish regulator[12] has also moved on the same lines. Comreg published a consultation paper on the subject where it proposed that the entire spectrum in the 900 MHz and 1800 MHz bands is put on offer for any interested party. Should demand exceed supply, Comreg is proposing to determine the spectrum assignments via an auction. In this case, given that the existing licences have different termination dates a number of proposals were put forward with the aim that going forward the termination dates are aligned.

[11]http://www.regjeringen.no/upload/kilde/sd/red/2002/0039/ddd/pdfv/262141-telenor.pdf

[12]http://www.comreg.ie/publications/consultation_-_liberalising_the_use_of_the_900_mhz_and_1800_mhz_spectrum_bands.583.103142.p.html

3 Local Situation

3.1 Current Assignments

900 MHz – 1800 MHz Bands

The current assignments in the spectrum bands under consideration took place over a number of years and were assigned on a first come first served basis.

The first assignment of spectrum in these bands took place in 1994, when Telepage Limited was assigned frequencies for the establishment of a National Radio Paging Service. The current licence expires on 4th March 2011.

In 1997, a licence was issued in the 900 MHz band to Vodafone Malta Limited (then Telecell Ltd) for the operation of a GSM radio telephone network. This licence terminates in July 2010.

In 2000, an assignment for a duration of ten (10) years in the 1800 MHz band was granted to MobIsle Communications Ltd. for the operation of the second mobile communications network on the Maltese Islands.

In January 1998, Smash Ltd. was assigned spectrum in the 1800 MHz band (1760 MHz) to operate a studio-transmitter link. This assignment does not have a termination date but can be terminated at any time following a formal 30-day notice.

It is also pertinent to point out that a sub-band within the 900 MHz band, i.e. 914 – 915 MHz / 959 – 960 MHz, was previously allocated for use by CT1 cordless telephones. Since end July 2003[13], such phones are no longer permitted to be placed on the market however some systems could still be in operation around Malta.

In addition, the original assignments to the mobile operators were amended in 2004 following requests from the licence holders to have spectrum assignments in both bands. These changes were implemented following an exercise carried out by the Malta Communications Authority whereby the mobile operators were granted spectrum in both the 900 MHz and 1800 MHz bands. Thus to date the usage of the said bands is as follows:

[13] http://www.doi.gov.mt/en/press_releases/2003/06/pr728.asp

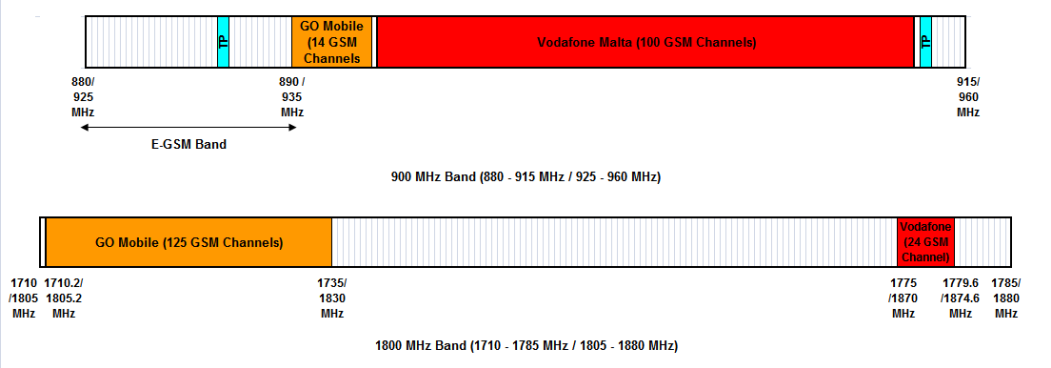


Figure 3: Current Spectrum Usage on the Maltese Islands

Other Relevant Assignments

In 2005 the MCA granted the rights of use of spectrum in the 2.1 GHz band for the deployment of UMTS Networks to MobIsle Communications Limited[14] and Vodafone Malta Limited[15]. The third licence in this band was awarded in August 2007 to 3G Telecommunications Limited[16]. These rights of use have a 15-year duration.

The first local UMTS network was launched in summer 2006 followed a few months later by the second network. These deployments have enabled customers of both licensees to start enjoying the new services made possible by this technology. A third UMTS network was launched very recently.

3.2 Current Spectrum Pricing Regime

The current pricing scheme as established through the 11th Schedule of the Electronic Communications Networks and Services (General) Regulations, ('ECNSR') (Chapter 399.28 of the Laws of Malta) for the 900 MHz and 1800 MHz band is as follows:

- € 3490 (Lm 1500) per 200kHz paired channel
- 2.5% of total gross revenue

[14] http://www.mca.org.mt/infocentre/openarticle.asp?id=775&pref=2
[15] http://www.mca.org.mt/infocentre/openarticle.asp?id=776&pref=2
[16] http://www.mca.org.mt/infocentre/openarticle.asp?id=1105&pref=2

3.3 Usage in Adjacent Bands

Any policy related to the 900 MHz and 1800 MHz bands must take into account the current and possible future uses of systems operating in adjacent bands.

Currently, there are no uses in the bands adjacent to 880 – 915 MHz. However, the bands 870 – 876 MHz and 915 – 921 MHz are under consideration for digital land mobile systems as per ERC/DEC/(96)04[17] and ECC/DEC(04)06[18]. Also a number of aeronautical radionavigation services are operating in the band adjacent to the upper part of the 900 MHz band.

The applications, in accordance with the National Frequency Plan, that can be deployed neighbouring the 1800 MHz band comprise: the downlink component of meteorological satellite services (1675 – 1700 MHz), short range devices (1785 – 1800 MHz), DECT systems (1800 – 1900 MHz) and UMTS (1900 – 1980 MHz).

In addition a number of systems providing wireless broadband solutions in the frequency range 1785 – 1805 MHz are operating in some countries within Europe. It is not excluded that in the future similar services are also introduced in Malta.

Further information on the allocation and utilisation of spectrum both locally and in neighbouring European countries can be found on the European Frequency Information System of the ERO[19].

For ease of reference, relevant excerpts from the National Frequency Plan[20] are also provided in Annex A.

3.4 Factors Influencing Spectrum Use

In developing a policy for spectrum assignments a number of factors have to be considered to ensure a holistic approach.

The Market

As at June 2008, the mobile penetration rate in Malta stood at 91.3%[21], which though below the EU average represents a strong and significant uptake. Also since the launch of UMTS services in 2006, particularly with the introduction of flat rates, local mobile operators experienced an increased uptake of data

[17] http://www.erodocdb.dk/Docs/doc98/official/pdf/DEC9604E.PDF
[18] http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC0406.PDF
[19] http://www.efis.dk/search/general
[20] http://www.mca.org.mt/infocentre/openarticle.asp?id=516&pref=24
[21] http://www.mca.org.mt/newsroom/openarticle.asp?id=636

services. This augurs well for the future of the mobile market in Malta, as more operators are launching their services and innovative applications are created.

In fact to date there are two network operators providing both GSM and UMTS services and a third UMTS operator has just launched its services. Furthermore two MVNOs have entered the market.

Technology

As outlined earlier in this paper, the 900 MHz and 1800 MHz bands represent a valuable asset for the mobile operators because of their superior propagation characteristics and spectrum capacity respectively.

Propagation characteristics are particularly important in the light of the inherent difficulties operators (in particular UMTS operators) have in order to provide adequate indoor coverage and which would be facilitated through the use of lower frequencies.

Pricing

The present pricing scheme consists of an annual fee based on percentage of revenue and a relatively small fee for every assigned channel.

Any revision to the pricing scheme needs to be reflective of the value of the spectrum, act as an incentive for efficient use of spectrum and ensure sustainability in the future.

Legal - Limitations of Current Rights of Use

The current licences for the 900 MHz and 1800 MHz bands do not allow the mobile operators to use their spectrum assignments to deploy UMTS.

The upcoming licence termination dates present a window of opportunity to establish a new regime based on the principle of technology neutrality.

Economic

The removal of technology limitations allows existing infrastructure to be reused well into the future given that, future technologies can be deployed in the same bands. Moreover operators have the possibility of building a hybrid network operating on different bands and using the most favourable frequency in a given circumstance.

A significant amount of spectrum is to date unutilised, particularly in the 1800 MHz band. This, together with the deployment of new technologies made

possible through the uplifting of existing licence limitations, should result in further deployments and ultimately greater choice for consumers.

Potential changes to current assignments

Any change to the existing spectrum assignments could have considerable cost implications associated with it, given that such changes would require the radio network to be redesigned. Moreover if any potential change in assignments is not handled appropriately disruptions to the current consumer services could result. At the same time, the status quo could potentially limit new entrants from acquiring spectrum particularly in the 900 MHz band which to date is relatively the most heavily used of the two.

The above analysis is captured in the following SWOT analysis.

Strength	Weakness
Strong mobile penetration rates Three UMTS networks in operation in addition to two GSM networks. 900 MHz and 1800 MHz bands have better propagation characteristics than higher frequencies.	Difficult in-building coverage at high frequencies 900 MHz band has very limited capacity Current pricing scheme does not incentivise spectrum efficiency Current licences limited in terms of technologies that can be deployed in the bands. Current 900 MHz spectrum assignments limit the potential for a third operator to be assigned spectrum in this band
Opportunity	**Threat**
Upcoming licence termination dates allow for the simultaneous refarming of the whole 900 MHz and 1800 MHz bands. Uplifting of technology limitations in new licences supports future technology deployments and new consumer services Use of lower frequencies could result in lower cost of ownership and lower environmental impact Significant spectrum in the 1800 MHz band which has to date not been taken up is available to support new players in the market	Change in current assignments with possible disruption to current GSM operations

3.5 Objectives for new licensing regime

The main objective of the proposed licensing regime is the maximisation of overall economic and consumer benefit, through an approach that stimulates effective and efficient use of spectrum.

The proposed implementation aims to retain and further reinforce the strengths identified above whilst seeking to eliminate existing weaknesses. Moreover the proposed assignment mechanism strives to mitigate possible negative outcomes associated with this process, so as to contribute towards a sustainable future for this market.

4 Proposed Assignment Process

In establishing the proposed assignment mechanism to be adopted in view of the upcoming expiry of the current licences, account has been taken of the principles laid out in the ECRA and the situational analysis carried out. The MCA is of the view that in order to avoid discrimination and to optimise the use of these frequency bands, especially given the fact that these bands are particularly valuable, there cannot be an automatic re-assignment of the spectrum to the current right holders.

4.1 Process Overview

The following process will apply to the spectrum in both the 900 MHz and 1800 MHz bands which will be issued simultaneously.

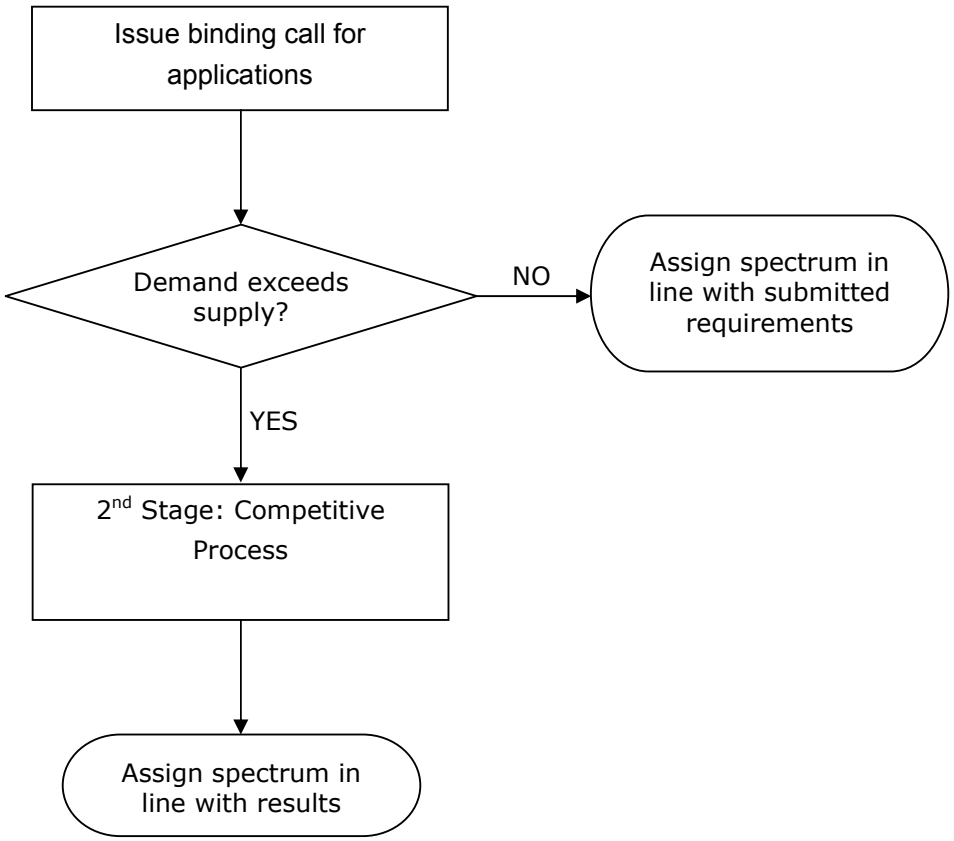


Figure 4: Proposed Assignment Methodology

4.1.1 Call for Applications

In line with the MCA's guiding principles, any course of action undertaken should be open, transparent, proportionate and non-discriminatory. Therefore the Authority proposes that the first step should entail an assessment of the market demand for the spectrum in question, through a binding call for applications backed by a bank guarantee of a sum of money that adequately reflects the importance of this commitment.

The bond is intended to ensure an applicant's commitment to the assignment process, lasting through the call for applications and throughout a possible, eventual competitive process.

In the case of unsuccessful applicants, the bond will be released at the end of the assignment process, once the successful applicants have been announced. In the case of successful applicants, the bid bond will be retained and muted into a performance guarantee.

This bond therefore will act as evidence of good faith, to guarantee that if:

- demand exceeds supply after completion of this application stage, the applicant will take part in the subsequent phase of the assignment process;
- the application submitted by the undertaking is accepted, or if the applicant is successful in securing access to rights of use at a later stage of the assignment process, the undertaking will honour any licence obligations included in the said rights of use.

4.1.2 Second Phase of the Assignment Process

If following the first phase it results that demand for the available spectrum exceeds supply, then a comparative (i.e. beauty contest) or competitive (such as auctions) selection process would need 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 given that in this case there is no overriding need to safeguard social and cultural interest, an auction is considered to be the most appropriate mechanism, should demand exceed supply.

In addition MCA is of the view that competition should be safeguarded and that multiple operators be provided access to the spectrum; it therefore proposes to introduce spectrum caps in an eventual second stage. This point is discussed further in section 4.2.3.

4.1.3 Possible Demand Scenarios

As indicated above the call for applications for the two bands will be issued simultaneously. In this case there are three possible demand scenarios as follows:

1. Demand is less than supply: A straight forward assignment will take place.
2. Demand exceeds supply in both bands: A simultaneous auction will take place.
3. Demand exceeds supply in one band and not the other: In this case it is proposed that one of the options outlined below is considered:

Option 1:

a. Provisional spectrum assignments are awarded in the band where demand doesn't exceed supply to those applicants that also have spectrum requests in the auctioned band;

b. Applicants who have only shown interest in the band where demand doesn't exceed supply are awarded the spectrum straightaway;

c. The second phase of the assignment process is carried out in the other band;

d. Applicants who are not able to secure their required spectrum in the auctioned band will be allowed to rescind any provisional assignment they may have without penalty or buy additional spectrum in the un-auctioned band subject to availability.

Option 2:

a. Provisional spectrum assignments are awarded in the band where demand doesn't exceed supply to those applicants that also have spectrum requests in the auctioned band;

b. Applicants who have only shown interest in the band where demand doesn't exceed supply are awarded the spectrum straightaway;

c. The second phase of the assignment process is carried out. The spectrum available will consist of the band where demand exceeded supply and any unassigned spectrum in the other band. This will provide applicants with all the available spectrum;

d. Applicants who are not able to secure their required spectrum in the band where demand exceeded supply will be allowed to rescind any provisional assignment they may have without penalty.

Option 3:

a. The assignment moves to its second phase. In this case the entire spectrum in both bands will be made available.

Once the auction starts, the greatest probability is that initially the bidders will focus on the band that registered the highest interest. However, as the auction proceeds some of the players might shift their interest to the other band. By placing both bands on auction simultaneously, the bidders would have the possibility to change their bidding strategy in an effort to obtain the spectrum required to achieve their objectives.

4.1.4 Future of Unassigned Spectrum

In the event that any spectrum remains unassigned, this will become available to any interested parties under the established conditions taking due account, where relevant, of the results of this assignment process. Any request will be published and should further interest be expressed this will trigger the above outlined process.

1. Do you agree with the proposed assignment process? Justify

2. Do you agree with MCA's preference for an auction, should demand exceed supply? Justify.

3. Should demand exceed supply only in one band, what is your preference vis-à-vis the options presented? Justify.

4.2 Spectrum Assignment Block

4.2.1 Channelling Plan

The channel bandwidth and a paired/unpaired allocation could affect the technology adopted and therefore the services offered by the successful applicants. Therefore in establishing the preferred channel bandwidths or the number of frequency blocks consideration is given to the services being implemented as well as the capabilities of the equipment available now and foreseen for the future.

A number of international studies were carried out so far analysing the technologies that can be deployed in this band. These studies were assessed by CEPT in its Report 82 'Compatibility Study for UMTS operating within the GSM 900 and GSM 1800 Frequency Bands Roskilde, May 2006'.

In line with these results, the MCA is of the view that a paired allocation with 5MHz channel bandwidth is the most appropriate so as to maximise flexibility in spectrum usage by the operators.

4. Do you agree with the proposed 5 MHz paired channel bandwidth? Justify.

4.2.2 Interference Mitigation Techniques

All wireless network operators are legally bound to ensure that their networks do not create any undue interference to other networks. In this case, there are several methods used to control the unwanted emissions.

One of the most straightforward methods is the establishment of guard bands. This implies that useful spectrum is left unassigned to act as a buffer between different undertakings operating in the same band. By its very nature this has negative implications in terms of spectrum efficiency.

On the other hand, techniques are available[22] that enable operators to minimise interference through effective and flexible management of their own spectrum assignment.

[22] EC Report 82 **Compatibility Study for UMTS operating within the GSM 900 and GSM 1800 Frequency Bands Roskilde, May 2006**

In view of these techniques, which have also been effectively implemented in other jurisdictions and in order to ensure that all available spectrum is utilised, it is being proposed that no guard bands are established between the 5MHz blocks.

As a result the bands under consideration will be subdivided as follows:

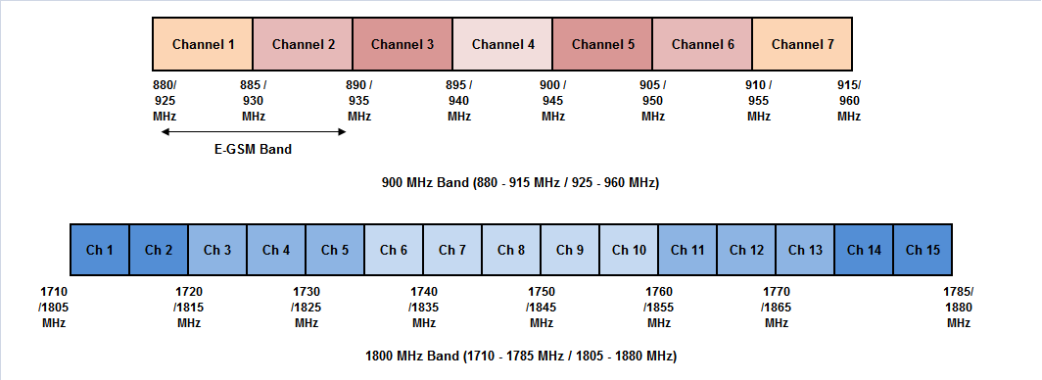


Figure 5: Proposed Channelling Plan

5. Do you agree with MCA's proposal in terms of channelling arrangements? Justify

4.2.3 Spectrum Caps

Spectrum is a scarce resource and needs to be appropriately managed. Therefore the spectrum made available, has to strike the right balance between the need to promote competition by allowing as many operators in the market as may be interested while at the same time providing the industry with adequate resources to effectively deploy reliable services.

The MCA is of the view that the assignment process should be designed in a way that operators can apply for the individual 5MHz channels. This methodology will lead to an optimal spectrum assignment, whereby operators have the flexibility to acquire the necessary amount of spectrum in line with their requirements without having to purchase spectrum they may not need.

However, as stated earlier on, there is also the need to ensure that a number of players have access to the spectrum.

It is therefore proposed that at the first stage of the call no spectrum caps are defined. However, should demand exceed supply, a spectrum cap will be introduced during the second stage of the assignment process.

In establishing the cap, consideration has also been given to the limited spectrum in the 900 MHz band and to this band's characteristics, and therefore a specific cap for that band will apply. In the case of the 1800 MHz band there is considerably more supply of spectrum and therefore only the overall spectrum cap will apply.

It is therefore proposed that the spectrum cap will be as follows:

An overall cap of eight (8) 5MHz-channels will be established with a limit of four (4) channels in the 900 MHz band.

6. Do you agree with the proposed spectrum arrangement Or do you prefer the size of the assigned blocks to be pre-established? Justify.

7. Do you agree that during the call for applications no spectrum caps are established? Justify.

8. Do you agree with the concept of spectrum caps? Do you agree that there should be a two-level cap as described above? Justify

9. Do you consider the proposed overall caps of 40MHz as adequate? Justify

4.3 Licence Duration

The licence duration should not be too long so as to ensure that national resources are returned to Government in due time and do not constrain potential developments in the market. On the other hand the duration must be proportional to the investment made so as to ensure that the operators have an adequate return on investment; too short a duration could lead to instability and inhibit investment particularly towards the end of the licence term.

The MCA proposes that the spectrum is assigned for a licence term of fifteen (15) years. This proposal is in line with the duration terms applied in recent spectrum assignments and European best practice.

10. Do you agree with the proposed licence term? Justify.

4.4 Spectrum Pricing

The current spectrum fee for GSM is established in the eleventh schedule of the Electronic Communications Networks and Services (General) Regulations under the Electronic Communications (Regulations) Act and consists of a fixed cost per MHz plus a fee in the form of a percentage of revenue. As part of this review both the pricing model and the actual price have been revisited

Efficient use of spectrum

The current model, wherein the fixed cost element of spectrum is nominal, has the advantage of encouraging new entrants in the market, but on the other hand, does not incentivise efficient use of spectrum.

It is therefore proposed that the pricing scheme for this spectrum will not be expressed in percentage of revenue terms, but will be based on a fee per MHz of spectrum assigned.

Establishing a base price

Spectrum pricing should be such that on the one hand supports sustainable investment whilst at the same time reflects the real value of the spectrum.

In determining the base price for the 900 MHz and 1800 MHz bands, cognisance has therefore been taken of the fees paid for other bands capable of offering similar services which were assigned in recent years, namely the UMTS 2.1 GHZ band spectrum,[23] and the physical characteristics of the bands under consideration that provide for better network performance and efficiency and as a result should command a higher price than the 2.1 GHz band.

Taking into account the principles outlined above, the MCA proposes that the one-off base price for a block of 5MHz of paired spectrum is set at €2,250,000 for both the 900 MHz and 1800 MHz bands.

Payment Options

The adoption of a one-off fee structure can result in onerous obligations for market players, particularly new entrants. In order to mitigate this concern a number of payment options listed hereunder are being considered.

These options are designed to ensure market sustainability by allowing the operators to stage their payments over the lifetime of the spectrum licence in line with their specific requirements, thereby lessening the impact on cash outflow. It

[23] €1,455,858 for a block of 5MHz of paired spectrum

is the MCA's intention that based on the responses received following the consultation, some of these options will be made available as part of the award process.

Payment Option 1: One-off fee

Successful applicants would have the option to make a one-time payment of the full fee to cover the licence for its full fifteen-year term. Such one-time payment would be made upon assignment of the new license.

Payment Option 2: Staggered Payment

This option enables operators to stage their payments over the proposed licence duration of fifteen (15) years. The final amount paid will consist of the upfront fee (€2,250,000 for every block of 5MHz acquired) plus the relevant interest charged at the applicable risk free rate.

The proposed payment profile in percentage terms under this option, for both principal and interest components, over the life of the licence is as follows:

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Total
Principal Repayment	€135,000	€135,000	€900,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€2,250,000
Interest	€116,325	€108,900	€59,400	€54,450	€49,500	€44,550	€39,600	€34,650	€29,700	€24,750	€19,800	€14,850	€9,900	€4,950	€0	€611,325
Total Payment	€251,325	€243,900	€959,400	€144,450	€139,500	€134,550	€129,600	€124,650	€119,700	€114,750	€109,800	€104,850	€99,900	€94,950	€90,000	€2,861,325
Principal % Repayment	6%	6%	40%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	100%
Outstanding Principal	€2,115,000	€1,980,000	€1,080,000	€990,000	€900,000	€810,000	€720,000	€630,000	€540,000	€450,000	€360,000	€270,000	€180,000	€90,000	€0	

Figure 6: Proposed Payment Schedule for Option 2

To compensate for the deferred payments under Option 2, the total interest charged is calculated based on the present value of the cost of the spectrum over its granted life at the risk free rate. The total interest is then charged on the balance outstanding. The rate used is that of Malta Government Securities maturing in 2023.

In the event of an auction, the new principal amount and interest charges thereon will be recalculated accordingly, and deferred over the same payment percentage profile.

Payment Option 3: One-off fee with an annual fixed fee

This option is very similar to Option 2 since it enables operators to stage their payments over the whole licence term (currently proposed for 15-years). As in

option 2, the final amount paid will consist of the upfront fee (€2,250,000 per 5MHz) plus the relevant interest charged at the risk free rate.

The proposed payment profile in percentage terms under this option, for both principal and interest components, over the life of the lease is as follows:

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Total
Principal Repayment	€990,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€90,000	€2,250,000
Interest	€69,300	€64,350	€59,400	€54,450	€49,500	€44,550	€39,600	€34,650	€29,700	€24,750	€19,800	€14,850	€9,900	€4,950	€0	€519,750
Total Payment	€1,059,300	€154,350	€149,400	€144,450	€139,500	€134,550	€129,600	€124,650	€119,700	€114,750	€109,800	€104,850	€99,900	€94,950	€90,000	€2,769,750
Principal % Repayment	*44%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	**100%**
Outstanding Principal	**€1,260,000**	**€1,170,000**	**€1,080,000**	**€990,000**	**€900,000**	**€810,000**	**€720,000**	**€630,000**	**€540,000**	**€450,000**	**€360,000**	**€270,000**	**€180,000**	**€90,000**	**€0**	

Figure 7: Proposed Payment Schedule for Option 3

As in option 2, the total interest charged is calculated based on the present value of the cost of the spectrum over its granted life at the risk free rate. The total interest is then charged on the outstanding balance.

In the event of an auction, the new principal amount and interest will be recalculated accordingly, and will be deferred over the same payment percentage profile.

Payment Option 4: Annual Fees

This option is very similar to the previous two, the only difference being that the repayment is done through equal annual instalments of €224,158 for every 5MHz block acquired. This repayment option also takes into account the relevant interest charges calculated using the risk free rate.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Total
Principal Repayment	€100,408	€105,930	€111,756	€117,903	€124,387	€131,229	€138,446	€146,061	€154,094	€162,569	€171,511	€180,944	€190,896	€201,395	€212,472	€2,250,000
Interest	€123,750	€118,228	€112,401	€106,255	€99,770	€92,929	€85,711	€78,097	€70,063	€61,588	€52,647	€43,214	€33,262	€22,763	€11,686	€1,112,364
Total Payment	**€224,158**	**€224,158**	**€224,158**	**€224,158**	**€224,158**	**€224,158**	**€224,158**	**€224,158**	**€224,158**	**€224,158**	**€224,158**	**€224,158**	**€224,158**	**€224,158**	**€224,158**	**€3,362,364**
Outstanding Principal	€1,995,842	€1,889,912	€1,778,156	€1,660,253	€1,535,866	€1,404,637	€1,266,191	€1,120,130	€966,036	€803,467	€631,956	€451,012	€260,117	€58,722	-€153,750	

Figure 8: Proposed Payment Schedule for Option 4

In the event of an auction the new annual instalment will be recalculated accordingly.

Payment Option 5: Schedule of Payment over a Shorter Timeframe

Under this option, the successful operator acquiring the spectrum could complete the spectrum fee payment over a shorter timeframe, after agreeing all terms and conditions with the MCA. In this case, the MCA would determine a new payment profile in line with the operator's requirements.

Similarly to options 2 and 3, the total interest charged is calculated based on the present value of the cost of the spectrum over the repayment transfer at the applicable risk free rate. The total interest is then charged on the outstanding balance.

In the event of an auction, the new principal amount and interest will be recalculated accordingly, and deferred over the same payment percentage profile.

11. What are your views on the proposed payment and payment options? Justify

12. Would you like to have other payment options? Explain

4.5 Technology Neutrality

As outlined earlier on in this document, despite the current designation of the 900 MHz and 1800 MHz bands for GSM through a number of EU decisions and recommendations, industry developments led to other technologies being deployed in this band, namely UMTS. However it is also true that GSM is still an important technology and is expected to remain in use in the years to come.

In line with previous spectrum assignments that, where possible, specifically avoided any pre-emptive choice between the various technologies, taking into account the studies carried out so far, the upcoming EU direction as well as the policy direction established in the 'Strategic Framework for the Management of Radio Spectrum 2007-2010', the MCA will be making this spectrum available primarily for GSM and UMTS. Users intending to use these bands for any other technology have to ensure adequate protection for any GSM and UMTS operations in these bands.

4.6 Service Neutrality

Independently from the technology of choice, a number of services are possible in the bands in question. One of the main objectives of the MCA is to foster competition and greater consumer choice.

The MCA is therefore of the view that any rights of use for spectrum in the 900 MHz and 1800 MHz bands should not include any constraints on the type of services that are offered over the resulting networks.

13. Do you agree with the proposal for service neutrality? Justify.

4.7 Conditions of Rights of Use

4.7.1 Licence Obligations

The MCA considers that so as to ensure maximum benefits for all the users, licensed operators should make any service they offer available on a nationwide basis. This obligation should be complied with within a period of 24 months from the date of assignment.

This period is sufficiently long to give new entrants adequate time to deploy a nationwide network. It is in line with the experience of local operators who launched nationwide UMTS services in less than 2 years as well as with timeframes stipulated for similar rollouts in other jurisdictions.

4.7.2 Technical Conditions

The MCA proposes to include specific technical conditions aimed at ensuring the co-existence of GSM and UMTS in the same bands. These conditions would be in line with the proposed EU decision on the harmonisation of the 900 MHz and 1800 MHz band.

4.7.3 Sanctions

The MCA proposes that clear sanctions are included in the rights of use in the event of non-compliance with any obligations stipulated therein. It is proposed that these sanctions include 'use it or lose it' clauses.

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

4.8 Other Issues

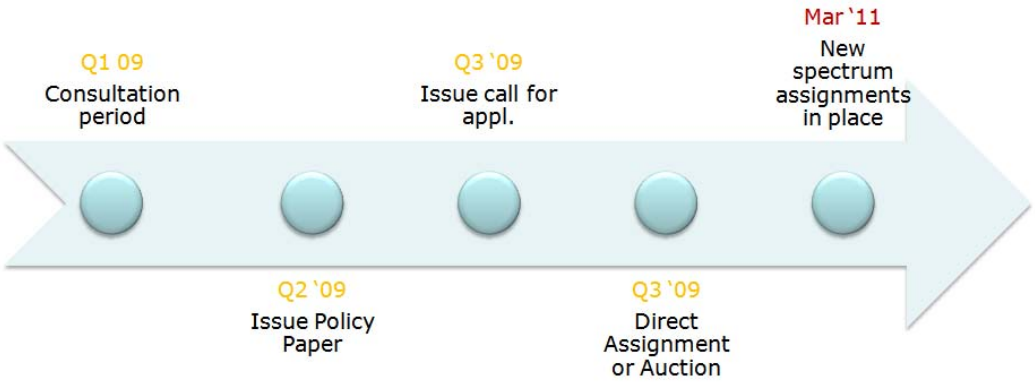
The MCA would be pleased to receive comments and proposals on any other issues which may be deemed relevant for the purposes of this consultation.

5 Indicative Timelines

The upcoming termination of the existing rights of use requires that any revised policy be put in place in the short term and that reassignment takes place within a timeframe that will allow for appropriate implementation.

A reassignment process could result in the need to carry out changes to the current networks. It is therefore important to allocate enough time to ensure that any changes can be managed with the least possible impact on network subscribers and operators themselves. It is also envisaged that a level of co-ordination between all parties involved could be required. The objective is that by 4th March 2011 all the operators, who would have successfully acquired spectrum in these bands, are in a position to make effective use of this spectrum in the best interests of the market and the consumers.

The timeframes presented below are premised on this objective.



6 Consultation Framework

The MCA invites comments from interested parties regarding this Consultation Paper. The consultation period will run until 12:00pm on Monday 30th March 2009. Comments should be sent to:

Chief of Technology and Spectrum Management
Malta Communications Authority
Valletta Waterfront
Pinto Wharf
Valletta FRN 1913
Malta

Tel: +356 21 336 840
Fax: +356 21 336 846
E-mail: gsm@mca.org.mt

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

16 February 2009

Annex A: Allocations in 870 - 1164 MHz and 1690 – 1930 MHz

Frequency Band (MHz)	ITU Allocation (relevant to Malta)	National Allocation	Usage	Notes
870 – 876	FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING	MOBILE		Under consideration for digital land mobile systems (paired with 870-876MHz, ERC Dec (96)04 & ECC Dec (04)06)
876 – 880	FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING	MOBILE		
880 – 890	FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING	MOBILE	GSM	GSM extended band (paired with 880 – 890 MHz, ERC Dec (97)02
890 - 915	FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING Radiolocation	MOBILE	GSM	EC Directive 87/372/EEC, ERC Dec (94)01 (paired with 890-915 MHz)
915- 921	FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING Radiolocation	MOBILE		Under consideration for digital land mobile systems (paired with 870-876MHz, ERC Dec (96)04 & ECC Dec (04)06)
921 – 925	FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING Radiolocation	MOBILE		
925 – 935	FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING Radiolocation	MOBILE	GSM Paging (public, 931,9375 MHz)	GSM extended band (paired with 880 – 890 MHz, ERC Dec (97)02
935 – 942	FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING Radiolocation	MOBILE	GSM	EC Directive 87/372/EEC, ERC Dec (94)01 (paired with 890-915 MHz)
942 – 960	FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING Radiolocation	MOBILE	GSM	EC Directive 87/372/EEC, ERC Dec (94)01 (paired with 890-915 MHz)
960 - 1164	AERONAUTICAL RADIONAVIGATION 5.328	AERONAUTICAL RADIONAVIGATION	Aeronautical radionavigation applications	Flight safety, navigation and information distribution systems (DME, TACAN, SSR, MIDS)

Frequency Band (MHz)	ITU Allocation (relevant to Malta)	National Allocation	Usage	Notes
1690 - 1700	METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (s-E) Fixed Mobile except aeronautical mobile 5.289 5.341	METEOROLOGICAL AIDS METEOROLOGICAL -SATELLITE (s-E) Fixed Mobile except aeronautical mobile	Meteorological applications	
1700 -1710	FIXED METEOROLOGICAL-SATELLITE (s-E) MOBILE except aeronautical mobile 5.289 5.341	FIXED METEOROLOGICAL -SATELLITE (s-E) Mobile except aeronautical mobile		
1710 - 1785	FIXED MOBILE 5.384A 5.149 5.341 5.385	FIXED MOBILE	GSM	ERC Dec (95)03, ERC Rec T/R 22-07 (paired with 1710-1785 MHz)
1785 – 1800	FIXED MOBILE 5.384A	FIXED MOBILE	SRDs	
1800 - 1805	FIXED MOBILE 5.380 5.384A	MOBILE Fixed		Reserved for harmonised European use (ECC Dec (02)07
1805 -1880	FIXED MOBILE 5.384A	FIXED MOBILE	GSM	ERC Dec (95)03, ERC Rec T/R 22-07 (paired with 1710-1785 MHz)
1880 - 1900	FIXED MOBILE 5.384A	MOBILE Fixed	DECT	EC Directive 91/287/EEC, ERC Dec (94)03
1900 - 1930	FIXED MOBILE 5.388A 5.388	FIXED MOBILE	UMTS/IMT-2000 (terrestrial	TDD-Unpaired (1900-1920 MHz), FDD paired (1920 – 1980 MHz / 2110-2170 MHz). ERC Dec (97)07, (99)25 & (00)01

Annex B: The WAPECS Concept and the 900 MHz and 1800 MHz Bands

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[24] 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[25]'.*

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 issued a mandate[26] to CEPT to investigate the possibility of implementing WAPECS in a number of bands including the 900 MHz and 1800 MHz. A report addressing technology neutrality in the said bands was tabled to the European Commission in December 2006.

As a result of the outcomes of this study a new commission decision was drafted with a view to allow technologies other than GSM to operate in this band, given certain technical conditions. This decision was approved by the RSC in 2007. However, prior to its coming into force the existing 87/372/EEC directive must be repealed. This process is expected to be completed in the coming months following approval by the European Parliament.

---

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

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

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

Annex C: New Technologies operating in the 900 MHz and 1800 MHz 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 downlink performance of up to 14.4 Mbit/s theoretically. Existing deployments provide up to 7.2 Mbit/s in downlink. Uplink performance is a maximum of 384 kbit/s. HSUPA provides improved uplink performance of up to 5.76 Mbit/s theoretically. In the last few years a number of HSDPA deployments have been carried out.

Originally these standards were deployed in the Core UMTS bands i.e. 2.1 GHz band but in 2007 a leading manufacturer deployed the first HSDPA network in the 900 MHz band. Other manufacturers are also developing equipment that enables operators to deploy UMTS in either the 900 MHz or 1800 MHz bands.

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.

To date considerable work has been carried out both by industry and the standardisation bodies. In 2008, 3GPP approved[27] parts of the LTE standard and further work is underway for the coming months. In the meantime, leading manufacturers are already outlining their vision for the product lines.

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 900 MHz, 1800 MHz, 2.5 GHz and the IMT-core bands, though it is expected that initially it will be deployed in the 2.5 GHz and 900 MHz bands.

[27] http://www.3gpp.org/Highlights/LTE/LTE.htm