UK Space Agency Response to Ofcom's WRC15 Consultation questions

We welcome the opportunity to respond to this consultation on the proposals for WRC15. As usual, we have restricted our views to those agenda items related to space sector interests. Spectrum is the only means available to communicate with space craft and spectrum issues are therefore critical to the sector. Where those spacecraft have been funded through international mechanisms, for example ESA or the EU we have an international obligation to protect the spectrum used by these missions. The global nature of the space sector means that allocations and use must be agreed on a global basis. For the space sector any repurposing of spectrum is especially problematic as it is not possible to modify existing assets in orbit. Proposals for changes to allocation must be tensioned against competing interests and rigorously evaluated through consultation and technical analysis. The agency therefore consider active participation of the UK regulator within the WRC process to be very much in the interest of the sector.

Question 1: Do you have any comments on the mechanism for UK preparation for WRC-15 and the role of Ofcom in this process?

In general, we agree with the mechanism. It is important for the UK to work within CEPT and to coordinate with our European partners in order to collectively be a strong voice at the conference. The UK space agency participates in the UK process and we attend the UK Spectrum Strategy Committee. The UK Space Agency actively participates in the UK process of stakeholder engagement, managed by Ofcom in preparation for WRC15. Specifically, we attend the IFPG and its four IFPG working groups. Resources do not permit us to attend all international meetings of CEPT and ITU-R. We have prioritised ITU-R SG7 (science services) and its associated working parties, and attend other meetings as appropriate.

In our opinion, the changes to the UK IFPG process may have gone too far. There remain many excellent opportunities for government colleagues to engage with and work closely with Ofcom in developing the UK position through the IFPG and in inter-departmental and bilateral meetings. However, we have received negative comments from industry who indicate that in this cycle there has been much less opportunity for them to come together with Ofcom to debate and influence the UK position and develop UK documents. This is especially with respect to agenda item 1.1, where industry have indicated to us that they consider UK position on WRC15 agenda items has been overly influenced by the domestic and Ofcom's role in developing mobile broadband. In contrast they feel that supporting UK space industry interests has not been as high a priority. This issue was noted by the UK Space trade association in their Space Growth Action Plan, Space Innovation and Growth Strategy 2014-2030.

The UK space agency have noticed that the amount of resource that Ofcom are able to provide in support of IMT in the UK delegation to JTG-4-5-6-7 has been much greater than the support they have been able to devote to space issues, especially science, ITU-R SG7. We have also seen in recent years a marked decline in UK contributions to propagation models through ITU-R SG3. Those models are vital to successful sharing and a lack of appropriate, agreed ITU-R propagation models has made interference evaluations under Al1.1 much more contentious than they might otherwise have been. We do not propose less support for mobile broadband activities; rather we would like to see additional support for the space and space science sectors.

Question 2: Do you agree with the prioritisation of the agenda items, as shown in Annex 6, and if not why?

The UK space agency exists to represents the interests of the space sector, in our view the space sector issues should be prioritised more highly than Ofcom have indicated in Annex 6. The current prioritisation for WRC15 appears to have been based more on domestic consumer benefits than on UK industrial interest.

In Annex 6 mobile broadband issues are all considered as a high priority while space issues generally considered medium or low priority. We agree that agenda item 1.1 on IMT should have a high prioritisation, but we would have expected several of the space related agenda items to also be a high priority. For example agenda items 1.6.1, 1.9.1 and 1.12 which could have a significant impact on the fixed satellite/EESS services and items 9.1.3 and 9.3 could have far reaching consequences on satellite operators. The reform of satellite filing procedures under agenda item 7 was a high priority at WRC12 and while proposals are not yet complete the potential impact on UK satellite operators is very significant and we would also have expected this to be a high priority for WRC15. The UK government continues to invest heavily in EESS/MetSat missions and therefore protection and meeting the future spectrum requirements for these missions is very important to the UK.

Question 3: Do you agree with Ofcom's general approach on WRC-15 agenda item 1.1?

We understand that this is a difficult issue. We do not completely agree with the approach and we have already noted in our response to question 1 that there are problems with industry engagement.

We accept that IMT needs more spectrum and that this is a UK priority. The very large list of candidate bands has been a problem and we would have liked to see this list reduced at an earlier stage within CEPT. Currently, (September 2014) we still have 7 bands in the "maybe" category, several of which are important space sector allocations. We consider that long established space sector bands should not be identified for IMT unless equitable sharing can be achieved.

We consider the characteristics of IMT mean that sharing on a co-primary basis would be very difficult to achieve with virtually any other service. Therefore, where an allocation is made to IMT that spectrum is effectively lost to the incumbent services and the spectrum becomes repurposed by default. For the space sector this repurposing of spectrum is especially problematic as it is not possible to modify existing assets in orbit¹ and developing new systems in response to changes in spectrum allocation takes a very long time in comparison to the mobile sector².

Question 4: In view of the recent developments on the 1 492 - 1 518 MHz and 5 925 - 6 425 MHz bands, what are your views on the potential identification of these bands for IMT and/or RLAN and on the mobile data applications that could make use of them? How do you believe the sharing with the fixed service and the fixed satellite services could be managed at the national level?

¹ Working in the space environment is difficult. Satellites have to be built to be extremely reliable as they can not be repaired. Launch costs are falling but still many £10millions.

² A typical life cycle for a telecommunications satellite from initial investment to replacement can often approach 25 years. In contrast, the first SMS text message was sent in the UK only 22 years ago and the network has changed considerably since then

We consider that the sharing of these bands will require global co-ordination.

1 492 - 1 518 MHz is not allocated to space services but it is important to ensure no harmful interference to the adjacent 1 518-1 559MHz MSS allocation arises from the out of band emissions of IMT terminals. Some studies have demonstrated potential interference but these studies are not complete. The 1 492 – 1 518 MHz band should not be allocated to IMT until these issues are resolved. As both IMT and the MSS are global services, it would make sense for the solution to be managed at a global level.

The 5 925 - 6 425 MHz band has a global c-primary allocation to mobile, fixed and fixed satellite services. In general we believe that the sharing of bands allocated to space services will need to be managed on a global basis as international co-ordination is needed to avoid harmful interference to the satellite operations of other states. As the 5 925 - 6 425 MHz band is allocated to the fixed satellite service, a national arrangement for sharing this band would not be not sufficient unless suitable mitigation, e.g. PDF limits towards the Geostationary arc were included to protect satellite use.

We also have concerns that the sharing of the 5 925 – 6 425 MHz band with IMT would lead to future restrictions on the introduction of new FSS Earth stations to avoid interference to these new IMT deployments, effectively preventing further development of the FSS in this band.

Question 5: For the band 1 427 – 1 452 MHz, do you agree that it is right to support the further consideration of the band, recognising the Ministry of Defence interest?

This spectrum is allocated to the space operations service. This use also needs to be considered when contemplating sharing with IMT. The band is also adjacent to the $1\,400 - 1\,427$ MHz passive allocation and strict adherence to out of band emission limits will be needed to protect earth observation.

Question 6: For the band 1 452 – 1 492 MHz, which is already subject to a harmonisation measure within CEPT, do you agree that this band be supported for an IMT identification at WRC-15?

No strong views.

Question 7: Recognising the UK plans to release spectrum in the 3 400 – 3 600 MHz band, coupled with the binding European Commission Decision (for electronic communications services) in the bands 3 400 – 3 600 MHz and 3 600 – 3800 MHz, do you agree that these bands should be supported for both a co-primary mobile allocation and IMT identification?

Our understanding is that within Europe, these bands are already available from IMT. This means that within the UK, these bands can already be used for IMT and there is no need to make any changes to the radio regulations to enable UK use. Supporting a global allocation would be of no direct benefit to UK citizens. We do not accept the economies of scale for reducing the cost of equipment argument as sufficient justification for a global allocation. Europe is already a very large market and if the market estimates for mobile broadband are correct will become more so. Wireless chipset technologies have advanced considerably and now only represent a relatively small fraction of the overall cost of mobile devices. Any economy of scale savings on hardware would most

probably benefit non-UK handset manufactures whereas in contrast, most of the largest satellite operators are based in Europe, with many located in the UK.

The UK Satellite operators have indicated to us that these bands are important to their global business activities and that a global allocation would damage their interests and investment opportunities overseas, especially in those regions where propagation considerations mean that C-band is required to provide high reliability, high value services. They reluctantly accept that within Europe, these bands are already available to IMT but consider a global allocation would threaten the revenue they earn from delivering overseas services and have requested the UK promote the "No Change" position.

We also note that the BBC and FCO have interests in C-band monitoring and the broadcasters have also requested a no change position.

As well as being the dominant home of satellite operators, the UK are also a major supplier of spacecraft, many hosting C-band transponders.

The UK Space Agency supports and promotes the growth of the UK space industry, including both upstream and downstream markets. We also recognise that the revenue generated by UK operators and manufacturers from their overseas activities contributes to the UK balance of payments and that access to C-band for monitoring purposes is in the national interest. We do not see significant benefits to UK citizens or industries will arise from upgrading the existing European provision for IMT to a co-primary global allocation. Therefore we do not support the co-primary allocation in these bands and favour the "No Change" position.

Question 8: Noting that there are a number of countries that strongly oppose the inclusions of the 3 800 – 4 200 MHz band, do you agree that we should support the longer term consideration of this band for potential mobile broadband use?

The band 3800-4200MHz is an extremely important satellite telecommunications band that was previously rejected within CEPT but has been re-introduced through the support of Ofcom. We recognise there needs to be some negotiation room and that more bands than strictly required will need to be kept on the table until agreement can be reached, but proposals that indicate the UK support the effective global elimination of satellite C-band appear to be in direct opposition our national policy to expand the space sector and to confirm the UK's reputation as the best place to invest in the space sector. Even if we do not expect 3800-4200 MHz to be supported at WRC15, UK support for this band risks sending a negative message to the rest of the world which could impact growth.

We therefore do not support the longer term consideration of this band for IMT as a re-allocation would be against UK interests.

Question 9: Noting that there is currently limited international support for a co-primary mobile allocation in the band 2 700 – 2 900 MHz, do you think that we should continue to support this band at WRC-15?

No view.

Question 10: Do you agree that the 5 350 – 5 470 MHz and 5 725 – 5 925 MHz bands could provide important additional capacity for Wi-Fi and similar systems? If so, and noting the need to protect both earth observation satellites and radar systems, do you agree that sharing solutions should be considered at WRC-15?

We do not agree that the 5 350 – 5 470 MHz band should be allocated to WiFi. This band is crucial to UK interests in Earth observation and we have invested heavily in instruments using this spectrum, most recently the Sentinel-1 radar satellite which has been launched through the European Copernicus programme. We consider the arguments for additional WiFi capacity are weak as they appear mainly to be to permit wider contiguous channel bandwidths. The modern technology necessary to make use of white spaces will need to make use of non-contiguous spectrum and the same capability should be included in future WiFi if it is to make the best use of available spectrum. There is therefore no overriding technical need to utilise this band, certainly not at the moment. We accept that an allocation may be made if this is achievable without impact on the existing use, however we feel it is too early to support such an allocation at WRC15. The results of ITU sharing studies supported by Ofcom and ESA have concluded that additional mitigation would be needed to facilitate sharing. The potential of this mitigation still needs to be evaluated. The Mobile Data Strategy indicates this additional capacity will not be required before 2020, in our view, it would be better to consider sharing solutions at a future WRC. This will allow time for mitigation studies and time to assess the in orbit performance of the EO instruments and their true vulnerability to interference. It would also allow more time to demonstrate that the predictions of the need for increased WiFi capacity are correct. We consider there is no particular need to rush to a decision on this allocation. We understand that the majority of CEPT states oppose this allocation and given the large UK investment in Sentinel-1 and the potential damage to confidence in the nascent industry that will exploit Sentinel-1 data, we would prefer that Ofcom not pursue an allocation at WRC15 and propose postponing this to the next conference.

The 5 725 – 5 925 MHz contains several bands which allocated to the Fixed Satellite service uplinks on a co-primary basis together with variously the Fixed, Mobile and Radiolocation services. Use of this band for RLANs would need to ensure protection of Fixed Satellite service and should not constrain the future deployment of Fixed Satellite service uplink earth stations. Recognising the need for more RLAN spectrum, we support consideration of sharing solutions but have some concerns. For example RLANs in the vicinity of Fixed Satellite earth stations may suffer interference from the normal activities of a ground station. This may make it impractical to introduce new earth stations into an area if RLANs are able to claim protection. We therefore do not support solutions where RLANs are able to claim protection from interference from Fixed Satellite service uplinks.

Question 11: Do you agree that we should oppose a co-primary mobile allocation at WRC-15 for the band 470 – 694 MHz?

No view

Question 12: Do you agree that the UK should continue to support harmonisation of 694 - 790 MHz for mobile broadband and an out-of-band emission limit for protection of DTT reception in an ITU-R Recommendation, alongside an acknowledgement that 694 MHz should be the lower frequency boundary for the band?

No view

Question 13: Do you agree that any harmonisation measures for PPDR use should be sufficiently flexible to enable PPDR agencies to choose the most appropriate spectrum solutions nationally?

We agree with the Ofcom approach and would add that no additional identification of spectrum to support PPDR should be made unless acceptable sharing criteria are developed. We ask Ofcom to monitor the evolution of the agenda item in order to avoid PPDR identification immediately above 406.1 MHz, noting the connection with WRC15 AI 9.1.1.

Where satellite spectrum is involved in providing PPDR services it will be necessary to continue to co-ordinate internationally. Space systems are extensively used for PPDR, for example Inmarsat's L-band service and VSAT systems operating in the C, Ku and Ka bands. In the 2GHz Mobile Satellite service band the UK licensees are obliged to provide PPDR under the terms of their license conditions through EC decision 626-2008.

Question 14: Do you have any comments on the potential use by the amateur service in the 5 250 to 5 450 kHz band?

No view

Question 15: Do you agree that if any allocations to the fixed satellite service in the 10-17 GHz range impose undue constraints on existing services then further studies on the demand and justification for use of the spectrum would need to be carried out?

This related to agenda items 1.6.1 and 1.6.2. There is an imbalance of Ku band uplink and downlink spectrum in Regions 2 and 3 that means that satellites are more complex than they would otherwise be to make full use of the downlink allocation. The total FSS spectrum available in each region currently varies, with less spectrum available in Region 1, which makes it difficult to design satellite networks covering multiple regions. The UK have interests in upstream and downstream services within this spectrum range across all regions we support the extended allocations

We do not agree that further demand studies are needed, we consider the current utilisation of Ku band and the strong competition for spectrum slots at key locations over Europe. Demand is evidenced through the expected additional demands arising from the move to higher definition and for ultra-high definition television services and the increased need for data services. The geostationary arc covering services to Europe is already congested with around 50 operational satellites and around 150 filings using FSS allocations in the 10.95-14.5 GHz bands. The competition for orbital slots is fierce and the limits of practical ground station antennas and demand for smaller terminals do not permit closer common-frequency spacing than already utilised. Practically, it is now

very difficult to co-ordinate new networks within the current allocations. We do not think that delaying a decision on this for a future WRC would be in the best interest of the satellite sector.

We also consider that in order to protect existing space sector, these new allocations should not place undue constraints on or adversely impact existing space services operating within this spectrum and in the adjacent bands.

Question 16: Do you agree that the UK should support retaining the recognition for aeronautical radionavigation use, but equally support reviewing the limits associated with the FSS with a view to facilitating better use by the FSS?

We support this position in favour of removing the 1st January 2018 date limit while preserving $\Delta T_s/T_s$ to aeronautical services. The aviation industry wish to revise the way the $\Delta T_s/T_s$ is calculated. Currently it is allocated for the Navigation and Communications contributions separately. This could be more usefully based on a combined result.

Question 17: Do you agree that the UK should support new primary allocations for the fixed-satellite service in the 7/8 GHz bands, with the proposed restrictions?

The UK Space agency support this allocation with the restrictions agreed with ESA at ITU-R WP4A and WP7B. We are concerned to protect existing space science use, in particular the protection of the deep space network (DSN) in the 8 400 – 8 500 MHz band. While the UK do not physically host the primary sites in the global network of earth stations that form the DSN, we still maintain a strong interest through our work within the European Space Agency and through our collaborations in the missions of other space agencies, including NASA. These ground stations are used to support deep space missions, many of which carry UK developed instruments funded through the UK space agency and its predecessors.

Question 18: Do you agree that the UK should not support new allocations for the mobile satellite service in 22-26 GHz as they are not justified and that the focus should instead be upon the continued protection of the incumbent services?

Yes, no evidence of demand for this allocation has been presented to us by UK space industry and there are many incumbent space services in this band including SRS, inter-satellite links, EESS, RNSS and FSS. Co-ordination with the NGSO inter-satellite links and their associated feeder links that support many space science missions would be especially difficult.

Question 19: What are your views on the use of FSS spectrum allocations for UAS, recognising the shared regulatory responsibility and the safety considerations for the control of unmanned aircraft?

This is a particularly difficult issue. The suitability of any radio link for unmanned aircraft control will be for ICAO to judge and the UK lead will be the CAA. We support changes to the Radio Regulations that address the technical and regulatory feasibility which would allow UAS control operations in the Ku-band and Ka-band FSS spectrum. We note that several UK satellite operators, have expressed interests in this agenda item including Inmarsat, O3b, SES, ViaSAT, Avanti, Astrium Services and Mansat. There are also several space science interests sharing the FSS spectrum and/or in adjacent bands that may be impacted. The UK Space Agency have organised a discussion with the CAA, NATS and the FSS operators listed above and we are currently working on potential solutions. At this stage it is too early to indicate an agreed position, however we consider that the following conditions should apply to changes to the radio regulations to support UAS control and non-payload communications (CNPC):

- 1. UAS CNPC operations should be permitted in any part of the FSS spectrum where it is feasible to meet the requirements.
- 2. Regulatory provisions should not require priority and pre-emption between networks.

Question 20: Do you have any view on the need, or otherwise, to modify the restrictions that relate to the operation of ESVs in the bands 5 925 – 6 425 MHz and 14-14.5 GHz?

The UK Space Agency supports the development of ESV services while recognising the need to protect existing space science use. No revision of the restrictions should be made unless acceptable sharing criteria are developed to maintain the protection with space science services.

Question 21: What are your views on a potential new allocation to the maritime mobile satellite service, recognising the UK interest in the other services that make use of the bands under consideration?

The UK Space agency share Ofcom's concerns that sharing this allocation between the MMSS and existing services would be extremely difficult. The allocation to the Earth Exploration Satellite Service in the 8 025 – 8 400 MHz band is heavily used by all space agencies, and also by government or private companies to download data obtained by Earth Observation satellites. There are ~100 operational missions operating in this band and a further 50 missions in development. Sharing with the MMSS would require in unfeasibly large protection zones. We are not aware of any UK interest in an MMSS allocation and therefore do not support it.

Question 22: Do you agree that the UK should not support a proposal for additional UHF spectrum for maritime on-board communications and that narrower channels will help to increase capacity?

No view.

Question 23: What are your views on any necessary regulatory provisions for AIS in the bands already identified for maritime use?

AIS is supported by a large shore based VHF infrastructure as well as being able to be detected by satellite. The proposals for a satellite component of in the VHF Data Exchange Service (VDES) are also of interest to the UK Space Agency. This component would permit communications to vessels in remote areas not supported by shore based infrastructure but would require spectrum. If this spectrum is taken from the existing VHF allocations, as has been proposed within CEPT, it may lead to channel congestion in some areas and there is a need to review the implications of potential loss of general AIS communications channels in order to support the satellite service. UKSA are generally

supportive of new allocations for satellite AIS. If new allocations are proposed they will need to be monitored to ensure protection of space services.

Question 24: Where the appropriate radio regulatory provisions are established for use in existing aviation related bands, do you agree that the UK should support regulatory conditions for the accommodation of WAIC applications?

We agree with the Ofcom proposals. The band 4 200 – 4 400 MHz has been identified for WAIC and this band is not allocated to space services. WAIC may require a safety service designation. Consequently, before an allocation is made studies should verify that the proposed WAIC systems would not receive harmful interference from the existing space services operating with their permitted technical and operational parameters. WAIC should not constrain the fixed satellite service downlinks located in the adjacent 3.4 – 4.2 GHz bands.

Question 25: Do you agree that the UK should support a generic radiolocation allocation in the 77.5-78 GHz band, where appropriate technical conditions are established?

The UK Space agency supports an allocation in 77.5-78 GHz for automotive applications as a means of clearing the 23.6-24 GHz band but we do not support a generic radiolocation allocation. No new allocations to radiolocation should be made unless acceptable sharing criteria with the space science services in adjacent bands are developed. In order to protect science use in our opinion the potential radiolocation allocation should be restricted to automotive radars.

Question 26: Do you agree that the UK should support an allocation across the 7 190 – 7 250 MHz band, dependent upon the outcome of technical studies?

Yes. The UK Space Agency support this allocation as long as the technical studies demonstrate protection of the Space Operations Service and the Space Research Service can assured. This new allocation will reduce congestion currently impacting the Earth Exploration Satellite and Space Research and Space Operations services in the 2 025 – 2 110 MHz and 2 200 – 2290 MHz bands.

Question 27: Do you agree that is right to wait for the relevant sharing studies to mature before coming to a final position on the potential for additional allocations to the earth exploration-satellite (active) service in the 8/9/10 GHz band?

The UK Space Agency support the extension by up to 600MHz as this gives a worthwhile improvement in image resolution, as evidenced in Report ITU-R RS.2274. We are aware that EESS operators would prefer the allocation centre frequency to be as close to 9 600 MHz as possible. We agree sharing studies need to be completed before a decision can be made and that it is important to protect the existing services. From the space sector side, the services most vulnerable to interference are likely to be the Space Research service in the 8 400-8 500 MHz band and the passive Earth Exploration, Space Research and Radio Astronomy services due unwanted emissions into the 10.68-10.7GHz passive band.

Question 28: Do you agree that the UK should support the CEPT position that removes the distance limitation on space vehicles communicating with orbiting manned space vehicles, whilst retaining the pfd limit to protect terrestrial services?

The UK Space agency fully support this proposal.

Question 29: Do you agree that the UK should support maintaining UTC as currently defined (i.e. with the inclusion of leap seconds) and that the UK should support further study around the concept of dissemination of two reference time scales?

No view

Question 30: Do you have any comments on the UK approach and positions on the elements of Agenda Item 7?

This is a complex issue and is currently something of a moving target. While recognising there are several important issues that need to be solved, we do not support the proposals for a general overhaul as we fear this may create more problems than it would solve, we agree that continuing evolution is the most appropriate way forward. The current draft CPM text within WP4A and the CEPT contains proposed methods for several issues:

Issue A Informing the Bureau of a suspension under RR No. 11.49 beyond six months Issue B Publication of information on bringing into use of satellite networks at the ITU website Issue C Review or possible cancellation of the advance publication mechanism for satellite networks subject to coordination

Issue D General use of modern electronic means of communications in coordination and notification procedures

Issue E Failure of a satellite during the ninety-day bringing into use period

Issue X Review of the orbital position limitations in Annex 7 to RR Appendix 30

Issue Y Possible method to mitigate excessive satellite network filings issue

Issue [XX] Transfer into the Radio Regulations of the Rule of Procedure regarding suspension of a frequency assignment in the List in Appendix 30B

Issue [YY] Comprehensive review of radio regulatory process under WRC-15 agenda item 7

The UK Space Agency positions on these agenda items are still being developed and we will continue to work closely with stakeholders, the satellite operators and Ofcom in finalising these positions. Our initial views on the proposed methods in the CPM are in agreement with those developed within IFPG WGB for submission to CPG-15 PTB in September.

Question 31: Do you agree that any potential regulatory constraints need to be fair and proportionate on both the Cospas-Sarsat operation and users in the adjacent band?

The UK Space Agency agrees that regulatory constraints need to be fair and proportionate but also note that the use of Cospas-Sarsat for the detection of safety and distress signals needs to be taken into consideration.

In order to ensure adequate protection of MSS systems in the frequency band 406-406.1 MHz and to detect and successfully process 406 MHz distress signals, the UK Space Agency supports a revision of Resolution 205 (Rev WRC-12) containing appropriate mitigation measures, such as establishment of a guard band above 406.1 MHz concerning new frequency assignments to mobile networks.

Measurements performed at 406 MHz have shown that the noise level is now especially high over Europe and in parts of Asia. Analysis of observations has shown that noise has increased by 15 to 20 dB in recent years and has now risen to approximately –190 dBW/Hz, some 20 dB above the –210 dBW/Hz limits.

Cospas-Sarsat receivers may be carried on satellites with orbits ranging from LEO to GEO and are transponders receiving the 406-406.1 MHz band and relaying this band to ground stations using L-band. We agree adequate filtering of satellite receivers is important but as these are transponders, we consider it much more probable that the increase in interference is due to unwanted emissions into the band from increased use of the adjacent bands rather than arising from inadequate on-board filtering.

Question 32: Do you have any comments on Agenda Item 9.1.2 concerning reduction of the satellite co-ordination arc?

At WRC12, it was agreed to reduce the co-ordination arc at C-band and at Ku band but no change was made at Ka band. This is expected to become more important as Ka band use increases. To date, 21 administrations have notified 185 Ka band networks but so far only 88 have been brought into use. CEPT have proposed the ($\Delta T/T > 6\%$) co-ordination criterion should be changed to one based on a C/I method which they believe to be more efficient.

The UK Space agency agrees these issues should continue to be discussed within the UK and have not yet reached a firm position. We consider a reduction in the co-ordination arc and a change to the co-ordination trigger criterion may be beneficial, however in discussions UK operators have indicated that while they are not fundamentally opposed to a change, and are supportive of a 2° reduction at c-band and ku-band, they do not see any need for reducing the ka-band co-ordination arc or modifying the co-ordination triggers. There may be difficulties if a change to the co-ordination triggers results in the revisiting of existing co-ordination agreements.

Proposals for $\Delta T/T$ of up to 20% have been proposed, which may help reduce the co-ordination effort needed between satellite operators, however we need to be careful that this does not then pass through as a de-facto standard in the co-ordination and sharing with other non-FSS services.

Question 33: Do you agree that the UK should oppose any proposal that aims at changing the provisions of the Radio Regulations in a way that gives inherent priority (i.e. coordination priority) to certain satellite systems over any other satellite system?

The UK Space agency agrees that the UK should oppose this proposal. We consider that all administrations and satellite operators should have clear and equal access to orbital slots and spectrum resource. The UK Space Agency is not in favour of additional priorities being awarded to International Governmental Organisations or Developing Countries over and above those already in

place in the ITU Regulations and Convention as this would undermine the whole filing procedure which aims to provide equitable access to all operators and administrations and could be detrimental to the interests of the UK satellite industry.

Question 34: Do you have any comments on Agenda Item 9.1.4 relating to updating the RR for out of date or redundant material?

We fully support the Ofcom position. Changes to regulations should only be made where necessary, otherwise there is a significant risk of unintended side effects.

Question 35: Do you have any view on the need, or otherwise, for additional international regulatory measures to support the use of earth stations for aeronautical and meteorological communications in the 3.4 – 4.2 GHz band?

The UK Space agency support the existing and future operation of FSS 3 400-4 200 MHz as an aid to the safe operation of aircraft and reliable distribution of meteorological information. Given the potential expansion of IMT into this band, we consider that additional protection may be necessary.

Question 36: Do you agree that the UK should not support any change to the fixed and mobile definitions under Agenda Item 9.1.6?

We fully support the Ofcom position. The UK Space Agency are opposed to redefinitions of Fixed and Mobile stations as this may lead to a redefinition of fixed satellite and mobile satellite terminals as this is a very different proposition for the space sector where interference environments are not the same.

Question 37: Do you have any views on the CEPT position that no further work is required in respect of spectrum management guidelines for emergency and disaster relief radiocommunications?

No view

Question 38: Do you agree that no specific measures need to be introduced for nano and picosatellites and that the current approach to their regulation is sufficient?

The UK Space Agency have been following this closely and have actively contributed to the draft ITU-R reports on Characteristics and Current Practice. We support the continued development of nanosatellites and picosatellites, which provide unique opportunities for UK industry and science. We understand the initial reasoning behind the proposal for a future agenda item was because many nanosatellites and picosatellites were being developed and launched for scientific and commercial purposes under the Amateur satellite service although these missions did not fit well into that service. In our opinion, satellite systems should only use the spectrum allocations appropriate to the service(s) they operate under. Further there are considered to be difficulties in applying the current filing procedures for spacecraft with uncertain orbital parameters, for example those launched as secondary or tertiary payloads. This has led to difficulties for some operators, especially those new to the industry, and the BR have noted several cases where the filing and co-ordination procedures were not correctly completed before launch.

The UK Space Agency supports the possibility of a new ITU category of satellites that, by satisfying well defined conditions, could be considered for a modified (simplified/faster/cheaper) filing and

coordination procedure. This will not imply any change in the RR definition of services and no satellites should be made exempt from filing and co-ordination procedures. We share the view that no specific changes to Articles 4 and 11 of the Radio Regulations are necessary to accommodate this class of satellites. We consider many of the reported issues could be dealt with under the standing agenda item dealing with satellite notification and co-ordination³. Any changes to satellite procedures should be carefully developed to ensure they apply exclusively to this new category of satellites. ITU-R WP7B have not yet been able to agree a common definition for this class of satellites and it is becoming clear that a definition on terms of size and/or mass is not really the issue from the frequency management side, where factors, including mission duration, orbital uncertainty, low PFD and speed of development are more important barriers to development.

Question 39: Do you agree that the UK should support the recent regulatory developments with respect to ESOMP operation, while continuing to monitor developments?

The UK Space Agency supports this position.

Question 40: Do you have any comments on Agenda Item 9.3 considering Resolution 80?

The UK Space Agency have not yet reached a position on actions in response to Resolution 80. We note the issues raised within the RRB reports to WRC2000 and WRC2003 which are annexed to Resolution 80. Several of these are important to the UK satellite industry and have been raised through the Innovation and Growth strategy. Several of these are being addressed under the standing agenda item on rules and procedures for satellite filings.

Question 41: Do you have any comments concerning the standing agenda items?

No views at this stage.

Question 42: Do you have any comments regarding UK positions for future WRC agenda items?

The UK Space Agency consider that it is very important to ensure that before any new agenda item is agreed at WRC-15, the following elements are already available:

- 1. Clear demonstration and quantification of the spectrum requirements.
- 2. Technical and operational parameters of the new systems for which modification of the RR is proposed.
- 3. Identification of the exact bands targeted for regulatory changes.
- 4. Preliminary studies on the sharing feasibility in these bands.

In our opinion future adherence to these principles would avoid repeating the problems encountered with WRC15 agenda items 1.1 and 1.10.

IMT Allocations above 6 GHz

This consultation is happening after the effect. We understand a proposal for an agenda item has already been submitted to CEPT by the UK.

³ For WRC15 this is Agenda Item 7.

The UK Space Agency have an interest in this proposed agenda item as the range includes many important allocations to space services. The expansion of the space sector is a government priority and we were therefore surprised to see this proposal emerging, initially as a UK input to CEPT without a prior consultation.

Satellite industry representatives have expressed to us their significant concern and surprise that Ofcom unilaterally proposed an agenda item for the development of IMT in the bands above 6 GHz and that this was done with very little discussion and initially specifically identifying the 20-50GHz frequency range. UK Satellite operators have told us they are especially concerned over the potential impact of allocations to IMT in Ka-band and the negative effect this would have on their business and on their ability to attract future investment. Investment in Satellite systems requires a long term view, typically 20 years or more. To date, UK operators including Avanti, DirectTV, Echostar, Inmarsat, O3B, Telesat and Viasat have collectively invested over £3B in their current Ka-band systems. The UK Space agency expects that the UK space sector will achieve a growth factor of 4 by 2030.

As well as the telecommunications use of spectrum in this region, there are several allocations important to the space science, space research and Earth observation sectors. These sectors and their downstream applications are supported by UK space agency programmes, as well as by research councils and the Met Office. We recognise that, even without having completed initial studies, the evidence from previous studies indicates that many of these services would not be able to share with IMT.

The real problem we see here is the message that is sent to the rest of the world through the UK proposing this agenda item. We would not expect the UK to make such a proposal, without having first completed preliminary sharing studies, an impact assessment and a public consultation. Indeed, our evidence based approach is one of the main reasons the UK still commands such high levels of respect within the ITU and for that reason outsiders are likely to consider this to be UK policy and question our commitment to the expansion of the space sector.

Consequently the UK Space Agency are not able to support it at this stage for the following reasons:

- The criteria given in PP Res 80 and WRC12 Res 804 have not been satisfied
- The need for this allocation has not been demonstrated. The current UK mobile data strategy (published by Ofcom in April 2014) does not identify a requirement for allocations above 6.425GHz.
- No preliminary impact studies have been performed
- Further, at this stage no specific list of bands has been identified we have grave concerns over the impact to:
 - Future investment opportunities of UK satellite operators owing to uncertainty over the UK position and UK commitment to the future of Ka-band
 - Risks to space science and Earth observation activities within this region of spectrum will not be able to share with IMT

Upgrade of Secondary EESS 460-470MHz to Primary

The UK Space agency support the Ofcom proposal to support this agenda time, to consider appropriate PFD limits and protection criteria.

Sweden Mobile allocation proposals 47-68 MHz, 1 427-5000MHz and 6.5-57GHz

We do not support these proposals. Sweden appear to be proposing looking at all spectrum up to 57 GHz for future mobile and broadband allocations even before we know the outcome of WRC15 Agenda item 1.1, which has covered pretty much the same topic. We agree with the CEPT position that it is far too early to make such a proposal until the results of WRC15 are known. We request that the UK oppose these proposals at this stage.

Question 43: Are there any other possible agenda items you wish to see addressed by future WRCs?

We note that there is a proposal for a future agenda item to WRC18 which was proposed at WRC12 regarding Picosatellites and Nanosatellites. However, this is missing from this section of the consultation as it is covered under WRC15 9.1.8. Depending on the outcome of WRC15, there may be a proposal for a future agenda item on this topic and this would be of interest to the agency.

The UK Space Agency supports further consideration of options to facilitate the development of nanosatellites and picosatellites, taking into account the comparatively short development time and the potential lack of advance knowledge of certain operational parameters. It may be possible to address this issue under the standing WRC Agenda item 7. It would be beneficial to modify Study Question ITU-R 254/7 to include the following items and to complete the work prior to WRC-18:

- study the growth in numbers of nanosatellites and picosatellites;
- study and propose ways to accommodate the growth in numbers of nanosatellites and picosatellites launched within the existing regulatory framework;
- study spectrum sharing techniques for nanosatellites and picosatellites among themselves and with other radio systems.

Question 44: Are there particular frequency bands, above 6 GHz, that should be considered for technical study in relation to the potential future agenda item addressing IMT use?

According to this proposal those frequency bands with existing mobile allocations will targeted in the first instance. There are many important satellite bands with co-primary allocations to Fixed Satellite Service and Mobile Service.

1) The satellite sector will only be able share with IMT if sharing is shown to be feasible. Prior studies have shown that such sharing is not feasible. We request Ofcom support new studies to identify sharing possibilities and also to identify where there are UK strategic interests and commercial interests, including those outside the UK. It may be necessary for the UK delegations to take a proactive stance at CEPT and at ITU in order to protect UK space sector interests.

2) The UK space agency, through ESA has invested heavily in the development of Ka-band satellite telecommunications and broadcasting services. The move to Ka-band allows higher bandwidth services to be delivered to small earth stations. The UK Space Agency requests that Ofcom actively work to protect UK satellite interests and support the international interests and

activities of the UK space sector. The space sector cannot engage at CEPT/ITU in order to protect and promote UK interests without the active support of the UK administration. This support has been very visible in promoting IMT but much less visible for the space sector. Meeting the aims of mobile data strategy should not be considered more important than supporting the interests of the UK space sector.

3) Ofcom's argument is that Ofcom's lead in this subject will help to protect UK interests. This approach can backfire as it did with WRC-12 Agenda Item 7. Many countries engage at all levels CEPT/ITU to protect/promote their national interests. Within the UK generally base our decisions on evidence and not national interest. Frequently the UK will not consider the interests of national industry and will remain neutral until sharing studies complete, but by then it may be too late to protect UK industry interests. The avoidance of such situations will be vital in enabling the continued growth of the space sector and achieving the government policy aim of a fourfold growth in the sector by 2030.