Award of available spectrum: 2500-2690 MHz, 2010-2025 MHz and 2290-2300 MHz

Executive summary

T-Mobile has serious concerns regarding the proposed auction. These are summarised below. Detailed responses to each of the questions in Ofcom's consultation document are set out in the main body of T-Mobile's response.

1. Auction design issues

T-Mobile has very significant concerns about the design of the proposed auction. T-Mobile does not believe the current design can deliver an efficient outcome. The reasons for this are:

I. The proposal to allow the amount of unpaired spectrum to be flexible, rather than follow the ECC Decision Band Plan is not efficient, it will (amongst other things) lead to interference for operators in the paired bands, higher costs and ultimately a worse outcome for UK consumers. In addition, the value of the unpaired spectrum in the 2570-2620 MHz band is higher than the value of any further unpaired spectrum; this is not reflected in the auction design.
II. The auction design does not permit bidders to use the 2600 – 2620 MHz spectrum to pair externally with the 1900 – 1920 MHz spectrum, which would be an efficient use of the spectrum.
III. The auction design does not recognise that the value of all the paired spectrum is not similar.
IV. ✂

Ofcom must amend the auction design. The two stage auction design is based on the assumption that the blocks are generic. As noted above, T-Mobile does not consider this to be the case and therefore we do not believe that the auction design will achieve its objectives. Ofcom should amend the auction design, either to add more clocks or to adopt a different design, if the auction is to be efficient and bidders able to bid for the specific spectrum they desire. To proceed with the current design would, we believe, result in a failure by Ofcom in its statutory to duty to ensure the efficient use of spectrum.

In relation to this, T-Mobile would observe that the proposed auction design is in contrast to that proposed for the 10, 28, 32 and 40 GHz auction. In that auction spectrum has been grouped together in blocks which appear to be of similar values and bidders are permitted to switch between frequencies as the auction develops.

2 Additional issues to be addressed before the auction can take place

2.1 Spectrum refarming

Ofcom must resolve the questions around refarming of current GSM spectrum in order to ensure that the auction is efficient and competitive, before allocating further spectrum. Without this being addressed bidders will not be able to efficiently assess their demand for spectrum. Bidders need to know when existing mobile spectrum can be refarmed and the conditions which will apply to this. Failure to resolve these issues will lead to an inefficient auction and consequently an inefficient allocation and use of UK

radio spectrum. Inevitably this will have a negative impact on long term consumer interests. T-Mobile's position is clear. All mobile operators must have access to 900 MHz spectrum before refarming takes place.

2.2 Floe case and uncertainty about spectrum licensing

The current legal uncertainty over the interpretation of spectrum licences created by the Floe case is such that new licences should not be granted until this case is resolved by the appeal courts. To issue new licences without being able to provide regulatory certainty will affect bidders' ability to finance the purchase of spectrum proposed, as will the use of spectrum usage rights without a clear legislative definition of rights.

T-Mobile is very concerned that Ofcom is proposing to auction this spectrum whilst critical aspects of the policy regime that will apply to the new licensees remain uncertain. T-Mobile has commented at length on the need to ensure that the property rights in spectrum are adequately defined prior to any auction. To be able to sell and obtain a certain, defined legal title to spectrum is far preferable than obtaining the legally unclear licence proposed. The failure to properly define rights means that disputes around interference and the question of liability relating to interference will remain unclear.

2.3 Technical work to be completed

T-Mobile believes further work is required on:

- Clarification of the necessary guard bands between FDD and TDD systems particularly with channels greater than 5 MHz (see response to Question 11).
- The base station and terminal spectrum masks for the award need to enable technologies such as 3GPP LTE (see response to Question 18).
- The effect of blocking. T-Mobile believes that the probability of blocking is high at the locations where the spectrum is the most valuable i.e. in locations where there are many users. Further, studies are needed on the interference which might be suffered by the users of TDD terminals when customers roam into countries which adopt the ECC Decision Band Plan (see response to Question 10).
- Further work is needed to clarify the impact of interference from PMSE and specify the filters that are needed to minimise this impact; bidders need to be aware of the level of interference they can expect (see response to Question 2).
- Interference from air-traffic control and military radars operating above 2700 MHz. T-Mobile believes that further work is required to quantify the impact of radars on the 2500 – 2690 MHz band; bidders need to be informed of the level of interference they can expect from radars (see response to Question 2).
- Interference from and towards Ireland and France. Further work is needed to clarify the constraints that UK operators will be required to operate under, particularly if the UK Auction is not in line with the ECC Decision Band Plan and Ireland and / or France adopt it (see Annex 2).

2.4 Lessons learnt from fixed links auction to be incorporated

Given the above auction design issues T-Mobile believes that the 10, 28, 32, 40 GHz auction should take place first to allow lessons from that auction to be incorporated in the 2.6 GHz auction design and auction process. Sufficient time should be left between these auctions to ensure that there is a sufficient

opportunity to make any necessary amendments to the auction design before proceeding with the 2.6 GHz auction.

2.5 European harmonisation measures

Clarification on whether the EC will introduce harmonisation measures, including adopting the ECC Decision Band Plan, should be obtained before the spectrum is auctioned. As is demonstrated by the recent European Commission's Communication on "Rapid access to spectrum for wireless electronic communications services through more flexibility", (Brussels, 8.2.2007), the EC are keen on introducing harmonisation measures for this band.

The Communication states:

> *"Existing and new operators wishing to implement different technologies (e.g. UMTS and WiMAX) want to make use of the 2.6 GHz band (will become available in 2008), which is of prime interest for mobile communications and accessing the Internet through wireless means. This band currently lacks a coordinated Community approach, which must be clear, proportionate and future proof.*
>
> *The European Commission will make use of current mechanisms to thoroughly investigate and propose practical implementation measures within the package of bands, in particular, concerning those cases awaiting urgent solutions and with a view to implementing a more flexible spectrum management approach consistently across Europe. In this context the Commission will review the validity of the GSM Directive and push for a common European approach to the 2.6 GHz band, in order to find a proportionate and consistent solution for these two bands, while taking account of the need for new innovative technologies and services to prosper in urban as well as rural areas."*

2.6 Optimal use and efficient management of spectrum

Releasing spectrum while demand for it is unquantified will inevitably lead to an inefficient outcome, in breach of Ofcom's statutory obligations. Ofcom has failed to establish that there is any strong demand for this spectrum. The current plan to auction these bands would also lead to an inefficient use of 3G licensed spectrum. The allocation of spectrum on a basis that is inconsistent with the harmonised approach being sought at a European level will also jeopardise efficiency and consumer interests.

2.7 Interests of consumers

By allocating spectrum on an unharmonised and inefficient basis Ofcom's approach is inconsistent with its duty to further the interests of consumers. Consumer interests will be further harmed by the inefficient use of 3G spectrum, by undermining the ability of mobile operators to provide economic 3G networks and services to consumers.

2.8 Legitimate expectations and non-discrimination

Ofcom's approach fails to take due regard of the legitimate expectations of current spectrum licence holders. Current licences were acquired subject to different terms and on the basis of certain legitimate expectations as to spectrum management and policy. The change from a "command and control"

licensing regime to a liberalised approach must apply uniformly and not discriminate against current licence holders. T-Mobile does not object to the principle of liberalisation. However, T-Mobile does consider that Ofcom is pursuing a hasty and discriminatory liberalisation agenda, with inadequate consideration of the consequences on the market. Releasing unrestricted spectrum in the time frames proposed will radically alter market dynamics and negate the case for much of the current investment now being made in services for the benefit of consumers.

Differences between the licence being proposed (or spectrum usage rights) means that, at the very least, coverage obligations similar to those applicable to 2.1GHz spectrum must be applied and consideration given to the duration of the current 2.1GHz licences.

2.9 Liberalisation objectives have been misunderstood

Ofcom appears to be pursuing liberalisation as a point of principle, without reflection on the real objectives of liberalisation. The Telecoms Regulatory Package does not require all limitations on use of the spectrum to be lifted as a matter of course. Rather liberalisation requires that licence conditions reflect the requirements of efficiency and harmonisation.

Contents

T-Mobile's response to the questions set out in Ofcom's consultation

Question 1:
Do you agree with these proposals for the awards of the three bands or have any other comments on the contents of this document?

T-Mobile has four main issues with the auction design. There are summarised below and then addressed in detail.

1.1 Summary of T-Mobile's concerns regarding auction design

1.1.1 The proposal to allow the amount of unpaired spectrum to be flexible, rather than follow the ECC Decision Band Plan is not efficient for UK operators, it will (amongst other things) lead to increased interference, high costs and a worse outcome for UK consumers. In addition, the value of the unpaired spectrum in the 2570-2620 MHz band is higher than the value of any further unpaired spectrum; this is not reflected in the auction design.

- T-Mobile argues strongly that it is not efficient to move from the ECC Decision Band Plan
- If, however, Ofcom does continue with this proposal, the differing values of unpaired spectrum within and outside the central band mean that separate clocks must be adopted for the unpaired spectrum that is within the 2570-2620 MHz band and the spectrum that is within the 2500–2570 MHz/2620–2690 MHz bands.

1.1.2 The auction design does not permit bidders to use the 2600 – 2620 MHz spectrum to pair externally with the 1900 – 1920 MHz spectrum, which would be an efficient use of the spectrum

- This would be an efficient use of the spectrum (for example, less spectrum would be required for guard bands). The auction design should allow bidders to bid for this spectrum specifically.
- This could be achieved by modifying the auction to have a separate clock for the spectrum in the 2600 - 2620 MHz band and allowing the guard band between FDD and TDD (currently channel 24) to move to channel 20.

1.1.3 The auction design does not recognise that the value of all the paired spectrum is not similar

- T-Mobile believes that there are significant issues associated with at least the top 2*5 MHz and bottom 2*5 MHz of the core ECC Decision FDD spectrum band. Hence the value of these bands is materially different from the value of the centre part of the band.
- As Ofcom has stated, the proposed auction design is only appropriate if the values are similar. Hence the demonstrable differences in spectrum value mean that the auction design should be modified, to allow separate clocks for these upper and lower frequencies as opposed to those in the middle.

1.1.4 ✂

Given these concerns, T-Mobile does not consider that a two stage auction is appropriate under the current auction design. However, if the above issues are addressed so that the generic blocks are of very similar value then we believe a two stage process with a sealed bid second stage may be practical.

1.2 Detailed arguments

The following section sets out further detail in respect of the issues highlighted above.

1.2.1 The proposal to allow the amount of unpaired spectrum to be flexible, rather than follow the ECC Decision Band Plan is not efficient for UK operators, it will (amongst other things) lead to greater interference, high costs and a worse outcome for UK consumers. In addition, the value of the unpaired spectrum in the 2570-2620 MHz band is higher than the value of any further unpaired spectrum; this is not reflected in the auction design.

1.2.1.1 Overview

As explained in our response to Question 10 below, T-Mobile believes that the band plan within ECC/DEC/(05)05 should be adhered to in order to avoid compatibility problems and to ensure a European market for equipment.

Extensive work has been done by ECC PT1 since 2000 under EC Mandate 4 (Mandate to CEPT to harmonise frequency usage in order to facilitate a co-ordinated implementation in the Community of third generation mobile and wireless communication systems operating in additional frequency bands as identified by the WRC-2000 for IMT-2000 systems) and EC Mandate 5 (Mandate to CEPT to harmonise the frequency usage within the additional frequency band of 2500-2690 MHz to be made available for IMT-2000/UMTS systems in Europe). These Mandates are attached as Annexs 3 and 4.

Mandate 5 states:

> *"In order to ensure harmonised conditions and efficient use of the abovementioned spectrum, it is necessary to investigate and decide on detailed spectrum usage parameters".*

Mandate 5 resulted in ECC Decision (05)05, which includes a harmonised band plan (the "ECC Decision Band Plan"). We believe that the Ofcom proposal is contrary to these Mandates.

The ECC Decision Band Plan is also incorporated within ITU-R Recommendation M.1036. The GSMA has published a white paper which describes the reasons to keep to the ECC Decision Band Plan[1]. In particular the GSMA white paper shows that mixed TDD/FDD use imposes significant costs on operators in the deployment of networks in this band.

The EC have drafted an EC Decision on this band which includes the ECC Decision Band Plan. This draft Decision suggests that the Commission wants to maintain the ECC Decision Band Plan. As seen by the recent European Commission's Communication on "Rapid access to spectrum for wireless electronic communications services through more flexibility", the European Commission is still keen on introducing harmonisation measures for this spectrum (see quotation in Executive Summary section 2.5).

[1] See http://www.gsmworld.com/documents/extensionbands_s1_e1.pdf

More specifically, deviation from the ECC Decision Band Plan in the manner proposed devalues the spectrum by introducing more boundaries between TDD and FDD spectrum, leading to more spectrum wastage in the provision of guard bands, and depending upon the guard band width, less reliable service offered to users because of inference between closely-spaced TDD and FDD terminals. The impracticality of requiring UK-specific terminals also denies operators the means to mitigate such inter-terminal interference by improving blocking and spurious emissions performance outside the terminal's receive and transmit bands respectively.

It should also be noted that the 2.6 GHz spectrum will be used by wider bandwidth technologies like LTE that will make guard band and inter-terminal interference issues more problematic. Ofcom should not compound these factors.

For TDD, T-Mobile believes that there are significant differences between the value of the 2570–2620 MHz band and the spectrum outside this range. This is due to a number of reasons including:

- Restrictions in receiving roaming traffic in the UK (for terminals which only operate inside the 2570–2620 MHz range as per ECC Decision Band Plan and current 3GPP specifications).
- Interference for TDD terminals designed to operate in the spectrum outside of the 2570-2620 MHz band when roaming outside the UK.
- Interference from neighbouring countries (for terminals operating outside the 2570–2620 MHz range).

Further details are set out in Annex 2 (section 2.2).

1.2.1.2 How to address this issue in the auction design

For the avoidance of any doubt, T-Mobile strongly urges Ofcom to remove the option of allowing the unpaired spectrum to increase.

If this option is not removed, the auction design would need to be modified to have separate clocks for the spectrum in the 2570–2620 MHz band and any unpaired spectrum in the paired bands. Bidders for spectrum in the 2500-2570 MHz/2620-2690 MHz bands would need to bid for a minimum of 2 x 5 MHz for paired use or 10 MHz for unpaired use. If the unpaired spectrum had to be allocated, then it should be allocated, as in Ofcom's proposal, at the higher end of the two bands.

It must be stressed, however, that T-Mobile strongly urges Ofcom to maintain the ECC Decision Band Plan.

1.2.2 The auction design does not permit bidders to use the 2600 – 2620 MHz spectrum to pair externally with the 1900 – 1920 MHz spectrum, which would be an efficient use of the spectrum

At present the auction design and packaging of the spectrum is based on the assumption that the unpaired spectrum will be used for TDD technologies which require a restricted block between operators. However, to maximise efficiency, bidders should have the opportunity to acquire spectrum in the 2600-2620MHz band for FDD downlink, either for asymmetric traffic or to pair with existing spectrum. As a consequence no guard band would be necessary between the FDD downlink blocks of different operators. This would be an efficient use of the spectrum. Furthermore, the auction design should allow bidders to bid specifically for this spectrum.

This is addressed in more detail in Annex 1.

1.2.2.1 Importance to the auction design

It is possible that the most valued use of spectrum between 2600 and 2620 MHz is for pairing with spectrum in the 1900 to 1920 MHz range. Ofcom's auction rules prohibit the possibility of using the spectrum for this purpose. Therefore, the auction runs the risk of inefficiently allocating spectrum.

1.2.2.2 How to address this issue in the auction design

One possible solution to this problem would be to modify the auction to have a separate clock for each 5 MHz block in the 2600-2620 MHz band. Bidders would be able to bid for specific blocks and those bidding for unpaired use would also need to bid for guard bands. A potential problem with this solution would be that bidders desiring to use this spectrum only for unpaired use would need to bid on separate products to piece together a single spectrum licence. Therefore, these bidders would be subjected disproportionately to aggregation risk.

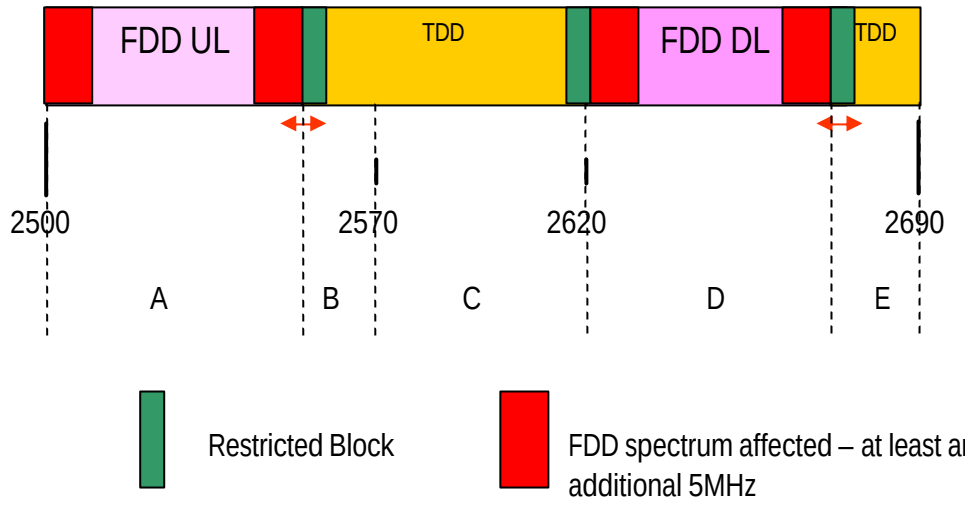
This option is not ideal and we would urge Ofcom to consider this matter further.

1.2.3 The auction design does not recognise that the value of all the paired spectrum is not similar

T-Mobile believes that there are significant issues associated with at least the first 5 MHz next to a restricted block at the FDD/TDD boundaries. Hence, the value of these bands is materially different from the value of the spectrum away from the TDD blocks.

These issues include:

- FDD blocks adjacent to restricted/TDD blocks will be worth less than FDD blocks further away due to increased interference and the costs of filters required to mitigate this (see Annex 2 section 2.1 and Figure below);
- interference due to PMSE at 2500 MHz and radars at 2690 MHz; and varying levels of constraint caused by interference from Ireland and France.



The current auction design makes it difficult for an operator to assess which block it will win during the clock stage of the auction. Therefore, the bidder must bid for spectrum on the assumption that it will be awarded the worst block. However, this would not lead to efficient bidding, or the efficient award of spectrum.

1.2.3.1 Importance to auction design

The importance of this issue to the design of the auction is that, unless this issue is properly addressed, price discovery and auction efficiency are frustrated. A goal of the clock phase of the auction is to allow price discovery, which reduces the problem of common value uncertainty.[2] If the value to most bidders of the FDD blocks adjacent to the TDD blocks is significantly less than the value of other FDD block, the clock stage of the auction only provides price discovery for the less valuable FDD blocks. As a consequence, common value uncertainty for the *most valuable* FDD blocks may be large. This would significantly frustrate auction efficiency.

A simple example illustrates this problem. Suppose that there are three lots of spectrum available for auction, and there are four bidders competing for those three lots. One lot is less valuable due to interference issues, and all four bidders recognize this interference issue but believe it will affect the value of the spectrum to varying degrees. Each bidder at auction demands one and only one block of spectrum. Bidder A is willing to pay 50 for the less valued block and 100 for the other blocks. All other bidders are willing to pay 70 for the less valued block and 90 for the other blocks. If only one clock is used to sell the spectrum, when that clock reaches 50, Bidder A must either drop out or continue bidding with the understanding that it may make a net loss in the auction—that is, the bidder stands a chance of winning the less valuable lot at a price that exceeds 50.

This example shows that the auction design, in its current form, risks limiting price discovery for the most desirable paired blocks and increasing common value uncertainty for bidders that demand those blocks. For this reason, the auction must accommodate the possibility that bidder values for the FDD blocks adjacent to the TDD blocks may materially differ from the value of other FDD blocks.

[2] See Ofcom, Award of Available Spectrum: 2500-2690 MHz, 2010-2025 MHz and 2290-2300 MHz, Dec. 11, 2006, at ¶A8.111-A8.115.

1.2.3.2 How to address this in the auction design

A solution to this problem would be to allow separate clocks for these upper and lower frequencies as opposed to those in the middle. A separate clock would be needed for paired FDD spectrum adjacent to one of the restricted TDD blocks. Furthermore, because the interference problem could affect more than 5 MHz of FDD spectrum, Ofcom would need to ensure the availability of 10 MHz of contiguous paired spectrum for an operator that bid for spectrum in one of these upper / lower frequencies.

Using this solution, bidders, during the clock phase of the auction, can properly discover the prices for unpaired spectrum, paired interior spectrum with no interference, and paired spectrum that will have interference issues with TDD spectrum. The bidder that can make best use of the FDD spectrum adjacent to TDD blocks is then able to win that particular FDD spectrum with certainty. Put simply, the bidder for whom interference is the least costly is the likely the winner of that spectrum.[3] Furthermore, bidders who believe that interference between FDD and TDD spectrum significantly reduces the value of particular blocks of FDD spectrum, must not bid on *all* FDD spectrum during the clock phase of the auction with those interference concerns in mind. Therefore, separating these FDD blocks apart from others as a separate "product" at auction would improve the efficiency of the auction.

1.2.4 ✂

1.2.5 Transparency

T-Mobile agrees with Ofcom's proposal that at the minimum the clock bids should be published on an anonymous basis.

1.2.6 Sealed bid stage

Given the above concerns, T-Mobile does not consider that a two stage auction is appropriate under the current auction design. However, if the above issues are addressed so that the generic blocks are of very similar value then we believe a two stage process with a sealed bid second stage may be practical. In this case, T-Mobile believes that the sealed bid second stage should be on a second price basis.

Question 2: Do you agree with the analysis in section 5 or have any comments on adjacent interference issues?

Our main concern relates to interference due to PMSE at the 2500 MHz boundary. Section 5.22 of the consultation states that there is a potential for interference from PMSE use into the 1st and 2nd adjacent 5 MHz channels at the 2500 MHz boundary. Interference can be mitigated against by the use of channel or band filters by PMSE users. However, it is not stated whether PMSE equipment users will have an obligation to fit the required filters.

This creates uncertainty over whether interference will be received into the blocks at 250 MHz. In particular, clarity is therefore needed on whether PMSE equipment will be required to be fitted with the filters necessary to prevent interference. Ofcom should explore with the PMSE community how this can be guaranteed. Bidders need to be informed about the level of interferences they can expect, prior to the auction.

[3] Presuming that all winners of paired spectrum have similar valuations for FDD spectrum adjacent to other FDD spectrum.

We are also concerned about interference from air-traffic control and military radars operating above 2700 MHz. T-Mobile believes that further work is required to quantify the impact of radars on the 2500 – 2690 MHz band. Again, bidders need to be informed about this, prior to the auction.

Regarding interference from Ireland and France, we believe that further work is needed on the impact to UK networks particularly if the UK auction is not in line with the EC Decision Band Plan and this is adopted by either/both Ireland and France.

We finally note that the work assumes the use of 5 MHz UTRA carriers, and has not considered the use of wider bandwidth technologies like LTE. A restriction on the carrier bandwidth in blocks at the edge of the 2500-2690 MHz band could have a significant impact on the value of such blocks, so this issue should be investigated further once the LTE RF specifications are further developed.

Question 3: Do you agree that Ofcom should authorise use of the spectrum bands 2500-2690 MHz, 2010-2025 MHz and 2290-2300 MHz?

Yes but subject to the issues in our response to Questions 5 and 6 being resolved and the auction design issues in Question 1 being addressed.

Question 4: Do you agree that awarding licences by auction would be the appropriate mechanism for authorising use of the spectrum bands 2500-2690 MHz, 2010-2025 MHz and 2290-2300 MHz?

Yes, provided the issues detailed in our response to Question 1 are addressed.

Question 5: Do you agree that it is likely to be in the interests of citizens and consumers to proceed with the award of the 2.6 GHz and 2010 MHz bands as soon as practicable, rather than to delay the award pending reduction in uncertainty relating to other bands?

See answer to Question 6.

Question 6: Do you agree Ofcom should aim to award the bands 2500-2690 MHz, 2010-2025 MHz and 2290-2302 MHz by the end of 2007, while keeping the position on the 2.6 GHz and 2010 MHz bands under review in the light of possible developments in European regulatory fora?

6.1 Summary

There are a number of issues, in relation to Questions 5 and 6, a proper analysis of which requires Ofcom to delay the auction in order to resolve them. These are set out in further detail below.

In summary, Ofcom should delay proceeding with the auction until the following issues have been resolved:

- spectrum refarming;
- the consequences of the Floe case in relation to interpretation of spectrum licences;
- completion of the technical work described in this response;
- incorporation of any lessons learnt from the fixed links auction in the auction design;
- a clear and certain definition of spectrum usage rights;
- European harmonisation measures for these bands; and
- ensuring compliance with the existing regulatory framework.

6.2 Refarming and the impact of GSM Directive

T-Mobile believes that it is imperative for Ofcom to resolve the issue of the unbalanced access to 900 MHz spectrum by UK MNOs in the light of refarming this spectrum for 3G services before auctioning the 2.6 GHz spectrum. Not doing so in time would risk, in addition to seriously distorting competition, impairing the MNOs' ability to correctly assess their demand for spectrum and hence evaluate the spectrum being auctioned. The risk of this auction being distorted by legacy uncertainties is high and an inefficient outcome would translate into inefficient spectrum usage for many years to come, potentially harming consumers' benefits. There are number of dimensions to this important issue that are of concern to T-Mobile; these are discussed below.

6.2.1 Demand uncertainty

There is general uncertainty over whether and when existing GSM spectrum will become available for 3G services. Such uncertainties prevent MNOs from correctly assessing their demand for 2.6 GHz spectrum and the costs associated with the further deployment of their 3G (and successor) networks in the UK. When planning their 3G network, MNOs (who have access to 900 MHz spectrum) have to decide whether to deploy a 3G network at 2.1GHz and 2.6 GHz frequencies or to wait and deploy at 900MHz if refarming is allowed. Deploying at higher frequencies involves significantly higher costs, because of the acknowledged propagation properties of spectrum, in particular in rural areas and to provide indoor coverage, whereby a greater number of sites are required to provide the same service. The investment choice is one of whether 2.6 GHz spectrum can be used for capacity-only purposes or also for coverage (for instance in rural areas). Using 900 MHz spectrum for coverage and 2.6 GHz in high density areas only is the most efficient outcome. Hence, 900 MHz spectrum needs to be reallocated between all mobile operators in order to allow operators to roll out a much more cost-efficient network. This would deliver economic benefits as well as social benefits as far fewer additional sites would be required, which would limit the concerns of local communities over site building. The interests of citizens and consumers would be furthered only when the most efficient 3G network is deployed. We therefore believe that Ofcom has an obligation to resolve this issue before the 2.6 GHz auction.

6.2.2 ✂

6.2.3 GSM Directive

The GSM Directive is likely to be repealed in the near future and replaced by a Decision allowing Member States to permit refarming of 2G spectrum. An auction should not take place before this Decision has been finalised.

6.2.4 Decision

Further, T-Mobile would observe that the current proposed EC Decision on GSM 900 spectrum is not in accordance with economic principle and is discriminatory as it does not require NRAs to resolve legacy competitive positions before its implementation. As noted at paragraph 3.4.1.3 of the 3G Information Memorandum:

> "*In order to pursue its objectives of effective and sustainable competition in the provision of mobile telecommunication services and to make spectrum available in the most efficient manner, the Government would expect to take account of potential effects on the viability of existing 2G and 3G operators and of the case for rectifying any distortions in the market caused by historic assignments*".

✂

In summary, an auction should not proceed until the issues around refarming have been resolved because it is only then that all market participants will be able to make an accurate market assessment of the value of 2.6 GHz spectrum and effectively participate in an auction: markets only function efficiently when participants have sufficient information to quantify the level of both supply and demand.

6.3 Spectrum to be licensed is not defined because of the Floe case

The current legal uncertainty over the interpretation of spectrum licences created by the Floe case is such that new licences should not be granted until the issues which this case has raised are resolved. To issue new licences would extend the uncertainty created by this case to additional spectrum.

Spectrum licences, including the draft licence at Annex 9 of the consultation, set out the frequencies that may be used by licensees. However, the consequence of the Floe judgement is that the implicit restriction on the use of other spectrum may not be effective.

There are several consequences to this. First, the uncertainty over the legality of spectrum use under the terms of the licence significantly erodes its value. Although the application of a liberalised regime reduces the importance of licences restrictions, it does not affect the importance of the legality of spectrum use. Licensees unsure of how they or others can use the licensed spectrum are exposed to significant uncertainties and risks. This will be reflected in the value they ascribe to licences and the extent to which they may innovate and provide new services. Not only will this impact the value of licences at auction, but it will also impact the secondary market. Commissioner Reding has herself observed that the definition of spectrum rights is a crucial aspect of this. In a speech at the European Spectrum Management Conference in March 2006 she observed that:

> *"There are many issues that will have to be considered before functioning spectrum markets will be in place in Europe. One obvious problem is the definition of spectrum rights. Only when the definitions are clear and understood can there be a functioning market."*

Second, to the extent that the Floe judgment is invoked by spectrum users, and doubt introduced as to the terms of licences, this may mean that problems relating to interference are more difficult to resolve. Resolution of interference is already an issue because of lack of clear spectrum property rights and this will complicate matters further.

6.4 Technical work to be completed

T-Mobile believes before an auction proceeds further work is urgently required on the following:

- Clarification of the necessary guard bands between FDD and TDD systems particularly with channels greater than 5 MHz (see response to Question 11).
- The base station and terminal spectrum masks for the award need to enable technologies such as 3GPP LTE (see response to Question 18).
- The effect of blocking. T-Mobile believes the probability of blocking is high at the locations where the spectrum is the most valuable, ie in location where there are many consumers. Further, studies are needed on the interference which users of TDD terminals may experience when they roam into countries which adopt the ECC Decision Band Plan (see response to Question 10).
- Further work is needed to clarify the impact of interference from PMSE, and minimise this impact; bidders need to be aware of the level of interference they can expect (see response to Question 2).
- Interference from air-traffic control and military radars operating above 2700 MHz. T-Mobile believes that further work is required to quantify the impact of radars on the 2500 – 2690 MHz band; bidders need to be informed of the level of interference they can expect from radars (see response to Question 2).
- Interference from Ireland and France. Further work is needed to clarify the constraints that UK operators will be required to operate under, particularly if the UK Auction is not in line with the ECC Decision Band Plan and Ireland and / or France adopt it (see response to Question 2).

6.5 Lessons learnt from fixed links auction to be incorporated

Given the auction design issues addressed in response to Question 1, T-Mobile believes that the 10, 28, 32, 40 GHz auction should take place first to allow any lessons from that auction to be incorporated in the 2.6 GHz auction design and auction process. Furthermore, sufficient time should be left between these auctions to ensure that there is a sufficient opportunity to make any necessary amendments to the auction design before proceeding with the 2.6 GHz auction.

6.6 Spectrum usage rights

T-Mobile is very concerned that Ofcom is proposing to auction this spectrum whilst critical aspects of the policy regime that will apply to the new licensees remain uncertain. T-Mobile has commented at length on the need to ensure that the property rights in spectrum are adequately defined prior to any auction. To be able to sell and obtain a certain, defined legal title to spectrum is far preferable than obtaining the legally unclear licence proposed. The failure to properly define rights means that disputes around interference and the question of liability relating to interference will remain unclear.

Further detail in respect of this is set out in response to Question 17 below.

6.7 Harmonisation obligations arising from the regulatory framework

Ofcom proposes to issue licences for the auctioned spectrum that are substantially unrestricted in terms of the technology that may be employed. Subject to interference related restrictions, the spectrum will be used for a potentially wide range of technologies.

Although T-Mobile does not object to the principle of liberalisation per se, T-Mobile does consider that Ofcom is pursuing a hasty agenda which does not meet the harmonisation duties that it is required to fulfil under EU and national law, and which is likely to lead to consumer detriment through the consequent impact on interference and roaming.

First, Article 8(3) of the Framework Directive provides that NRAs shall contribute to the development of the internal market by encouraging the establishment and development of trans-European networks, the interoperability of pan-European services and end to end connectivity. If spectrum assignment policies are asymmetrical across Europe, as may easily be the case if the auction goes ahead before these issues are resolved, interoperability is likely to be more difficult and in some cases might be impossible. If, as is proposed, a free market approach is implemented without adequate harmonisation measures in place (or at least agreed in principle) efficient application of standards across Europe will be obstructed. Furthermore, to the extent that the UK finds itself unaligned with European standards, Ofcom's haste to auction spectrum is likely to harm consumer interests directly.

Second, Article 9(2) of the Framework Directive provides that Member States shall promote the harmonisation of use of radio frequencies across the Community, consistent with the need to ensure effective and efficient use thereof in accordance with the Radio Spectrum Decision. Recital 18 of the Decision states that implementation of Community policy may require spectrum co-ordination. By auctioning spectrum before Community policy has been agreed, Ofcom's course of action is likely to unnecessarily obstruct harmonisation.

Third, these imperatives are reflected in Ofcom's duties under the Communications Act. Section 4(4) of the Communications Act provides that Ofcom's activities must contribute to the development of the European internal market. In the event of any conflict between Section 4 and any other duty (for example Section 154 of the Communications Act - the demand for use of spectrum), Ofcom's obligation to promote the common market under Section 4 prevails.

Ofcom's proposed approach of licensing the 2.6 GHz spectrum on a wholly technology neutral basis goes against these harmonisation requirements. As addressed further at Section 6.11 below, liberalisation, and the consequent aims of technology and service neutrality, are not imperative aims in themselves. Rather, Ofcom's liberalisation obligation is to consider whether the efficient use of spectrum requires the elimination or reduction of limitations on rights of use. Maintaining restrictions which have an inherent value and which encourage initial investment therefore remains a legitimate and effective way to ensure efficient use of radio frequencies.

Ofcom must therefore consider whether harmonisation requires restrictions on the licensed spectrum, or the delay of licensing in order to allow harmonisation to be resolved at the relevant international level. Ofcom is required to demonstrate that its proposals do not impede harmonisation. It has not done so.

In particular, the current international framework for the use of 2.6 GHz spectrum, and the likely future framework, is for this to be harmonised for UMTS/IMT-2000 systems. Significantly, the ECC Decision

Band Plan allocates spectrum in the 2500-2690 MHz band for terrestrial UMTS/IMT-2000 (i.e. 3G) use. Although Ofcom rightly states that it is not bound by the CEPT framework, the requirements of harmonisation outlined above clearly require Ofcom to take due account of spectrum allocations suggested at this level.

In addition, Ofcom must now take account of the Commission's recent Communication on access to spectrum for wireless communications services[4], which makes clear that the Commission will revisit the 2.6 GHz expansion band and push for harmonisation. The Communication refers to the GSM Directive and it is not unreasonable to interpret the Communication as suggesting that it may achieve the desired harmonisation by adopting a similar measure in relation to the 2.6 GHz band. The Commission will also mandate ETSI to develop harmonisation standardisation.

Similarly, the European Parliament has recently adopted a resolution on European spectrum policy[5], which:

> *"Notes that the divergence in Member State regimes for spectrum allocation and exploitation differ widely and that these differences represent serious obstacles to the achievement of a well-functioning single market"* and *"Calls on Member States to support enhanced cooperation measures between spectrum management authorities, to consider areas where common spectrum allocation would allow new technologies and services to emerge, to step up their information exchanges and to remove over-prescriptive regulatory constraints[6]"*

In the light of these clear signals at the European level, Ofcom's proposed auction timetable creates a significant risk that UK spectrum allocations will not be harmonised with European allocation. In particular, the proposed auction would endanger the harmonised use of IMT-2000 in the 2500–2690 MHz bands. This would not only fall foul of Community obligations, and complicate or preclude efficient equipment procurement: there would be a substantial risk that licences issued following the proposed auction would have to be recalled and the spectrum re-auctioned in order to comply with EU harmonisation measures. This would not only be a significant embarrassment, but would be at considerable cost to bidders, consumers, and the efficient use of spectrum.

It follows from the above that the current approach suggested by Ofcom poses a considerable risk to international roaming, both by UK consumers and incoming visitors. If the ECC Decision Band Plan is not adopted in the UK, but is followed by other European countries (as is likely) then international mobile roaming will be jeopardised. As further explained in response to Questions 10 and 11 below, failure to follow the ECC Decision Band Plan will result in considerable hurdles to handset procurement for UK customers and result in interface and interference problems that will obstruct the ability of consumers to roam. In allocating spectrum outside the ECC Decision Band Plan Ofcom's approach is therefore likely to lead to direct consumer detriment. This would be in clear breach of its obligations, under both European and domestic legislation.

Lastly, in discounting its harmonisation obligations, Ofcom's current proposals are inconsistent with previous Government statements regarding harmonisation. At section 3.4.1.2 of the Information Memorandum on the auction of 3G spectrum in 2000 it was stated that:

[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 Communications Services. COM (2007)50 Final. 08.02.07

[5] European Parliament resolution Towards a European policy on the radio spectrum (2006/2212(INI)).

[6] Clauses 31 and 32.

"the Government would support action within the ERC to make any additional spectrum available on a harmonised basis across CEPT countries. Since IMT-2000 is a global concept, the Government will also press for harmonised use of spectrum identified for IMT-2000 to be facilitated at a global level, through the development, after WRC-2000, of appropriate recommendations within the International Telecommunication Union Radiocommunications Sector."

Accordingly, Ofcom's proposals are not only inconsistent with its harmonisation obligations under the regulatory framework, but also inconsistent with previous statements on the UK's intentions to ensure harmonised use of 2.6 GHz spectrum.

On the basis of the imperatives summarised above it is clear that Ofcom's assertions that there is demand for the spectrum, that delay would result in unacceptable inefficiencies and that liberalisation requires this spectrum to be licensed without technology related conditions, even if correct, wholly fail to take account of the overriding requirement of harmonisation. This in turn will lead directly to consumer detriment through the consequent handset procurement, interference and roaming.

The rationale of the legislative framework that dictates Ofcom's remit is clearly that the internal market and other Community obligations should take precedence over national considerations such as satisfying apparent domestic demand in the short term. Ofcom should therefore either ensure consistency in spectrum allocation through the use of licence conditions, or delay auctioning the spectrum until European coordination has been agreed.

In summary, Ofcom's proposals do not place sufficient weight on the internal market and harmonisation of spectrum regimes across Europe. Ofcom is required to demonstrate that its proposals do not impede harmonisation, but has not done so. Ofcom should therefore not proceed with licensing before a harmonisation framework for this spectrum has been agreed, or should do so cautiously and therefore adopt the ECC Decision Band Plan. Failure to do so would be result both in a breach of Ofcom's harmonisation obligations and in direct detriment to consumers.

6.8 Inconsistency with Ofcom's duties to secure the optimal use and efficient management of spectrum

Under Section 3(2)(a) of the Communications Act, Ofcom is under a duty to ensure the optimal use and efficient management of spectrum. Implicit in this is the derivative duty to ensure that the release and disposal of spectrum is itself efficient.

Ofcom considers that because there is demand for this spectrum, it should be auctioned as soon as possible. Ofcom's view is that this is the best means of ensuring efficiency of spectrum use. However, this approach is only valid in the short term.

Even if there is demand for the spectrum, something which Ofcom has failed to demonstrate, the proposed timetable for auction is such that many potential bidders (for the reasons set out below) are unable to quantify their demand. These bidders will therefore be unable to make an accurate assessment of the value of the spectrum and the market value at auction will therefore not reflect the actual long term value either. Proceeding with the auction before demand can be quantified will inevitably lead to an inefficient outcome.

There are broadly two types of potential bidders for the spectrum: Wi-Fi/WiMax broadband operators and mobile broadband operators. However, half the potential pool of bidders, the mobile operators, are unable to quantify their demand for the spectrum at present. Not only does this mean that the spectrum is likely to be inaccurately valued, and therefore inefficiently allocated, but it also potentially removes some of the most innovative and competitive providers from the pool of bidders.

The principal reason for which mobile broadband operators are unable to quantify their demand for the spectrum is that until Ofcom resolves the timing of and how 2G refarming will take place, and resolves legacy issues from the licensing of 2G and 3G spectrum these operators cannot quantify their demand for further spectrum generally, or for the 2.6 GHz spectrum specifically.

As a consequence, these potential bidders may either choose not to bid, or to bid defensively. In either case, this will lead to an inefficient outcome. By creating a situation in which significant potential bidders consider the value of the spectrum too uncertain to participate in the auction, Ofcom's auction will not lead to efficient spectrum allocation. Similarly, the uncertainty created by Ofcom's haste may lead to other operators making defensive bids, in order to avoid the risk that they will have insufficient spectrum in future. This would also lead to inefficient spectrum allocation, since these bidders would seek to acquire a licence at any cost, driving up the price of the spectrum to an inefficient level. Furthermore, the allocation of spectrum in such circumstances may result in different bands of spectrum being underused or overused by the licence-holders and thus create inefficiency and potentially prevent effective use of that spectrum (which was acquired for defensive reasons) by other operators.

While Ofcom recognises the uncertainties and risks 3G operators face, it fails to acknowledge its responsibility for them. Ofcom suggests that these are simply an aspect of doing business, which should be accepted as part of the reality of participating in a dynamic market. This ignores the fact that it is Ofcom that is responsible for regulating the market, determines the rights that are being auctioned and the timing of spectrum release. It is Ofcom that determines both the bidders' current rights and the value of the rights being auctioned. It is therefore Ofcom's duty to address the uncertainties and risks its policy creates.

Furthermore, allowing spectrum allocation to proceed on a basis that is not harmonised with the rest of Europe may lead to considerable issues regarding equipment procurement, roaming, interference etc. Allocating spectrum on the basis proposed may also lead to considerable harm to operators of 3G licences, leading to significant inefficiencies in the use of their spectrum also (see further Section 6.9 below).

Proceeding with the auction in these circumstances will lead to a highly inefficient outcome and be in breach of Ofcom's obligations under section 3(2)(a) of the Communications Act.

6.9 Inconsistency with Ofcom's principal duty to further the interests of consumers in communications markets

Ofcom's principal duty is to protect and promote the interests of consumers in the market. This duty takes precedence over any obligations in relation to securing efficient use of spectrum. Until such time as operators are able to fully exploit their 3G spectrum it is extremely difficult to justify requiring consumers to acquire new terminals for services which are also replicated in whole or part on 3G networks.

Consumers also have an interest in the viability of existing operators. Such viability depends on the ability to make a return on existing assets, including 3G spectrum.

6.9.1 ✂

6.9.2 ✂

6.9.3 Harmonisation

As noted at Section 6.7 above, proceeding with the auction without due regard to Ofcom's duties to ensure European harmonisation will deny consumers the benefits of pan-European services interoperability and end to end connectivity and the efficient application of equipment standards across Europe will be hampered. Pursuing an auction before harmonisation of this band has been addressed is inconsistent with Ofcom's duties.

6.10 Ofcom must have regard to the legitimate expectations of current spectrum licence holders and the need to not discriminate against those licensees

Ofcom has acknowledged that special considerations apply in respect of incumbent 3G operators in its Implementation Plan[7]. These considerations arise because of the circumstances of the artificially created spectrum scarcity and controlled regulatory environment at the time of the 3G auction. These justify a period of transition to liberalisation and a delay in the implementation of its proposed measures.

The licence holders of spectrum currently used for broadband services (the likeliest use of the spectrum to be auctioned) paid £4 – 6bn pounds for each of their licences. There are many reasons for this, including the 'dot com bubble' and a miscalculation by the market of timing of availability of equipment and of the services and revenues that could be realised using mobile broadband. However, another of the principal reasons for the high price paid was the low level of supply of spectrum for mobile broadband services. This restricted availability of spectrum was created by the regulatory regime then in place. Mobile operators paid these prices because of the exclusivity the regime provided in the market for mobile broadband. This exclusivity was based on the absence of trading or liberalisation provisions which would have undermined this exclusivity and above all on the lack of other spectrum made available for equivalent services. As noted at paragraph 8.45 of Ofcom's Spectrum Framework Review: Implementation Plan:

> *"The change in policy towards spectrum management described in this document is a major change in the regulatory environment. Trading and liberalisation were not under discussion at the time of the 3G action (there was discussion of possible release of additional spectrum)."*

Although the possibility of additional spectrum release was acknowledged, the RA's conduct in holding the auction, and the general wording of the Information Memorandum, gave rise to the expectation that Ofcom's approach would not change without a significant change in circumstances, or that 3G licence-holders would be treated in the same way as any other spectrum holders. Although new spectrum has been made available, the implementation of trading and the application of liberalisation to allow new spectrum to be used for 3G services were not foreseen. Accordingly, although there was discussion of a

[5] See paragraphs 8.348.45.

possible release of additional spectrum, it was reasonable for the market to assume that any such release would not substantially harm the interests of licensees of the original 3G auction.

Instead, under the proposed auction, Ofcom will release spectrum that will be in direct competition with that held by current 3G licensees, without compensating them for the consequent change in the value of their licences or the service they provide to consumers.

Furthermore, Ofcom effectively proposes to discriminate between current and future licence holders, by failing to apply the same principles of liberalisation and trading to existing licensed spectrum. Existing licences will therefore remain subject to onerous conditions (notably the 80% rollout obligation, the inability to trade or adapt the use of spectrum and the fixed duration). Ofcom's suggestion that these conditions were accounted for in the market price of licences is misleading, since it was these restrictions that both reinforced their scarcity value and provided the basis for the legitimate expectation that the investment would be protected.

By discriminating between current and future licence holders, Ofcom fails to have regard to the non-discrimination test set out in Article 9(1) of the Framework Directive. This requires that spectrum allocation is based on objective, transparent, non-discriminatory and proportionate criteria. This is a continuing obligation. Accordingly, Ofcom should either amend the terms of the proposed new licences or amend the terms of existing licences in order that the new regime does not discriminate against existing licensees.

Lastly, Ofcom suggests that it cannot take account of the circumstances of previous auctions in designing the proposed auction because this could lead it to breach the duty of a public body not to fetter its discretion. On this basis, Ofcom defends its assertion that it does not have to have regard to the legitimate expectation of existing licences that their investment in mobile broadband licences would be protected and that they would not be discriminated again in the release of additional spectrum.

However, there are circumstances where a legitimate expectation will be protected in the face of a change of policy, despite the duty of a public body not to fetter its discretion: the question is whether the change is a lawful exercise of discretion and whether due account of relevant considerations was taken in the exercise this discretion to alter policy. T-Mobile considers that Ofcom has failed to take due account of relevant considerations, by failing to address the situation now faced by current 3G spectrum licence holders. Ofcom has acknowledged but not addressed the impact that the new licensing policy (and more particularly the contemplated auction) will have on both the business case for 3G mobile broadband services and the viability of further investment in 3G infrastructure to extend services to consumers currently without coverage.

In the light of the risk of discrimination and of legitimate interests being ignored the European Commission has urged Member States to avoid penalising existing rights holders in relation to new rights holders issued with more flexible, service- and technology-neutral licences, for example by allowing existing rights holders increased freedom in exercising their current rights. In its Communication[8] on the introduction of a market based approach, the Commission stated that:

[8] European Commission Communication ((COM) 2005 400 final) of 14 September 2005 on a market based approach to spectrum management in the European Commission.

"The introduction of spectrum markets is expected to impact the value of existing licences, whether tradable or not, as well as on related investments. Such an impact might affect different right-holders in different ways. In any case, that impact will reflect the existing and future licensing conditions as well as the level of competition across the Community.

When handling the transition to a market-based approach, Member States should take the legitimate interests of right-holders into account, while at the same time ensuring the compatibility with competition law requirements and general Community law principles. In order to avoid penalising existing right-holders, it may be necessary, for example, to give them increased freedom in exercising their rights and to remove unjustified restrictions to the usage of those rights. This should be done in a gradual and non-discriminatory manner, while the market value for spectrum rights develops."

The dismissal of any questions of discrimination or legitimate interests/expectations in respect of current licence holders set out in Ofcom's consultation illustrates the lack of any serious consideration of these questions. It is also inconsistent with Ofcom's own statements. As recently as January this year, Ofcom has stated that:

"Rights of spectrum users should be clearly defined and users should feel comfortable that they will not be changed without good cause"[9]

Despite such statements however, Ofcom's approach remains discriminatory, fails to address legitimate interests of current licence holders, and makes no proposal as to how these issues may be addressed as the market develops.

As noted above, the existing 3G mobile operators are under an onerous obligation to provide 80% population coverage by the end of 2007. However, Ofcom now considers that pursuing policy goals through licence conditions is not desirable and proposes that other operators be allowed to enter the market to offer 3G services without any coverage obligation. The consequence of this discriminatory approach would be to allow new operators to target their entry on the areas and services of highest value while existing operators remain burdened with the cost of providing coverage on a near-national basis.

If Ofcom considers that competition on price in urban areas is more important than competition for the provision of 3G services at a national level, and therefore licenses new providers with no roll out obligations before existing investment in infrastructure can be recouped, then Ofcom should address the effect this will have on current licensees and their customer base. If Ofcom no longer believes that coverage obligations are desirable, then it should remove the coverage obligations on the 3G operators as soon as possible. We note that Ofcom proposes to remove conditions on the 3.4GHz licences a mere 4 years after they were issued whereas Ofcom expects 3G operators to meet a goal, which Ofcom no longer appears to support, over 7 years after the release of the 3G licences.

On the other hand, if the coverage obligations are to be maintained, then Ofcom must provide legacy licence holders with a period in which to recover the cost of rolling out their networks to meet their coverage obligations before new 3G entry is allowed without such obligations.

[9] Ofcom presentation "Spectrum: a briefing for analysis". 30 January 2007. Page 14.

Ofcom should also consider the discrepancies in duration, tradability and liberalised usage. In order to prevent discrimination between competitors, licence terms should be harmonised in these respects.

Failure to proceed in this way would be in breach of the non-discrimination test set out in Article 9(1) of the Framework Directive and ignore the Commission's Communication regarding discrimination and the legitimate interests of existing licence holders

6.11 Ofcom has misunderstood the imperative to liberalise licence conditions

Ofcom cites the Telecom's Regulatory Package requirement to liberalise licence conditions in justifying the few conditions that will be attached to the new licences. Within this package, Article 5(5) of the Authorisation Directive provides that Member States shall not limit the number of rights of use to be granted except where this is necessary to ensure the efficient use of radio frequencies in accordance with Article 7. Article 7 sets out a procedure for limiting the number of rights of use to be granted for radio frequencies.

Ofcom would appear to consider the liberalisation agenda as an absolute obligation. This is mistaken. The Telecoms Regulatory Package does not require all restrictions to be lifted as a matter of course. Rather, the intention is that limitations should reflect only those required to ensure efficient spectrum use. The exception referred to in Article 5(5) of the Authorisation Directive is clear in this regard.

Ofcom's liberalisation obligation is therefore to consider whether the efficient use of spectrum requires the elimination or reduction of limitations on rights of use. Accordingly, maintaining restrictions which have an inherent value and which encourage initial investment remain a legitimate and effective way to ensure efficient use of radio frequencies. As noted above, Ofcom should either await the conclusion of discussions on harmonisation of the 2.6 GHz band at a European level or include appropriate licence conditions to ensure that UK customers benefit from harmonised spectrum allocation.

6.12 BT dominance

Lastly, Ofcom may wish to reflect further on the identity of likely new entrants. As observed by Ofcom, BT is very likely to bid for 2.6 GHz spectrum.

Ofcom's proposals, which considerably disadvantage existing mobile operators, while favouring new players offering mobile services, are of particular concern because one of the most likely new entrants is BT – the dominant provider of fixed services with the scope to further leverage its fixed dominance into convergent fixed/mobile markets. Ofcom's proposals would allow BT to acquire mobile spectrum without any roll-out obligations and at a price significantly below that paid by the current 3G operators. This would enable BT to offer mobile broadband network and retail services at a significantly lower cost than the 3G operators. This could lead to BT targeting the most profitable metropolitan areas and undermine 3G operators' ability to compete in those areas and to support their national networks. Such an outcome would disadvantage consumers and aggravate the digital divide.

Given Ofcom's duty to ensure a competitive telecoms market, it may wish to consider the desirability of providing BT with the opportunity to purchase spectrum in one of the few opportunities left for new infrastructure-based broadband competition at a time when its mobile competitors are already facing considerable difficulty funding their existing broadband infrastructure. However, Ofcom's proposals may

result in preferential treatment of a dominant player, and consequently threaten the strong competition and high levels of investment and innovation that have characterised mobile services to date.

Question 7:
Do you agree with Ofcom's proposals for licence conditions (technology neutrality, tradability, conditions of tenure and absence of roll-out obligations)?

As discussed in response to Question 6 (at 6.10), T-Mobile believes the proposals discriminate between current and future licence holders, by failing to apply the same principles of liberalisation and trading to existing licensed spectrum. Existing licences will therefore remain subject to onerous conditions (notably the 80% rollout obligation, the inability to trade or adapt the use of spectrum, and the fixed licence duration). Ofcom's suggestion that these conditions were accounted for in the market price of licences is misleading, since it was these restrictions that both reinforced their scarcity value and provided the basis for the legitimate expectation that the investment would be protected.

By discriminating between current and future licence holders, Ofcom fails to have regard to the non-discrimination test set out in Article 9(1) of the Framework Directive. This requires that spectrum allocation is based on objective, transparent, non-discriminatory and proportionate criteria. This is a continuing obligation. Accordingly, Ofcom should either amend the terms of the proposed new licences, or amend the terms of existing licences in order that the new regime does not discriminate against existing licensees.

Regarding technology neutrality, T-Mobile believes that any technology needs to be applied to well defined requirements to:

- avoid interference;
- avoid service quality degradations;
- use spectrum efficiently i.e. minimising guard bands;
- maximise economies of scale for equipment i.e. adhere to harmonised band plans; and
- allow for sufficient certainty to enable bidders to raise finance for their acquisitions.

For these reasons we strongly believe that TDD and FDD technologies should be segregated in accordance with the ECC Band Plan for 2500 – 2690 MHz spectrum.

Regarding licence conditions for mobile terminals to be used in these bands, Ofcom will need to clarify whether these will be exempted from licensing. It is assumed that the relevant Interface Requirement documents will also be updated and this needs clarification.

Question 8:
Do you have views on whether or not there should be a "safeguard" cap on the amount of spectrum that any one bidder could win in an award for the 2.6 GHz bands and, if so, do you have a view on whether 90 MHz would be an appropriate size for a safeguard cap?

T-Mobile agrees that a safeguard cap is necessary. 90 MHz may be rather high and we would welcome consideration of a lower cap.

Question 9:
Do you agree with Ofcom's proposal to package spectrum as lots of 2 x 5 MHz for paired use and 5 MHz lots for unpaired spectrum and to allow the aggregation of lots by bidders?

T-Mobile agrees with this proposal. It is essential that the aggregated lots are contiguous to allow for use with technologies with bandwidths greater than 5 MHz.

Question 10:
Do you agree with Ofcom's proposed approach to allowing the respective amounts of paired to unpaired spectrum for the band 2500-2690 MHz to be varied (maintaining the 120 MHz duplex spacing and allowing additional unpaired spectrum, if needed, at the top end of the band)?

10.1 Summary

T-Mobile agrees that it is vital that the 120 MHz duplex spacing should be kept. However, as discussed in response to Question 1, T-Mobile strongly disagrees with the proposal to allow the respective amounts of paired and unpaired spectrum to be varied. We believe this would be contrary to the EC Mandates 4 and 5.

The auction design implications of this issue are addressed in our response to Question 1 and the technical and commercial arguments are set out below.

To avoid compatibility problems and to ensure a European market for equipment, it is necessary that the band plan in ECC Decision is maintained. The problem of interference due to blocking if the ECC Decision Band Plan is not maintained is addressed below. Further detail is set out in Annex 3.

10.2 Efficient use of the spectrum

Introducing an unpaired allocation into paired bands creates the need for an extra guard band, places further restrictions on FDD base stations in terms of additional filters and increases the interference due to another TDD/FDD boundary. We address the TDD/FDD boundary in our response to Question 11.

In order to avoid this, TDD technologies such as IEEE 802.16e have an FDD variant which should be implemented, since these can fit within the ECC Band Plan without causing compatibility problems. Other TDD technologies such as UTRA TDD can also be adapted to fit within FDD spectrum in within the ECC Band Plan. For example T-Mobile has deployed modified TDD equipment that operates in half duplex FDD mode in the paired spectrum band 872 – 876 MHz/917 – 921 MHz in the Czech Republic. This approach would allow the maintenance of the ECC Decision Band Plan, with all technologies accessing parts of the 2500 – 2690 MHz band without causing interference.

10.3 Interference due to receiver blocking

The Masons report (section 5.2.4) highlights the problem with Receiver Blocking of UTRA FDD systems:

> "*The overall conclusion of this analysis of the potential for receiver blocking to occur is that the 3GPP blocking specifications for the 2GHz band have been developed in accordance with the CEPT band plan and hence blocking specifications for the base station and mobile standards*

are defined relative to the FDD pass bands designated in the CEPT plan. Alternative specifications are not considered to reflect alternative band plans implemented on a national basis.

Based on the information contained within the existing 3GPP specifications, our conclusion is that, from the limited perspective of blocking, there would be a preference for TDD to be deployed within the FDD duplex gap and the FDD uplink band, rather than the FDD downlink band (due to the impact of TDD blocking on the FDD mobile receiver). The FDD uplink band is a preferred location for TDD because it is possible to mitigate blocking effects of TDD transitions by fitting filters to standard FDD base stations, effectively reducing the base station receiver band to those channels used by FDD only.

The alternative mitigation for TDD in the downlink would be to modify mobiles, which would be more expensive and could affect roaming.

It is also not clear from the specifications reviewed as part of this study that the UTRA FDD and TDD specifications are compatible with each other when considering TDD systems deployed in the FDD duplex gap. For instance, in future iterations of the standards, it may be beneficial to seek to align FDD in-band and out-of-band blocking specifications with TDD (UTRA and WiMAX) out of band emission specifications. "

If TDD terminals are allowed to operate in the paired spectrum then FDD mobile terminals will suffer interference in the UK:

- because adequate FDD blocking specifications cannot be implemented within their receive band; and
- TDD out-of-band and spurious emissions cannot be reduced to a suitable level.

Similarly, TDD terminals capable of operating outside of the 2570 – 2620 MHz central gap will suffer interference from FDD terminals.

Section 4.1 of the "Technical Study Adjacent and In-Band Compatibility Assessment for 2500-2690MHz" also covers the issue of Blocking and concludes:

"At separations up to a few metres indoors in a typical network deployment, there will significant potential for WiMAX TDD mobiles to interfere with UMTS FDD mobile reception - enough to cause noticeable service degradation to the UMTS user. For separations beyond 10m, UMTS service disruption reduces to a level that may not be noticed. In the same environment, TDD UMTS mobiles, at 10MHz or greater separation, are not expected to cause significant service degradation to FDD UMTS mobile reception."

We do not believe that 10 MHz between channel centres will be sufficient to prevent blocking:

- Wider bandwidth carriers likely to be used by the WIMAX and LTE technologies that operators are likely to deploy in the band should be analysed.
- The results state that outage probability reduces with the number of terminals (load). The outage probability needs to be determined for the particular terminal in close proximity to the TDD terminal, rather than for all terminals. As stated in the report, in that case the outage increases with load but no figures are given.

- The power allocated to an individual speech user does not seem to be limited below that for the carrier as a whole. In practice a speech user does not consume a large fraction of the total BS power, as seems to be allowed in the simulation. At the low loads modelled, it maybe possible to increase the load substantially. As mentioned in the point above, in that case a higher load should be considered.
- It is not clear what in-building penetration loss is modelled. It is important to assume a representative penetration loss so that receive level is realistically close to thermal noise floor.
- The analysis is based upon voice outage. In many cases where voice might be supportable, the data rate might suffer unacceptably. An analysis based upon HSDPA data rates should be analysed.

As noted above, interference will occur in the locations where 2.6 GHz will be the most valuable i.e. hot spots. Requiring FDD users to move 10m or more away from TDD equipment is simply not an option. T-Mobile believes that 10m is rather optimistic and interference will be received at even greater distances.

Further detail regarding the interference problems associated with the variation of paired and unpaired spectrum allocation is set out in Annex 3.

10.4 World market for terminals

It is unrealistic to suggest that interference problems to handsets can be overcome by terminals with modified filters since such equipment would be specific to the UK market. Niche products for a limited market of the size of the UK might encourage customers to buy more attractive and cheaper terminals from outside the UK. This would exacerbate the interference problems described above.

Furthermore incoming roaming mobiles would also be affected, raising serious concerns regarding UK compliance with Community harmonisation objectives (see response to Question 6 above). This is because the frequency arrangement as proposed by Ofcom is likely to be specific to the UK and at variance with those agreed for a large part of Europe.

Question 11: Do you agree with Ofcom's proposals for a 5 MHz restricted block between FDD and TDD neighbours and between TDD and TDD neighbours and with a modified out-of-band base station mask for second adjacent 5 MHz blocks?

11.1 Summary/General remarks

The issue of interference between TDD and FDD technologies has been studied in detail within the ITU for many years and work is still on-going.

T-Mobile considers that Ofcom's proposal, of having a 5 MHz restricted block between FDD and TDD neighbours and between TDD and TDD neighbours and with a modified out-of-band base station mask for second adjacent 5 MHz blocks, is not sufficient to ensure that both TDD and FDD systems do not receive interference.

It is accepted that having larger restricted blocks between both TDD and TDD and between FDD and TDD blocks would reduce spectrum utilisation. However, it has to be recognised that FDD systems

adjacent to the restricted block will receive more interference than FDD systems further away. It is therefore important that the auction design allows operators to bid for spectrum which is further away from the interference caused by TDD systems.

However, this issue is raised only because of Ofcom's current auction design. Accordingly, if Ofcom proceeds with an auction design that does not diverge from the ECC Decision Band Plan, then fewer guard bands would be required. This would offset the cost of robust guard bands, and so avoid interference between both domestic handset terminals and incoming roaming handsets.

11.2 Receiver Blocking

As stated in our response to Question 10, we do not believe that 10 MHz between channel centres will be sufficient to prevent blocking.

11.3 TDD systems with bandwidths greater than 5 MHz

Of particular concern is interference from TDD systems with bandwidths of greater than 5 MHz which would result in more interference than is presented in the analysis undertaken by Masons. Masons acknowledge that:

> *"Our analysis assumed a 5MHz channel width for both FDD and TDD systems. It is noted that 802.16 systems and 3GPP LTE may use 10MHz channels. An 802.16e system with a bandwidth greater than 5MHz, sharing a frequency band with a 5MHz WCDMA system, would typically result in less interference to WCDMA, but more interference from WCDMA to 802.16 than is presented in our analysis."*

Both FDD and TDD systems are expected to operate with higher bandwidths (3GPP standards foresee up to 20 MHz). T-Mobile believes that the impact of technologies with larger bandwidth needs to be analysed.

11.4 Interference to Mobile terminals

We are concerned that interference will still occur to mobile terminals.

Masons acknowledge that:

> *"The results of our analysis suggest that interference will be noticeable when the distance between mobiles is less than 10 metres."*

One major benefit of the 2.6 GHz band is to provide capacity relief in areas such as airports, hotels, meeting venues etc. Not being able to use the spectrum within 10m of a TDD terminal places severe constraints on the customer and hence will have a direct impact in the evaluation of spectrum which is close to a TDD block.

We do not agree with Masons brief analysis of the probability of mobile-to-mobile interference and their conclusion that this would be low. Their assessment is based purely on the assumption that mobile terminals are on for 3% of the time and only 5% of terminals will be able to use 2.6 GHz. Given that a 2.6

GHz terminal will in fact be on constantly, then on their analysis the real probability of interference would be extremely high and would be closer to 100%.

11.5 Assumed mitigation techniques

Without mitigation it is clear from the Masons report that TDD/FDD and TDD/TDD co-existence is not feasible even with 15 MHz between channel centres. Mitigation techniques are therefore required to ensure compatibility and without them interference will arise. Masons have assumed a number of mitigation techniques in the study:

- Site placement: typically 17dB
- Site engineering: 15dB
- Tx/Rx filter: 30 – 60 dB
- Antenna Azimuth: 5-10 dB

Many of these mitigation techniques assume that operators will co-ordinate their networks. This is not generally done today with 2G/3G networks and will place additional costs and constraints on the network operators. If an operator does not wish to co-ordinate or the mitigation techniques assumed are less effective than predicted by Masons then there is a strong possibility of interference into neighbouring networks.

The cost of providing filtering to meet the modified out of band emissions mask is considerable. Masons quote a figure of €1000 per filter. Such filters are needed for each receiver (3-sector) of the FDD BTS as well as in all top tower amplifiers (2 per sector, i.e. for a 6-sector site 12 top tower amplifiers have to be modified).

We have studied two possible scenarios for base station deployment to meet the mask and concluded that the cost per site will be in the range from €✂ to €✂.

a) ✂.

b) ✂

11.6 Site coordination and synchronisation of systems

Masons concludes that:

> *"Co-ordination between FDD and TDD systems will be required at each FDD/TDD boundary within the 2.6 GHz band:*
> - *For FDD/TDD operating at 10MHz offset (i.e. second adjacent channel) – our view is that site coordination will be required if systems are to be co-located, plus use of band stop filtering on base station transmitters*
> - *For TDD/TDD operating at 5MHz and 10MHz offset – synchronisation of systems will avoid ACI occurring. However, this also requires detailed coordination of usage between operators (e.g. equivalent up/down timeslot allocations). Without synchronisation, interference will occur, which will require site coordination and base station transmitter and receiver filtering to overcome."* (emphasis added).

These conclusions, related to site coordination and synchronisation of systems, are not reflected in the Ofcom proposals.

Question 12: Do you agree with Ofcom's proposals to award the 2010 MHz band as a single 15 MHz lot?

T-Mobile agrees that if the band is used for TDD technologies then there is a need for guard bands between the TDD operators to avoid interference. However, it is worth noting that the 1900 – 1920 MHz band was auctioned by the Radiocommunications Agency to four separate operators. As we explain in Annex 1 it is not viable to operate TDD systems independently without a suitable guard band or synchronisation between all networks.

Question 13**:** Do you agree with Ofcom's proposals to award the 2290 MHz band as a single 10 MHz lot?

T-Mobile does not have any strong views on the 2290 MHz band.

Question 14: Do you agree with Ofcom's proposals to combine the award of the 2.6 GHz and 2010 MHz bands and to hold the award of the 2290 MHz band separately and in advance?

T-Mobile does not have any strong views on combining the award of these bands.

Question 15: Do you agree with Ofcom's proposals for a two-stage auction design for the 2.6 GHz and 2010 MHz bands?

T-Mobile is happy with the principle of a two-stage auction, provided that the difference in the value of the generic blocks is small compared with the value of the other blocks. Assuming the auction design can be modified to address the points we have raised in response to Question 1 then T-Mobile would agree with a two-stage auction. However, if these modifications are not made then T-Mobile would strongly disagree with the auction design.

Question 16: Do you agree with Ofcom proposals to award the 2290 MHz band through a second price sealed bid auction?

T-Mobile does not have any strong views on the 2290 MHz band.

Question 17: Do you have a preference for either of the two approaches to specifying technical licence conditions?

17.1 Summary

T-Mobile welcomes a more flexible approach to specifying technical licence conditions but has concerns over the practical implication and enforcement of spectrum usage rights ("SURs").

On balance, unless the problems raised below can be addressed, T-Mobile would propose that for transmission rights the approach that Ofcom have already used in previous awards should be maintained i.e. with an in band EIRP limit and out of band emission mask.

T-Mobile feels strongly that primary legislation is needed to clarify the relevant legal rights.

17.2 Concerns with SURs

Moving away from the traditional spectrum mask approach to manage interference can be attractive for innovative operators like T-Mobile who may wish to utilise new technology and we welcome fresh ideas to the problem of fitting new applications into "old" spectrum.

However, we believe the current SUR proposals in the consultation have not had sufficiently rigorous industry and peer review to ensure they meet the needs of industry and consumers to provide confidence that they will allow a quality mobile communication service. Further, we are disappointed that industry was not involved in the development of SURs. The proposals and methodology for dealing with interference problems are still immature and need further development.

It is helpful that there is ongoing work in CEPT and ETSI in progressing EC Mandates on WAPECS and Flexible Bands which will allow industry in conjunction with administrations to participate in developing common and minimal (i.e. least restrictive) technical conditions across frequency bands. In view of these initiatives, coupled with the lack of maturity of the SUR proposals, it is T-Mobile's opinion that SURs should not be used, especially in the frequency bands covered by the consultation, until there has been sufficient industry peer review and the EC Mandates have been completed by CEPT and ETSI.

Prior to deployment of an SUR regime, the method by which interference will be investigated and controlled must be specified and done in a manner which does not affect the service offered to customers. This is covered in more detail below.

As we explain in our response to Ofcom's SURs, T-Mobile has concerns over the current formulation of SURs:

Our key points in response to this consultation were:

- Both transmission and reception rights need to be defined. In particular, guaranteed protection levels for spectrum are required to ensure that spectrum is free from interference.
- Any formulisation of SURs needs to be legally robust, easy to implement, measurable, enforceable, and unambiguous. T-Mobile proposes that for transmission rights, the approach that Ofcom has used in previous awards should be maintained i.e. with an in band EIRP limit and out of band emission mask. We also feel strongly that primary legislation is needed to clarify the relevant legal rights.
- For border areas, a similar approach could be taken to that contained in cross-border agreements such as ERC/Recommendation 01-01.

- The prerequisite for the introduction of SURs is a legally robust definition of "harmful interference".
- A clear process for change of use and dispute resolution is required. Anyone who could be impacted by a change of use should be consulted. To consult with users within 250% of the transmission bandwidth may not be sufficient.
- Third parties need to be able to easily identify the rights of spectrum licensees and to have comfort that they can obtain all relevant information to make informed decisions as to the rights of owners of particular pieces of spectrum.

T-Mobile believes SURs with a maximum power limit are still needed to avoid the blocking of receivers in adjacent bands. Therefore SURs do not provide a great advantage in terms of flexibility.

It is also important that consideration is given to how interference policing and enforcement will be managed.

In common with other operators T-Mobile has suffered from radio interference to its base stations and we are grateful for the support given by Ofcom's enforcement staff for resolving the problems. Interference can be difficult to identify with a nationwide network of thousands of base stations and is normally first detected by the effect on service such as an increased drop call rate or call set up failures. In some cases we have had base stations completely blocked.

It is difficult to see how interference problems can be speedily resolved in an SUR regime. The proposed method in section A11.4 states that the measurement area for interference monitoring should include around 10 cells in order to identify whether SUR parameters have been exceeded in at least 50% of locations. The consultation seems inconsistent as the measurement area, Akm^2, specified in 9.47 is defined as $0.34km^2$ for an FDD downlink in table 23. The 12th April SUR consultation proposed in section 6.14 that at least 25 measurements should be made in the area (which we assume is at least 10 cells in this case) or more to get statistical confidence. However, 25 measurements in 10 cells is insufficient to give confidence in the result and at least 10 times this number would be required. These measurements are likely to take at least one day (and probably longer) and will require all base stations to be switched off to monitor interference levels. This is a serious service and revenue problem and is clearly unacceptable. Even if after this procedure it can be shown a transmitter is at fault it is likely that the result will be challenged because of the statistical nature of the measurement, thereby leading to even longer delays in resolution.

It could well be that the interfering source meets the SUR parameters which will leave the victim with a mitigation problem probably requiring a change of site location. Moving sites is not trivial and can take many months and considerable cost to implement.

Question 18: Do you have any comments on the transmitter spectrum masks defined below?

18.1 Base stations using paried spectrum blocks – in band emissions

T-Mobile notice that the in-band EIRP limit is 4dB lower than that currently specified for 3G at 2.1 GHz. It is not clear why Ofcom have chosen to reduce the permitted transmitter powers and we would welcome further discussion on this. The increase in frequency already makes it problematic to achieve good in-

building coverage for high data rate services in the 2.6 GHz band. A reduction in the allowed EIRP will make that even more difficult.

18.2 Base Stations using paired spectrum blocks – out-of-block emissions (Table 4 and Table 5)

Judging by the significant effort being devoted to the standardisation of LTE in 3GPP standards body it is likely that operators will wish to deploy LTE technology in the spectrum under consultation.

There is a difficulty that the LTE emission masks have not been agreed yet but it is likely that for bandwidths greater than 5 MHz they will not meet the existing 3G mask. This problem could equally apply to WiMAX technology where there is some difficulty in agreeing WiMAX parameters in ETSI BRAN.

We expect LTE masks to be agreed by summer 2007. The masks for the 2.6 GHz spectrum should be such that operators can deploy LTE within them.

We believe that the cost of adhering to the out of band mask adjacent to a restricted block could be great and hence we would not wish to see a tighter mask. Masons quote a figure of €1000 per filter. Such filters are needed for each transmitter (3-sector) of the FDD BTS as well as in all top tower amplifiers (2 per sector, i.e. for a 6-sector site 12 TTAs have to be modified), see further Section 11.5 above.

18.3 Terminal Out-of-block EIRP Mask for paired and unpaired spectrum (Table 6)

Judging by the significant effort being devoted to the standardisation of LTE in 3GPP standards body it is likely that operators will wish to deploy LTE technology in the spectrum under consultation.

Although the LTE emission masks have not been agreed yet, it is likely that they will not meet the existing 3G mask for bandwidths greater than 5MHz. This problem could equally apply to WiMAX technology where there is some difficulty in agreeing WiMAX parameters in ETSI BRAN.

We also believe it inappropriate to derive the mask assuming a terminal power of 24 dBm/MHz, or 30 dBm in a 5 MHz block. Given potential problems with inter-terminal interference, we believe it more appropriate to base the mask on a lower output power (e.g. 24 dBm). Furthermore different mask might need to be defined for different spectrum bandwidths, in order to minimise the interference caused in each case.

As set out in our response to Question 11 (see 11.5 above) we estimate that the costs are €✂ -€✂ per site.

18.4 Terminal masks for restricted blocks

For the restricted blocks, the spectrum masks for the mobile terminal are at the same level as those in other blocks. We propose that these are lowered to prevent interference.

18.5 TDD terminal mask for transmission above 2620 MHz

FDD terminals operating in the 2620-2690 DL band should be protected from transmissions of TDD terminals operating in the 2570-2620 MHz central gap. TDD terminals operating at 2570-2620 MHz should therefore meet a more stringent “spurious emission” requirement over most of the 2620-2670

MHz band. The exact requirement needs to be defined once the LTE RF specifications are further elaborated, matching the equivalent blocking performance of FDD terminals in the 2570-2620 band. The current UTRA TDD specifications include a requirement for spurious emission of -37 dBm within the 2620-2690 MHz band.

Question 19: Do you have any comments on the SUR parameters defined below?

The SUR parameters in section 9.52 onwards are derived from the work described in the Consultation's Annex's 11 and 13. The points made in answer to Questions 20, 21 and 22 are also relevant here.

In particular we note that our preliminary investigations suggest that, if implemented, either the EIRP or the urban density of base stations may be reduced from those currently used in 3G deployments. Further work is required by industry and Ofcom to verify if this is the case.

Question 20: Do you have any comments on the SUR methodology and assumptions detailed in this annex?

Please see T-Mobile's response to Question 17 and 22.

Several assumptions have been used in the annex to define the SURs which may not be accurate in practice. For example a 50% duty cycle is assumed for a TDD system.

As the specification for LTE is still being developed and as it is highly likely that operators will wish to deploy the technology (for the reasons explained in Question 17), many of the assumptions will be incorrect. This is likely to be particularly true for operating LTE systems in bandwidths greater than 5MHz. Ofcom's assumptions are therefore not likely to be appropriate and further work is required.

Furthermore, parameters for WiMAX are still being debated in the technical committee ETSI BRAN where co-existence with W-CDMA systems is being debated. This suggests that the parameters for a typical TDD system are unstable and that SURs should be re-evaluated when they have been agreed.

Question 21: Do you have any comments on the use of the Visualyse tool as described, on the assumptions or the propagation model proposed in this annex?

If interference is encountered on a network, we believe that statistical modelling of this nature could lead to time consuming disagreements between the parties concerned as explained in our answer to Question 17.

We have not evaluated the Visualyse tool and therefore we cannot comment on its suitability. However, as use of a tool is not proposed to be legally binding and could not be used to justify interference into another user, any appropriate tool can be used. Though it is desirable that a common tool is made available it should be under the control of an independent body such as ERO or ETSI, much as ERO's

SEAMCAT is today. In this way, industry can be confident of its accuracy, maintenance and development.

Question 22: Do you have any comments on the assumptions detailed in this annex?

We note that the proposed power flux density values are derived from assumptions about the deployment of existing UMTS FDD and TDD technology rather than actual implementations. In addition, we understand that published specifications have been used in the model rather than equipment values.

With the limited time and resource available to us during the consultation (which is taking place in parallel with several others) we have not been able to completely analyse the impact that the proposed values would have on a typical 3G WCDMA or IEEE 802.16 implementation. However, there is some evidence that cell densities may be insufficiently restricted, compared to current deployments, to impair in-building cellular coverage. This can be very serious to both operators and customers as it is difficult to see how cost effective remedies can be put in place.

We recognise that the work is based on ECC Report 45. However, the scenarios used by the report in 2004 may not be consistent with actual implementations. Accordingly, it is not celar if the assumptions made in the report are valid in practice today. We would recommend that further analysis is made of typical 3G deployments using cell densities derived from public information like Sitefinder or a 3G operator.

In particular we note that the typical cell powers (35dBm), heights (10m) and radii (0.315km) are for those of a "pedestrian micro network" as defined by ECC Report 45 (in the case of FDD DL). ✂

Another important point is that equipment is normally more sensitive than given in the specifications which will affect the modelling. We would therefore recommend that sensitivity analysis is performed to check interference scenarios.

Finally, as we mention above, it is important that parameters for 3GPP's LTE are considered as it is highly probable the technology will be deployed in the band.

T-Mobile (UK)

Annex 1 - Pairing of 1900 – 1920 MHz with 2600 – 2620 MHz

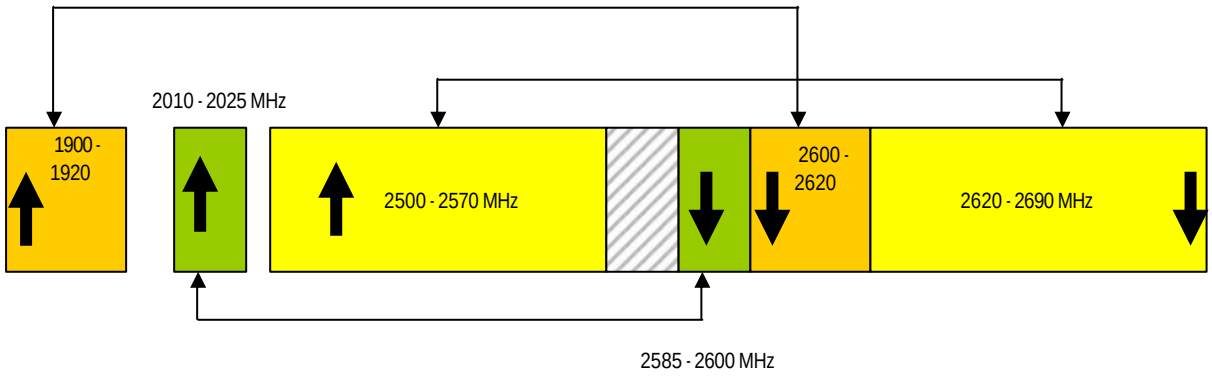
✂

Another possibility is to use this spectrum for an uplink i.e. to pair it with another band such as the 2600 – 2620 MHz band. Such a pairing is accommodated within ECC Decisions (06)01 ECC Decision (05)05: ECC Decision (06)01 states that the 1900 – 1920 MHz band may be used for TDD or for FDD uplink. The ECC Decision (05)05 states that the administrations may assign the frequency band 2570 – 2620 MHz either for TDD or for FDD downlink (external).

T-Mobile is interested in the possibility of paring the band 1900–1920 MHz with the 2600–2620 MHz. ETSI MSG is currently in the process of standardising this pairing. The advantage of such an approach is that guard bands are not required at 1920 MHz and hence the band 1915 – 1920 MHz could be used. The guard band at 2620 MHz would need to be shifted to the FDD/TDD boundary which we propose to be 2600 MHz.

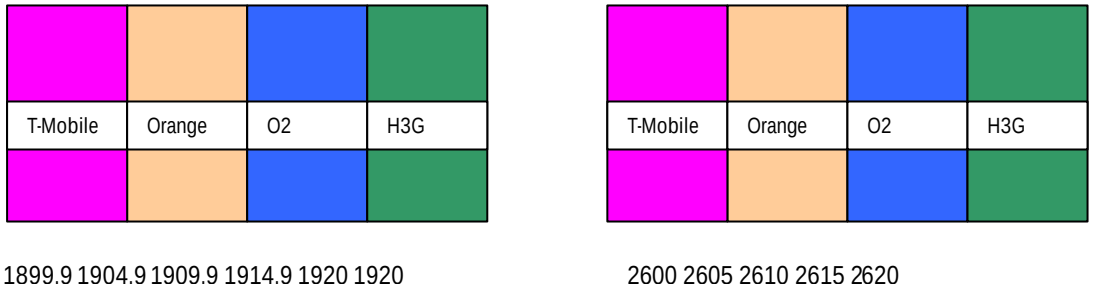
ECC PT1 have the following working assumptions shown below and have communicated this to 3GPP and ETSI (ECC PT1(06)262R1 ANNEX 5, ECC PT1(05)161 ANNEX 07, ECC PT1(06)053 ANNEX 13).

Figure 1: Current ECC PT1 working assumption for FDD Pairings of 1900 – 1920 MHz, 2010 – 2025 MHz and 2585 – 2620 MHz



The 1900 – 1920 MHz band is allocated to T-Mobile, Orange, O2 and 3. One *possible* outcome of an auction could be as follows:

Figure 2: Pairing of 1900– 1920 MHz with 2600 – 2620 MHz



However, Ofcom's current auction design prohibits this outcome since for every unpaired block within the 2600 – 2620 MHz band a 5 MHz guard band is required. For example, if 02 obtained the band 2610 – 2615 MHz, then they would also have to acquire 2605 – 2610 MHz. This would therefore make it impossible for Orange to acquire the 2605- 2610 MHz band.

Also the 2615 – 2620 MHz is listed as a guard band in the current auction design which would prohibit H3G from obtaining this band.

Ofcom's award process assumes that an unpaired channel automatically requires a 5 MHz restricted channel. For the case of FDD downlink, no guard band would be required if it were adjacent to another FDD downlink channel.

Ofcom's award process allows the TDD allocation at 2.6 GHz to be increased depending on market demand. However it does not allow the market to choose an increase in the amount of spectrum available for FDD.

Annex 2 - How interference issues might affect the worth of the IMT-2000 extension band spectrum

1.0 ECC/DEC/(05)05 – The ECC Band Plan Decision

Within ECC/DEC/(05)/05 it was stated "that administrations shall make provisions to allow for the harmonised utilisation of spectrum in the frequency band 2500 – 2690 MHz for terrestrial IMT-2000/UMTS, as identified in Annex 1 to this Decision".

3GPP has adopted this decision and completed technical specifications for FDD systems operating in the paired band of the spectrum as well as TDD systems for the centre part. ETSI is working on a technical specification allowing pairing of the centre part as FDD downlink with other spectrum (1900 – 1920 and 2010 – 2025 MHz) for uplink. This should be completed by May 2007.

Development activities within the industry are and products can be expected to become world market products. This is particularly the case for product terminals.

Accordingly, a deviation of spectrum use from the ECC decision in the UK will increase the risk for interference and reduce the worth of the spectrum the operators. This is further explained in the following section.

2.0 Impact of Ofcom proposal on UK operators

Within this Annex, the OFCOM proposal to use the upper parts of the FDD UL and DL bands (marked in Figure 1 as band parts B and E) for TDD instead of FDD has been considered:

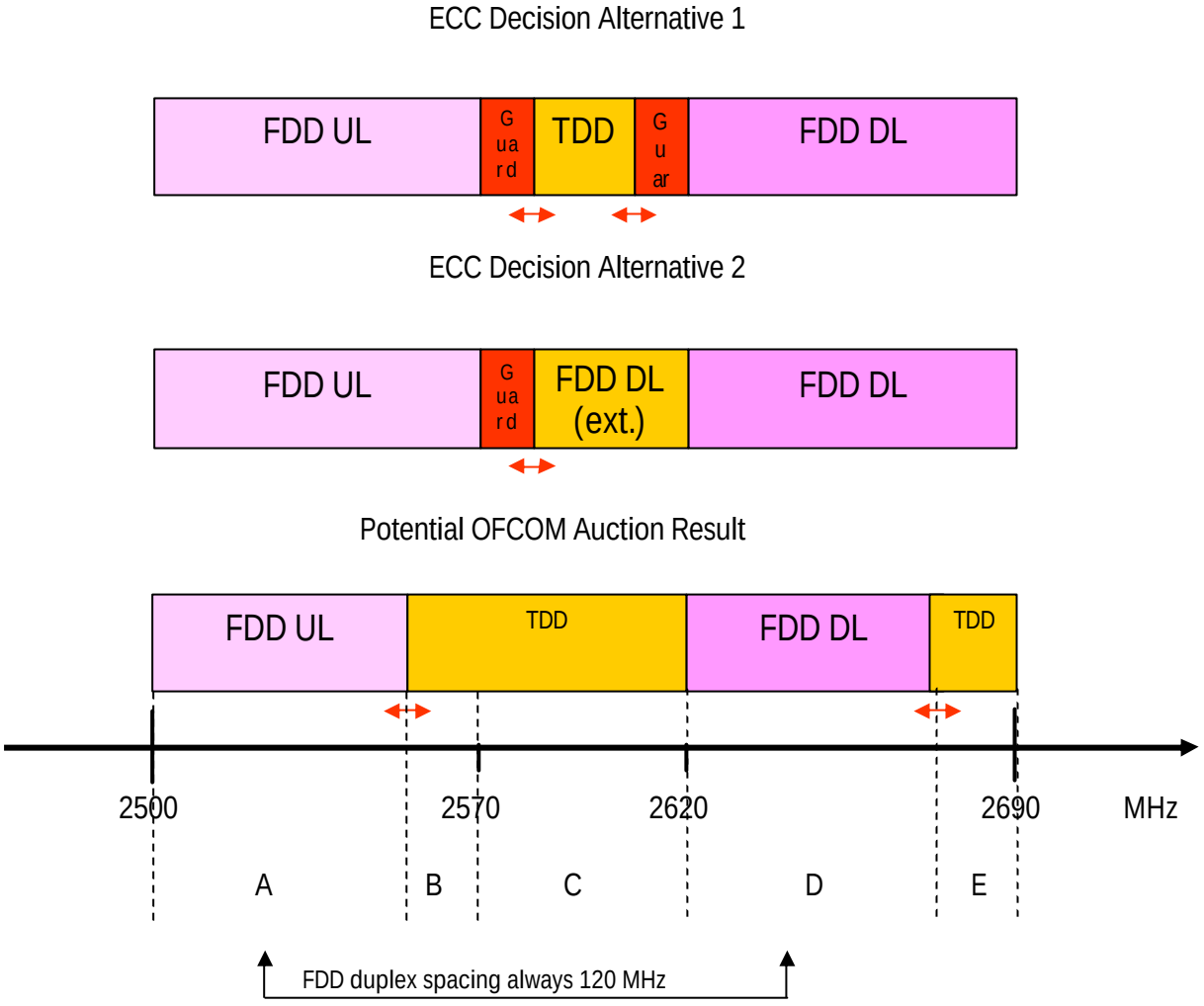


Figure 1: alternative plans for dividing the UMTS extension band

2.1 For operators with interest in the FDD paired spectrum

2.1.1 Impact of TDD within FDD Uplink band (part B)

World market BTSs will consider the full FDD UL band as a receive window, including the band part B. In Ofcom's proposals TDD terminals and BTSs will both transmit in part B also. Accordingly, in an uncoordinated deployment of different operators the TDD BTS will transmit into the receive window of FDD BTSs nearby and cause blocking.

This can only be avoided by implementing specific filters at the FDD BTS reducing the receive window compared to products following the technical specifications. Such filters are needed for each receiver (3-sector) of the FDD BTS as well as in all top tower amplifiers (2 per sector, i. e. for a 6-sector site 12 TTAs have to be modified). We have studied two possible scenarios for base station deployment to meet the mask and concluded that the cost per site will be in the range of €✂ to €✂ per site.

This is an additional burden for the FDD operators.

2.1.2 Impact of TDD within FDD downlink band (part E)

The TDD BTS and especially the TDD mobile fall within the receive window of any FDD terminal which is compliant to the 3GPP specification. FDD mobiles will therefore suffer from blocking if in the vicinity (at least 10m) of TDD transmitters.

This problem will extend into the 5 MHz block adjacent to the restricted block and possibly beyond. Further work is necessary to establish how much of the FDD spectrum will be affected especially considering technologies having bandwidths greater than 5 MHz.

It is unrealistic to assume that this problem could be overcome by terminals with modified filters since such equipment would be specific for the UK market. Furthermore niche products for a limited market size might encourage customers to buy more attractive and cheaper world market products elsewhere giving rise to interference once these terminals were brought in to the UK. In addition, incoming FDD roaming mobiles would be affected, and would suffer interference when in the vicinity of TDD transmitters.

A similar problem can exist between TDD mobiles operating in the same band on unsynchronised networks. However in that case the concerned operator can cooperate to synchronise their base station transmissions to minimise or eliminate the timing overlap between UL and DL transmissions. In the FDD-TDD case this is not possible as the terminal will be expected to continuously receive on the DL band.

This case is a serious Network quality restriction for FDD operators and can not be overcome.

2.1.3 FDD uplink and downlink bands (Band part A and D)

T-Mobile believes that there is a high risk that the out of band emissions of the TDD transmitters will affect the network quality of systems using the uppermost channels (at least the highest 5 MHz adjacent to a restricted block) within band part A.

The same holds for the lowest and the uppermost channels (at least the 5MHz adjacent to a restricted block) within band part D. Thus, it has to be the goal of a FDD operator delivering high quality services to his customers to get channels in the middle of the FDD band.

From T-Mobile's point of view, the worth of the different paired channels within band parts A and D is not equal, at least the uppermost and lowermost 5 MHz are less useful.

Figure 2 shows the impact of the Ofcom proposal and the affected spectrum. Allowing TDD to extend into the FDD spectrum results in a large amount of FDD spectrum being affected.

As an example by allowing TDD to operate up to 2615 – 2620 MHz this impacts on the 2620 – 2625 MHz /2500 – 2505 MHz channel. If 5 MHz is allowed to be used for TDD at 2565 – 2570 MHz/2685 – 2690 MHz this results in a loss of 2*10 MHz and a further impact to 2*5 MHz. This assumes that the impact of TDD will only affect the 5MHz adjacent to a restricted block whereas the impact could extend further.

In total therefore there is a loss of quality FDD spectrum of at least 40 MHz out of the 2*70 MHz. (the areas shown in red). There will also be a loss of quality of TDD spectrum which we have not addressed in the figure below but we believe that this will also be at least 5 MHz.

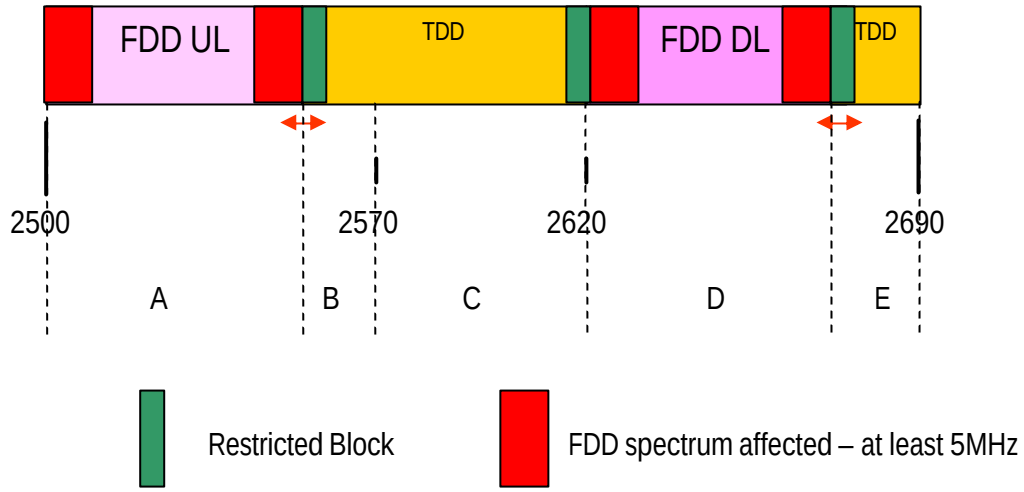


Figure 2: Affected FDD spectrum

2.2 For operators with interest in the unpaired bands for TDD use

2.2.1 Band parts C, B and E

In case of intended TDD use, there would be a difference in the value of the spectrum in band part C compared to spectrum in the band parts B and E.

It is easy to envisage 2 types of TDD equipment, those which conform to the ECC Decision Band Plan, and those which do not and support a TDD band that extends over the full 2500-2690 MHz band. In the former case, measures can be taken to protect against TDD-FDD interference, while the latter offers global roaming to countries with TDD systems deployed that do not conform to ECC Decision Band Plan.

It can be assumed that there will be a strong requirement from other EU operators for TDD equipment (BTSs and terminals) being compliant with the technical specifications of 3GPP and ETSI, which adopt the ECC Decision Band Plan. Thus, operators getting spectrum in the band part C can utilise these optimised products while the others will need to rely on equipment designed to operate over the full 2.6 GHz band.

Ideally, such equipment operating in band parts B and E would be required to have sufficient blocking performance to protect against FDD transmissions in band part A (especially severe for TDD systems operating in band part B), and meet improved regulatory requirements on spurious emissions designed to protect the FDD receive bands (band part E into band part D). However such capabilities are complicated because such blocking and spurious requirement need to be met within the terminal's receive and transmit band respectively, and we do not believe that this will be practical.

By keeping to the ECC Decision Band Plan and avoiding the B and E TDD allocations, TDD-FDD inter-terminal interference issues are much more manageable. FDD terminals are able to block out TDD transmissions in band part C as they remain outside of the FDD receive band. TDD terminals in band part C are also able to block out FDD transmissions from band part A. Both FDD and TDD can apply filtering to reduce spurious emissions.

If, on the other hand, TDD bands B and E are allocated, they have a different value from each other (B is more susceptible to FDD interference) as well as from band C. The auction rules should therefore clearly differentiate between these.

Only such a modification of the auction rules would allow operators to place a bid with respect to the worth they consider for the respective spectrum parts.

2.2.2 Cross –border co-ordination

Clarification is required prior to the auctions on the constraints that operators will be required to operate under as a result of co-ordination with France and Ireland. This is particularly significant if the UK move away from the ECC Decision Band Plan.

TDD networks operating in parts B and E could cause more interference to neighbouring countries and would therefore need more constraints in cross border coordination agreements:

- A UK TDD BTS transmitting in band part B towards a country border potentially interferes into the receiver of a FDD BTS of another country.

- A FDD BTS close to the UK border operating in band part E potentially interferes into the receiver of a UK TDD BTS.

In both cases, the BTSs are using identical channels and could transmit with more than 20 W. Both, Tx and Rx antennas can have gains of 18 dBi and could face each other.

2.2.3 Impact on networks outside UK

Customers of TDD networks on the continent roaming to the UK with terminals conforming to the ECC Decision Band Plan will be restricted only to have access to networks using spectrum in the band part C. This shows again the unequal worth of UK TDD spectrum in band part C compared to B and E.

If the UK deviates from the ECC Decision Band Plan, European networks will also be affected by the quality problems mentioned in the preceding section, since UK imported terminals and UK roaming terminals that need to operate over the full 2.6 GHz band may suffer from interference from FDD terminals operating in their receive band.

Annex 3 – Mandate 4

Brussels, 9 March 2001

Mandate to CEPT to harmonise frequency usage in order to facilitate a co-ordinated implementation in the community of third generation mobile and wireless communication systems operating in additional frequency bands as identified by the WRC-2000 for IMT-2000 systems

Mandate 4

Purpose

To mandate CEPT to develop and adopt the measures necessary to ensure the availability in the Community of harmonised frequency bands, within the *additional* spectrum bands identified by WRC-2000 for the provision of terrestrial and satellite IMT-2000 services.

Justification

The Decision 128/1999/EC of the European Parliament and of the Council on the co-ordinated introduction of a third generation mobile and wireless communications system (UMTS) in the Community adopted on 14 December 1998 ('UMTS Decision') requires that compatible UMTS networks and services be provided in frequency bands to be harmonised by CEPT to ensure interoperability of services as well as roaming capabilities at Community-wide level, on the basis of internal market principles and in accordance with commercial demand.

Pursuant to Article 5.1 of the 'UMTS Decision', the Commission shall give CEPT mandates *inter alia* to harmonise frequency use. Those mandates shall define the tasks to be performed and lay down a timetable.

Pursuant to Annex II of the 'UMTS Decision', the Commission can also issue mandates to CEPT on further spectrum allocation, including *additional* spectrum beyond that originally identified by WARC-92. The present mandate calls upon CEPT to undertake preliminary investigations and to adopt a first set of the harmonising measures necessary to make available throughout the Community *additional* frequency spectrum for the provision of terrestrial and satellite IMT-2000 services. This is required as a follow up of the WRC-2000 resolutions, which have identified *additional* spectrum for the terrestrial and the satellite component of IMT-2000 systems.

Background

The WARC-92 identified a total of 230 MHz frequency spectrum for IMT-2000 in the bands 1885-2025MHz and 2110-2200MHz. It should be noted that from the spectrum identified by WARC-92, a 'core bandwidth' of 155MHz (i.e.1900–1980MHz, 2010–2025MHz and 2110-2170MHz) was designated for terrestrial UMTS services by the ECC Decision ERC/DEC(97)07 of 30 June 1997. On the other hand, the spectrum identified by WARC-92 for satellite services was not formally designated in the ECC Decision ERC/DEC(97)07, but only 'accommodated' within the bands 1980-2010MHz and 2170-2200 MHz since market demand for satellite UMTS services was not visible at the time.

Pursuant to the 'UMTS Decision', the Commission issued a series of mandates to CEPT. In response to mandate 1[10], the ECC subsequently adopted the Decision ERC/DEC(00)01 on 28 March 2000 making

[10] Document LC/10/99/final, 26 March 1999

available by 1 January 2002 at the latest, in accordance with commercial demand and subject to national licensing schemes, the full 'core bandwidth' (155 MHz) for terrestrial UMTS and other terrestrial systems included in the IMT-2000 family, in order to enable a competitive market for third generation mobile services. The full 'core bandwidth' should be made available by 1 January 2002, subject to market demand and national licensing schemes.

A further mandate 2[11] resulted in the ECC Decision ERC/DEC/(99)25 of 29 November 1999 which contains the spectrum plan for the usage of the 'core band' and provides a common approach to be followed by CEPT administrations when licensing IMT-2000/UMTS services to operate in the 'core band'. In July 1999, the Commission issued a Mandate 3[12] for the development of a common plan to identify, with a view to make available between the years 2005 and 2010, *additional* frequency spectrum for the provision of terrestrial 3G mobile and wireless services in the Community. This resulted in a European Common Proposal (ECP) for 160 MHz of additional spectrum for the terrestrial component of IMT-2000 being drafted and adopted by CEPT. The *additional* band preferred by CEPT, i.e. the 2500-2690MHz band (see ECP Part 1A2), was subsequently accepted by WRC-2000 as one of the *additional* frequency bands identified for IMT-2000 systems.

WRC-2000 identified three possible bands for IMT-2000 services, in addition to the 230 MHz bandwidth identified by WARC-92 for IMT-2000 services, leaving it to ITU members to decide when and to what extent to allocate spectrum for IMT-2000 systems out of these identified bands.

Table: Bands identified by ITU for IMT-2000 services (WARC-92 and WRC-2000)

900 MHz band	806[13]-960 MHz[14]
1.8 GHz band	1710-1885 MHz[15]
2.0 GHz band	1885-2025 MHz and 2110-2200 MHz[16]
2.5 GHz band	2500-2690 MHz[17]

Further to the WRC-2000 resolutions, work is now being undertaken within ITU (notably within ITU-R WP 8F) to define recommendations for the usage of these *additional* bands. In this context and in order to maintain a co-ordinated approach, it is necessary for the Community to formalise the identification of its specific needs for *additional* spectrum for the provision of 3G services. (Similar decision processes will take place as well in all major regions/countries.)

[11] Document LC/11/99/final, 26 March 1999
[12] Document LC/15/99/final, 26 July 1999
[13] For Region 1, the band 806-862 MHz was not identified for IMT-2000 services
[14] EU Member States have licensed GSM900 services in the band 880-915MHz paired with 925-960MHz according to ERC/DEC/(94)01 and ERC/DEC/(97)02.
[15] EU Member States have licensed GSM1800 services in the band 1710-1785MHz paired with 1805-1880MHz according to ERC/DEC/(95)03.
[16] The bands 1900–1980MHz, 2010–2025MHz and 2110-2170MHz were designated for terrestrial UMTS services in the ERC Decision ERC/DEC(97)07 of 30 June 1997. EU Member States have already licensed (or will license soon) terrestrial 3G services in the bands 1900-1980MHz and 2110-2170MHz.
[17] This band was the CEPT preferred *additional* spectrum band (see ECP Part 1A2). Note that WRC-2000 has earmarked the sub bands 2500-2520 MHz and 2570-2590 MHz for satellite services. However, these sub bands may also be used by terrestrial services, in accordance with market demand.

The objective of the present mandate is start the process which will lead to sufficient spectrum being made available in due time, in a co-ordinated manner and based on market demand. Ultimately, this decision process will determine how much spectrum will be needed, at what point in time, which bands are to be used and how these bands will be organised to accommodate 3G services.

However, many important aspects of the future usage of the *additional* spectrum are unknown today, such as:

- IMT-2000 services are not expected to be launched in the Community on a major commercial basis before 2002. The evolution of the market for IMT-2000 services and therefore the spectrum needs are uncertain.
- Technology developments may significantly influence the spectral usage efficiency, which can be achieved, as well as the cost of multi-band and/or variable duplex gap terminals.
- The evolution of traffic characteristics (e.g. traffic asymmetry, capacity demand for the up and/or downlinks) is unpredictable.

Since IMT-2000 is a system of global reach, the planning of spectrum in the different regions/countries is potentially related to each other, while the benefits or costs of a globally co-ordinated approach have not yet been sufficiently analysed.

Despite these uncertainties, taking into account the long and complicated procedures which need to be undertaken until new spectrum becomes effectively available[18] it is necessary to launch the decision process on *additional* spectrum well in advance and before all elements impacting on the future spectrum needs can be fully assessed. In these circumstances, the present mandate proposes a staged approach. This process will necessarily be an iterative one, requiring regular checks against defined milestones and regular assessment as to whether the original market assumptions are still valid.

The scope of the present mandate covers in greater detail the general objective already formulated in mandate 3, i.e. the development of a common plan to identify, with a view to make available between the years 2005 and 2010, *additional* frequency spectrum for the provision of terrestrial 3G mobile and wireless services in the Community. Mandate 4, therefore, replaces mandate 3 as far as further deliverables from CEPT are concerned.

Due to the above mentioned uncertainties, it is of paramount importance that first results of deployed IMT-2000 networks are available and be taken into account before detailed decisions on the frequency arrangements for the additional bands are taken.

The present mandate also outlines a schedule for the preliminary investigations and initial decision required before final measures are established at a later stage to make available *additional* spectrum and to define the related spectrum scheme. For these latter decisions, it is expected that separate mandates[19] will be issued in due course.

[18] From the WARC-92 initial identification in 1992 until IMT-2000 spectrum becomes effectively available in 2002, ten years of spectrum management efforts were necessary. CEPT took its first decision in 1997, with a perspective to make IMT-2000 spectrum effectively available 5 years later.

[19] Mandates to CEPT are covered by the UMTS Decision 128/1999/EC, which is in force until January 2003. The Commission has proposed a Decision of the European Parliament and of the Council on a regulatory framework for radio spectrum policy in the European Community COM (2000) 407 which foresees a mandate procedure similar to that of the UMTS Decision and should provide the legal basis for further mandates.

Order and Schedule

By this order (Mandate 4), the CEPT is mandated to undertake all necessary steps to assess the need for *additional* bands under different usage scenarios and based on detailed studies reflecting the views of all parties concerned.

The work to be done by CEPT, in response to this mandate, should take into account the prospective development of the 3G market and should consider both the terrestrial and the satellite component of IMT-2000. Due consideration should be given to the specific European situation. Although solutions should be sought by CEPT to achieve global harmonisation (notably within ITU-R WP 8F), these solutions must, having regard to current usage of the bands concerned, meet European requirements, including, in particular, promoting competition and ensuring flexibility in time scales adapted to market needs.

At this moment, and for the purpose of planning the decision process ahead, it is suggested that a 'reference date' as from which additional spectrum should become available be set as 1 January 2007. However, this 'reference date' should be re-assessed and, if necessary, revised according to market needs, before the adoption of a CEPT Decision by 31 March 2003.

The following deliverables are requested through this mandate:

Delivery date	Deliverable	Subject
30 November 2001	Report from CEPT	Initial proposals for: amount of additional spectrum needed (terrestrial and satellite component). frequency bands to accommodate additional spectrum needs (incl. Inventory of current usage of proposed bands and assessment of scenarios to relocate/free/share these bands). time table to make available additional spectrum. analysis of the global roaming implications of the initial proposals considering envisaged choices for additional bands in other regions/countries.
30 November 2002	CEPT Report Draft Decision by CEPT for adoption by 31 March 2003	Validation of initial proposals, including the confirmation of the 'reference date'. Designation of additional frequency bands to be used for IMT-2000 systems as from a 'reference date'.
31 March 2003	adoption of CEPT Decision	

Upon delivery of a CEPT Decision by 31 March 2003, subsequent mandates for further harmonisation of the *additional* IMT-2000 frequency bands and for the development of a common spectrum scheme may be issued by the Commission.

The result of this mandate can be made applicable in the European Community pursuant to Article 5.3 of the 'UMTS Decision'.

In the Decision to be adopted as mandated hereby, the CEPT shall, where relevant, take the utmost account of Community law applicable. This includes in particular the 'UMTS Decision' and the Directive 97/13/EC of the European Parliament and of the Council of 10 April 1997 on a common framework for general authorisations and individual licenses in the field of telecommunications service, as well as relevant proposed legislation currently under co-decision procedure[20].

[20] Proposal for a Decision of the European Parliament and of the Council on a regulatory framework for radio spectrum policy in the European Community ('Spectrum Decision') COM(2000)407.
Proposal for a Directive of the European Parliament and of the Council on the authorisation of electronic communications networks and services ('Authorisation Directive') COM(2000)386.

Annex 4 – Mandate 5

Brussels, 10 June 2003

Mandate to CEPT to harmonise the frequency usage within the additional frequency band of 2500-2690 MHz to be made available for IMT-2000/UMTS systems in Europe (Mandate 5)

Mandate 5

1. Title

Mandate to CEPT to harmonise the frequency usage within the additional frequency band of 2500-2690 MHz to be made available for IMT-2000/UMTS systems in Europe (Mandate 5)

2. Purpose

To mandate CEPT to develop and adopt the measures necessary to ensure a harmonised and efficient use of the frequency band 2500-2690 MHz for IMT-2000/UMTS.

3. Justification

Pursuant to Article 4 of the Radio Spectrum Decision[21], the Commission may issue mandates to the CEPT for the development of technical implementing measures with a view to ensuring harmonised conditions for the availability and efficient use of radio spectrum; such mandates shall set the task to be performed and the timetable thereof.

In Europe the frequency band 2500-2690 MHz is foreseen as additional spectrum for IMT-2000/UMTS. In order to ensure harmonised conditions and efficient use of the above-mentioned spectrum, it is necessary to investigate and decide on detailed spectrum usage parameters as well as whether or not and to which extent the satellite component of IMT-2000 could use parts of this additional spectrum.

4. Background

Pursuant to the UMTS Decision[22], and after consulting the Member States at the Licensing Committee, the Commission issued on 9 March 2001 a fourth Mandate to CEPT to harmonise frequency usage in order to facilitate a co-ordinated implementation in the Community of third generation mobile and wireless communication systems operating in additional frequency bands as identified by WRC-2000 for IMT-2000 systems.

Mandate 4 asked CEPT to undertake all necessary steps to assess the need for additional frequency bands under different usage scenarios and based on detailed studies reflecting the views of all parties concerned. The work to be done by CEPT took into account the prospective development of the 3G market and considered both the terrestrial and the satellite component of IMT-2000 systems.

CEPT delivered a Report and an ECC Decision in line with the scope and tasks given under Mandate 4. The key points included in the adopted ECC Decision, ECC/DEC/(02)06, are:

- Designation of the whole band 2500-2690MHz to IMT-2000/UMTS systems.

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[21] Decision 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the European Community, OJ L 108 of 24.4.2002, p.1.

[22] Decision 128/199/EC of the Euro pean Parliament and of the Council on the co-ordinated introduction of a third generation mobile and wireless communications system (UMTS) in the Community of 14 December 1998.

- Making the whole band 2500-2690MHz available for use by IMT-2000/UMTS systems by 1 January 2008, subject to market demand and national licensing schemes.
- Designation of the frequency band 2520–2670MHz for use by terrestrial IMT-2000/UMTS systems.
- Detailed channelling arrangements for the whole band 2500–2690MHz as well as the utilisation of the bands 2500–2520MHz / 2670–2690MHz shall be decided in an additional ECC Decision to be adopted by the end of 2004.

Following the delivery of the report and the ECC Decision by CEPT the Licensing Committee adopted the deliverables through a written procedure which was opened on 5 December 2002 and ended on 19 December 2002. Licensing Committee members unanimously agreed on the following statement: *"The Committee welcomes the results of the work done by the CEPT pursuant to Mandate 4 and accepts the ECC Decision ECC/DEC/(02)06 of 15 November 2002 on the designation of the frequency band 2500-2690 MHz for UMTS/IMT-2000. The Committee invites the EU Member States to commit to the implementation of such ECC Decision in due time."*

5. Order and Schedule

Considering that the band 2500-2690 MHz is to be made available by 1 January 2008 and that the ECC Decision that was agreed under the 4th Mandate to CEPT foresees a second ECC Decision dealing with the channelling arrangements for the band 2500-2690 MHz by the end of 2004;

CEPT is mandated to develop channelling arrangements for the band 2500-2690 MHz taking into account and commenting on at least the following issues;

- Availability of the bands 2500-2520 / 2670-2690 MHz for the use by the IMT-2000 satellite component and/or terrestrial component;
- The impact of BSS sound at 2605-2655 MHz (and possibly other services in the band 2500-2690 MHz) on IMT-2000/UMTS services;
- The impact of technological advances such as variable duplex spacing or other developments that may facilitate flexible channelling arrangements as well as technology neutrality, noting that these technologies must be commercially available by 2008;
- The desirability to take utmost account of making regulation technologically neutral, and
- Efficient and harmonised use of spectrum.

These issues are to be addressed in a CEPT Report which would be the basis for a following ECC Decision concerning channelling arrangements.

The deliverables of this Mandate are an interim and final report, as well as an ECC Decision on IMT-2000/UMTS channelling arrangements with the following delivery dates.

- July 2004: Submission of an interim report to the RSC giving initial proposals or strategies, commenting on the progress of the work and highlighting any problems with the timing of the mandate on the basis of which the Commission with the support of the RSC might have to reassess the timing of the outstanding deliverables.
- November 2004: Submission of the final CEPT report to the RSC and adoption of the ECC Decision for public consultation;
- March 2005: Final approval of the ECC Decision by the ECC.

The result of this mandate can be made applicable in the European Community pursuant to Article 4 of the Radio Spectrum Decision.

In implementing this mandate, the CEPT shall, where relevant, take the utmost account of Community law applicable.