The Response of Motorola Ltd

to the

Consultation on the Award of Available Spectrum: 2500-2690MHz, 2010-2025MHz and 2290-2300MHz

Motorola is grateful for the opportunity to contribute to the consultation on the award of spectrum in the above three bands.

The release of these bands potentially represents a significant change in the ability of operators to deploy innovative and valuable services to citizens and consumers. It is particularly welcome that one of these bands provides sufficient bandwidth to extensively deploy some broadband services. Motorola again stresses the point that benefit is only gained for consumers through the actual use of the spectrum to support valuable services. The more citizens and consumers who can use the service, the greater the overall benefit will be.

We see this auction to be of great importance in view of the potential societal and economic benefit in the event that the release of this spectrum leads to the rapid deployment of such services.

We consider that the success of this spectrum release could be very influential throughout the rest of the EU in terms of the assignment process chosen, the conditions applied and arrangements for secondary trading afterwards for the subsequent spectrum releases in each of the other Member States.

Key Points

Motorola would make the following summary points:

1. **We support the proposal to hold the auction at the end of 2007 without the need to await developments elsewhere. The earliest possible deployment of services is important to derive the greatest economic and societal benefit for UK consumers.**
2. **As a supplier of both FDD and TDD equipment, we applaud the current Ofcom intention to permit a variety of service solutions.**
3. **We believe that the deployment of attractive, large scale, commercially viable and sustainable broadband wireless systems offering attractive services will require at least 50MHz of usable TDD spectrum (net of such guard bands as deemed necessary) for each such operator.**
4. **We note that the future LTE systems may benefit from FDD spectrum at that time.**
5. **To permit the consumers to gain the maximum benefit from the economies of scale, Motorola encourages efforts be undertaken to promote that the spectrum arrangements for this band are Internationally harmonised to avoid unique transceiver requirements and complex roaming scenarios (as much as possible) which would add a cost penalty to consumers' products.**
6. **5 MHz may be insufficient guard band at the FDD/TDD borders to limit the operational degradation that might occur due to mobile to mobile interference when mobiles are in close proximity.**
7. **We support the Transmitter Spectrum Masks approach instead of the Spectrum Usage Rights approach to specify the technical licence conditions within a technology neutrality framework.**

Detailed Questions

As a manufacturer of equipment, Motorola makes no response to some questions.

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?

Motorola generally agrees with the proposals.

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

Motorola generally agrees with the adjacent bands interference analysis. We are however concerned that the in-band interference between FDD/TDD and unsynchronized TDD/TDD systems might not be solved with only a 5 MHz channel guard band as we explain in our answer to question 11.

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.

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, 2010-2025MHz and 2290-2300 MHz?

No comment.

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?

Yes. Motorola supports the earliest possible release of this spectrum.

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?

Motorola does not see the necessity of delaying the release of the spectrum to await developments elsewhere.

Motorola is, as a global manufacturer, always advocating the benefits of harmonization when it comes to regulation of the spectrum, in order to serve the mass markets with cost-effective devices offering roaming and global circulation. In this case we encourage efforts be undertaken to ensure any future EU spectrum regulation is in alignment to the maximum extent possible.

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

Motorola continues to support technology and service neutrality in spectrum regulation.

Motorola favours that some obligation to implement an actual system be included to avoid the spectrum remaining unused after the auction. This may take to the form of the inclusion of roll-out obligations or perhaps some other method.

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?

Motorola notes that there have been very few releases of spectrum to-date or projected that are of sufficient size to sustain the delivery of broadband services. Consequently, we would be concerned over auction arrangements giving the possibility of the establishment of a monopoly. Therefore we support the inclusion of a safeguard.

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?

Motorola agrees to auction the paired spectrum in 2x5 MHz lots and unpaired spectrum in 5 MHz lots. However, we believe that broadband systems such as WiMAX or 3GPP LTE will be deployed in this band with channel bandwidths of 10 MHz or more. Therefore, a significant amount of spectrum might be needed for a proper operation of each network depending on the services offered.

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)?

No Comment on this specific question.

We take this opportunity to stress our belief that the deployment of attractive, large scale, commercially viable and sustainable broadband wireless systems offering

attractive services will require at least 50MHz of usable TDD spectrum (net of such guard bands as deemed necessary) for each such operator. This amount will vary depending on the sophistication of the services carried and the number of consumers and enterprises served.

Motorola further notes that there are technical implications of flexible TDD/FDD boundaries which could have commercial impact. Having different FDD/TDD borders in different countries could result in additional interference when a transceiver roams into a new area where the FDD/TDD borders may not be the same. This brings about the need for a unique duplex filter for each unique set of FDD/TDD borders or relaxed interference expectations. Supporting several band arrangements (to enable roaming across a region where several band arrangements exist) would increase product cost and complexity accordingly.

Because of this technical interference matter, Motorola advocates that efforts be undertaken to encourage the maximum degree of spectrum harmonization across Europe to minimize product costs and enable the wider adoption of services.

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?

Motorola believes the interference situation to be more complex. The use of a single channel may be insufficient in some situations[1] such as MSs in close proximity.

Motorola also notes that the MS to MS and BS to BS interference scenarios across the FDD/TDD borders will be an issue in both the extended TDD and CEPT/ECC plans. In the Mason report some of the key parameters such as spectrum emissions and receiver blocking were studied and Motorola generally agrees with the conclusions. However we note that the TDD assumptions were not in-line with ongoing work in ETSI TFES and BRAN, which could result in some different conclusions. Motorola also questions the level of interference mitigation achievable with the techniques described in the report, in particular the level of filtering which can be applied to a base station especially with the increased use of high order modulation schemes which pose stricter limits on modulation accuracy.

Motorola continues to develop modelling techniques to study the effects of interference in forum such as CEPT and 3GPP, again Motorola would gladly share this information with both OFCOM and other interested parties in the UK.

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

Yes, Motorola would support to award the 2010 MHz band as a single slot, as this would then allow the operation of broadband systems.

[1] Motorola would be pleased to discuss this further with Ofcom were that to be desired.

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

Yes, provided this does not cause delay.

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?

No comment.

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

No comment.

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

No comment.

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

As expressed in our previous comments on OFCOM's Spectrum Usage Rights consultation, Motorola believes that the current best approach to specifying technical license conditions for in-band and out-of-band interference is the simple approach of a technology neutral transmitter spectrum mask and radiated transmit power limit without the complexity of specifications proposed in the Spectrum Usage Rights approach. Although an emission mask/power limit might not address aggregation of interference from more than one transmitter, it ensures consistency between equipment specifications and regulatory requirements and defines limits that are easily measured and enforced. We believe that such an approach will best serve the interests of effective interference protection, ease of interference measurement, and consistency between equipment specifications and regulatory requirements.

To illustrate our concern, consider a possible situation in which only one[2] high power base station is used instead of many medium power base stations. The problem with very high power base stations is that the co-existence scenario in the adjacent channel is very different and will lead to high blocking and consequently more stringent filter requirements will be necessary for terminals.

[2] or a small number

A limit on transmit power levels, both within and outside a band is in common use today. It is a key specification needed for the design and manufacture of radio transmitters, receivers, and systems. This method of equipment specification has served very well and has the advantage of clarity. We expect the need for this limit to be defined and specified to continue for practical reasons.

In addition, license holder coordination of base stations is a proven approach for mitigating the effects of in-band and out-of-band interference and should be encouraged.

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

Motorola notes that the transmitter spectrum masks proposed are based on 5 MHz spectrum blocks. We believe that broadband systems such as WiMAX or 3GPP Long Term Evolution will also be deployed in this band with channel bandwidths of 10 MHz or even more. The masks proposed by OFCOM might present a challenge when operating with 10 MHz bandwidth or greater. For mobile/nomadic Broadband Data Transmitting Systems operating in the 2500 - 2690 MHz band, ETSI BRAN is developing a new Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive 1999/5/EC[3]. This impending standard will cover both the 5 MHz channel bandwidth and the 10 MHz case. We therefore recommend that the spectrum masks developed within ETSI and in particular the ones being drafted in ETSI (as EN 302 544) are accommodated within the proposed OFCOM regulation.

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

And

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

The proposals for the Spectrum Usage Rights approach appear to be too complicated. Some of our comments and concerns are as follows.

1. **The values of H, X2, X3, Y, Z, and A need to be determined through system simulation using a common methodology and agreed set of assumptions. Reaching such agreements may be challenging.**

2. **The feasibility of the approach to achieve the objective of full usage neutrality is unclear. System simulation is typically based upon specific types of spectrum usage, service requirements associated with the types of usage, channel bandwidths, etc. Therefore, the practical constraints of system simulation may limit the ability to provide interference levels for all possible usages, thus compromising technology and service neutrality goals.**

[3] ETSI Work Item ref: DEN/BRAN-0060000 producing standard EN 302 544

3. **Another concern is that even if it is possible to specify interference levels for all possible usages, meeting the requirements of the most demanding usage could result to more stringent emissions limits than normally needed and lead to increased equipment costs and/or less efficient spectrum usage to meet the interference requirements.**

4. **The SUR specification of out-of-band and in-band interference is not easily translated into the emissions mask requirements needed for the design and manufacture of radio transmitters, receivers, and systems. This could lead to a possible inconsistency between equipment specifications and regulatory requirements.**

5. **SUR specification complicates the measurement of in-band and out-of-band interference levels. The complexity of measurement could lead to difficulties in enforcement and as before, create opportunities for manipulation of the rules to the detriment of the neighbor license holders. It is difficult to foresee how agreement could be reached over measurement methods for this level of complexity.**

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?

Any tool used or made available by OFCOM should be benchmarked against some of the existing tools to ensure that SUR results are consistent with those obtained using other tools for system specifications purposes.

Motorola fully appreciates the complexity of this task and the consequential risks associated with it and so would prefer a simpler approach based on transmitter spectrum masks in line with standards specifications.

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

See above for our answers to Questions 19 & 20.

Questions and comments regarding this response should be addressed to T. Cull in the first instance

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