

BT'S RESPONSE TO THE OFCOM CONSULTATION DOCUMENT ON ULTRA WIDEBAND

1. INTRODUCTION

BT welcomes the opportunity to comment on the *Ofcom Consultation Document on Ultra Wideband*, and presents our opinion on this subject, and our responses to the questions in the Consultation Document.

We recognise that Ultra Wideband (UWB) is a technology which can meet the needs of new products in the consumer market, however we believe that its introduction should be undertaken in a considered and cautious manner. We have been closely following the technical studies which are still ongoing within the radio regulatory community, and we believe that the body of evidence indicates that there is still the potential for interference into the existing services, which could result in unacceptable economic costs on those services. We do recognise the results of the study by Mason and Dotecon, however we believe that the study did not include the full costs of UWB.

2. RESPONSES TO THE QUESTIONS IN THE CONSULTATION DOCUMENT

In the following section, we present BT's responses to the specific questions which are raised within the Consultation Document.

Q1: Are these the appropriate topics to be consulting on?

We do believe that these are the key points on which Ofcom should gather opinions.

Q2: Do you agree with this analysis of our statutory duties? Are there any important factors that have been omitted?

Whilst we agree with the list of statutory duties given (which do refer to "if UWB can be deployed without causing undue interference to existing applications"), there is one overarching responsibility of Ofcom which has not been sufficiently emphasised in the list, namely ensuring the protection of existing licensed users from interference which degrades the service.

Q3: Do you agree with the economic study? Are there other studies that Ofcom should be conducting?

BT does have some reservations about the work undertaken within the economic study. We recognise that it was a difficult subject to address, but we believe that the cost element of UWB does not necessarily represent the impact on other radiocommunication services. For example, the impact on the 5 GHz band has been ignored, on the grounds that it is a licence-exempt band, however it is intended to be used on a commercial basis, to provide telecommunication services for which consumers will pay. Therefore any significant interference in the band will have a cost on the operation of the business. It is interesting to contrast that the economic study does not consider it appropriate to include the cost of interference into a commercial service on the grounds that it is licence exempt, yet it is appropriate to include the benefits of UWB which may also be licence exempt but not currently anticipated to be used to provide a commercial service.

We are pleased to see that Ofcom is undertaking further study into the impact of UWB on Broadband Wireless Access systems, since this is an area of particular concern to BT and others in the industry.

Q4: Is there a better way that future use of the spectrum could be taken into account?

We believe that the impact of UWB on the future use of the spectrum has not been sufficiently taken into account. Clearly it is difficult to identify how the frequency bands will be used in the future, but it should be possible to include an estimation for uses which are currently anticipated. The Consultation Document acknowledges that the value of the bids in any future auctions for bands will take account of the potential for interference from UWB, and hence the bidders will not be disadvantaged. However the reduction in bids will represent a “cost” to the UK economy which should be reflected accordingly in the economic analysis.

It is also interesting to note that Ofcom have proposed that no account should be taken of future use of frequency bands, however the proposed emission mask in this Consultation Document includes a very specific measure to protect the future of the 2.5 GHz band.

Q5: What is the most appropriate solution to the potential interference from UWB to BFWA?

As technology develops, new and innovative techniques are formulated to maximise the use of the radio spectrum. An example of this is the introduction of Dynamic Frequency Selection (DFS) to permit the RLANs to operate in the 5 GHz band without causing interference to the incumbent radar systems. Many of these new ideas fall within the general term of “cognitive radio”, which is a term which is being used to cover a range of possible techniques to adapt the operation of a radio system to suit the local environment, and in particular to avoid the other radio systems which are already operating in the area and which might experience harmful interference. We believe that the use of such cognitive technologies will play an increasing role in maximising the use of the spectrum, and might in the future be required as an essential element for the operation of UWB in bands such as those used by Broadband Wireless Access.

The Consultation Document lists a number of interesting ideas to mitigate potential interference between the UWB and Broadband Wireless Access.

- Raising the lower frequency for UWB to 5 GHz would solve the problem for the 3.4 - 4.2 GHz band, but would probably exacerbate the problem for the WLAN devices in the 5.15 - 5.725 GHz range, and the Broadband Wireless Access devices which are being deployed in the UK in 5.725 - 5.875 GHz band. We are also surprised to see this being proposed, since Mason has concluded that “Restricting UWB to the upper band only would be value destructive”. It is suggested that “notches” could be inserted into the 3.4 - 4.2 GHz band on a dynamic basis, however it is not suggested how the required notches would be determined. In practice, we believe that this would probably require a reduction of the permitted spectral mask across the whole of the Broadband Wireless Access band by about 10 or 20 dB.
- Advising the end user to perform their own interference mitigation is not likely to solve the problem; some consumers will note and heed the advice, however this is likely to be the exception rather than the rule. If it appears to work, then most consumers will be happy. However, as a consequence the Broadband Wireless Access might need to compensate by increasing the transmitter power, with consequences for the network as a whole. Leaving the

interference to the end user might also be a problem if the Broadband Wireless Access terminal belongs to a neighbour (e.g. it is mounted externally, close to the window of the UWB user). We are concerned that this could lead to customers reporting “faults” on their Broadband Wireless Access terminal, with a significant cost penalty for the network operator, whilst it might be difficult and expensive for the network operator to trace the interference.

- Increasing the robustness of the Broadband Wireless Access deployment is not an acceptable cost on the commercial operation of the Broadband Wireless Access network operator.
- Introducing a mechanism for co-operation between UWB and Broadband Wireless Access is an interesting idea, so that the UWB device detects the Broadband Wireless Access terminal and modifies its transmission. We do believe that this sort of smart technology is likely to provide the future way forward for maximising efficient use of the radio spectrum. However this is really only practicable for a Broadband Wireless Access system which is operating in a TDD mode, since it would need to know the receive frequency of the Broadband Wireless Access, rather than the transmit frequency (as noted in the Consultation Document). Furthermore, as has been demonstrated by the development of Dynamic Frequency Selection (DFS) for WLAN devices to operate in the 5 GHz band, this would very likely be a long process to agree the mechanism, and would probably not be completed within the timescale that is needed for action within the UK.

Q6: Would it be possible to achieve sufficient isolation between radio astronomy and UWB through practical methods of physical separation?

(no comment)

Q7: Are there any other options that we should consider?

We believe that if there is any consideration of the possible need for narrowing the emission mask in the future, then it would be preferable to introduce the narrower mask from the outset. It will always be more difficult to introduce more restrictions in the future, and hence it would be better to start off with a more restrictive regime, and then consider relaxing it later with the benefit of experience.

Both the Mason Study and the Ofcom Consultation Document focus on solutions using variations of the emission mask based on changes to the UWB band edge frequency and / or changes to the roll-off for out of band emissions. However there appears to be little consideration to the potential for amending the permitted power level across the operating range of the UWB device (i.e. between 3.1 to 10.6 GHz band). We are aware that this is being discussed extensively in the work of ECC TG 3 and ITU-R TG1/8 (as reported in Section 5 of the Consultation Document). We believe that, if Ofcom is prepared to consider changes to the mask such as amending the roll-off or the lower band edge frequency, then it should also be prepared to consider the more practical solution of changing the permitted power density across the band.

Q8: Are there any major technical studies that we have omitted?

We believe that the key technical studies have been considered here in the Consultation Document, recognising that Ofcom has commissioned an additional study on the issue of sharing with Broadband Wireless Access, which we very much welcome.

Q9: Have we made an accurate assessment of the existing studies?

We noted that many of the studies have been labelled as conservative. If Ofcom is to set aside the collective opinion from ECC & ITU, then this needs to be on the basis of alternative published studies or justifications. We understand that Annex 4 goes some way to addressing this, but we do believe that it falls short of an acceptable justification in many respects. As an example of our concern, we cite Ofcom's view in the "Overall Conclusion" on page 65 relating to the Fixed Satellite Service.

Q10: Do you agree that we should seek a common European framework for the introduction of UWB?

Recognising the relative market forces of a UK only regulation compared to a Europe wide regulation, we certainly agree that Ofcom should strive to seek a common European framework for the introduction of UWB, in an effort to ensure that the regulations for the introduction of UWB are respected and controllable within the UK.

Q11: Have we proposed the most appropriate mask? Will it be possible to deliver equipment conforming to this mask?

As noted above in the response to Question 7, whilst consideration has been given to changing the band edge frequencies or the roll-off of the mask, little consideration has been made to the power spectral density across the operating band. The technical evaluations of the ECC TG3 studies given in Section 5 highlight that the sharing studies with a number of radiocommunication services have identified that additional protection is required. However these are then dismissed as being conservative studies, implying that no additional protection will be needed in practice. Whilst we might agree that, in many of the cases considered, the study is conservative, we believe that this is appropriate in view of the potentially disruptive nature of UWB devices. The introduction of UWB on a licence exempt basis, permitted to operate across licensed bands is a revolutionary step, which should be taken carefully. We are not objecting to the introduction of UWB devices in the 3.1 - 10.6 GHz band, however we believe that this should be undertaken in a careful and conservative manner, and believe that a measured approach is appropriate. It would be better to take a conservative approach at the start, and then relax the limits if considered acceptable, rather than dismissing the sharing studies as conservative and then discovering interference problems and trying to "put the genie back in the bottle".

Furthermore, the need for a conservative approach is underlined by Section 4.5 of the Consultation Document, which states that "we could allow UWB in the 3.1 - 10.6 GHz band initially, but if the 3 GHz and 4 GHz bands became increasingly used for mobile applications, we could require UWB to migrate to the 6 - 10.6 GHz bands." Such uncertainty surrounding the potential for unacceptable interference from UWB underlines the need for a cautious introduction.

We are not in a position to comment on "whether it will be possible to deliver equipment conforming to the mask", but the important issue is that the mask should be set to protect the incumbent users of the band, and that the onus will be on the equipment manufacturers to meet the mask. The mask should not be modified to accommodate the equipment if this would adversely affect the incumbent and licensed users of the band.

Q12: To what extent should we define parameters such as those listed above? What is the most appropriate definition for each of these parameters?

We agree that there are aspects of the UWB device other than the emission mask which might be appropriate for regulation.

- In the case of UWB devices where the pulse repetition frequency (PRF) is relevant, the issue of regulating the value is important. This has been previously discussed, in the context of false triggering of the DFS mechanism in Wireless Access Systems including RLANs in the 5 GHz band. On page 60 of the Consultation Document, it is acknowledged that the DFS mechanism is designed to detect radars with PRFs of the order of 200 to 3000 pulses per second, and it is very important that the UWB devices do not cause a false trigger of the DFS mechanism. (There was an input paper from the UK to the work of ECC TG3 highlighting this specific concern¹.) As a consequence, we would definitely support a minimum PRF for the UWB device, and we believe that it should be significantly higher than the range of PRFs detected by the DFS mechanism.
- In the interests of minimising the background “noise” from UWB devices which are not associated with another device, we would support any effort to minimise unnecessary transmissions from such “non-associated” devices. We do not believe that imposing such a limit would be problematic, since it should not be necessary for UWB devices to continuously broadcast messages to announce their presence. Furthermore, in many cases for handheld devices, it would be advantageous to minimise such broadcasts, to reduce the power consumption of the device.
- We believe that the ability to turn off the UWB transmitter should be an essential requirement, particularly where the UWB device is embedded in another device (e.g. television, PDA, etc). This would be needed if interference is experienced (e.g. with a Broadband Wireless Access or RLAN device, as suggested), and also if the device were to be used in a location where locally unauthorised radio transmitters are not permitted (e.g. in a hospital or on board an aircraft).
- In an effort to minimise the interference, it would be beneficial for the transmitter power to be adaptive (and data rate, if possible) to match the requirement for the application / range of the link.
- We certainly believe that guidance should be provided to the UWB user, in a clear, concise format. It should indicate the ability of the device to cause interference to other radio devices (e.g. RLANs, Broadband Wireless Access, etc), and that the user might need to experiment with the siting of the UWB device to minimise interference. It should also explain that the equipment is intended for short range links (e.g. to replace wiring between devices), and is not intended to operate over a range of more than a few metres. If appropriate, guidance on the restrictions regarding outdoor operation should also be included.
- We have no specific opinion on the question of minimum bandwidth for UWB
- We believe that it would not be practical to limit the range of applications that UWB could be used for. The applications should be limited by the range / data rate of the technology.

¹ TG3#3_15R0_UWB_Proposed revisions to Annex 2-8 on RLAN_UK submitted to 3rd meeting of ECC TG 3, August 2004

Q13: Is our proposed approach to international bodies appropriate?

We agree that Ofcom should encourage a European wide approach to the regulation of UWB devices, preferably through an EC Decision. Ofcom should work in co-operation with the ECC, with the aim of producing an ECC Decision, which could then form the basis of an EC measure.

Ofcom may also need to provide early indication of the regulatory measures that might be required (including those considered in Section 6.5 / Question 12), so that the appropriate measures can be taken to incorporate these requirements into the relevant standards (e.g. IEEE 802.15).

Q14: How should we best deal with the precedent potentially set by our proposed approach to UWB?

We assume that the precedent which is being referred to here is that of abandoning historical and currently accepted best practice in setting internationally accepted interference levels, which are consistently referred to in this document as conservative. If this is the case then we would refer to our response to Question 9 above. We believe that there is merit in establishing the legal basis for UWB within the Radio Regulations, which do not currently allow for this sort of usage, except under Article 4.4. An interim step towards this would be a common policy within Europe; however, these measures would not protect the UK from any precedent that would be set. We note the suggestion that the formulation of spectrum usage rights could be used to address this problem, while we believe that this may indeed be a way forward in the longer term, we must make the point that the concept of spectrum usage rights remains for resolution within the new framework, and would suggest that this would best be re-considered once that concept has been acceptably defined.

Q15: What should Ofcom's role be in setting and monitoring EMC standards?

Where appropriate Ofcom should participate in standards bodies where new standards are being developed or existing standards updated. In general appropriate EMC standards for intentional radiators already exist (EN 301 489 series). However we believe that there is a need for a greater role in monitoring emissions, and ensuring that all apparatus complies (i.e. "policing the standard").

Furthermore, there are many electrical products (non-telecommunications related) which are capable of causing excessive electromagnetic emissions, but which are currently not subject to adequate assessment. The responsibility for policing the EMC Directive is generally left to local trading standards offices, which cannot provide the level of assessment that is required across the broad range of electrical products. In view of the potential for interference into telecommunications systems from such products, we believe that Ofcom should take a greater role in promoting a more visible, accessible, coherent and comprehensive programme of monitoring and enforcement of compliance with the EMC Directive.

BT would like to see the wired telecommunications industry given the same level of protection as currently afforded to the wireless telecommunications industry under the Wireless Telegraphy Act. Indeed within Statutory Instrument 2005 No.281 "The Electromagnetic Compatibility Regulations", Schedule 3 contains a list of apparatus whose operation must not be hindered; Item 10 in the list is "telecommunications networks and apparatus". Of course these regulations only apply to apparatus when it is first placed on the market or taken into service, which would be a help if it were properly enforced. But this SI gives us no protection when the same electrical equipment develops a fault during its lifetime that causes interference to our network but still appears to the user to be

functioning normally. To date we have many experiences of this situation occurring with no resolution possible in many instances, other than to cease service or leave the customer to try and tolerate it, which may for example mean they have no service during the evenings or weekends when the faulty equipment is being used.

3. CONCLUSIONS

We believe that, if UWB is to be introduced in the UK, then Ofcom should take a cautious approach to its introduction. The extensive studies that are being undertaken within CEPT and ITU, which have justifiably taken a conservative approach, are indicating that there might be a significant potential for interference into the existing services, in certain circumstances.

It is recognised that there are difficulties associated with such technical studies, and therefore we would agree that practical experience of the deployment of UWB may be the best method to confirm the results of these studies. Therefore, if the operation of UWB devices is to be permitted in the UK, we believe that it should be undertaken in a suitably cautious and conservative manner. Our view on this reflects our concerns that once UWB devices are in widespread use (assuming that they are operating under a licence exempt regime), it would effectively be impossible to stop their use, in the event of unacceptable interference being experienced by the incumbent users.

Therefore we believe that if UWB devices are to be permitted to operate in the UK, then initially this should only be allowed, with additional mitigation measures, such as a lower in-band emission threshold to protect the operation of Broadband Wireless Access systems. If subsequently, in the light of experience, it is confirmed that unacceptable interference would still not occur in the event of widespread deployment, then it may be appropriate to consider relaxing those mitigation measurements at some later date.

Furthermore, to ensure that the practicality of such mitigation measures, Ofcom should encourage their adoption across those other European countries which permit UWB operation.