15th August 2008

Digital Dividend Review: 550-630 MHz and 790-854 MHz: T-Mobile's response

T-Mobile welcomes the opportunity to respond to Ofcom's consultation, Digital Dividend Review: 550-630 MHz and 790-854 MHz.

Executive Summary

- T-Mobile has serious concerns with Ofcom's proposals. The Digital Dividend could provide significant economic benefits to the UK. However under Ofcom's proposals, we believe the value to the mobile community would be drastically reduced in a way that harms overall economic benefits.

- These issues are not incidental to the award design and T-Mobile strongly believes that if these are not rectified, they will severely limit the usefulness of this spectrum for mobile services.

- The importance of this band can be seen from the extensive work that has taken place over the last year in a number of International fora including the WRC-07, The European Parliament, the EC, and CEPT. Final completion of this work is not expected before June 2009. The timetable set for the UK award is therefore too rushed as it is impossible for Ofcom to take regard of this important European work.

- Ofcom has not planned to clear the entire range of spectrum that was agreed at the World Radio Conference in 2007 with only channels 63-68 being cleared and awarded on a nationwide basis. This reduces the value of the UK spectrum as no channel can be harmonised according to the CEPT FDD band plan.

- If Ofcom continues with its current approach then the benefits to the UK are likely to be seriously affected with the spectrum being unusable by terminals developed for the European market and hence of no or limited use to the UK mobile community.

- Harmonised solutions for the GSM and UMTS bands are success stories that have delivered massive economic benefits to consumers both in terms of lower cost equipment and the ability to roam internationally. The Digital Dividend spectrum presents a unique opportunity to harmonise spectrum for mass market mobile use below 1 GHz.

- T-Mobile does not feel that Ofcom's Impact Assessment is fit for purpose as it does not provide a cost benefit analysis of the major decision as to whether there are really net benefits from abandoning a harmonised European approach in favour of Ofcom's current proposals.

- The cost of clearing channels 61, 62 and 69 will be significantly less than the benefits that would be achieved by packaging the spectrum according to the harmonised CEPT band plan.

- T-Mobile feels that due to the serious concerns we have detailed above, it is premature to consider the detailed technical conditions and auction design issues that Ofcom has dealt with in this consultation. Nevertheless we do have the following specific comments with regards to the consultation:

  - T-Mobile believes that it is vital that Ofcom align its technical conditions with those developed with CEPT. The mobile industry prefers using block edge masks rather than using SURs as the approach for defining consistent TLCs;
  - With regards to the protection clause proposed, T-Mobile is greatly concerned that there is no onus of the DTT services to improve the receivers in DVB-T devices. There needs to be some reciprocity to ensure that the constraints on the licensee of the cleared spectrum are eased over time by the phasing in of better receivers for DVB-T equipment. Protection of DTT should be conditional on the equipment meeting specified standards of quality and resistance to interference;
  - We do not agree that an information provision condition is required or necessary. Transmitter site information is commercially sensitive and has security implications;
  - T-Mobile believes that it is important to distinguish between the upper and lower cleared spectrum. The lower sub-band can be packaged in 8MHz lots whilst the upper sub-band should be packaged in 5MHz chunks. Having both sized lots in both sub-bands is inefficient;
  - The complexity of the proposed auction, with 35 distinct lots, is such that it will discourage participation in the auction. Smaller bidders will find it more difficult to prepare for this auction and to effectively compete in it. Were this the case, the complexity of the auction could potentially impede competition;
  - T-Mobile agrees with the assessment that Ofcom have made with regards to the benefits of sub 1GHz spectrum. We feel a hard cap should be used as opposed to a soft cap.

Response to Consultation Questions

T-Mobile comments on Ofcom's Impact Assessment

T-Mobile is very surprised that Ofcom have not carried out an impact assessment detailing the costs and benefits of the current proposals for the cleared award as a whole against other key potential proposals for dealing with the digital dividend spectrum. Given the scale of this project, we believe that an impact assessment of all the major decisions embodied in Ofcom's proposals is essential to determining the best overall approach and needs to be carried out as soon as possible before Ofcom moves forward with further proposals. The impact assessment that Ofcom have presented in Annex 5 only addresses individual elements of the proposal and does not consider the proposal as a whole. Ofcom's assessment also does not consider the impact of aligning the spectrum with that packaged across Europe. T-Mobile therefore does not feel that the Impact Assessment carried out by Ofcom is fit for purpose, and urges Ofcom to carry out a new Impact Assessment before moving further with the current proposals.

T-Mobile believes that a thorough impact assessment would find that the benefits of revising the current proposal to another which is more suitable for mobile use would far outweigh the costs. The proposal that we feel should be adopted includes the following points:

- Clear channels 61 and 62 completely to be auctioned within the Digital Dividend award;
- Re-locate channels 61 and 62 to within the lower sub-band of digital dividend spectrum or where possible to within the interleaved spectrum;
- Clear channel 69 for auction and move PMSE users to alternative spectrum, potentially within the duplex gap between the FDD uplink and FDD downlink;
- Package the spectrum available in the upper sub-band in paired 5MHz lots with a fixed duplex spacing
- Use the technical conditions being developed by CEPT for mobile use of the 790 – 862 MHz range.
- Package the spectrum available in the lower sub-band in 8MHz lots only so that it is suitable for broadcasting uses.

T-Mobile realises that these proposals differ significantly from the current approach and urges Ofcom to re-consult on the upper band when the CEPT work in response to the 2nd EC Mandate has been completed.

[**CONFIDENTIAL INFORMATION REMOVED]**

In order to move PMSE users out of channel 69 which currently has been allocated to them, costs will also be involved. These costs of replacing radio microphones are small and a number of them could continue to be used on other frequencies. [**CONFIDENTIAL INFORMATION REMOVED]** However given the fact that PMSE users currently use channels 67 and 68 as well, a number of these relocation costs will need to be borne anyway, even with the current Ofcom proposals.

Ofcom will need to factor in what the cost is of reducing the lower sub-band or the interleaved spectrum by the two channels needed to cater for the DSO providers that are currently using channels 61 and 62 which will need to be moved over. The other cost that Ofcom needs to take into account in this impact assessment is the opportunity cost of the spectrum being packaged in a way that prevents other potential uses of the upper sub-band able to win spectrum in the auction. In order to determine these costs, Ofcom should use the previous work it has commissioned from Analysys about demand for the spectrum in general and whether any of the other potential uses could not be sufficiently handled on the remaining lower sub-band.

T-Mobile feels that the costs of this new proposal are outweighed by the large benefits that are potentially on offer. The current proposals detailed in this consultation will leave mobile operators sidelined from the auction and there will be very little benefit reaped from the mobile industry. We have set out in Annex B how mobile use of the spectrum is thought of by UK citizens to provide the highest benefit from the Digital Dividend spectrum. We have also set out the large benefit that the mobile industry currently gives to society as a whole. We note the recent paper by Spectrum Value Partners which estimated the benefits to European society of allocating the Digital Dividend spectrum to mobile use.[1] This notes that allocating some spectrum to mobile operators as opposed to broadcasting would generate up to €165bn over the next 20 years and in order to maximise the value for the European economy as a whole, at least 92MHz of the Digital Dividend should be allocated for mobile use. Using their calculations we can see that approximately 10% of this European valuation would be a benefit for the UK[2] Therefore the benefit of making spectrum available for mobile use as opposed to broadcasting use would be approximately €16.5bn.

Furthermore, it is incumbent on Ofcom to undertake an impact assessment relevant to the key decisions it is undertaking under its statutory duties, under section 7 of the Communications Act 2003:

> *(1) This section applies where—*
>
> *(a) OFCOM are proposing to do anything for the purposes of, or in connection with, the carrying out of their functions; and*
>
> *(b) it appears to them that the proposal is important;*
>
> *but this section does not apply if it appears to OFCOM that the urgency of the matter makes it impracticable or inappropriate for them to comply with the requirements of this section.*
>
> *(2) A proposal is important for the purposes of this section only if its implementation would be likely to do one or more of the following—*

[1] Spectrum Value Partners, Getting the most out of the Digital Dividend, March 2008

[2] In their calculations they have determined the total benefit for three representative countries across the EU (Italy, The Netherlands and Slovakia) and scaled these up using an index based on GDP and percentage mobile spend to determine a cumulative European wide benefit. In the scenario they have calculated on pages 84-86, the UK would thus represent €12.1bn out of a cumulative benefit of €111.5bn across the EU.

(a) to involve a major change in the activities carried on by OFCOM;

(b) to have a significant impact on persons carrying on businesses in the markets for any of the services, facilities, apparatus or directories in relation to which OFCOM have functions; or

(c) to have a significant impact on the general public in the United Kingdom or in a part of the United Kingdom.

(3) Before implementing their proposal, OFCOM must either—

(a) carry out and publish an assessment of the likely impact of implementing the proposal; or

(b) publish a statement setting out their reasons for thinking that it is unnecessary for them to carry out an assessment.

(4) An assessment under subsection (3)(a) must set out how, in OFCOM's opinion, the performance of their general duties (within the meaning of section 3) is secured or furthered by or in relation to what they propose.

(5) An assessment carried out under this section—

(a) may take such form, and

(b) must relate to such matters,

as OFCOM consider appropriate.

(6) In determining the matters to which an assessment under this section should relate, OFCOM must have regard to such general guidance relating to the carrying out of impact assessments as they consider appropriate.

(7) Where OFCOM publish an assessment under this section—

(a) they must provide an opportunity of making representations to them about their proposal to members of the public and other persons who, in OFCOM's opinion, are likely to be affected to a significant extent by its implementation;

(b) the published assessment must be accompanied by a statement setting out how representations may be made; and

(c) OFCOM are not to implement their proposal unless the period for making representations about it has expired and they have considered all the representations that were made in that period.

Ofcom's proposals in respect of the relevant spectrum are important and it follows that, under subsections 1 and 3, Ofcom is under a duty to undertake an impact assessment in respect of its proposals. T-Mobile does not believe Ofcom has discharged this duty, or that it would be possible for it to avoid it under subsection 3(b). It is clear from subsection 4 that such an assessment should lie at the very heart of Ofcom's decision making process. It is clear in the circumstances that Ofcom's

decision making process to date has not adopted this approach and is in breach of its duties under the Act.

The guidelines for UK Government impact assessments, prepared by the Department for Business Enterprise and Regulatory Reform (BERR), stipulates that a "description and scale of key monetised costs and benefits accrued by the main groups affected by the proposal or other impacts (such as particular environmental impacts) should be clearly stated."[3] It is clear that harmonisation of spectrum can bring a number of key benefits. Indeed Ofcom's Spectrum Framework Review is clear about the benefits of harmonisation:

> "Ofcom believes that the combination of standardisation and harmonisation can bring a number of benefits such as reduced interference, lower cost equipment through economies of scale, increased certainty for manufacturers and international roaming… Ofcom will seek to promote more flexible approaches to harmonisation and look for ways to make it work better so that the risk of inefficient spectrum use is minimised."[4]

Given that these key benefits of harmonisation are not included in Ofcom's Impact Assessment, it is clear that this does not meet the guidelines as set out by BERR and referred to in subsection 6.

T-Mobile remains unconvinced that Ofcom's current approach conforms to European harmonisation obligations, the optimal use and efficient management of spectrum and is therefore in the best interests of consumers. Any reasons in favour of the current proposals are heavily outweighed by Ofcom's broader regulatory duties to ensure that spectrum is allocated and used efficiently. Packaging spectrum not in accordance with a European harmonised approach will inevitably lead to an inefficient outcome, in breach of Ofcom's statutory obligations.

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.

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.

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[3] Department of Business Enterprise and Regulatory Reform, Impact assessment Guidelines, p6 available from http://www.berr.gov.uk/files/file44544.pdf

[4] Ofcom. Spectrum Framework Review Statement, 28 June 2005, p38

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.

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 lead to considerable harm to the UK mobile industry.

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.

In light of the statutory duties incumbent upon Ofcom, we strongly urge Ofcom to do a further rigorous impact assessment before carrying on with the present proposals.

Question 1: This executive summary sets out our proposals for the Digital Dividend Cleared Award. Do you agree with these proposals?

T-Mobile has serious concerns with Ofcom's proposals. Indeed, T-Mobile has consistently disagreed with Ofcom's proposals and continues to disagree with the terms of the proposals set out in the Consultation.

The Digital Dividend could provide significant economic benefits to the UK as demonstrated by Ofcom and comprehensive studies undertaken by Spectrum Value Partners ('Getting the most out of the digital dividend'[5]) and SCF Associates ('Economic impacts of alternative uses of the digital dividend'[6]). However under Ofcom's proposals, we believe the value to the mobile community would be drastically reduced in a way that reduces overall economic benefits to UK citizens and consumers.

The importance of this band can be seen from the extensive work that has taken place over the last year in a number of International fora including the WRC-07, The European Parliament, the EC, and CEPT. The discussions in many of these groups are still on-going. If Ofcom continues with its current approach then the UK is likely to be seriously affected with the spectrum being unusable by terminals developed for the European market and hence of no or limited use to the UK mobile community.

[5] This study was commissioned by Ericsson, Nokia, Orange, Telefónica and Vodafone. It is available at: http://www.spectrumstrategy.com/DigitalDividend.pdf

[6] This study was commissioned by Deutsche Telecom / T-Mobile. It is available at: www.digitaldividend.eu

The experience of harmonised solutions for the GSM and UMTS bands are success stories that have delivered substantial economic benefits to consumers and to competitiveness all over the world. This is largely due to there being:

1. Enough spectrum for more than one operator, thus stimulating competition and a constant improvement in the level of the service;
2. Economy of scale for equipment: this represents a significant concern that Ofcom has completely ignored in its analysis. We submit that scale economies for equipment delivers the highest benefits. In particular, we believe that if the UK did not align with the European harmonised band plan, the costs would significantly damage the UK economy and the UK consumers. Terminals would be prohibitively expensive – vendors will not design terminals only for the UK market;
3. Global roaming and therefore enhanced mobility; and
4. Continuity and interoperability with existing 2G and 3G systems.

T-Mobile does not believe vendors will be able to produce mobile terminals using the spectrum due to be released to an acceptable cost. This viewpoint is supported by a study undertaken by RTT for the GSMA [7]

The current proposals for the spectrum being released by Ofcom is not compatible with the FDD band plans being developed by CEPT (see Annex A for details). T-Mobile instead proposes that Ofcom seriously considers releasing the whole of the 790 – 862 MHz range. Furthermore the spectrum should be packaged to allow operators to buy spectrum which conforms to the FDD Full Duplex band plan and technical conditions being developed by CEPT in response to the EC Mandate.

T-Mobile therefore does not agree with the proposals set out in this consultation.

Question 2: Do you agree with our proposal to include the interleaved spectrum in channels 61 and 62 in the cleared award?

It is important that Ofcom seriously considers clearing channels 61 and 62. Ofcom are already aware of the National Grid Wireless study which quantifies the cost of clearing the remaining spectrum to make it compatible with the rest of Europe. We believe that the cost involved is significantly less than the benefit from making the spectrum available for mobile use. The cost involved should be taken from the auction proceeds or from the Spectrum Efficiency Fund.

Figure 4.2 of the consultation document show the use of these channels by DTT services post DSO. It is clear that the Channels 61 and 62 are of very limited use to a nationwide operator unless they can be cleared. The Ofcom studies for this award show the potential compatibility difficulties between DVB-T and mobile use in adjacent channels. Co-channel sharing between the two services will be even more difficult.

[7] http://www.rttonline.com/Research/V21 Halfduplexstudyfinaljuly08 .pdf

Question 3: Do you agree with our proposal not to allow licence-exempt use of channels 61 and 62 by cognitive devices?

T-Mobile agrees that licence-exempt use of these channels by cognitive devices should not be allowed for the reasons stated in paragraph 4.42 of the consultation.

As we state in our response to earlier questions, we believe that it is important that Ofcom seriously considers clearing channels 61 and 62.

Question 4: Do you have any comments on our assessment of the most likely uses of the cleared spectrum and the amount of spectrum required for these services? Are there any other potential uses that we should consider?

T-Mobile believes that it is important to distinguish between the likely uses in the upper and lower cleared spectrum separately. If the spectrum could be cleared and packaged appropriately then the most likely users of the upper cleared spectrum would be mobile operators. Conversely, the lower cleared spectrum would be more suitable for the Broadcasting community.

Ofcom has commissioned work from Analysys to determine the likely demand for the spectrum, which T-Mobile understood would be made publicly available. Ofcom have not published this report yet and T-Mobile feels that stakeholders will benefit from seeing this.

Question 5: Do you agree that we should proceed with our current timetable, with a view to holding the cleared award in summer 2009?

T-Mobile strongly believes that an auction in 2009 is premature.

Ofcom is aware of work being carried out in CEPT in response to the EC 2nd Mandate.[8] This work is intended to identify common technical conditions, international co-ordination and channelling arrangements. Final completion of this work is not expected before June 2009. Ofcom's timetable for the cleared award specifies the Information Memorandum and draft regulations being published by late spring 2009 with the auction beginning in summer 2009.

Ofcom's timetable for the cleared award makes it impossible for Ofcom to take regard of any decision on harmonisation at the European level. We believe that the requirement in Article 9.2 of the Framework Directive to "promote harmonisation of the use of radio frequencies across the Community" is relevant to this award.

[8] European Commission, Second Mandate to CEPT on technical considerations regarding harmonisation options for the digital dividend in the European Union, 3 April 2008 (RSCOM08-06).

An additional issue surrounding the timetable for the award is that issues surrounding the re-allocation of 2G spectrum are unlikely to be resolved prior to this award. This uncertainty could affect the valuation that T-Mobile has for the DDR spectrum. The 2.6 GHz auction has also been delayed and T-Mobile thinks it will be counterproductive both to industry and Ofcom to have these auctions so close together. It will detract considerably from Ofcom's completion of the liberalisation work. It will also impact on decisions made by Ofcom on preparing a spectrum cap for sub 1GHz spectrum discussed in question 43. The decision on spectrum liberalisation needs to precede any auction of the upper Digital Dividend cleared spectrum.

What seems particularly challenging to T-Mobile is that whilst the mobile industry can identify real costs due to the timing that Ofcom is planning towards, the benefits of maintaining the planned timetable do not seem apparent. Whilst Ofcom is correct that some areas of the UK will be switching off their analogue TV signal before 2012, the fact is that any nationwide operator or broadcaster would not consider offering a nationwide service until after London analogue TV signal is switched off in 2012, irrespective of the date of auction. Mass market equipment for mobile operators is unlikely to be available until 2012 at the earliest, and so there is little value in having access to this spectrum earlier than this date.

Ofcom appear to have realised that this spectrum will not be usable in the years immediately after the planned auction in 2009. Ofcom have indicated in this consultation that they would prefer to allow PMSE users to remain in the upper sub-band of the cleared spectrum even after the award of the spectrum in 2009. The reasoning that Ofcom have used is that "*the cost to potential providers of new services in the cleared spectrum may be very low or negligible, as it may be unlikely that they will offer commercial services in the first 12 months after award.*"[9] If Ofcom has correctly understood that commercial services will not be ready for a period for time after the auction, then there appeals little reason to continue with the current timing given the significant reasons for delaying the auction. Those obtaining the spectrum will also be carrying the holding costs and any risks as to the change in value of the spectrum and this would not appear to be to the benefit of the mobile industry – or indeed any UK industry, and thus citizens or consumers.

If Ofcom believe that similar issues do not exist for the lower sub-band, and conversely broadcasters want to have access to this spectrum as soon as possible, then T-Mobile does not have an issue with two separate auctions being carried out; an early auction for the lower sub-band and a later award for the upper sub-band.

It is essential that Ofcom reconsider their position with regards to the timing of the cleared award.

[9] Consultation, Paragraph 4.80

Question 6: Do you have any views on the appropriate notice period for temporary PMSE access to channels 63-68, and/or on whether or not extend temporary access to channels 31-40?

T-Mobile does not have any strong views on the appropriate notice period for temporary PMSE access**.**

As noted above in our response to Question 5, if Ofcom understands that commercial services will not be ready for a period of time after the auction, then there appears little reason to continue with the current timing given the significant reasons we have identified for delaying the auction.

Ofcom have identified that channel 69 in isolation is of limited value to PMSE users because touring companies, who generally use channel 69, also require access to channels 67 and 68. If, after the appropriate notice period, Ofcom have planned to move PMSE users out of these channels, it should be possible that they can be moved out of channel 69 as well at the same time. T-Mobile feels that there is a clear benefit from moving PMSE users to other spectrum frequencies and including channel 69 as well in the cleared award.

We would propose that PMSE could use the duplex gap between the uplink and downlink channels for the band 790 – 862 MHz band plan. This duplex gap is likely to be harmonised across Europe and hence could become a common band for PMSE across Europe. Other spectrum within this DDR award that could be used for PMSE includes Channel 38 which has a low power limit and hence of limited value to other services. T-Mobile also notes that there is alternative spectrum, such as the 872-876/ 917-921 MHz award, which could also be suitable for PMSE use. Ofcom should seriously look at moving PMSE users to spectrum where the opportunity cost of other uses is reduced.

Question 7: What are your views on deferring the start date for rights to use cleared spectrum in London to help meet the need for wireless microphones and other audio links for the London 2012 Olympic Games and Paralympic Games?

T-Mobile has no problem in principle with a deferral to the start date for the rights to use cleared spectrum in London. We see this as another reason for deferring the award of this spectrum.

Question 8: Do you agree with the use of SURs as the approach for defining consistent TLCs for this award?

Extensive work is being carried out on the technical conditions for the 790 – 862 MHz range under an EU Mandate. T-Mobile believes that it is vital that Ofcom align its technical conditions with those developed with CEPT as Ofcom did for the 2500 – 2690 MHz award.

T-Mobile and other stakeholders have raised a number of concerns with SURs in the past. We recognise that Ofcom have made some progress to alleviate these concerns. However T-Mobile still prefers Block Edge Masks to SURs. We understand that Ofcom considers SURs are preferably to Block Edge Masks, but disagree and consider it important in this area that commercial acceptance comes before academic purity

Any solution must be legally robust, easy to implement, measurable, enforceable and unambiguous. We remain unconvinced that this is true for SURs. Ofcom has so far progressed the SUR regime without taking any steps to validate it at a practical level by applying it to a current network. Nor do we believe that the banking market has yet been exposed to SURs and given the importance of this auction that should not be ignored.

SURs may provide some extra re-assurance that interference will not be received from a high density network of transmitters. However in practice the density of a network is limited by factors such as cost and inter-system interference. We note that Ofcom has developed different SURs depending on the technology deployed in the band. We therefore do not understand why Ofcom can not develop different Block Edge Masks which take into account the expected density of the different technologies.

CEPT SE42 have started to discuss the least restrictive technical conditions in relation to the 790 – 862 MHz band. Document SE42(08)063 Annex 4 contains the follows relevant statements:

> "During its recent work, e.g. on the 2.5-2.69 GHz and the 3.4 – 3.8 GHz bands, CEPT has gained expertise on the definition of least restrictive technical conditions with the Block Edge Mask model. This model is particularly relevant to address scenarios of coexistence in adjacent frequencies in the same geographical area.
>
> CEPT Report 19 defines other possible models, including a hybrid model which has been defined which combines the BEM approach for scenarios of coexistence in adjacent frequencies in the same geographical area and a model based on PFD levels for scenarios of coexistence in the same frequency in geographically separated areas.
>
> SE42 will consider the suitability of the models described in Report 19, and any other proposals, when defining the most appropriate model(s) for the definition of technical conditions in the 790-862 MHz band."

We believe that it is inadvisable to try SURs on spectrum intended for uses including mobile when other mobile spectrum is not packaged in this manner

In summary T-Mobile still has concerns with SURs and therefore would urge Ofcom to align the technical conditions for this award with those being developed by CEPT SE42.

Question 9: Do you have any comments on the SUR parameters listed in Tables 5.1 to 5.5 and the assumptions used to derive them?

See also response to Question 8. T-Mobile believes that it is important that Ofcom align its technical conditions with those that will be developed within CEPT.

Many of the parameters used to derive the SUR values still need to be confirmed within CEPT. LTE parameters for example for this range need to be discussed and agreed within the 3GPP and CEPT. The parameters used to develop SURs are therefore very likely not to be the same as those agreed by these bodies. It is important that Ofcom await the discussions in CEPT.

Question 10: Do you agree with our proposals for managing interference between new services in the DDR cleared spectrum?

Guard bands in relation to FDD.

CEPT is currently undertaking extensive studies within SE42, TG4 and PT1 in response to the second EC Mandate. This includes studies of the required guard bands and we would urge Ofcom to await the decisions by CEPT before fixing any Guard bands in relation to the DVB-T and FDD. It is worth noting that the recent ECC meeting (Kristiansand, 23rd - 27th June 2008) has stated:

> "As far as the development of channelling arrangement is concerned, without prejudice of application of any mitigation techniques ECC PT1 should not assume guard bands for the protection of broadcasting from the mobile downlink and should minimise guard bands for the protection of broadcasting and other applications from the mobile uplink."

T-Mobile would therefore urge Ofcom to wait for the international studies on the guard band requirements to be completed.

We believe that it is important that systems in the Digital Dividend do not receive interference but it is also important to minimise guard bands wherever possible to maximise the spectrum utilisation. Some of the figures Ofcom propose for guard bands look overly protective and we would urge Ofcom to work within CEPT to ensure that guard bands are minimised.

Guard band between FDD uplink and FDD downlink

The guard band between FDD uplink and FDD downlink is being considered in ECC PT1 in relationship to the centre gap within the FDD band plan. T-Mobile considers that a value of either 10 MHz or 12 MHz is likely to be agreed for the centre gap.

Guard band figure for DVB-T - FDD downlink

Clarity is required on whether Ofcom is proposing a protection clause for the protection of DVB-T in addition to a fixed guard band or as a replacement to a guard band. Very careful consideration is needed on whether a small guard band is required as this will impact on the auction design. If a small guard band is indeed needed then it would be more efficient to explicitly include this in the auction design. Otherwise an operator could be forced to sterilise a complete 2 x 5 MHz channel.

The need for a guard band for DVB-T - FDD downlink is currently being considered in ECC. Previous work within ECC TG4 concluded that no guard band is necessary. [10] T-Mobile is currently undertaking further studies on this issue including a review of the mitigation techniques recommended by ECC TG4. It could be possible that no guard band is required if suitable mitigation techniques can practically be deployed but this needs to be confirmed. We would urge Ofcom to await the international discussions before deciding on the need or the size of any guard band.

Question 11: Do you agree that the most efficient and effective means of preventing interference to the existing DTT services is by the addition of a protection clause to licences in the cleared spectrum? If not, what alternative approach would you suggest?

T-Mobile is greatly concerned that there is no onus of the DTT services to improve the receivers in DVB-T devices. In fact DTT devices are likely to evolve in the future which could mean further constraints on the licensee of the cleared spectrum where such a protection clause is included in licences.

T-Mobile would propose that if there is to be a protection clause that there is some reciprocity to ensure that the constraints on the licensee of the cleared spectrum are eased over time by the phasing in of better receivers for DVB-T equipment.

Furthermore, any such protection of DTT equipment should be conditional on it meeting specified standards of quality and resistance to interference etc. The liability of licencees to protect DTT receivers cannot be boundless, and should not extend to providing a de facto guarantee to suppliers/purchasers of substandard equipment.

T-Mobile understands that Ofcom is proposing to model interference. T-Mobile considers that it would be proper if Ofcom were to fully expand the model in order to regulate the proposed protection clause, the thresholds it proposes and to the regime for the resolution of disputes.

Lastly, to the extent that licencees are placed under an obligation to protect DTT receivers, this should be reciprocal with an obligation on DTT broadcasters to ensure that they do not create interference in the spectrum held by non-DTT licencees.

[10] CEPT supplementary report (to Report B) to ECC

Consideration should be given to using the auction proceeds to pay for any remedial action to the adjacent broadcasting allocation. This would allow the upper spectrum lots to be made generic.

Question 12: Do you agree that the best way to finalise the protection clause approach and to address the practical implementation issues is through direct engagement with interested stakeholders? With which stakeholders should we engage?

Noting our response to Question 11 above, T-Mobile feels that the wording of the protection clause needs very careful discussion between the interested stakeholders and Ofcom before the award.

Question 13: What do you believe would be the implications of protecting indoor/set-top antennas? Should a distinction be drawn between set-top antennas and larger antennas designed for external reception of TV signals that are loft-mounted?

T-Mobile believes that if indoor/set-top antennas need to be protected then this would place unacceptable constraints on the licensee of the cleared spectrum. As noted in the consultation it is difficult to specify set top antenna equipment requirements, making a licence obligation potentially uncertain or overly burdensome.

The UK DSO plan has been established based on roof top reception with an aerial at a height of 10 metres. T-Mobile therefore agrees that protection of DTT is only offered to reception via rooftop antennas within a defined coverage area.

Question 14: Do you agree with our proposals for managing interference between new and existing users?

Interference from mobile transmitters

As noted in our response to Question 10, the issue of guard bands is being addressed by CEPT. We would therefore urge Ofcom to await the results of these discussions before deciding guard band requirements.

Protection of PMSE services in channel 69

T-Mobile agrees that no guard band is required to protect PMSE.

As noted in our response to earlier questions, T-Mobile believes that it is vital that PMSE services in channel 69 are migrated to other spectrum. This will ensure that interference is minimised.

Question 15: Do you agree with the proposed propagation models and databases to be used for compliance assessment?

Ofcom propose the use of the Infoterra clutter database. We believe that this may be incompatible with the two ITU Recommendations proposed.

Question 16: Do you have any comments on the transmit masks set out in paras 5.128 to 5.130?

The FDD uplink and downlink power levels and out-of-band emissions limits are those specified for the 2.6 GHz award. The process in CEPT has just started on establishing the technical conditions and no work has begun yet to standardise equipment for this band. Therefore we feel that further work is required before agreeing these parameters. The parameters which will be agreed within 3GPP and CEPT will most likely be very different to those Ofcom propose here. It is also possible that these parameters will be included in a future RSC decision for this band as occurred for the 2500 – 2690 MHz band.

T-Mobile therefore would urge Ofcom to await the discussions in CEPT before deciding these parameters.

Question 17: Do you agree that where the cleared spectrum is used for the operation of a DTT multiplex, we should replicate the ownership restrictions from the Broadcasting Act regime relating to (a) local authorities, (b) political bodies, (c) religious bodies and (d) bodies exerting undue influence but not replicate restrictions relating to (e) broadcasting bodies and (f) advertising agencies?

T-Mobile does not have any comments on this question but can understand why Ofcom might want to liberalise this regime.

Question 18: Do you agree that we should facilitate interoperability between existing DTT multiplex operators and new operators using cleared spectrum?

T-Mobile does not have any comments on this question.

Question 19: We welcome views on the relative merits of such an approach to information provision; in particular concerning the type of information that may be helpful and any impacts that publication of information might have both on licence holders and the wider spectrum market.

We do not agree that an information provision condition is required or necessary.

Transmitter site information is commercially sensitive and has security implications. As a general rule T-Mobile believes all licensed transmitters should be marked on a public website on a voluntary basis such as Sitefinder as recommended by the Independent Expert Group on Mobile Phones.

The Sitefinder website provides information on site location, height, frequency band and transmitter power and has been found sufficient to meet citizen requirements whilst preserving commercial sensitivity, although a FoI/EIR request for the dataset has cast a shadow over this conclusion.

If somebody wishes to buy spectrum, then all that is required is a contact name of the registered owner and the frequencies owned to allow normal commercial discussions to take place. Any pre-analysis by a prospective buyer is unlikely to be worthwhile as the spectrum owner will determine the conditions of any trade or even if they wish to enter into commercial negotiation. It is difficult to see why making more information available will encourage spectrum trading and is likely to add an unnecessary bureaucratic load to both industry and Ofcom.

With regards to the duration of the initial term, Ofcom have indicated in paragraph 6.60 that if a delay occurs in the completion of DSO in each region, then there will be a corresponding delay in the date from which the new rights to the spectrum can take effect. T-Mobile contends that if the Digital Switch Over is delayed, the purchasers of the spectrum need to be compensated by Ofcom for the extra costs incurred and the revenues forgone until the moment they will effectively be able to use make use of the spectrum acquired.

The possibility of a delay in the DSO risks distorting the outcome of an auction process as it would distort the incentives for the operators who wish to bid for the spectrum, and impair their evaluation ability. This would have a disruptive effect on the efficiency of the auction process. This is because when assessing the value of this spectrum, operators would incorporate the risk that they will not be able to make use of the spectrum they legally acquired and to offer the services as in their business plans: this reduces the expected revenues and hence the evaluation of the spectrum. In addition, the time over which the licensees will have certainty as to their rights in the spectrum is unknown at the time of the auction.

Since operators will always face a significant yet unknown probability that the spectrum acquired will generate lower value for a shorter time, they will not be in a position to correctly assess the value of the spectrum and to bid rationally for it. The whole auction would be impaired and the outcome necessarily inefficient.

Question 20: Do you agree that the cleared award should include both 8 MHz lots for DVB-T and MMS TLCs and 5 MHz lots for FDD and TDD TLCs across the band?

T-Mobile believes that it is important to distinguish between the upper and lower cleared spectrum. For the lower cleared spectrum, only 8MHz channels should be included; we do not see the need to offer 5MHz channels.

The decision on whether to have 5MHz or 8MHz channels in the 790 – 862 MHz range is currently being discussed in CEPT. T-Mobile believes that 5 MHz channels are more suitable. T-Mobile supports the statements within the GSMA/E contribution into ECC PT1 (ECC PT1 (08)039):

> "All of the mobile technologies that are likely to be deployed in the UHF band are designed to operate in blocks of 5MHz, as implemented in Europe in licensing regimes for the 2GHz and 2.6GHz bands. The terminals that will operate in the UHF band will also need to support these other bands. The block size for the UHF band should therefore also be 5MHz."

Assuming that CEPT decide on 5 MHz channels then we would strongly argue that only 5 MHz lots are included in the award for the upper cleared spectrum.

Question 21: Do you agree that the cleared award requires a mixture of frequency specific and frequency-generic lots to be offered in the auction?

T-Mobile does not have any strong views on the lower cleared spectrum.

For the upper spectrum, T-Mobile believes that the range 790 – 862 MHz needs to cleared. If the subsequent lots can be shown to be of similar quality then a generic approach might be appropriate. However our understanding is that the channel adjacent to DVB-T will need additional constraints and hence would not be of a similar value to the rest of the cleared spectrum.

Consideration should be made of using the auction proceeds to pay for any remedial action to the adjacent broadcasting allocation. This would allow the upper spectrum lots to be made generic.

Question 22: Do you agree with the proposed outline definition of lots suitable for MMS, DVB-T, TDD and FDD applications?

Ofcom should await discussions on the channelling plans within CEPT before deciding on this. In order to maximise the benefits of the spectrum for the UK economy, the lots available in the upper part of the band should be in exact alignment with the final European harmonised plan for mobile which is likely to have a fixed duplex separation.

T-Mobile does not believe that it is necessary to accommodate TDD in the upper band for the reasons presented in Annex A.

Question 23: Should the flexibility to bid for lots defined on both fixed and variable frequency rasters be preserved in the auction? If not, which are preferred?

T-Mobile requires the ability to buy spectrum which is aligned with the eventual CEPT FDD Band Plan which is likely to have a fixed duplex separation.

Question 24: Do you agree with the proposed basis for awarding Channel 38 as a distinct lot in the auction?

T-Mobile notes that this channel would be more suitable for PMSE usage due to the power constraints in the band.

Question 25: Do you agree with the proposed structure of frequency rules for allocating different licence types in the auction? Are there any amendments that would improve the efficiency of spectrum allocation via an auction?

Discussions have started within CEPT on the duplex gap between the uplink and downlink block. Ofcom should await these discussions before deciding rules such as "All uplink licences would be positioned at least 10 MHz higher than the highest FDD downlink or TDD licence"

The potential duplex spacings that have been proposed within CEPT are currently 40 MHz and 42 MHz**.**

Ofcom should await discussions on the channelling plans within CEPT before deciding on this. In order to maximise the benefits of the spectrum for the UK economy, bidders should be able to buy spectrum which is aligned with the eventual CEPT FDD Band Plan which is likely to have a fixed duplex separation.

Question 26: Do you agree with our proposal to proceed on the basis of UK-wide lots?

T-Mobile agrees that it is necessary to proceed with nationwide lots for the upper cleared spectrum. We do not have any comments on the lower cleared spectrum.

Question 27: Do you favour including the available cleared spectrum in (a) Guernsey and (b) Jersey in the geographic coverage of the licences to be awarded? If not, what approach do you favour instead?

T-Mobile does not have any strong views on this question.

Question 28: Do you agree that the combinatorial clock auction is the most suitable auction design for the cleared DDR award?

Question 29: What potential simplifications, if any, could be made to the proposed lot structure for DVB-T, MMS, TDD and FDD lot categories which would still reflect the most important differences in value between lots?

Question 30: Do you have any comments on our proposals for the Application and Qualification Stages of the combinatorial clock auction for the cleared DDR award, including our proposals for initial deposits?

Question 31: Do you consider that it is important to distinguish relative weightings in advance between the eligibility points of the different 1 MHz blocks available in this award? If so should this be restricted to channels 36, 38, 61 and 62 and what do you consider these relative weightings should be?

Question 32: Do you have any views on whether an ex ante eligibility points activity rule or a revealed preference activity rule should be used in this award?

Question 33: Do you have any views on whether there should be restrictions on bidders' ability to bid on multiple technical licence types within single package bids or between different rounds of the auction and whether bidder association rules should potentially be adjusted to cater for any such restrictions being imposed?

Question 34: Do you have any further comments on any aspect of our proposals for the Principal Stage of the combinatorial clock auction for the cleared DDR award?

Question 35: Do you have any comments on any aspect of our proposals for the Assignment Stage or the Grant Stage of the combinatorial clock auction for the cleared DDR award?

Question 36: Do you agree with our approach to assessing whether the award of cleared spectrum fully promotes competition and efficiency?

Response to questions 28 through to 36.

As we have set out above we believe that the greatest benefits for the UK economy, citizens and consumers will come from the whole of the 790 – 882MHz being aligned with the CEPT band-plan. Therefore we think that the specific auctions need to be re-visited and we think that they can be simplified considerably.

In an attempt to improve auction efficiency, the proposed design allows bidders to express preference for these 35 different lot categories, and let the bidders' valuations determine the winning allocation of lots. The reason for doing this is that Ofcom is unsure whether the lower band, for example, is most efficiently used by DVB while

the upper band is most efficiently used by FDD. Because of its uncertainty, Ofcom has proposed an auction mechanism to decide the appropriate allocation.

The result however is an auction that will be far more complicated than, say, the 2.6 GHz auction which allows for only three lot categories, or the 10-40GHz auction.

This complexity is two sided. Not only will bidders be required to value, monitor, and bid for 35 different lot categories, but Ofcom too will have to optimize package bids from potentially numerous bidders across these 35 categories.

The complexity of the auction is such that it will discourage participation in the auction. In particular, large bidders may (although this is far from clear) be able to adequately prepare for a combinatorial auction with 35 different lot categories. Smaller bidders, however, will find it more difficult to prepare for this auction and to efficiently compete in it. Were this to be the case, the complexity of the auction could potentially serve as an impediment to competition in the auction.
As noted in our response to Question 20, T-Mobile considers that the upper band should be awarded in paired 2 x 5MHz lots which are aligned with the CEPT band-plan. Hence we do not believe that the flexibility that Ofcom has built into the proposals is necessary.

Following from this a way that Ofcom could decrease the number of lot categories in the auction would be to allocate specific bands to specific types of use: (i.e. the upper band in 2 x 5MHz lots and the lower band in 8 MHz lots).

This would significantly reduce the number of lot categories in the auction and would simplify the auction (for both the bidders and for Ofcom) to a great degree. T-Mobile considers that the disadvantages of this approach (in terms of reduced flexibility of bidding options and therefore auction outcomes) are considerably outweighed by the advantages. The outcome is likely to result in much more efficiently used spectrum and much more interest in the auction.

Question 37: Do you have particular concerns about possibilities for award outcomes to fail to fully promote competition in downstream markets or to result in inefficient use of spectrum? If so, please explain what these are and provide supporting evidence.

As detailed in our response to Question 22, T-Mobile has major concerns with the spectrum that is being awarded by Ofcom which will not be usable in terminals developed for the European market. The production of bespoke terminals and equipment for the spectrum that is not harmonised with the rest of Europe will be prohibitively expensive for the UK mobile operators. We believe that this will leave the UK mobile industry at a distinct competitive disadvantage relative to operators in other European countries.

Whilst T-Mobile supports Ofcom's intentions to be technologically neutral, we feel that the resultant guard bands that would be needed would result in inefficiencies in

the use of the spectrum. It cannot be beneficial for the UK economy for a large proportion of this spectrum being wasted in guard bands between different technologies. We understand that Ofcom has seen plenty of documentary evidence on this point, including the Spectrum Value Partners work.

In our response to Question 20, we noted that it would be more efficient to only have 8MHz lots in the lower sub-band and 5MHz lots in upper sub-band. This would simplify the auction design and prevent spectrum being used inefficiently in the form of guard bands as described above.

Question 38: Do you agree with our view that we should introduce a general safeguard cap aimed at promoting diversity of spectrum holdings? Do you have views concerning the level of such a cap?

We agree with Ofcom's intentions and also believe that if some operators have access to valuable low frequency spectrum on a liberalised basis whilst others do not; there are very real competitive issues.

T-Mobile does not think a general safeguard cap of 50MHz will have any impact in the auction given the limited amount of spectrum that will be practically suitable for cellular mobile use. In this regard there is potentially only 2 x 30 MHz of spectrum at 790 – 862 MHz (If cleared by Ofcom).

As we address in our response to Question 43, we think that Ofcom should consider imposing a 'hard' cap on the total amount of sub 1GHz spectrum which a Mobile Operator would be unable to exceed during this DDR auction

Question 39: Do you agree with our proposals to include an information provision licence condition to help facilitate efficient secondary trading?

We cover our response to this issue under Question 19.

Question 40: Do you agree with our view that we should not apply any other general remedies in the cleared award?

Given the complexity of this award structure and the number of different potential uses for this spectrum, T-Mobile does not believe that any other general remedies are suitable for this cleared award. We believe that licensees will be incentivised to make best use of the spectrum given that they have paid the market price for this spectrum at auction.

Question 41: Do you agree with our identification of the three areas requiring further attention?

T-Mobile agrees with Ofcom's reasoning regarding the potential competition issues that could occur if some operators have access to the advantages of this low frequency spectrum on a liberalised basis whilst others do not. We believe that is right that Ofcom give further attention to this issue. T-Mobile is happy that Ofcom is now, with this consultation on the Digital Dividend and the work being done with spectrum liberalisation, recognising the benefit that low frequency operators could benefit from in providing a 3G or LTE network. However we note that Ofcom have still not recognised the benefit that operators have enjoyed historically with regards to the use of lower frequencies for their 2G network. This issue is still very relevant in the mobile industry and constrains the voice service that 1800MHz operators are able to competitively offer. It would be correct for Ofcom to recognise this historical benefit and consider what can be done to rectify the issue. It may be more sensible for Ofcom to consider how to utilise the spectrum being awarded as a specific way of rectifying any historical competitive issues as opposed to just considering the potential future issues that may arise.

Question 42: Do you agree with our assessment that the limitations on the amount of cleared spectrum available for mobile broadband applications, and the particular advantages of sub 1GHz spectrum, could result in an outcome where there are limits on the level of competition possible in the provision of these services?

T-Mobile agrees with the assessment that Ofcom have made with regards to the benefits of sub 1GHz spectrum. We have argued for a number of years that as an 1800MHz operator, we are disadvantaged in comparison to the 900MHz operators in terms of building penetration and coverage. However as Ofcom have noted in paragraph 9.75 the main reason why this spectrum is potentially so valuable is due to the "prospect of non-mandatory harmonisation of the upper sub band for mobile broadband use in some European countries". As detailed above, we feel that Ofcom's plans for the cleared spectrum will not allow it to align with this harmonised approach with Europe and will mean that the UK spectrum is much less valuable than it has the potential to be.

Question 43: Do you think that a soft spectrum cap on either (a) the cleared spectrum suitable for mobile broadband applications alone, or (b) the holding of any sub 1GHz spectrum suitable for mobile broadband applications, which would trigger action if a significant competition concern emerges in relation to the market structure in the future mobile broadband market, could be an appropriate approach to these concerns?

T-Mobile believes that Ofcom is taking the correct line with regards to attempting to rectify these potential competition issues before they occur. We believe that a 'soft' cap would not adequately protect against these potential competition issues. Instead we think that Ofcom should instead consider imposing a 'hard' cap on the total amount of sub 1GHz spectrum which a Mobile Operator would be unable to exceed

during this DDR auction.[11] We feel that this will give more certainty to the bidders as to the level of spectrum they are able to bid for. Given that there is potentially 2x30 MHz of spectrum available in the upper sub band and 2x 34.8 MHz in the GSM 900 MHz band, Ofcom needs to consider an appropriate cap so that this spectrum is allocated efficiently and allows effective competition amongst the operators.

We would also note that the experience on the rollout condition in mobile licences, where Ofcom effectively found that it did not have a real remedy, should be utilised here to ensure that any competitive problem can be effectively addressed. A soft cap could lead to potential 'grey areas' and prevent Ofcom regulating effectively.

As the amount of 900 MHz spectrum that each operator will be holding in future will be unknown until after spectrum liberalisation has been finalised, we feel it is prudent for Ofcom to delay this DDR award until after these issues have been finalised. Only then will the competitive outlook be resolved.

Question 44: Do you agree with our assessment that issues in the pay TV market are not at this stage primarily an issue for the cleared award?

T-Mobile does not have any comments on this question.

Question 45: Do you agree with our initial assessment that we should not intervene further in the cleared award to remedy any potential impact on competition resulting from the holding of cleared spectrum by NGW/Arqiva?

T-Mobile does not have any comments on this question although it notes that the Competition Commission has done a thorough investigation of their proposed concentration and would see no reason to prolong this.

T-Mobile (UK)
August 2008

[11] For sub 1 GHz spectrum we only refer to that which is harmonised for mobile use; i.e. the GSM 900 MHz spectrum currently held by Vodafone and O2 and the upper sub-band of the DDR cleared spectrum which hopefully will end up prepared according to the harmonised CEPT band-plan.

Annex A – FDD , TDD and progress of work within CEPT

1.0 Full Duplex FDD Band Plans

CEPT have started work on channeling arrangements for the 790 – 862 MHz range in response to the EC Mandate. However looking at the three proposed CEPT Full Duplex Band Plans with the CEPT working document, we see that there is no overlap with the spectrum being released by Ofcom:

OPTION 1: 30MHz paired with a duplex gap of 12MHz, fixed duplex spacing of 42 MHz

61	62	63	64	65	66	67	68	69
790-798	798-806	806-814	814-822	822-830	830-838	838-846	846-854	854-862
Downlink				**Duplex gap**	**Uplink**			
30 MHz (6 blocks of 5 MHz)				**12 MHz**	**30 MHz (6 blocks of 5 MHz)**			
1	**2**	**3**	**4**	**5**	**6**		**1**	**2**	**3**	**4**	**5**	**6**
790-795	**795-800**	**800-805**	**805-810**	**810-815**	**815-820**	**820 – 832**	**832-837**	**837-842**	**842-847**	**847-852**	**852-857**	**857-862**

- Use of Channel 69 stops use of the 'mobile' Channels 5 and 6.
- DVT-T use of Channels 61 and 62 stops use the 'mobile' channels 1,2,3,4
- Therefore no UK spectrum is useable.

OPTION 2: 30MHz paired with a duplex gap of 10 MHz, fixed duplex spacing of 40 MHz and a guard band of 2MHz

61	62	63	64	65	66	67	68	69
790-798	798-806	806-814	814-822	822-830	830-838	838-846	846-854	854-862
	Downlink			**Duplex gap**	**Uplink**			
	30 MHz (6 blocks of 5 MHz)			**10 MHz**	**30 MHz (6 blocks of 5 MHz)**			
	1	**2**	**3**	**4**	**5**	**6**		**1**	**2**	**3**	**4**	**5**	**6**
	792-797	**797-802**	**802-807**	**807-812**	**812 - 817**	**817 - 822**	**822-832**	**832 - 837**	**837 - 842**	**842 - 847**	**847-852**	**852 - 857**	**857 - 862**

- Use of Channel 69 stops use of the 'mobile' Channels 5 and 6.
- Broadcasting use of Channels 61 and 62 stops use of the 'mobile' channels 1,2,3

- The proposed guard band of 5 MHz within Channel 63 stops use of 'mobile' channel 4.
- Therefore no UK spectrum is useable

OPTION 3: 32MHz paired with a duplex gap of 8MHz and fixed duplex spacing of 40 MHz

61	62	63	64	65	66	67	68	69
790-798	798-806	806-814	814-822	822-830	830-838	838-846	846-854	854-862
Downlink				**Duplex gap**	**Uplink**			
32 MHz (4 blocks of 8 MHz)				**8 MHz**	**32 MHz (4 blocks of 8 MHz)**			
1	**2**	**3**	**4**		**1**	**2**	**3**	**4**

- Use of Channel 69 stops use of the 'mobile' Channels 4.
- Broadcasting use of Channels 61 and 62 stops use of the 'mobile' channels 1 and 2
- The proposed guard band of 5 MHz within Channel 63 stops use of 'mobile' channel 3.
- Therefore no UK spectrum is useable.

2.0 FDD Half duplex and national solutions

RTT have carried out a study on behalf of the GSMA to study whether half duplex FDD provides a technically and commercially viable and/or attractive solution for the Digital dividend spectrum[12]. We believe the RTT report provides valuable evidence of relevance to this award.
The study shows that it is unlikely that half duplex FDD devices will be produced for the European market for this band. The study also shows that it is even more unlikely that country specific variants, such as products for the UK market, will be supported.

3.0 TDD

T-Mobile does not believe that TDD needs to be catered for within the Digital Dividend spectrum.

T-Mobile supports the statements within the GSMA/E contribution into ECC PT1 (ECC PT1 (08)039):

> "FDD and TDD are spectrum management approaches, not technologies. Both of the beyond 3G technologies that are likely to be deployed in this band (LTE

[12] http://www.rttonline.com/Research/V21 Halfduplexstudyfinaljuly08 .pdf

and IEEE 802.16e) are capable of supporting FDD and TDD, including half duplex FDD.

The studies in SE42 for the 2500 – 2690 MHz band have highlighted some of the difficulties in mixing FDD and TDD in close proximity. These would be magnified for the 470-862MHz band, because the available spectrum is likely to be less and because the band is more important for coverage (i.e. there are likely to be larger cells, and no alternative band for handover if coverage holes are caused by interference). A restricted block was found necessary between TDD licences. For the likely number of licences, this would result in more 'lost' spectrum than the centre gap needed for FDD. It is very unlikely that there will be sufficient spectrum for mobile in the UHF band to enable it to be efficiently and effectively used by both TDD and FDD.

The EBU has expressed concern about terminals operating in frequencies close to broadcasting channels. A bandplan based on FDD with reverse duplex direction would increase the separation between broadcast and FDD uplink compared to the current separation between Channel 69 and the GSM 900 uplink band. However, a bandplan based on TDD would reduce it, unless there was a very large guard band[13]."

For these reasons, T-Mobile has a strong preference for paired spectrum for this band.

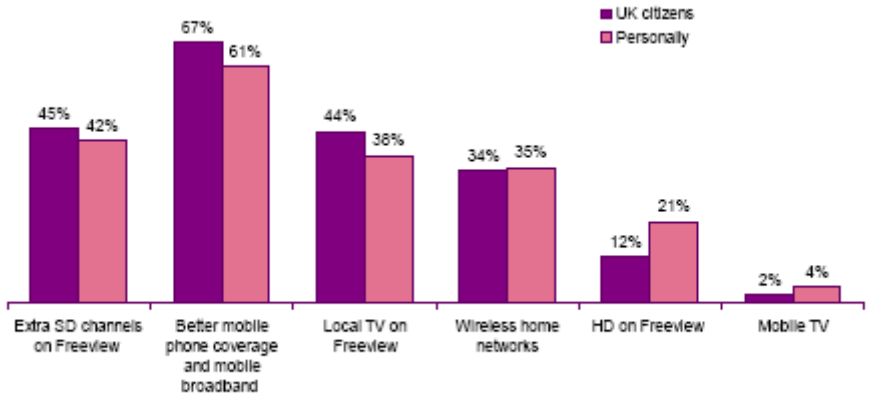
[13] As described in the supplementary report B from ECC TG4

Annex B: Mobile Use of DDR Spectrum will be beneficial to the UK

Ofcom market research indicates that mobile use will benefit UK citizens

In the Market Research that Ofcom commissioned in both 2006 and in 2007 to input on the potential uses of the Digital Dividend Review spectrum, better mobile phone coverage and mobile broadband came consistently near the top of individuals rankings as to the potential service that individuals felt would benefit UK citizens the most. This result was found in both the quantitative and qualitative research. Figure 2.4 in Ofcom's executive summary[14], reproduced below, shows the final ranking from the qualitative research. This clearly indicates that the market research indicated that this mobile use of the digital dividend is likely to provide strong benefits to society.

Figure 2.4, final ranking from qualitative research



Source: Opinion Leader Research

Mobile industry currently conveys vast benefit to society

There any many economic benefits which mobiles convey to society. A recent report prepared for the GSM Association has attempted to quantify the contribution that the mobile industry has brought to social and economic development.[15] Since the introduction of mobile services in the early 1980s, the market has grown at an impressive rate. Mobile communication is now a key European industry, comparable in size to pharmaceuticals or aerospace, with revenues amounting to €208bn.

Today, mobile services are often the only access to communication services for the less well off. In the UK, the younger and less well off segments of the population are much more likely to rely exclusively on mobile for communication services. Difficulties in meeting regular payments has been found to be a key reason why almost all low income households that have mobiles are on prepaid tariffs.[16] Also, mobile prepaid services alleviate barriers preventing marginalized groups from

[14] Ofcom, Digital Dividend Review Market Research 2007 – Executive Summary, 28 November 2007
[15] GSMA, Mobile Industry Observatory, July 6 2008. Prepared for the GSMA by A.T. Kearney

gaining a fixed line telephone – e.g., having a fixed address, a bank account and a credit history. According to Eurobarometer, 18% of European households have access to one or more mobile phone but not to a fixed line.[17]

More broadly speaking, mobile services make a very strong socio-economic contribution to Europe: The mobile industry also makes a very substantial contribution to the European economy, generating an estimated 4 million jobs for Europeans. Key contributions include**:**

- Mobile operator GDP of approx. €162 billion (1.3% of total EEA GDP);
- Contribution to public funding amounting to approx. €180 billion – of which €50 billion from mobile operators directly;
- Direct employment of 1.6 million Europeans, and induced employment of 2.4 million from direct employees' spending and the mobile industry's contribution to public funding;

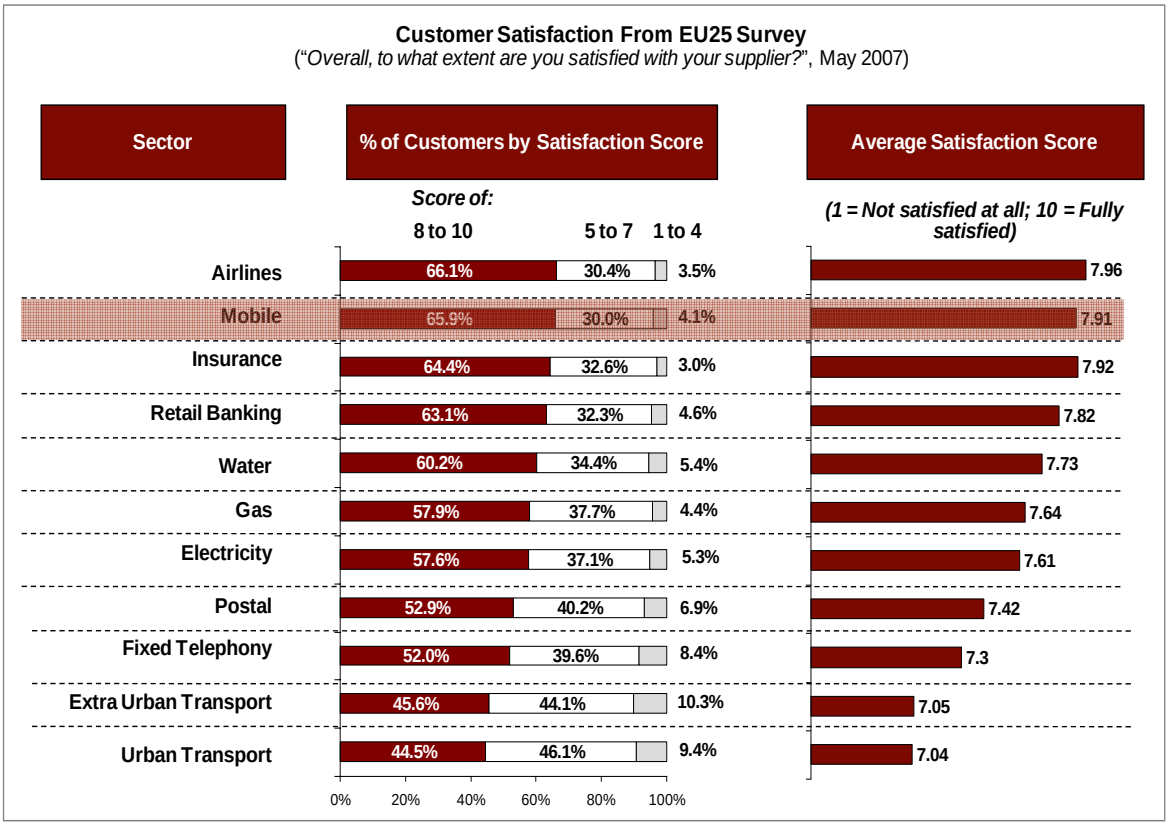
Mobile services are making an important contribution to improving the health and safety of European citizens – by increasing emergency service response times and by permitting the development of innovative services to protect vulnerable groups such as children or the elderly;

The mobile industry demonstrates strong commitment to consumer protection – as exemplified by comprehensive initiatives to protect children from inappropriate content, reducing handset theft and preventing spam.

Customers have expressed very strong satisfaction with mobile services, particularly when compared to other services. In fact, a survey conducted for the European Commission showed that consumers ranked mobile number two in overall satisfaction, against a range of other services such as fixed telephony, utilities, banking, insurance and transport.

[16] Ofcom, Low income consumers and the communications market, 20 November 2007, p.15.
[17] E-Communications Household Survey, Eurobarometer (2006).

Figure 1: Levels of Customer Satisfaction with Mobile and Other Services in the EU25, 2007[18]



Mobile sector has consistently participated in spectrum auction

The mobile industry in the UK has had experience in paying the market price for spectrum in the past. In the UMTS auction in 2000, the mobile operators paid a combined amount of £22bn for the rights to use 3G spectrum. Having spent this money on the spectrum, the mobile operators were still able to spend significant sums to build out the 3G network. Mobile operators are also expected to bid for the 2.6GHz spectrum that is being auctioned and will make the required network investment to utilise this spectrum efficiently.

Other industries have not had this level of experience in financing spectrum at a market level and then in addition make the required investment to make use of this spectrum. Other spectrum holdings have either been given to firms, or they pay minimal annualised prices for these. In both cases, the firms have not been required to make the significant financial investments in spectrum.

T-Mobile feels that the experience that the mobile operators have had in purchasing spectrum for significant sums in the past ensures that the mobile industry use of this

[18] GSMA, Mobile Industry Observatory, July 6 2008. Prepared for the GSMA by A.T. Kearney. The survey comprised of over 29,000 interviews across the EU25.

spectrum will provide significant benefit to society, as well as being an efficient use of spectrum. As a result of this, it is imperative the Ofcom do not pursue a plan that could lead to mobile operators being sidelined from the auction due to un-intentioned consequences of the plan.