BASIC DETAILS

Consultation title: **Spectrum planning for the London 2012 Olympic Games and Paralympic Games**

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Representing (self or organisation/s): BBC

Address (if not received by email):

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Name   Vanessa Tamms   Signed (if hard copy)

BBC Response to Ofcom Consultation:

**Spectrum planning for the London 2012 Olympic Games
and Paralympic Games**

The BBC welcomes this consultation. Ensuring that sufficient spectrum is available (at a reasonable price) to cover the 2012 Games in London is an issue of considerable importance, and it is crucial that this is considered now – before several of the bands that may be needed for coverage of the Games are auctioned, such that appropriate provisions can be written into licence terms and conditions.

The BBC has for some time now been making its concerns known regarding the future availability of spectrum needed to operate the equipment used to provide this sort of coverage on a day-to-day basis. While Ofcom's Digital Dividend Review statement outlines its intention to make spectrum interleaved with digital terrestrial broadcasts available for wireless microphone use via a band manager until 2018, how much spectrum will be available and at what price is unlikely to be known before the first quarter of 2009. The situation with regards to spectrum for wireless cameras (which use higher frequencies than wireless microphones) is less clear: in addition to quantity and price of spectrum, it is unclear whether this spectrum will need to be accessed from more than one band manager.

The BBC recognises that there are increasing demands on spectrum due to the advancement of wireless technologies over the past decade or so. However, clearly coverage of the Games is likely to require access to spectrum in addition to that which is currently used on a day-to-day basis. It is also becoming increasingly difficult to use wired equipment, due to heightened security concerns and health and safety legislation, and some events will only be able to be covered by wireless cameras, such as those over long distances (particularly those over water).

We continue to examine new technologies, with a view to seeing whether there are things we are currently doing which we might be able to do in a more spectrum-efficient manner. However, the vast majority of new technologies use shared networks, which are especially prone to falling-over when there is lots of simultaneous use within a given geographic area, and hence will be of limited use in covering events of major cultural or sporting significance where continuity of service is very important.

It is difficult for any individual broadcaster to assess the likely spectrum needs of the host broadcaster, or indeed of other Rights-Holding Broadcasters (RHBs) (or any other user of spectrum at the Games), and hence the majority of our answers below are written from an individual RHB's perspective. Clearly it is also difficult to assess spectrum needs now, some four years in advance of the Games, and in the absence of final details regarding the layout of events, etc.

Responses to the Discussion Questions

Approach and assumptions

Question 1: *Do you have any comments on our approach?*

Question 2: *Do you have any comments on our assumptions?*

The BBC has no detailed comments to make on either the approach taken or assumptions made by Ofcom in its consultation document. However, we would draw Ofcom's attention to our comments above about the likely margin of error in assessing the spectrum needs of the Games some four years in advance, particularly in the absence of final details regarding the layout of events, etc.

Requirements for PMR and broadcasting

Question 3a: What is your assessment of the requirements for handheld radio systems?
      3b: How can they be met most efficiently?

Question 4: Would you want to use capacity on LOCOG's trunk network through a rate card?

Question 5a: What is your assessment of the requirements for land mobile radio systems?
      5b: How can they be met most efficiently?

Question 6a: What is your assessment of the requirements for maritime radio?
      6b: How can they be met most efficiently?

The BBC does not feel in a position to meaningfully comment on these issues.

Question 7: Do you think that <u>digital</u> wireless microphones will be widely used by the time of the London Games?

Digital wireless microphone technology is at a very early stage and the improvements in spectrum efficiency are very small (where they exist at all). A number of competing proprietary systems are appearing in the market, but no clear leader has yet emerged. In addition, the processing latency associated with these systems is typically 2-3 ms and this can be an issue for many applications. The compatibility of digital wireless microphones with digital

terrestrial television and their suitability for use in the white space spectrum is also as yet unknown. Alternative systems which use the unlicensed 2.4 GHz ISM band are unlikely to deliver the required quality of service. Given this, we do not anticipate the technology to be widely adopted in time for the Games.

Question 8a: What is your assessment of the requirements for wireless microphones?

As stated above, it is difficult for an individual broadcaster to ascertain total spectrum requirements, including for wireless microphones. Information regarding wireless microphone spectrum requirements should already be available for the Beijing Games later this year from BOCOG. However, this is likely to underestimate requirements for the London Games, for two reasons. First, there are likely to be fewer restrictions on coverage of the London Games; second, the (lesser) time difference between the UK and the rest of Europe and the US in particular is likely to increase coverage by RHBs.

8b: How can they be met most efficiently?

Greater access to digital interleaved spectrum is likely to need to be made available for the period of the Games, given that RHBs will want to bring "standard" equipment with them. Careful management will be required to accommodate all requests for access to spectrum.

Question 9: How do you think developments in audio technology will affect spectrum requirements?

We do not anticipate developments in audio technology affecting spectrum requirements for the Games (particularly in the light of the fact that technologies to be used are typically required to be set in stone some eighteen months to two years in advance). It will therefore be important to ensure that sufficient access is available to digital interleaved spectrum for use of conventional analogue FM radio microphones for the period of the Games.

Question 10a: What is your assessment of the requirements for in-ear monitors?

Information regarding in-ear monitor spectrum requirements should already be available for the Beijing Games later this year from BOCOG, although once again this is likely to underestimate requirements for the London Games.

10b: How can they be met most efficiently?

The BBC understands that the spectrum used for in-ear monitors is the same as that used for wireless microphones, and hence greater access to digital interleaved spectrum is likely to need to be made available for the period of the Games. Once again, careful management will be required to accommodate all requests for access to spectrum.

Question 11a: What is your assessment of the requirements for talkback?

Host production teams will require multiple good quality traditional talkback systems within their venues; however, with careful control of power levels, some frequency re-use may be possible.

11b: How can they be met most efficiently?

Given the geographical setting, it may be that intensive use can be made of an effective digital trunked system to cover all the park venues (and extend to outlying locations) which would reduce demand on the traditional less spectrum-efficient systems. There are some good talkback systems on the market which use the ISM band around 2.4 GHz but these are unlikely to perform in an environment where so many other devices (WiFi etc) will also be using that band.

Question 12a: What is your assessment of the requirements for ADS?
12b: How can they be met most efficiently?

The BBC does not feel in a position to meaningfully comment on this question.

Question 13a: What is your assessment of the requirements for S-RSLs?
13b: How can they be met most efficiently?

The BBC does not feel in a position to meaningfully comment on this question.

Question 14a: What is your assessment of the requirements for wireless cameras?

Information regarding wireless camera spectrum requirements should already be available for the Beijing Games later this year from BOCOG, although once again this is likely to underestimate requirements for the London Games given that there are likely to be fewer restrictions on coverage and given the lesser time difference between the UK and the rest of Europe and the US in particular.

14b: How can they be met most efficiently?

Any wireless cameras operating within stadia can use higher frequencies such as 7 GHz with strict power limits. It might be possible, with careful management and control, to re-use frequencies at other stadia.

Coverage of events which take place over a wide area (such as the Marathon, Road Cycling, etc)- particularly those events over water (such as Sailing) will require use of mobile, wide area and aerial cameras, which must use lower frequencies such as 2.0, 2.2 and 2.6 GHz. These are mainly for host broadcaster use but RHBs will also require them. Outside use by RHBs within localities at different venues on different days will need careful co-ordination.

Question 15: How do you think the use of HD will affect spectrum requirements?

HD radio cameras currently use MPEG-2 video encoding to achieve low latency. In a typical broadcast chain, video is decoded and encoded several times (cascading) and quality suffers at each stage. It is important to encode at an adequate data rate to prevent significant degradation. For an overall PSNR reduction of 0.5 dB, a data rate of at least 50 Mb/s has been found to be necessary. This suggests spectrum requirements for HD, based on existing technology, will be at least twice that required for standard definition systems.

Question 16a: What is your assessment of the requirements for point-to-point links?

Point-to-point links can be a cost-effective solution in a number of situations. These are typically used by "beauty cameras", presentation positions and as reserve links for critical applications (to back-up underground fibre links).

16b: How can they be met most efficiently?

Given that these are static links and have a clear line of sight, they can sensibly use higher frequencies, e.g. 10 GHz or higher, provided of course that suitable equipment is available.

Question 17: How do you think spectrum could be used more efficiently?

As well as licensing frequency use, power levels will need to be controlled to allow some re-use in nearby areas. Effective monitoring will be required in order to ensure that licensed levels are not exceeded.

It will also be necessary to ensure that the host broadcaster (OBS)'s needs are prioritised while ensuring that the RHBs are also satisfied.

Question 18a: Do you think that wireless-camera technology operating between 3 and 7.5 GHz will be more widely available by the time of the London Games?

Wireless cameras which operate at 3.5 GHz and 7 GHz are already available in the UK, and there is some use of equipment at 3.5 GHz for coverage of major events. As stated above, 7 GHz is likely to be useful for use within stadia (but not for coverage of 'mobile' events).

However, the current regulatory uncertainty surrounding these bands is deterring use of them: wireless camera users are reluctant to purchase equipment which operates at 3.5 GHz given current uncertainty as to how long they will continue to have access to this band (it is likely that this band will be made available to fixed and mobile wireless access services), and are reluctant to invest in the terrestrial network associated with use of 7 GHz given current uncertainty as to security of tenure and the level of Administered Incentive Pricing (AIP) to apply to this band.

18b: Do you think that wireless-camera technology operating at up to 60 GHz will be available by the time of the London Games?

This technology will not be mature in time for the Games, as concluded by Sagentia in the work they did for Ofcom (Report OF014, available at: http://www.ofcom.org.uk/consult/condocs/spectrum2012/shf_ehf/report.pdf).

18c: Could existing wireless cameras be adapted to work at higher frequencies?

See response to 18b above.

18d: Are there any other considerations that will affect the feasibility of using higher-frequency spectrum for wireless cameras?

The possibilities of operation beyond 10 GHz are limited by antenna aperture, propagation characteristics and the high cost of circuit components; health and safety issues also become a concern as the required transmitter power for a given performance increases as the square of frequency.

Question 19: Do you think that using optical-fibre cameras will reduce spectrum requirements?

Use of optical-fibre cameras will reduce spectrum requirements, but only to a very limited extent (for example, fixed use within stadia). As stated above, their use is being increasingly limited due to heightened security concerns and health and safety legislation, and events taking place over long distances (and hence requiring mobile coverage) or water will not be able to be covered by wired cameras.

Question 20: Do you think that using short, wireless video links to fixed, cabled access points will reduce spectrum requirements?

This technology will not be sufficiently mature to have any impact on spectrum requirements (even if the range were sufficient, which it isn't for most applications). Currently existing modulation systems do not work and equipment is unlikely to be available. The issues with 20 GHz and 60 GHz systems are discussed in the Sagentia report referred to in our response to Question 18b above.

Question 21: Do you think that using optical fibre within and between competition venues will reduce the requirement for fixed point-to-point links?

(Where possible) use of optical fibre will reduce spectrum requirements for fixed point-to-point links.

Requirements for support services

Question 22: Do any public support services have spectrum requirements that cannot be met through existing allocation and assignment processes?

The BBC does not feel in a position to meaningfully comment on this question.

Requirements for cultural events

Question 23a: What is your assessment of the requirements for cultural events?
        23b: How can they be met most efficiently?

It is difficult to comment meaningfully at this stage on the likely spectrum needs for cultural events. LOCOG has so far announced four of the eight major strands that will make up its "Cultural Olympiad Strategy"; it is expected to announce the remaining four later this year.

However, at this stage it appears as though the majority of the events will take place in advance of the Games and across the UK, and hence are unlikely to add to spectrum requirements during the Games themselves.

Other requirements

Question 24a: What is your assessment of other requirements?
         24b: How can they be met most efficiently?

(In addition to the host broadcaster and RHBs), non-Rights-Holding Broadcasters (such as UK broadcasters who are not RHBs, news channels from around the world) are likely to want to report from near stadia using wireless devices. While they will probably not be allowed to enter the Games site, they are likely to set-up reporting positions close enough to require frequency coordination. It is possible that this issue has not arisen in Beijing (and hence will not appear in any data obtained from BOCOG).

Spectrum may also be required for radio cars.

Operational Issues

Question 25a: Do you have any views on previous or possible licensing systems?

Some sort of Web-based request procedure is the norm for international events and is useful for assessing/ processing the requirements of spectrum users based overseas.

However, it is important that a team of skilled experts with experience of frequency management for programme-making deal with all the requests. The task should not be underestimated, and cannot be left to software alone. Given that power levels will need to be closely managed, the task is much greater than anything faced in the UK before.

Indeed, knowing a little about the close proximity of many of the venues and the likely large demand for, and scarcity of, spectrum, the BBC would suggest it may be the most demanding special event spectrum management exercise ever undertaken.

         25b: When should the licensing system start to accept applications?

The licensing system should start to accept applications as soon as production requirements are known - probably some eighteen to twelve months before the Games.

Question 26: Do you have any views on enforcement?

We anticipate that virtually all available spectrum will be used during the Games so there will be little or no margin for error. It will therefore be vital that there is an effective monitoring process to identify and resolve problems promptly. These problems are usually borne of operator error or misunderstanding, but the consequences for say, the Opening Ceremony of someone switching on an unlicensed wireless camera could be very serious. There will need to be a strong and effective presence of enforcement officers at all major venues.

Some major events have implemented a sticker system where all equipment taken in to the site has to have a specific prior approval label but these schemes are rarely effective and should be avoided. This is because most equipment is frequency-agile, so even if approved it can still easily transmit on the wrong channel with dire consequences. Furthermore, perimeter access staff are often unable to recognise an RF radiating device to know whether or not it requires a permit. Body-worn radio microphones, for instance, are very inconspicuous.

22 February 2008