

**Question 1:Do you agree that the most relevant comparator for a top-down approach is likely to be the London 2012 Games?:**

Yes, earlier Games are not likely to have similar spectrum requirements due to the increasing use of wireless technologies. London 2012 has broadly similar events. As long as the ACTUAL, not PREDICTED, London 2012 requirements are used, and some thought is put into the scaling of requirements due to fewer events (as this won't be a linear reduction), it should be a suitable comparator.

**Question 2:Do you agree that comparing data for the number of radio channels used for specific services at different events is an appropriate approach to estimating spectrum demand? If you disagree, please explain your reasoning?:**

Yes, but with some reservations. Care required when scaling (see Q1 above). Some events have large spectrum requirements, others very little but these requirements can change depending on the actual venue or location for a specific event.

**Question 3:To what extent do you think we should place more emphasis on estimating demand from information provided by stakeholders rather than on the limited data available from past events of a similar scale? :**

The stakeholder information is likely to be their best guess at the time of the initial enquiry. As the event approaches the requirements will almost certainly vary. For example, stakeholders may need to wait to see if fibre can be provided before deciding if they need to deploy point-to-point links. Also exact event requirements will not have been determined at this stage nor will service providers have been appointed. Host Broadcaster requirements, as detailed in the consultation document, seem to be estimates or assumptions and do not seem to be accurate now that the requirements are becoming apparent. Spectrum demand needs to be re-assessed at intervals as the event dates draw nearer and if this is done then the information gathered will be more relevant.

**Question 4:Is there any other relevant technical guidance that we should be taking into account in order to validate our assumptions and our estimate of spectrum demand?:**

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**Question 5:Do you have any comments on how relying on wired communicatiosn could be used to reduce spectrum demand at Glasgow 2014?:**

The decision for Wired v Wireless is usually based on financial and technical suitability criteria, not spectrum availability, so it will be difficult to steer decisions towards a Wired solution.

Fibre-wireless ARE used by Broadcasters but only to improve reception coverage of wireless cameras, NOT to reduce spectrum requirements. Large scale networks, of the type described in the Analysys-Mason study for city-wide coverage, are financially impractical and have not been implemented in practice.

In short, there will be virtually no reduction in spectrum demand by proposing wired alternatives.

**Question 6: Do you have any comments on the scope for maximising supply by reusing spectrum efficiently?:**

With careful planning co-channel re-use of frequencies can be successful.

Off-setting of centre frequencies fills us with trepidation, it can't be realistically considered as a workable solution. Even if it is technically possible in the equipment it will lead to confusion. It effectively re-writes the band plan for different events which will not result in the availability of more frequencies.

Propagation modelling has to assume antenna heights and other working practices by the user. Variations in these will lead to markedly different results in practice so predicted results should be treated with caution.

Allocating frequencies only for the actual time period required (for a specific use or event) rather than a blanket allocation across the whole time-span of the Games should be considered as good practice. The Start and End dates for the whole Games Time Period of spectrum administration need VERY careful consideration (unlike the London 2012 practice) and in reality different sections of the spectrum could easily have different Start and End dates. The blanket control imposed on spectrum at London 2012, with its early Start and late End dates caused severe difficulties for Business as Usual (non-games, occasional use) needs. The spectrum requirements for the Queens Baton Relay and various Cultural Events that take place in the run up to the Games are best administered by the usual authorities eg JFMG rather than being included in the Games Spectrum umbrella.

**Question 7: Do you have any comments on the scope for maximising supply by using higher-frequency spectrum?:**

Frequencies up to 7.5GHz can be, and have been, very successful for wireless cameras in Olympic sized Stadia.

There is little or no point in making additional higher frequencies available if equipment that can use them is not already owned, or hireable, by Broadcasters. New investment in expensive equipment for a one-off event is just not financially viable. Equipment on these frequencies may not even be available from manufacturers in the required timescale. The performance of wireless links at frequencies above 7.5GHz when deployed on Games type events is generally not well known and Broadcasters will be reluctant to deploy new and un-proven technology on a major event.

**Question 8: Would you consider using free-space optics technologies?:**

Contrary to the statement in the consultation document these links are no quicker to set up than conventional RF links. They also have severe range limitations and less weather immunity. They are not widely stocked in the UK making them difficult (and therefore probably expensive to hire). Thus we think they will see very little service at Glasgow 2014. However, if circumstances were favourable for their acquisition and deployment we would have no objection to using them.

**Question 9: Do you have any comments on our planning assumptions?:**

Your assumptions are generally acceptable. Point C (detailing Start and End dates for spectrum) needs very careful consideration as previously mentioned. Not every frequency needs to have the same start and end dates!

**Question 10:how would you prefer to receive PMR/PBR services?:**

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**Question 11:Would you be willing to use CTCSS tones/DCS codes to allow the same channel to be used for PMR/PBR?:**

CTCSS/DCS is not a panacea or a replacement for good spectrum management. It has limited use in allowing co-channel re-use and should not be employed for critical applications. Tones and codes would need to be individually allocated to ensure success.

**Question 12:Do you have any comments on our assessment and proposals for wireless microphones and IEMs?:**

No

**Question 13:Do you have any comments on our assessment and proposals for talkback?:**

Weather equipment moves between venues or not is irrelevant, most equipment is multi-channel. It is frequency re-use at venues that needs to be considered. Allocation of pairs of frequencies for duplex talkback should consider the use of branching/combining between Tx/Rx and antennas, and consider intermodulation products which can be minimised by non-standard Tx/Rx frequency offsets.

**Question 14:Do you have any comments on ADS?:**

No

**Question 15:Which bands would you prefer to use for wireless cameras?:**

For more complex and technically demanding wireless cameras (eg motorcycle mobile, ground-to-air or air-to-ground) the use of the 2GHz band is virtually essential although 3GHz can be used for some applications. These would be our preferred options. For more wireless camera systems 2GHz is still the preferred option, due to the stock or availability of equipment, although 7GHz is an option, particularly for stadium or indoor use.

**Question 16:Which bands would you be willing to use for wireless cameras if you cannot use your preferred bands?:**

We would only be willing to use bands that are technically suitable and that we have equipment available for. That limits the options to 2, 3 and 7GHz bands.

**Question 17:Do you have any other comments on our assessment and proposals for wireless cameras?:**

Give priority to Airborne and Ground-to-air allocations at complex events as these will have more demanding engineering requirements.

Re-visit the assessment of quantities as the actual event requirements become known.

Do not assume Broadcasters will be able to use frequencies outside the normal bands their equipment is designed for. There is a significant cost implication in equipment to other bands as this can require complete replacement of elements of a system rather than just an adjustment or modification. The timescale to obtain equipment in other bands also needs consideration. It may not be available off-the-shelf from suppliers.

**Question 18:Which bands would you prefer to use for point-to-point links?:**

As with Q16 we would only be willing to use bands that are technically suitable and that we have equipment available for. That limits the options to 2, 3 and 7GHz bands.

**Question 19:Which bands would you be willing to use for point-to-point links if you cannot use your preferred bands?:**

See Q18 above.

**Question 20:Do you have any other comments on our assessment and proposals for point-to-point links?:**

Due to the availability of equipment we feel that point-to-point links will use the same spectrum bands as wireless cameras (2, 3 & 7GHz) and will therefore need to be included in the overall spectrum plans for these bands.

**Question 21:Do you have any comments on our assessment and proposals for FSS?:**

No

**Question 22:Do you have any comments on our assessment for MSS?:**

No

**Question 23:Do you have any comments on our assessment for RNSS?:**

No

**Question 24:Do you have any comments on our assessment and proposals for telemetry and telecommand?:**

We will have, and there will be other, requests for camera control telecommand frequencies in the UHF Radio Talkback spectrum (450-470MHz) which will need to be integrated into

the overall plans for this band. We could also have requirements for telecommand spectrum in the analogue video link 5GHz band although exact requirements are not yet known.

**Question 25:Do you have any comments on our assessment and proposals for WLANs?:**

No

**Question 26:Do you agree that licensing arrangements for users covered by the spectrum guarantees should not be subject to a special regime as we have for the London 2012 Games:**

Yes

**Question 27:How can efficient sharing and co-ordination between Games and non-Games spectrum use best be achieved?:**

Give the job of frequency co-ordination to the people best qualified, in terms of past performance and customer satisfaction, to do the job, the JFMG. As they will be responsible for Business as Usual frequency co-ordination (for occasional use as well as annual assignments) around Games time it makes sense for one organisation to co-ordinate the entire spectrum.

**Question 28:Do you have any other comments on how best to license spectrum use for the Glasgow 2014 Games?:**

Please consider the actual date requirements for the various frequencies and do not impose a Games Wide blanket date window (or, as in the case of London 2012, an even wider window) for all frequencies.

**Question 29:How can interference management be most effective in ensuring the successful running of Glasgow 2014? Are there other measures we should consider implementing? To what extent is your response based on previous experience of similar events?:**

Based on personal experiences at both London 2012 and the Diamond Jubilee we suggest that the ability for Games licence holders to be able to report possible un-licensed users and for Ofcom to follow this up with fast response field teams is a valuable resource. Also to have an interference help desk, with technical back-up to trace and eliminate problems, is an essential requirement.

**Question 30:Do you have any comments on our approach to test events?:**

We agree that these should not be included in the Glasgow 2014 spectrum plan. Frequency co-ordination for these events can be handled by the usual organisations eg JFMG.