Inmarsat Response to Ofcom's Consultation on "UK preparations for the World Radiocommunication Conference 2019 (WRC-19)"

13 September 2018

Introduction

The outcomes of the ITU World Radiocommunication Conferences (WRCs) are of very high importance to Inmarsat. The ITU Radio Regulations establish the framework for the use of the radio spectrum which is vital to Inmarsat's operations as a global satellite operator, supporting our operations in the UK and throughout the world. For example, the Table of Frequency Allocations in the Radio Regulations ensures that the spectrum used by the Inmarsat service links is available in all countries of the world and can be used with little risk of interference. Furthermore, the satellite coordination procedures are vital to ensure that Inmarsat's fleet of satellites can operate with no significant risk of interference from other satellites. Consequently, many of the possible changes to the Radio Regulations through WRC-19 could have a direct impact on Inmarsat and it is therefore important that the UK preparatory process and activity during the conference is effective and responsive to Inmarsat's objectives.

Inmarsat is pleased to provide comments to Ofcom in response to this consultation. Inmarsat supports the response from the EMEA Satellite Operators Association (ESOA) but provides below some additional comments and information, intended to supplement the response from ESOA.

Answers to questions

Inmarsat provides answers to the most relevant questions below.

Question 1: *Do you agree with the prioritisation of the agenda items, as shown in Annex 5, and if not why?*

There are two agenda items which should be raised in priority: agenda items 9.1.1 and 9.1.7.

Agenda item 9.1.1 has been provisionally placed as "low" priority. There are important UK and European interests at stake with this agenda item. The bands within the scope of this agenda item are harmonized for MSS operations in the UK and Europe, and are used by Inmarsat and another MSS operator. Interference from terrestrial IMT systems deployed in countries outside of the EU could cause harmful interference to MSS services in the UK. Furthermore, the fact that Inmarsat is a UK headquartered company and that Ofcom is its notifying administration amplifies the UK interest in this agenda item. This agenda item gives an opportunity to address the issue at WRC-19 and consider changes to the Radio Regulations to eliminate or reduce substantially the risk of interference in the future. Given the significant UK interest in this agenda item this issue appears to fit either in the High or Medium category.

Agenda item 9.1.7 has also been provisionally placed as "low" priority. Although this is not a significant issue regarding the use of spectrum in the UK, it is an important issue for UK based satellite operators, most of which provide service to multiple countries, anywhere in the world. Under this agenda item, some countries could consider placing draconian requirements on satellite operators as a condition of providing satellite service. Furthermore, some proposals under this agenda item have sought to place significant responsibility for authorization abroad on the notifying administration, which could have important repercussions for Ofcom itself. While the UK has a provisional No Change position for this agenda item, it is apparent that some countries will propose some specific action is taken at WRC-19 which could be harmful to UK interests. This agenda item therefore appears to fit in the Medium category at least.

Question 2: *Ofcom is supporting the following three priority bands for IMT identification in the RRs:*

24.25 - 27.5 GHz
40.5 - 43.5 GHz (as part of a wider global 37-43.5 GHz tuning range)
66 - 71 GHz

If you don't agree with any of these bands, or think we should be promoting other bands, please provide justification for your views.

Inmarsat recognizes the strong will to identify additional frequency bands for IMT, that can be used to accommodate new 5G systems. Inmarsat can support the identification of these three bands for IMT under certain conditions.

All three of the frequency bands mentioned in this question have allocations for satellite services (FSS or MSS) and all three bands should continue to be available for satellite use, even if WRC-19 identifies the bands for IMT. In satellite uplink bands, the aggregate interference from terrestrial systems could cause harmful interference to satellite receivers and EIRP limits or other constraints will be needed to maintain compatible operations. Studies show that this is easily achieved without significantly constraining IMT operations. In both the uplink and downlink bands, gateway earth stations will be required and some regulatory conditions may be required to ensure that new earth stations will be able to be deployed even if bands have been authorized for terrestrial 5G systems.

The Q/V-band allocations (37-50.4 GHz) are of particular interest to Inmarsat and this band is likely to be brought into use within a few years. It is important that Ofcom takes a holistic and balanced view of these bands, ensuring that satellite systems will continue to have access to spectrum in Q/V-bands in the future, including those bands already identified for the "HDFSS" through footnote 5.516B. This means ensuring that some spectrum is not identified for IMT and remains available for satellite user terminals (fixed and mobile).

Regarding the range 37-43.5 GHz, which is described as a "wider global tuning range", Inmarsat supports a solution for all 3 ITU Regions as illustrated below.

	37-39.5 GHz	**39.5-40**	**40-40.5**	**40.5-43.5 GHz**
Region 1	No change	No change		**IMT**
Region 2	**IMT**		No change	
Region 3	No change	No change		**IMT**

This solution would provide 3 GHz of spectrum for IMT in all ITU Regions and would allow common IMT equipment to be used, provided the RF equipment can tune across the whole 37-43.5 GHz range. This solution would also preserve the bands identified for HDFSS through RR footnote 5.516B, which is important to provide regulatory certainty to the satellite industry, so that the investments for new satellite systems in this frequency range can be made with a clear and stable regulatory framework. The situation in Region 3 seems to be less well defined but the 40-40.5 GHz is identified for HDFSS. For economies of scale and to assist the market in Region 1, it would make sense to have Region 3 align with Region 1.

Inmarsat proposes that the UK supports this global solution for the frequency range 37-43.5 GHz.

Inmarsat would be opposed to the identification of the full range 37-43.5 GHz in all 3 Regions, which is unnecessary to meet the European objectives, but would undermine the use of parts of those bands for HDFSS applications and would introduce extra regulatory uncertainty for satellite operators.

Question 3: *What are your views on the suitability of the currently identified bands for HAPs and do you think there is a requirement for additional spectrum? Recognising that we support 26 GHz as a global band for IMT under agenda item 1.13, what are your views on the bands currently under study for HAPs, both globally and in ITU-R Regions?*

Inmarsat is concerned about the potential use of HAPS in the satellite bands, in particular the bands 27.9-28.2 GHz, 47.2-47.5 GHz and 47.9-48.2 GHz. These bands are allocated to the FSS and use of this band by HAPS would require technical constraints on HAPS to ensure compatibility with FSS applications.

Question 8: *What are your views on the approach we are proposing to take in respect of ESIMs and are there any additional factors that you think we should take into account?*

Inmarsat appreciates the support already provided by Ofcom to develop new regulations to support ESIM in the bands 17.7-19.7 and 27.5-29.5 GHz. New regulations for these frequency bands will enhance the operation of ESIM in these frequencies at a global level, which is important for Inmarsat's Global Xpress system deployment.

Regulatory provisions for ESIM have previously been discussed and agreed in CEPT and we note that Ofcom has implemented ECC Decision DEC (13)01 and adopted national regulations based on the CEPT framework. We are pleased that Ofcom and CEPT are supporting the extension of such regulations globally. It is particularly important that the UK continues to promote the aero ESIM pfd limits adopted by the CEPT, as other more restrictive limits have been proposed by some administrations. For maritime ESIM, Inmarsat supports the adoption of the Resolution 902 approach, but highlights the importance that a distance in line with the CEPT studies (i.e. 60-70km) is adopted rather than larger distances proposed by some administrations. A larger distance would overprotect terrestrial services and cause unnecessary constraints on ESIM.

Inmarsat supports Ofcom's opinion that Recommendation ITU-R SF.1719 provides a valid short-term interference protection criteria for fixed service links that operate with a typical 10 dB

clear-sky fade margin. However, it is important that UK continues to promote the methodology used in CEPT studies, which adjusts the link fade margin based on fixed station antenna gain in order to avoid overly conservative results.

Question 9: *What are your views on the establishment of regulatory provisions, in Article 22, that cover non-GSO operation between 37.5 and 51.4 GHz?*

Inmarsat supports the principle that accommodation of non-GSO FSS systems in these bands should be on the basis of sharing with GSO FSS networks. Furthermore, technical measures should be applied that prevent interference to GSO FSS networks, even if deployed after non-GSO systems. This can be accomplished with epfd limits, similar to those applied in parts of C-band, Ku-band and Ka-band. Inmarsat is aware that other approaches than epfd limits are being considered and Inmarsat will continue to study the proposals to ensure adequate provisions for protection of GSO networks, noting that resolves to invite ITU-R 2 of Resolution 159 limits studies under this agenda item to epfd limits.

Question 10: *What are your views on the various issues under consideration under Agenda Item 7, particularly in respect of the bringing into use of non-geostationary satellite networks (i.e. Issue A)?*

Inmarsat views the current process of incremental improvements made to the satellite coordination procedures and processes at successive WRCs as appropriate.

For Issue A: Inmarsat supports the adoption of bringing-into-use (BiU) procedures for non-GSO systems that is comparable to those for GSO systems, together with a milestone regime for satellite deployment requirements for frequency assignments to be included in the master register. Procedures are necessary to minimise the potential for operators to warehouse spectrum for large constellations which are not built and to avoid blocking of other prospective users of the spectrum. For non-GSO BiU procedures, Inmarsat supports the adoption of either Option A or B in the current draft CPM text (and provided for Option B, that a high number of days is considered to permit a single non-GSO satellite to BiU a notified orbital plane). For the deployment milestone requirements, Inmarsat supports the inclusion of appropriate and significant targets for the minimum percentage of satellites that need to be deployed in order to comply with a milestone, as well as shorter periods between milestones following the end of the seven-year regulatory period. For example, the first milestone should be within 2 years of the BiU deadline and should require at least 25% satellites to be deployed. Inmarsat also

supports the application of non-GSO BiU requirements across different FSS and MSS bands (including for MSS the L, S, Ka & Q bands).

For Issue B: Inmarsat strongly supports the application of the coordination arc (i.e., adoption of Method B) to MSS networks in MSS-MSS and MSS-FSS coordination, to simplify significantly the coordination requirements without adverse impact on other networks.

Question 11: *What are your views on Agenda Item 9.1.1?*

WRC-19 agenda item 9.1, issue 9.1.1 relates to the frequency bands 1980-2010 MHz and 2170-2200 MHz. These bands are harmonized for MSS operations in the EU through Commission Decision 2007/98/EC and any other use of these bands in Europe is on condition of not causing harmful interference to mobile satellite services and not claiming protection from harmful interference from mobile satellite services. Other Decisions have been published related to the selection of the European MSS operators and deployment of MSS services. Inmarsat is one of the two operators that were selected in a Commission-led process to operate in these bands. European Union Member States have subsequently adapted their national regulatory framework to license the selected MSS operators including the terrestrial component.

Inmarsat has deployed an MSS system in Europe in these bands. It is composed of a space segment and a complementary terrestrial network ("complementary ground component"). The system is called the European Aviation Network (EAN), which will provide European aircraft passengers with high quality broadband Internet connectivity. The Inmarsat S-band satellite, "Europasat" is currently in operation in these bands, a Europe-wide ground station network has been deployed, and aircraft equipment is being installed. Commercial arrangements have been made with a number of airlines who are preparing their services to their customers on a pan-European basis.

The successful operation of the EAN is at risk of interference from incompatible terrestrial operations outside of Europe. These frequency bands are allocated to terrestrial services and are identified in the Radio Regulations for both the satellite component of IMT and the terrestrial component of IMT. In accordance with the EC Decision, terrestrial service deployment in these bands in Europe is effectively limited to a complementary ground component to mobile satellite services, but outside of Europe some countries may allow deployment of independent terrestrial operations in these bands rather than satellite operations. Outside of the EU, countries are free to deploy terrestrial systems with no significant restrictions and this presents a major interference risk, especially with regard to

interference to MSS satellite receivers in the MSS uplink band, 1980-2010 MHz, where high power terrestrial base stations could be deployed. The Radio Regulations, as they currently stand, do not provide adequate limits or any mechanism to prevent such interference.

This agenda item presents an opportunity to make changes to the RR at WRC-19 that would prevent or significantly reduce the risk of interference to current and future MSS operations in the UK and in Europe. Inmarsat believes that Ofcom should actively support action under this agenda item to ensure that MSS operations are protected.

Question 13: *Do you have any views on the bands being studied and are there any other considerations which you think should be taken into account? What are your views on the appropriateness of the current emission limits in the band 3 700 – 4 200 MHz?*

Inmarsat supports No Change to the Radio Regulations on this issue, as ITU-R studies have shown that circular-orbit non-GSO FSS operations used for global broadband services in the examined bands could result in large exceedances when tested against the Recommendation ITU-R S.1323 protection requirements to ensure compatibility of non-GSO operations with GSO networks, thus confirming the appropriateness of the current emission limits in 3700-4200 MHz in protecting GSO networks.

There now seems to be little interest in modifying the RR under this agenda item.

Question 14: *Do you agree that no changes to the RRs are required, under Agenda Item 9.1.7, and that managing the unauthorised operation of earth station terminals (deployed within its territory) should be addressed by the national administration concerned?*

Inmarsat supports the current studies in order to assist administrations to manage any unauthorized operation of earth station terminals. Inmarsat is of the view that earth station licensing and related issues of licensing are national matters, and no changes to the Radio Regulations are necessary as Article 18 sufficiently addresses the required international regulatory measures. Therefore Inmarsat is also of the view that the issue referred to in studies under 2a) is already addressed in Article 18 and does not see the need for any changes of the Radio Regulations.

Inmarsat does however support, for the issues referred to in studies under 2b), possible ITU-R studies on best practices, related to national management of unauthorized operation of earth station terminals deployed within the territory of concerned administration. Furthermore

Inmarsat notes this issue deals with unauthorized ubiquitous earth stations and therefore is not the same issue of earth stations in motion (ESIM), which is covered by Agenda item 1.5.

Overall, Inmarsat agrees that there is no need for any changes of the Radio Regulations.

Question 15: *What are your views on the need for additional fixed satellite service allocations in the band 51.4 – 52.4 GHz?*

Inmarsat supports making the band 51.4-52.4 GHz available for FSS (Earth-to-space) links. Inmarsat and other FSS operators are currently developing systems that will operate in the Q/V band allocations (between 37.5 GHz and 51.4 GHz). Applications envisaged for these frequency bands include feeder link earth stations, that will require access to large spectrum bandwidths (several GHz) and broadband user terminals that would be deployed in large numbers. Given that the Q/V band allocations are also of much interest to other services such as fixed links and IMT, this additional allocation for the FSS considered under AI 9.1.9 could be very valuable .

Question 16: *What are your views on Agenda Item 1.8, particularly the need to enhance maritime safety, set against the need to respect the international spectrum allocations and the protection of passive services in adjacent bands?*

Inmarsat notes that Iridium has now been adopted by the IMO as a new provider of communications within the GMDSS. Inmarsat is of the view that careful consideration should be given to the recognition of the Iridium frequency band 1618-1626.5 MHz in the Radio Regulations and potential consequences for other services in the adjacent frequency bands.

Ofcom has highlighted that the radio astronomy community has suffered interference from Iridium for many years and Inmarsat concurs that this is an important consideration. Similarly, the use of the adjacent band 1626.5-1660.5 MHz by Inmarsat and other GSO MSS operators should not be impacted by the decision to adopt Iridium as a new GMDSS provider, noting that Resolution 359 states that GMDSS satellite systems should operate within the interference environment of existing systems.

If the Iridium band is recognized in the RR for GMDSS, a footnote in Article 5 should be added to ensure that Iridium terminals cannot seek protection from interference and hence cannot place new constraints on Inmarsat terminals. This is “method B2” in the draft CPM text for this agenda item.

Question 19: *What are your views on Agenda Item 1.10 and do you think that any changes to the Radio Regulations may be necessary?*

Inmarsat agrees with Ofcom that the evolving requirements for the GADSS do not require any new frequency allocations or other changes to Article 5 of the RR.

Inmarsat notes the GADSS concept as defined by ICAO has many elements to increase the effectiveness of the tracking of aircraft, and the alerting of the search-and-rescue services in case of aircraft emergency. While most of the objectives of GADSS clearly require a safety allocation, some objectives, such as the timely retrieval of flight recorder data and the routine tracking of aircraft location do not. Such functions may be provisioned, particularly over remote areas, through the use of satellite services that do not have an associated safety allocation (e.g., the FSS and some MSS frequency bands). Restricting GADSS functions only to operate in frequency bands that are provided for safety purposes is likely to limit the further development and provisioning of GADSS within ICAO.

Inmarsat favours the adoption of Method A of the draft CPM text over Method B, since it is unnecessary to restrict GADSS functions only to frequency bands that are provided for safety purposes, as is proposed in Method B.

Question 22: *What are you views on Agenda Item 9.1.4 concerning radiocommunications for sub-orbital vehicles?*

Satellite systems are likely to have an important role in providing communications for sub-orbital vehicles. Inmarsat therefore supports the ongoing consideration of the regulatory issues around the communication requirements for sub-orbital vehicles and supports further studies into the potential for current and future satellite systems to provide service.

Question 30: *Are you aware of any specific issues, not covered elsewhere in this document, which are likely to be raised in this part of the Director's Report and of which you think Ofcom should be aware?*

At this stage Inmarsat is not aware of any specific issues that might be raised through the Director's Report. However Inmarsat considers the Director's Report of high importance and would request Ofcom to urge the ITU to release the Director's Report as early as possible. The timing of submission at previous conferences left little time for thorough review and

preparation by administrations and stakeholders, which in turn lead to less efficient discussions during the WRC itself.

Question 31: *Do you have any comments on Agenda Item 9.3 considering Resolution 80?*

Inmarsat does not see the need for any action under this agenda item at WRC-19. Inmarsat concurs with Ofcom that there has been little activity on this topic in the current ITU-R study period, but experience of previous WRCs has shown that controversial proposals can appear close to the WRC. Therefore a close watch should be maintained for possible proposals under this agenda item that may appear before or during the conference.

Question 32: *What changes to the Radio Regulations have you identified that would benefit from action at a WRC and why? Do you have any proposals regarding UK positions for future WRC agenda items or suggestions for other agenda items, needing changes to the Radio Regulations, that you would wish to see addressed by a future WRC?*

Inmarsat has developed a system to provide space-to-space communication links to cubesats and other small LEO spacecraft using the L-band MSS allocations and our current satellite fleet. This would provide the operators of small satellites with an cost effective means to provide payload and control communications between the spacecraft and ground. While the technology is now available for such systems, the current Radio Regulations do not permit such space-to-space links (except on a non-conforming basis under RR No. 4.4). ITU-R Working Party 4C is developing a new ITU-R Report on this topic[1].

Inmarsat supports a new agenda item for WRC-19 to study the issue and to consider making changes to the RR to accommodate space-to-space links in the existing L-band MSS allocations, and would appreciate Ofcom's support for such a new agenda item.

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[1] See Annex 8 to Document 4C/417