Response to Ofcom Consultation:
London 2012 Olympic Games and Paralympic Games:
Draft spectrum plan

We would like to thank Ofcom for the opportunity to offer our views on the London 2012 Olympic and Paralympic Games draft spectrum plan. As the current PMSE band manager we are uniquely placed to identify a number of issues that the proposals raise from both a PMSE and spectrum management perspective.

JFMG have extensive knowledge and experience of managing major sporting events ranging from those that occur year on year, such as the British F1 Grand Prix, Wimbledon and the FA Cup Final, to exceptional events such as the 2002 Commonwealth Games held in Manchester, the Champions League Final 2003 and the visit of the Tour de France to the UK in 2007.

We have been planning spectrum use at events and issuing licences on the regulators' behalf since 1997 and during this time have developed and honed the skills required to ensure high-profile, complex and spectrum-hungry events are successful. As the coverage of sporting events become more imaginative so too does spectrum planning. There is an inextricable link between production innovation, technology development and spectrum requirements. We are therefore required to develop ways of increasing spectrum efficiency wherever possible to ensure all users' requirements are met. We do this through early communication with organisers and attendees to gain a clear understanding of all requirements to formulate the plan. We increase capacity by visiting venues to understand where there may be room for adapting our planning assumptions to better reflect the 'real' environment and attend events to monitor use and solve problems.

We have therefore leant on this experience in our responses to specific questions surrounding maximising efficiency and spectrum planning. We have not gone into great detail regarding the frequencies to be made available for particular uses. We believe that these questions are better answered by the users and manufacturers of the relevant equipment. However we have commented on areas where we feel some additional insight may be useful. Where questions relevant to PMSE use have been left blank it can be deducted that we broadly agree with Ofcom's proposals.

1. Summary

Ofcom's draft spectrum plan document has managed to estimate the spectrum requirements for the 2012 Games despite the multitude of uncertainties surrounding an event that doesn't occur for another 3 years. It is clear that the spectrum plan will become more detailed as the Games approach and more certainty regarding real usage becomes available.

The document has identified methods of maximising spectrum efficiency and we have attempted to add value to those approaches throughout the course of this response. This includes providing feedback on the principles of reducing re-use distances. We state that the path loss figures identified within the document are likely to be greatly improved if supplemented by practical surveys of venues once they are completed.

Whilst Ofcom's assumptions appear to be comprehensive we do note that there doesn't appear to be any reference to the use of 1W audio links (high power wireless microphones and in-ear monitors). It is likely that events covering larger distances would require them so we recommend Ofcom consider their spectrum requirements in future iterations of the plan.

Ofcom's identification of spectrum to fulfill the requirements for specific uses appears to be in the appropriate ball park but we believe it is for users and manufacturers to provide confirmation of the feasibility of the spectrum identified. We would however recommend that Ofcom reconsider their

estimate of the amount of spectrum required for airborne use as we believe that it is currently on the conservative side.

Whilst we understand that there are factors that make it necessary to create a separate spectrum licensing process for the Games, we are concerned that managing it in isolation from business as usual PMSE could be harmful to both parties. We recognise the importance of the Games to UK plc but feel that other users' ability to operate their businesses should not be sacrificed. We therefore highlight ways that we believe will avoid the need to revoke licences, reserve spectrum or create exclusion zones.

In order to achieve appropriate coordination and sharing of existing PMSE bands effective communication and coordination between the Games licensing team and the PMSE band manager is vital.

2. Consultation Questions

***Question 1)**: Do you have any comments on the three approaches we have taken to spectrum planning for the London Games?*

N/A

***Question 2)**: Do you have any comments on the scope for reducing demand by using fibre-wireless networks within venues?*

N/A

***Question 3)**: Do you have any comments on the scope for reducing demand by deploying a London-wide cellular receive system?*

We believe this question is for the Broadcasters and their production experts to comment on.

***Question 4)**: Do you have any other comments on the scope for reducing demand by relying more heavily on wired communications?*

N/A

***Question 5)**: Do you have any comments on the scope for maximising supply by using spectrum more efficiently?*

We broadly support Ofcom's thoughts on how to maximise spectrum efficiency but note that whilst there have been significant developments in digital wireless microphone technology it is unlikely that products would be used in significant numbers before 2012.

We also support Ofcom's discussion regarding off-setting centre frequencies for wireless cameras to increase efficiency between venues. However, whilst off-setting could reduce interaction between different venues it would result in reducing the total number of channels available within the same band at each of those locations.

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

Whilst using prediction tools to calculate free-space path losses between the Olympic park and other venues provides a useful reference point, we believe that calculations are likely to be on the conservative side. In the run-up to the Games there will also be the opportunity to study more closely

the actual path losses between known Games locations and refine predictions with practical surveys. This should provide more scope for maximising supply by reusing spectrum efficiently.

Greater efficiency can also be achieved by designating power limits in specific frequency ranges to vary the reuse distance for particular applications. For example, this could include avoiding allocating high and low power wireless camera use in the same frequency band.

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

Whilst this question is primarily for users there could be some scope for improving supply by using higher-frequency spectrum for specific wireless cameras' use. Given the capacity issues surrounding 2GHz it would seem sensible to ensure that the band is only utilised when absolutely necessary. Therefore 7GHz and above could be used for low power indoor or in stadia use, leaving scarce 2GHz channels for other applications that are required to cover greater distances with more challenging signal paths.

This option would need to be tested with the relevant users in advance of any final decisions.

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

N/A

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

We note that there are no references to 1W audio links or high power IEMs within the list of assumptions. We would therefore suggest that they be added to ensure that requirements for their use get taken into account in any amendments to the plan.

With reference to points 4.25 and 4.26 on page 27: Whilst it is possible for wireless cameras to operate in adjacent channels its success relies heavily upon both transmitter and receiver performance. Wireless camera users in the UK have found that receiver performance can often be the limiting factor in ensuring satisfactory adjacent channel operation. If adjacent channel use is to be relied upon it may be necessary to ensure that spectrum users pay additional attention to their receivers, perhaps by employing additional filtering.

***Question 10)**: Would you be willing to use LOCOG's land-radio network?*

N/A

***Question 11)**: If not, how would you prefer to receive land-radio services?*

N/A

***Question 12)**: Would you be willing to use CTCSS tones/DCS codes to allow the same channel to be used for land radio in both the Olympic Park and the River Zone?*

N/A

***Question 13)**: Do you have any other comments on our assessment and proposals for land radio?*

We notice that the bands identified for PMR and Talkback are almost identical apart from the inclusion of VHF frequencies for land mobile. This would be the obvious conclusion as equipment is often very similar. However we would suggest that those bands currently identified for PMSE use be retained for talkback and are only used for PMR in exceptional circumstances. PMSE talkback users are used

to these frequencies and are already equipped for them. Maintaining this separation would also protect 'business as usual' PMSE users.

***Question 14)**: Do you have any comments on our assessment and proposals for maritime radio?*

N/A

***Question 15)**: Do you have any comments on our assessment and proposals for wireless microphones and IEMs?*

We believe the majority of questions posed within this particular section of the consultation are better answered by wireless microphone users. However there are some areas on which JFMG would like to comment.

Clarification

Firstly we seek clarification on table 6 (p38) of the consultation which shows the availability of UHF bands IV and V for wireless microphones and IEMs in the Olympic Park. The accompanying key provides details regarding availability for each channel except for channel 42, which is shaded differently but which does not have a corresponding key description.

In addition, point 6.8 states that up to 320MHz could be available in the Olympic Park, particularly if Ofcom hold back rights of new use of the spectrum that will comprise the UK's digital dividend until after digital switchover. Preventing access to the digital dividend for the 2012 Games could have a significant impact on the spectrum plan. It is therefore important for Ofcom to make a clear statement regarding availability for the Games as several other documents have indicated that it would be, not just in London but throughout the whole of the UK.

Wireless microphone efficiency

Whilst accommodating a peak of 350 wireless microphones and 100 IEMs at the Olympic Park sounds like a significant challenge, JFMG agree that this should be possible given the provision of all UHF spectrum and a robust spectrum plan. JFMG worked with Ofcom colleagues and was responsible for the spectrum planning of the London stages of the Tour de France in 2007 and can confirm that 23 microphones were accommodated per TV channel. Recent licensing of an event in Trafalgar Square for a television advertisement also confirms that it is possible to improve efficiency and accommodate a significant number of microphones within relative close proximity. However, it should be noted that there was a significant amount of RF engineering and planning involved in both of these events. It should also be noted that it is much easier to be efficient when there is only one licensee using known equipment. Greater efficiency becomes more difficult when multiple users appear in the same location. In these instances it is vitally important to develop a detailed spectrum plan, backed up by sound RF engineering on the ground. Only then, with strict adherence to the plan can greater efficiency be achieved successfully.

High power audio links

We note that there doesn't appear to be any reference to the use of high power wireless microphones or IEMs within the plan. These are typically used at sporting events that cover a wide area and so could be used extensively at some Games venues. Spectrum availability becomes more of an issue when dealing with powers in the realm of 1W. Therefore Ofcom may want to consider adding these to their considerations in future iterations of the plan.

Channels 21 and 24

The exclusion of channels 21 and 24 from use by wireless microphones should not cause any significant capacity issues, however it should be noted that US visitors routinely use these channels

for wireless microphones and IEMs. Early notification of this fact should remedy any issues prior to the Games.

Finally, we broadly agree with Ofcom's assessment and proposals for wireless microphones, but note that expert spectrum planning, RF engineering and monitoring will be necessary to achieve the desired successful outcome.

***Question 16)**: Do you have any comments on our assessment and proposals for talkback?*

We have no comments regarding Ofcom's assessment and proposals for talkback apart from those discussed in question 13. Maintaining those bands currently allocated to PMSE for talkback use unless absolutely necessary for land mobile will simplify the process for both PMSE and business radio users alike.

***Question 17)**: Do you have any comments on ADS?*

N/A

***Question 18)**: Which bands would you prefer to use for wireless cameras?*

N/A

***Question 19)**: Which bands would you be willing to use for wireless cameras if you cannot use your preferred bands?*

N/A

***Question 20)**: Do you have any other comments on our assessment and proposals for wireless cameras?*

Once again we believe it is for users and manufacturers to indicate the appropriateness of the spectrum to be made available for the 2012 Games. Only they can provide Ofcom with information regarding which bands they would be willing to use and manufacture.

However we would like to take this opportunity to point out that we believe Ofcom's forecast for airborne demand to be on the extremely conservative side. We have been spectrum managing the airborne requirements for events like the London Marathon for over ten years and during this time coverage has improved in quality and complexity. As a result we typically find ourselves licensing 5 airborne frequencies for marathon/cycling events. This would constitute 4 frequencies for bike relays and 1 for the heli-cam. And still this requirement does not take into account covering simultaneous events. We would therefore suggest Ofcom consider amending their forecast and revisiting how this demand might be met for the Games.

***Question 21)**: Which bands would you prefer to use for point-to-point links?*

N/A

***Question 22)**: Which bands would you be willing to use for point-to-point links if you cannot use your preferred bands?*

N/A

***Question 23)**: Do you have any other comments on our assessment and proposals for point-to-point links?*

N/A

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

N/A

***Question 25)**: Do you have any comments on our assessment for MSS?*

N/A

***Question 26)**: Do you have any comments on our assessment for RNSS?*

N/A

***Question 27)**: Do you have any comments on our assessment and proposals for telemetry and telecommand?*

Wireless cameras also require telecommand channels to adjust settings from the production area and these are traditionally situated in 462MHz (and also 473MHz in London). However, these licensed frequencies are not mentioned in the plan for telemetry. In addition some are located in channel 21, where only land mobile and talkback use is proposed to be allocated. We would suggest therefore that the use of licensed channels for telecommand be included in future iterations of the plan.

***Question 28)**: Do you have any comments on our assessment and proposals for WLANs?*

Vancouver's approach to WLANs appears to have merit. We would therefore support the exclusion of 2.4GHz WLAN equipment in venues to minimise potential interference to other services.

***Question 29)**: Do you have any comments on our assessment or proposals for spectrum at the six football venues?*

We agree that there is unlikely to be any spectrum congestion issues at the six football venues identified for the 2012 Games. Whilst there is still a considerable amount of spectrum use for comparable large events such as the FA Cup Final and the Champions League Final, demand can usually be met by coordinating requirements in advance and developing a detailed understanding of the characteristics of the venue.

A detailed understanding of these venues can be ascertained by undertaking a technical survey of the ground in advance of the event. This ensures spectrum planners are aware of the infrastructure already in place and where the broadcasters and corresponding transmitters are located. It also allows measurements to be taken to ascertain the level of interference received into the venue from elsewhere as well as the level of radio signal that travels outside the venue into the neighbouring area. Determining these factors greatly aid the spectrum planning process and increase the possibility of spectrum reuse in a location. Determining how far signals from within stadia travel allows planners to amend their planning assumptions and build a plan that increases the availability of spectrum for users considerably.

In addition to the coverage of a match itself many are also accompanied by corporate VIP events held in stadium conference facilities. This further increases the demand for spectrum, in particular for wireless microphones and stage intercom systems, Careful coordination with the main arena is required This additional requirement can increase the overall demand by as much as 50%.

Although not currently included in Ofcom's estimates we do not anticipate any difficulties in accommodating the overall demand.

Whilst spectrum use within football stadiums will be strictly managed, it can sometimes be disturbed by users just outside the venue. It is important to ensure that all users' requirements including non rights holding visitors, are taken account of and strictly controlled. It will therefore be necessary to ensure onsite attendance to address this issue. Whilst Ofcom are suggesting exclusion zones for some areas to avoid this issue it would seem excessive to employ this approach for the 6 football venues.

***Question 30)**: Do you have any comments on our assessment and proposals for cultural events?*

It is likely that peak demand and therefore capacity issues will be most significant during the course of the actual Games' themselves. It would therefore follow that cultural events in the run up to the Games, whilst generating significant demand, should be catered for without relying unduly on the additional spectrum Ofcom has identified. It should be possible to accommodate the events that occur across the country whilst also ensuring non-Games events aren't adversely affected.

There may be a requirement however to access additional spectrum for cultural events that occur during the Games in some locations, especially those in close proximity to the Games venues themselves. Borrowing spectrum from other owners is unusually common practice for PMSE. We often require permission to use additional spectrum for large annual events, especially where parties are traveling from abroad. We would hope therefore that Ofcom would not discount this possibility.

Given their nature JFMG assume that these cultural events will be catered for by the PMSE band manager and charged the market rate associated with PMSE access at the time.

Whilst the 'Other events and celebrations' mentioned above are not subject to Government guarantees, the Olympic and Paralympic torch relays are. We agree their spectrum requirements can be catered for on a business-as-usual basis, but it raises some queries regarding how this particular use would be dealt with. The relays will be traveling the UK in the build up to the Games and will utilise existing available spectrum. It will therefore be necessary to coordinate their spectrum usage with normal PMSE use as they make their journey. This could be difficult as the short-term nature of PMSE means the spectrum usage landscape is dynamic and subject to change at a moments' notice. It would be necessary for the band manager issuing regular PMSE licenses and Ofcom to share up-to-date information on requirements and usage to ensure no disruption was caused to either area of use.

This is just one of the concerns we have with regard Ofcom's proposal to manage the Games spectrum plan in isolation from day-to-day PMSE operations.

JFMG firmly believe that in order to affect a successful Games both Games and non-Games use needs to be fully catered for. We believe the only way of being sure that the day-to-day business of PMSE users is not affected is by enabling full coordination of both requirements. Whilst the Games is an amazing opportunity for the UK, a one-off event should not result in unrelated PMSE activity being harmed. Only by being aware of the totality of requirements; existing usage in an area; by having expert knowledge of PMSE; event planning and management can spectrum utlisation be maximised and the integrity of all events and uses be achieved.

***Question 31)**: Do any non-guaranteed public services have spectrum requirements that cannot be met through existing allocation and assignment processes?*

N/A

***Question 32)**: Do any non-guaranteed private services have spectrum requirements that cannot be met through the market and existing assignment processes? Should we make alternative arrangements for handling such requests?*

We have no specific concerns regarding non-guaranteed spectrum requirements as long as there is sufficient collaboration between Ofcom's Games licensing team and the PMSE band manager. We believe that treating PMSE use as a whole would minimise the likelihood of spectrum requirements from users such as non-rights-holding broadcasters being unsatisfied. It might also negate any requirement to implement exclusion zones around Games venues.

***Question 33)**: Do you have any comments on our approach to innovation and legacy?*

N/A

***Question 34)**: Do you agree we should establish special licensing arrangements for users covered by the Government's spectrum guarantees? To what extent is your response based on what has worked well at past Games and comparable events?*

We agree that special licensing arrangements for users covered by the Government's spectrum guarantees will be necessary to establish that they are exempt from spectrum fees and that their requirements should be treated as a priority. The government will cover the cost of the spectrum so appropriate records of usage will also be required for these purposes. In addition many of Ofcom's current licensing products are not designed for short-term use of the type required for the Games (time and location specific). It is likely that licence schedules similar to those currently issued by JFMG on Ofcom's behalf would be the most appropriate to replicate.

However having two separate entities licensing PMSE use may cause some confusion, especially for those covering the Games but outside of the guarantees.

Whilst it may be necessary to create special licensing arrangements it will still be important to ensure that this use is captured by the PMSE band manager to ensure that any assignments it makes do not clash with those assigned for the Games. Whilst exclusion zones may remedy this problem in part, some PMSE use can travel significant distances. Therefore precise knowledge of usage will ensure interference is not caused by non-Games use. In addition sharing of information will also allow greater frequency reuse within the London area and minimise the likelihood of spectrum scarcity for everyday PMSE users.

***Question 35)**: Do you agree that an online application process using the LOCOG rate-card ordering system is the best way for guaranteed users to apply for spectrum licences? How could the licence-application process be made optimal?*

We agree that an online application process is the best way for guaranteed users to apply for spectrum licences. However we are concerned that there may be some confusion regarding who needs to apply in this way. There should therefore be a process in place that allows all accidental non-guaranteed applications to be passed to the PMSE band manager without delay and vice-versa.

***Question 36)**: How can efficient sharing and coordination between Games and non-Games spectrum use best be achieved?*

Whilst the options identified for efficient sharing and coordination between Games and non-Games spectrum use may be necessary in some instances, we would suggest that they be employed only as a last resort. Setting aside particular channels for Games use only and introducing geographic exclusion zones in particular could place unnecessary restrictions on non-Games use if employed arbitrarily.

We believe that careful planning and cooperation with the PMSE band manager could better facilitate efficient sharing and coordination than these measures.

However, to achieve this there needs to be a joined up approach between the existing authorisation process and the process for the Games. This would ensure that Games use was taken into account

when making day-to-day assignments, without unduly restricting their use. In order to facilitate this the PMSE band manager would need sufficient information regarding spectrum use in Games locations, including: frequencies, powers, duration and location. Using this information they would be able to determine what could be used for day-to-day PMSE activity near Games locations without causing any undue interference on a case-by-case basis. This would remove the need to set aside channels for Games use only and facilitate more efficient use of the spectrum. It would also remove the need to implement geographic exclusion zones as any use would be allocated with protection of the Games in mind, reducing the risk of interference. The establishment of coordination zones would further minimise any risk and negate the need for exclusion zones completely.

JFMG manage large events on a regular basis and ensure attendees' needs are met without denying access to other users in and around the vicinity. An experienced band manager develops good relationships with customers and is able to negotiate usage in a way that produces a satisfactory outcome for all. We believe that varying or revoking licences for the Games could be avoided completely as it is possible to contact users and negotiate access to spectrum that they are licensed for without these measures. We frequently contact licensees to borrow spectrum for large events, and find that customers are usually extremely amenable. Working closely with the band manager may therefore facilitate the organisation of such arrangements without the need for regulatory action.

We further believe that a cooperative approach is necessary to ensure that day-to-day users are not disadvantaged as a result of the focus on the Games. Restricting access to frequencies and/or locations could have an impact on businesses' ability to provide services to customers and could therefore affect their financial well-being beyond the Games.

We believe that the adapted use of a service currently available via our online system could also add value to the Games licensing process and indeed facilitate coordination and interference resolution where it occurs. Those responsible for licensing at Games venues could log onto the system and interrogate the PMSE band manager's database online to discover who was licensed in an area. This could help identify any potential frequency clashes or clarify the presence of unlicensed use. The current facility is designed for venue owners and provides them with the ability to see all licensed users at their location.

In conclusion we believe it will not be necessary to place restrictions on PMSE use at specific times and locations if information is shared dynamically and efficient cooperation established between the Games licensing team and the PMSE band manager.

***Question 37)**: How can the use of licence-exempt equipment best be managed?*

Our experiences at large events such as golf's Open Championship indicate that coordination of licence-exempt equipment would greatly benefit the running of the Games. Whilst it is important to coordinate between licence-exempt users it should also be extended to include licensed users as there are instances where mutual interference has been received. This is especially relevant in the case of wireless cameras whose spectrum use is adjacent to exempt bands.

***Question 38)**: Do you have any other comments on how best to license spectrum use for the London Games?*

N/A

***Question 39)**: How can interference management be most effective in ensuring the successful running of the London Games? Are there other measures we should consider implementing? To what extent is your response based on previous experience of similar events?*

We believe Ofcom have captured the most effective methods of interference management within the document. Practical site surveys and measurements in advance of events allow planners to adjust technical assumptions to reflect the real operational environment, therefore maximising spectrum

efficiency and limiting interference potential within the spectrum plan. Encouraging early applications also ensures event requirements are known with enough time to tailor the plan and negotiate application amendments with customers. These processes work together to minimise the risk of interference caused by licensed users within the venue.

As the current PMSE band manager we use the spectrum planning methods above as standard for many events. However, for major events such as the British Formula 1 Grand Prix on-site attendance is also necessary. This ensures that any last minute frequency issues can be addressed, that advice on set-up can be given if necessary and proactive monitoring of spectrum usage can be undertaken. Users can then be advised if they are on incorrect frequencies and interference issues can be investigated on the ground. For the Games it will be vital to have sufficient staff to deal with these issues as well as equipment approval and checking procedures.

***Question 40)**: Do you have any comments on our approach to test events?*

It will be necessary for those issuing licences for test events to work closely with the PMSE band manager to ensure use is coordinated with day-to-day PMSE operations. We therefore recommend the same approach to these events as highlighted for the Games themselves. These test events could provide useful opportunities to test information sharing mechanisms with the band manager and refine the coordinated approach.