

# **UK preparations for the World Radiocommunication Conference 2019 (WRC-19)**

UK provisional views and positions for WRC-19

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**CONSULTATION:**

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## About this document

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The use of radio spectrum, and its role in today's technology focused society, has never been so important. Most of us make direct use of spectrum in our everyday lives when we use mobile/smart phones, laptops, tablets and when we watch television (which may receive signals from transmitters on the ground or from satellites that orbit the earth). Outside these more familiar examples, radio spectrum is also used for many other purposes including for aviation, maritime and by the scientific community for the detection of emissions from space (radio astronomy) or from the earth itself.

To assist this usage, frequency band harmonisation plays a pivotal role. The most important global spectrum harmonisation activity are World Radiocommunication Conferences (WRCs), of the International Telecommunication Union. These Conferences are held approximately every four years and take key decisions concerning the identification and international harmonisation of spectrum bands.

The next WRC will take place in November 2019 and Ofcom represents the UK at WRCs. This document sets out the key issues that will be considered at the conference and explains why they matter to the UK.

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## 1. Executive Summary

- 1.1 This consultation calls on stakeholders to help us play an important part in shaping the regulations that govern how the world's radio spectrum is used. It sets out the key issues to be discussed at next year's World Radiocommunications Conference (WRC-19) – and spells out our early thinking on the outcomes we'd like to achieve. It also explains the engagement process which Ofcom manages in order to allow stakeholders to feed into the development of UK positions for the WRC.
- 1.2 Among the areas for discussion at WRC-19 are use of spectrum for mobile broadband – including next generation 5G. Decisions taken at the conference on this and other matters could affect thousands of UK businesses and consumers.

### Background

- 1.3 WRCs are held approximately every four years to discuss and revise the Radio Regulations of the International Telecommunications Union (ITU). The Regulations form an international treaty containing rules and coordination arrangements covering all the different uses of spectrum.
- 1.4 The next WRC takes place between 28 October and 22 November 2019. Thousands of engineers, diplomats and business executives from up to 193 countries will be taking part. The decisions reached will set the framework for how spectrum is used, throughout the world, for the next few years and beyond. It is therefore important that the UK's voice is heard.
- 1.5 It is Ofcom's role to lead the UK delegation at the WRC and in the relevant preparatory work, including the various regional preparatory meetings. We confirm with Government the positions we will take into the WRC across the agenda items to ensure consistency and coherency with UK policy. We also commit the UK to the outputs of the conference by signing the Final Acts to amend the ITU Radio Regulations.

### Stakeholder views

- 1.6 The views of those stakeholders who use spectrum are vital in informing the UK's position. Ofcom engages regularly with companies with an interest in the items relevant to WRC, both on an individual and multilateral basis. We aim to ensure that stakeholders are kept informed of our overall strategic approach and emerging UK views - and that they can bring ideas and proposals into the WRC preparatory process. This consultation is part of this engagement and we are particularly interested in hearing from those stakeholders not already involved in the WRC preparatory process.

- 1.7 In addition to seeking views on the development of UK positions on the individual agenda items, we also hope that this consultation helps to draw out linkages between different agenda items which may not be apparent otherwise.

## Agenda

- 1.8 The issues to be discussed at WRC19 are routinely wide and varied and can go into a level of technical detail that is not always easy to follow. The purpose of this document is to explain more simply the process and UK preparations for WRC and the objectives behind the various agenda items.
- 1.9 There are two main types of WRC spectrum related decisions:
- Those which support services which are inherently international (for example satellites, maritime and aeronautical), where the nature of the service means that a consistent approach is required across national boundaries; and
  - Those where there is more scope for decisions to be taken at a national level. However, even in these cases there may be significant advantages in aligning with international frameworks. These include international harmonisation to support economies of scale and the need to prevent harmful cross-border interference.
- 1.10 One of the highest profile issues being considered at WRC-19 concerns the future availability of **spectrum for the next generation of mobile broadband**, commonly referred to as 5G. The preceding WRC (WRC-15) saw an increase in the number of spectrum bands harmonised for mobile broadband. Since then there has been strong interest in using spectrum bands for 5G in higher frequencies ranges than are currently used for mobile, i.e. above 24 GHz. Ofcom has addressed that emerging interest through our mobile data strategy<sup>1</sup>, our July 2017 *Call for Input on 26 GHz and update on other bands above 30 GHz*<sup>2</sup> and a discussion document, *Enabling 5G in the UK*<sup>3</sup> published in March 2018. These documents identify spectrum at 26 GHz (24.25 – 27.5 GHz) as being of high interest and a band that should be supported for global harmonisation.
- 1.11 In addition to the 26 GHz band we see benefit in pursuing options in the bands, 37-43.5 and 66-71 GHz. Ofcom has identified this WRC agenda item as having a high priority for the UK.
- 1.12 Another area of importance for the UK at WRC-19 is the development of the space and satellite sector. One agenda item concerns the regulatory conditions and availability of spectrum for **short duration satellite missions**. This is a highly innovative and growing area

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<sup>1</sup> <http://stakeholders.ofcom.org.uk/consultations/mobile-data-strategy/>

<sup>2</sup> "Call for inputs on 5G spectrum access at 26 GHz and update on bands above 30 GHz"  
<https://www.ofcom.org.uk/consultations-and-statements/category-2/5g-access-at-26-ghz>

<sup>3</sup> Enabling 5G in the UK  
[https://www.ofcom.org.uk/\\_data/assets/pdf\\_file/0022/111883/enabling-5g-uk.pdf](https://www.ofcom.org.uk/_data/assets/pdf_file/0022/111883/enabling-5g-uk.pdf)

of the economy, with new design techniques enabling much smaller satellites to be produced at much lower cost. We are keen to ensure that regulatory conditions and lack of spectrum are not a barrier to the ongoing development of such technologies. At the same time, we recognise the need to take account of the needs of existing services in the spectrum bands being considered.

- 1.13 A third important issue for the UK, also related to satellites, concerns extending the frequency bands available in the Radio Regulations for **satellite Earth Stations in Motion (ESIMs)**. At the WRC in 2015, changes were made to the Regulations that formalised the use of satellite earth stations that move position whilst in use (such as on boats or planes), in a band allocated to fixed satellite services.
- 1.14 This recognises changes in technology enabling earth stations with antennas that can be directed electronically to address potential compatibility issues with satellites in adjacent orbits. Following this decision, the UK is supporting efforts to widen the potential frequency bands shown in the Radio Regulations for use by ESIMs to include the 18 GHz (17.7 – 19.7 GHz) and 28 GHz (27.5 – 30 GHz) bands.
- 1.15 Apart from these three priority issues for the UK, other important issues that will be considered at WRC-19 include:
- **Regulatory conditions for High Altitude Platforms (HAPs):** HAPs, in the context of the Radio Regulations, are an inflight platform which operate at a fixed point between 20 to 50 km above the ground. Although this technology has existed for some years, recent improvements in the design and production of HAPs has led to renewed interest. The frequency bands under consideration for this agenda item (at least in some parts of the world) means that there may be some linkage with Agenda Item 1.13 which is considering spectrum for mobile broadband (5G). This linkage is most apparent in respect of the 26 GHz band which the UK is prioritising as a global band for 5G.
  - **Local Wireless Broadband or “Wi-Fi”:** WRC-19 will consider the case for identifying additional spectrum for Wi-Fi in the 5 GHz band in order to deliver further capacity for Wi-Fi services. At this stage, however, due to the need to protect incumbent services in the bands under consideration, the prospect of being able to identify additional suitable spectrum is diminishing. Ofcom continues to support sharing studies in these bands and will keep the situation under review. In the meantime, Ofcom has already decided to grant access to the 5 725 – 5 850 MHz band for Wi-Fi at a UK national level.
  - **Harmonisation of frequency bands to support railway communications between train/trackside and harmonised spectrum for Intelligent Transport Systems (ITS):** the inclusion of these two transport related agenda items on the agenda of WRC-19 reflects an increasing interest in spectrum for transport applications. Whilst we recognise the interest, in including regulatory measures in the Radio Regulations, we note that making a specific Radio Regulation identification to either train or ITS use risks placing unnecessary limitations on what delivery platforms (e.g. satellite, short

range device or mobile services) can be used. We therefore do not support such an approach and feel that, where ITU level discussion is required, there are other channels within the ITU (outside the formal WRC process) which could better address train and ITS spectrum requirements.

- **Studies on the technical and operational aspects of narrowband and broadband machine-type (i.e. IoT, “Internet of Things”) communication infrastructures:** we do not feel that changes to the Radio Regulations are necessary for IoT and Machine to Machine (M2M) spectrum use. IoT/M2M applications are able to make use of many types of delivery mechanisms (e.g. short range devices, satellite, mobile etc.) and, consequently, different spectrum bands. Therefore, rather than being an enabler, specific Radio Regulation identification could draw unhelpful focus on a much smaller range of bands and services, thereby creating an unhelpful potential limitation that we feel could inhibit IoT and M2M development.
- **Satellite coordination & recording procedures and processes:** The ITU plays a key role in the global management of satellite orbits and facilitates the complex process of assessing a satellite’s technical compatibility with other networks. Each WRC considers these processes in order to consider any proposals for improvements to the coordination mechanisms and provide clarity and certainty for countries and operators. One particular issue being considered, at WRC-19, concerns the bringing into use of non-geostationary satellite networks.

## Next steps

- 1.16 We are keen to hear from all stakeholders with an interest in any of the issues to be discussed at the next WRC. This consultation complements our programme of on-going stakeholder engagement, which includes active discussions with stakeholders in dedicated working groups, roundtables, workshops and bilateral meetings.
- 1.17 The closing date for responses is 13 September 2018. We will consider these as we refine our thinking, bearing in mind that the final UK positions will only be adopted, a few weeks before the conference.
- 1.18 We will, of course, continue to actively engage with all stakeholders over the coming months and in the run-up to the start of the conference.

## 2. Introduction

### Ofcom's engagement with UK stakeholders

- 2.1 Ofcom is inviting comments from industry and interested stakeholders to ensure that the development of UK positions for the next WRC consider the views and concerns of all UK stakeholders. We engage regularly with industry and others, both bilaterally and on a multilateral basis. We have set up four separate working groups that are open to all UK stakeholders<sup>4</sup> having a relevant interest in international spectrum matters. These Working Groups allow for an open debate to help inform the development of UK positions on individual issues which can then be taken forward into the European (CEPT) and international (ITU) discussions.
- 2.2 For each of the WRC-19 Agenda Items, we will appoint a UK coordinator. They will be primarily responsible for reviewing the technical work and for seeking stakeholder input through a combination of face-to-face meetings, correspondence and participation in the relevant working group. UK coordinators will seek to develop draft UK positions for each of the agenda items for which they are responsible. In doing this, they will endeavour to communicate openly and clearly to stakeholders the rationale for the UK position and explain how we have considered and balanced the various concerns that have been raised. A contact point within Ofcom, for each of the four UK Working Groups, is shown at Annex 6.

### The Radio Regulations and why they matter

- 2.3 The international framework for the management of the radio frequency spectrum is documented in the International Radio Regulations (RRs)<sup>5</sup> as published and maintained by the International Telecommunication Union (a specialised agency of the United Nations). These are part of an international treaty and determine the rights and obligations placed upon national administrations around the use of spectrum in their country relative to spectrum use in all other countries. Alongside this the RRs also recognise the sovereign right of countries to manage and use spectrum, within their borders, the way they wish, subject to not causing interference to other countries' use. The RRs are produced and updated by the World Radiocommunication Conference (WRC), which is held approximately every four years, consisting of participants from up to 193 countries.
- 2.4 The RRs contain a table of frequency allocations which subdivides the radio spectrum from 8.3 kHz to 275 GHz into a large number of frequency bands, each being allocated to one or

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<sup>4</sup> To reflect an overall considered UK position, for WRC-19, a UK stakeholder is one considered to have a significant and relevant UK presence.

<sup>5</sup> <http://www.itu.int/pub/R-REG-RR/en>

more defined radiocommunication services (such as broadcasting, mobile, fixed and various space services).

- 2.5 The RRs also contain regulatory procedures for coordinating frequency use between countries at the level of individual assignments, i.e. individual stations or networks. Such procedures establish rights and obligations, giving the regulatory certainty necessary for investment in radiocommunication systems. For example, the right to operate frequencies on a satellite cannot be defined simply on the basis of the operation from the territory of one country and a complex set of procedures is in place for notification and co-ordination of frequency assignments to ensure equitable access to this valuable spectrum/orbital resource. Other provisions may be specific to certain radio services, including pre-determined frequency assignment plans in some cases, and detailed operational procedures (particularly for maritime and aeronautical services).
- 2.6 For the purposes of spectrum allocations, the RRs divide the world into three broad geographical Regions: Region 1 covers Africa, Europe (including Russia, former soviet states and Turkey) and the Middle East; Region 2 covers the Americas; and Region 3 covers the Asia-Pacific countries. Although there is a good degree of alignment in the allocations across these 3 Regions, there are also distinct differences in many important parts of the spectrum.
- 2.7 The RRs have, for many years, determined the pattern of spectrum use internationally. In many cases, it is necessary to do this at international level in order to;
- avoid or keep international interference to a minimum;
  - facilitate mobility and harmonisation through the identification of global bands (especially important for terminal equipment such as mobile phones);
  - derive benefits from international markets for equipment with resulting economies of scale for operators and users; and
  - recognise the international nature and interference management aspects of some radio services (for example, aeronautical, maritime and satellite services all require spectrum to be available seamlessly across national boundaries).

## UK preparation for WRC-19

- 2.8 There has not been a comprehensive revision of the RRs since 1979. All subsequent WRCs have undertaken a partial revision of the Regulations based on a fixed, pre-determined agenda prepared at the previous WRC and subsequently formally endorsed by the Council of the ITU.

- 2.9 The initial version of the agenda for WRC-19 was drafted and provisionally agreed at WRC-12. However, the majority of agenda items and their detailed scope were subsequently agreed at WRC-15. This is normal practice and allows for changes between WRCs as some items may no longer be valid and may be removed from the provisional agenda of a later WRC. The organisation of work between WRCs, including the attribution of the work to the appropriate ITU-R Study Groups, is decided at the first Conference Preparatory Meeting (CPM) held during the week immediately following the previous WRC.
- 2.10 Proposals to WRCs are usually co-ordinated by countries through the relevant regional group. For the UK, this is the European Conference of Postal and Telecommunications Administrations (CEPT, which currently has 48 member countries). CEPT submits European Common Proposals (ECPs) to the WRC. Each CEPT member country is free to formally sign each ECP and, unless there is a good reason not to do so, the UK would usually anticipate supporting ECPs developed through this process.
- 2.11 Ofcom is responsible for the development of the UK positions taken into both the CEPT process and then on to the WRC itself. Ofcom chairs the International Frequency Policy Group (IFPG) which provides a forum for Ofcom, Government, stakeholders and other interested parties to meet and discuss the developing positions across the WRC Agenda. As mentioned above Ofcom has, under the IFPG, established 4 Working Groups to facilitate discussion with stakeholders and interested parties in specific sectors and to develop UK positions in respect of each of the individual Agenda Items. Before the start of the WRC, Ofcom confirms the positions and negotiating lines that we will take into the WRC with Government.
- 2.12 As well as leading for the UK in the European process, Ofcom also monitors developments at the global level and, where justified, is able to participate in other relevant regional groups outside Europe as appropriate.

## Purpose of this consultation

- 2.13 This consultation aims to inform users of the radio spectrum of the issues that will be discussed at WRC-19, along with either the current UK position or our preliminary views. We invite interested parties to identify and share views they may have relating to individual agenda items and comment on our overall strategy and process of engagement. We are particularly interested in the views of those stakeholders that are not active in the formal preparatory process. For details of how to respond to this consultation see Annex 1.

## 3. The WRC-19 agenda

### Brief description of WRC-19 agenda items

- 3.1 The agenda for WRC-19 contains over 30 agenda items and issues covering many frequency bands and radio services and includes “standing” agenda items which address general regulatory and procedural matters. Some items are very specific and tightly defined while others cover a wide range of issues. All of them have the potential to create new opportunities for the use of the radio spectrum and may therefore present a potential threat to existing users.
- 3.2 There will be varying levels of interest across the agenda items. Internationally, the level of interest will be predominantly driven by differing national policies, regional agreements and industrial interests related to the nature of the issue and the frequency band, or bands, under consideration.
- 3.3 For the purposes for this consultation, we have grouped the various agenda items into the following broad subject categories (these do not have any formal international recognition and are merely used to aid the reader who may not be so familiar with the WRC process):
- **Wireless Broadband Connectivity:** this covers spectrum allocations and regulatory provisions around communications systems that would predominantly deliver services to end users. This includes high profile issues that have a significant citizen and consumer interest such as future spectrum for wireless broadband to support devices such as smartphones, tablet computers and associated consumer devices (including the Internet of Things – IoT).

Two issues likely to attract particular attention at WRC-19 are the identification of spectrum to provide options for the next generation of mobile technologies, commonly referred to as 5G, in bands above 24 GHz (Agenda Item 1.13), and additional spectrum bands in support of Wi-Fi (and comparable technologies) in the bands 5 150 MHz to 5 925 MHz (Agenda Item 1.16). In this section, we also consider the item related to High Altitude Platforms (HAPs, Agenda Item 1.14). Although Agenda items 1.13, 1.14 and 1.16 are focused on wireless broadband, Wi-Fi and the delivery of capacity via HAPs, a number of other services could potentially be impacted by any decision to allocate additional spectrum to these services.

*Relevant agenda items: 1.13, 1.14, 1.16, 9.1.5 and 9.1.8*

- **Satellite Services:** this covers spectrum allocations and regulatory provisions around satellite services. Satellite services are inherently international in nature and therefore are a matter of extensive discussion at every WRC. One important issue covered in this section relates to Earth Stations in Motion (Agenda Item 1.5).

In addition, there are a number of other issues covered in this section that will be particularly important for the satellite industry as they impact the process for the international management of satellite networks, which is maintained by the ITU.

*Relevant agenda items: 1.4, 1.5, 1.6, 7, 9.1.1, 9.1.2, 9.1.3, 9.1.7 and 9.1.9*

- **Transport:** this covers spectrum use by transport related applications. Many of these agenda items are of particular interest to the aviation and maritime sectors and the associated regulatory bodies in the UK (i.e. the Civil Aviation Authority, the Maritime and Coastguard Agency and the Department of Transport). These bodies have overarching responsibility for the regulation of the aviation and maritime sectors in the UK and they will consider any outputs of WRC-19 within this broader regulatory context. This could for example lead to new, or amendments to, regulatory measures which place certain requirements on aviation or maritime, whether UK based or for those coming into UK airspace or UK waters. Moreover, these UK authorities are active in International bodies (such as ICAO and IMO) that have wider responsibility for aviation and maritime measures and these links play an important part in the formulation of UK positions.

*Relevant agenda items: 1.8, 1.9 (1.9.1 and 1.9.2), 1.10, 1.11, 1.12, and 9.1.4*

- **Scientific use of spectrum:** issues considered within this section include Radio Astronomy which is the detection of naturally occurring radio emissions in space; and Earth Exploration Satellite which is the use of radio spectrum for the purposes of mapping and imaging of the earth's surface. This data is for example used to assess the impact of environmental change on the earth. We also include the item on wireless power transfer in this section and the item on fixed and mobile above 275 GHz. For the latter this is because many of the compatibility issues are with science (including passive) services. Finally, the consideration of international allocations to amateur use of spectrum, is also included in this section.

*Relevant agenda items: 1.1, 1.2, 1.3, 1.7, 1.15, and 9.1.6*

- **Standing agenda items:** these are agenda items discussed at each Conference to make general regulatory changes to the Radio Regulations. One of these is the consideration of the Director's Report (Director of the ITU Radiocommunication Bureau) to WRC-19 which will evaluate developments in the Radiocommunication Sector since WRC-15. In addition, one of the standing items is a consideration of items for the next WRC and the conference subsequent to that. These proposals can appear right up to and during the WRC itself.

*Relevant agenda items: 2, 3, 4, 5, 6, 8, 9.2, 9.3 and 10*

3.4 The remaining sections of this document are structured around each of these categories. Each section provides a summary overview of the individual agenda items in a format suitable for those who are not already familiar with the WRC process. We also set out the UK objectives as understood at this stage which are based on existing Ofcom policies,

previous consultations, and discussions with UK stakeholders. Finally, we have sought to identify any linkages between issues which may not be immediately obvious from the WRC agenda itself.

3.5 Given the lead time to the conference, we expect to continually review our objectives and positions, not least as the technical preparatory work progresses. We see this consultation as an important step in this process.

3.6 The consultation also identifies what we consider to be the relative priorities of the various agenda items. We have prioritised these as follows:

**High:** key policy issues for the UK, either because of their strategic importance or because of the potential threat they may pose to UK interests. This will usually apply where there is a major conflict between radio services or between differing UK interests, and especially where the agenda item is so wide-ranging that it presents potentially multiple, as yet undefined, threats (e.g. where additional spectrum is sought without any indication as to the target band). We anticipate these to be controversial with diverging views between countries, including within Europe. We will aim to actively engage at all stages.

**Medium:** important for the UK and/or likely to present some difficulties, at least in detail. This will generally apply to agenda items mainly confined to a single radio service, rather than where this is a major conflict between services. We expect some degree of consensus at least in Europe but will ensure UK participation in all relevant meetings.

**Low:** either relatively unimportant for the UK or sufficiently straightforward and uncontroversial that we can expect others to lead with minimum risk to the UK. We will however continue to monitor developments.

3.7 As a rule, we will devote more resources to our high priorities but will keep this prioritisation under review. Even for low priority items, proposals could be made that require a more proactive involvement and hence result in the elevation of the priority of particular agenda items.

3.8 A list of all the agenda items and the priority we have provisionally assigned to them is set out in Annex 5 and we would welcome views as to whether we have identified the priorities correctly. We will take account of responses to this consultation in prioritising the work going forward.

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

## 4. Wireless Broadband Connectivity

- 4.1 This section addresses the following WRC-15 agenda items:
- 1.13 Mobile broadband 5G in bands above 24 GHz
  - 1.14 Regulatory conditions for High Altitude Platforms
  - 1.16 Spectrum for Radio Local Area Networks (Wi-Fi) between 5150 MHz and 5925 MHz
  - 9.1.5 Operational studies with respect to ITU-R Recommendations referred to in the frequency bands 5 250-5 350 and 5 450-5 7250 MHz
  - 9.1.8 Studies on the technical and operational aspects of narrowband and broadband machine-type (i.e. IoT) communication infrastructures

### Agenda Item 1.13 - Mobile broadband 5G in bands above 24 GHz

- 4.2 In the run-up to WRC-15<sup>6</sup>, there was considerable discussion about a future agenda item to address the need for frequency ranges for future 5G services above 24 GHz. Following WRC-15 discussions have continued and, within Europe, interest has been focused on three bands for 5G, these being 700 MHz, 3.4 – 3.8 GHz and 26 GHz.
- 4.3 We have previously made clear that we support the harmonisation of the 26 GHz band (24.25 – 27.5 GHz) for IMT at WRC-19, on a global basis. We believe that this is the highest priority mmWave band for 5G and identification at WRC-19. In July 2017, Ofcom published a call for inputs (CFI) to gather input from stakeholders on all aspects related to making the 26 GHz band available for 5G. In that document, we noted that we expect that WRC-19 will decide to formally identify the 26 GHz band as a global band for IMT (the ITU terminology for mobile broadband).
- 4.4 In order to fully understand the co-existence questions related to making the 26 GHz band available for 5G and, where appropriate, sharing it with other services, Ofcom has input studies and sharing scenarios into the relevant European and International groups. These discussions are on-going.
- 4.5 In addition to the 26 GHz band, other bands that we intend to promote for identification for IMT are; 40.5-43.5 GHz (as part of the wider 37-43.5 GHz band) and 66-71 GHz. As we said in our Call for Input and more recent Enabling 5G in the UK, we consider that the frequency range 37-43.5 GHz has strong potential to become a 5G band, noting its attractiveness as a wide tuning range for harmonised equipment, while equipment development in 66-71 GHz should be able to draw on the experience of multi-gigabit wireless systems in the adjacent band. The 66-71 GHz band also appears to have no

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<sup>6</sup> Ofcom consultation on the UK preparations for the World Radiocommunication Conference 2015 (WRC-15) <https://www.ofcom.org.uk/consultations-and-statements/category-1/wrc15>

operating users and this spectrum has recently been opened in the USA for unlicensed use. Finally, the band 32 GHz (31.8 – 33.4 GHz) has also been discussed internationally, although there appears to be little traction on this band at present.

**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**

## **Agenda Item 1.14 - Regulatory conditions for High Altitude Platforms**

- 4.6 High Altitude Platform stations (HAPs), in the context of the Radio Regulations, are stations which operate at an altitude between 20 to 50 km at a specified nominal fixed point above the earth. This is at a height much lower than satellites, but well above the heights where civilian aircraft operate. HAPs have the potential to cover much larger areas than land-based radio systems and historically have been viewed as having greatest benefit in locations where coverage is required over large and sparsely populated areas or in disaster and recovery scenarios.
- 4.7 Initial discussions on HAPs date back to the WRC in 1997, where regulatory provisions agreed for inclusions into the Radio Regulations resulting in several identified frequency allocations for HAPs. The necessary technical conditions accompany these frequency designations, to ensure the international interference management aspects are taken into account. These include cross border power flux density limits (pfd) and appropriate technical criteria to manage protection of the satellite services both in band and adjacent bands. Since that time, other than some tests and trials, it does not appear that there has been any widespread adoption of HAPs either globally or regionally. More recently, however, improvements in the design and production of HAPs platform technologies has led to renewed interest in the platform particularly for broadband connectivity applications. This led to agreement at WRC-15 to review existing HAPS identifications and consider additional frequency bands for HAPs usage as part of the WRC-19 Agenda.
- 4.8 The agenda item requires that an assessment of the suitability of the currently identified HAP designations should be undertaken to ascertain whether the originally identified bands are both practical and/or sufficient to meet the estimated demands at the regional/global level. This reflects arguments put forward by some proponents, of HAPs, that existing bands are neither sufficient nor suitable and that, as a result, there should be

an assessment of other potential frequency allocations. One option to resolve this agenda item would be for the conditions and/or availability of some of the existing bands to be varied to make them more suitable for HAPs. The agenda item also allows for the possibility for the study of the bands: 38-39.5 GHz (globally), and 21.4 – 22 GHz and 24.25 - 27.5 GHz (in Region 2) to then be considered at WRC-19.

- 4.9 Of the additional bands mentioned above there has been consideration of the 26 GHz (24.25-27.5 GHz) band for potential use for HAPs in the Americas region (ITU-R Region 2), rather than in Europe (ITU-R Region 1). However, in line with our mobile data strategy, we are of the view that the 26 GHz band is better utilised to support the development of 5G services on a global basis. Whilst we always support technical analysis that looks to provide sharing of spectrum bands and therefore innovation, our focus for the 26 GHz band is that it is a priority band for global 5G harmonisation.

**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?**

## **Agenda Item 1.16 - Spectrum for Radio Local Area Networks (“Wi-Fi” and similar) between 5 150 MHz and 5 925 MHz**

- 4.10 Alongside spectrum for the development of 5G, the WRC in 2019 will consider identifying additional spectrum for Wi-Fi in the 5 GHz band. WRC-15 was unable to reach agreement on what frequency bands in the 5 GHz band could be made available for Wi-Fi and so a further discussion on the issue, for WRC-19, was agreed. Harmonising spectrum in this band could help to deliver further capacity for Wi-Fi services, which we anticipate will continue to grow over the coming years.
- 4.11 In anticipation of this demand and outside of the WRC process, Ofcom has already decided to make the 5 725 – 5 850 MHz band available for Wi-Fi in the UK<sup>7</sup>. This mirrors the situation in a number of other countries, including the USA.
- 4.12 One of the considered frequency ranges (5 350 – 5 470 MHz), is used by a European satellite network called “Copernicus” which will scan the earth providing imaging data for environmental/security/disaster monitoring. In our March 2017 statement on the 5 725 – 5 850 MHz band, we explained that the potential for opening up the 5 350 – 5 470 MHz band was one we would look at in the longer term but noted that wider international harmonisation was needed. Since this statement, there has not been any new supporting technical compatibility arguments in the international preparatory processes. Ofcom is therefore proposing that, unless technical compatibility can be presented in these

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<sup>7</sup> <https://www.ofcom.org.uk/consultations-and-statements/category-1/5-GHz-Wi-Fi> (March 2017)

international discussions, the UK will not support changes to the international spectrum allocations for this band.

- 4.13 For the bands 5 250-5 350 and 5 850-5 925 MHz, there is currently a lack of sufficient evidence required to support any changes to the Radio Regulations. If industry believes that such changes are necessary, it is important that they come forward with the appropriate analysis to support their view. While we remain open to any considerations that might provide for sharing in the bands, without supporting evidence it seems unlikely that there will be a credible basis to support significant changes to the RR. In this case we would anticipate supporting a CEPT position of No Change for both these bands.
- 4.14 For the 5 150 – 5 250 MHz band work is ongoing to explore options to remove the indoor use only limitation which was put in place to protect both MSS feeder links and aeronautical radionavigation operation. There is a need for more work in this area, before the international process is likely to support any such change and we are continuing to work closely with all interested parties.
- 4.15 More recently and outside the work preparing for WRC-19, the 6 GHz band (i.e. above 5 925 MHz) has come into focus for potential sharing opportunities with Wi-Fi or similar short range wireless broadband access technologies. CEPT earlier this year agreed work items<sup>8</sup> to consider the range above 5 925 MHz additionally the Federal Communications Commission in the US have invited comments on use of the 6 GHz band for similar wireless broadband services<sup>9</sup>. Ofcom will continue to monitor these developments to help us understand which of the bands of interest for potential expanded Wi-Fi use have the greatest prospect of support.

**Question 4: What are your views on the bands within scope of Agenda Item 1.16 and their suitability for Wi-Fi and Wi-Fi like services? Do you agree that Ofcom should support the CEPT position of No Change? If not, please provide evidence to support your view.**

## **Agenda Item 9.1.5 - Operational studies wrt ITU-R Recommendations referred to in the frequency bands 5 250 – 5 350 and 5 450 – 5 725 MHz**

- 4.16 This item is linked to the use of the 5 GHz band in general and is related to the appropriate regulatory references (in the Radio Regulations, footnotes<sup>10</sup> Nos 5.447F and 5.450A) for the types of radars that might make use of the band.

<sup>8</sup> [http://eccwp.cept.org/WI\\_Detail.aspx?wiid=627](http://eccwp.cept.org/WI_Detail.aspx?wiid=627) and [http://eccwp.cept.org/WI\\_Detail.aspx?wiid=639](http://eccwp.cept.org/WI_Detail.aspx?wiid=639)

<sup>9</sup> Notice of Inquiry: [http://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2017/db0713/DOC-345789A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0713/DOC-345789A1.pdf)

<sup>10</sup> Please see references in [https://www.itu.int/dms\\_pub/itu-r/oth/Oc/Oa/ROCOA00000C0023PDFE.pdf](https://www.itu.int/dms_pub/itu-r/oth/Oc/Oa/ROCOA00000C0023PDFE.pdf)

- 4.17 At every WRC one of the more routine matters is to update the Radio Regulations to ensure that new or updated references to ITU-R Recommendations, predominantly documented in footnotes to frequency allocations, are correct and appropriate. During the consideration of the references to the updated ITU-R Recommendations M.1638-1<sup>11</sup> and M.1849-1<sup>12</sup>, it appeared that these might place limits upon Wi-Fi and similar access technologies where required to protect different radar types that were not originally envisaged.
- 4.18 At present we can support including a reference, in the Radio Regulations, for the revised Recommendation M.1849-1 (“Technical and operational aspects of ground-based meteorological radars”) in footnote No.5450A. This would be alongside no changes to the allocation conditions of the frequency band 5 470 - 5 725 MHz for the existing radio services. This reflects the current CEPT position on the matter. However, we are concerned that to include reference to the updated ITU-R Recommendation ITU R M.1638 1, in footnotes No.5447A and 5.450A which apply to parts of the band 5 250 - 5 850 MHz, might impose additional constraints on current Wi-Fi and similar access technologies that employ dynamic frequency selection.

**Question 5: Do you agree that UK support the inclusion of the updated Recommendation M.1849-1 (“Technical and operational aspects of ground-based meteorological radars”) in footnote No.5450A? What are your views on the requirement to include a reference to ITU-R Recommendation ITU R M.1638 1 in footnotes No.5447A and 5.450A and the potential impact upon Wi-Fi (and similar technologies)?**

## **Agenda Item 9.1.8 - Studies on the technical and operational aspects of narrowband and broadband machine-type (i.e. IoT) communication infrastructures**

- 4.19 This item was added toward the end of the preceding WRC in 2015. Some countries felt that to spur future deployment of machine to machine (M2M) as a part of the Internet of Things (IoT) specific actions should be undertaken, which might include references in the Radio Regulation.
- 4.20 Thus far, development of M2M and IoT has happened without any specific references in the Radio Regulations. However, these devices make use of a wide range of communications platforms (such as Wi-Fi, Bluetooth, mobile cellular, satellite) which use spectrum bands which are referenced in the Radio Regulations. Ofcom is of the view that

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<sup>11</sup> [M.1638](#) : Characteristics of and protection criteria for sharing studies for radiolocation (except ground based meteorological radars) and aeronautical radionavigation radars operating in the frequency bands between 5 250 and 5 850 MHz

<sup>12</sup> [M.1849](#) : Technical and operational aspects of ground-based meteorological radars

changes to the Radio Regulations should be justified, not least as they send a strong signal to regulators and industry around how spectrum should be used internationally. We do not think that having specific RR identification for M2M/IoT is necessary. Indeed we consider that specific RR identification might actually limit M2M/IoT development as it might be viewed that M2M/IoT use needs to be directed to certain bands.

- 4.21 While Ofcom does not support making changes to the RRs, we are potentially supportive of other ITU documents being produced that give information as to how M2M applications might be deployed and what variety of spectrum bands can or are being used around the world.

**Question 6: Do you agree that UK support a position of not making changes to the Radio Regulations to reference specific bands for M2M/IoT usage?**

## 5. Satellite Services

- 5.1 This section addresses the following WRC-19 agenda items:
- 1.4 Review of certain limitations on satellite networks under provisions in the Radio Regulations (i.e. Annex 7 of Appendix 30)
  - 1.5 Earth Stations in Motion (ESIM) in 17.7-19.7 and 27.5-29.5 GHz
  - 1.6 Regulatory framework for non-GSO fixed satellite systems operating in bands between 37.5 and 51.4 GHz
  - 7 Satellite coordination procedures and processes
  - 9.1.1 Compatibility between the terrestrial and satellite component of IMT in the frequency bands 1 885-2 025 MHz and 2 110-2 200 MHz
  - 9.1.2 Compatibility between IMT and the broadcasting-satellite service (sound) in the frequency band 1 452-1 492 MHz
  - 9.1.3 Studies relating to new non-geostationary-satellite orbit systems in bands between 3 700 and 7 025 MHz allocated to the fixed-satellite service
  - 9.1.7 Studies around the possible methods that will assist administrations in managing the unauthorized operation of earth station terminals deployed within its territory
  - 9.1.9 Studies relating to spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space)

### **Agenda Item 1.4 - Review of certain limitations on satellite networks under provisions in the Radio Regulations (i.e. Annex 7 of Appendix 30)**

- 5.2 Agenda item 1.4 addresses a provision of the Radio Regulations (i.e. Appendix 30) which sets out predefined assignment Plans for Broadcasting Satellite Service (BSS) use in bands around 12 GHz. Annex 7 of Appendix 30 places limitations on the orbital location, eirp and power flux density for various sharing scenarios between BSS and fixed satellite services (FSS) between the three ITU regions. This arises because the allocations for BSS around 12 GHz differ between the 3 Regions, in that spectrum allocated to BSS in one region is allocated to FSS in another. The Annex 7 limitations were developed some decades ago based on the capabilities of the technology at the time. However, with the significant advances in technology since then, it has become relevant to consider if these limitations are still appropriate or necessary. Thus, in view of the improvements in technology, and to make better use of the finite spectrum currently allocated to BSS and FSS, WRC-15 decided that the issue should be studied for consideration at WRC-19.

- 5.3 Following discussions in CEPT, there is a provisional view that supports the deletion of the following limitations in Annex 7 of Appendix 30:
- Limitation A1 (part a) (No assignments in the Region 1 List further west than 37.2°W)
  - Limitation A2a (No modification in the Region 2 Plan in 12.5-12.7GHz further east than 54°W)
  - Limitation A2b (No modification in the Region 2 Plan in 12.2-12.5GHz further east than 44°W)
- Within the CEPT there have been other, additional, limitations proposed for deletion:
- Limitation A1 (part b) (No assignments in the Region 1 List further east than 146°E)
  - Limitation A2c (No modification in the Region 2 Plan further west than 175.2°W)
- 5.4 Ofcom is continuing to consider this issue and to discuss the limitations with relevant stakeholders. We intend to develop definitive positions on the limitations, taking account of the information we have and ongoing discussions in CEPT, over the coming months.
- 5.5 This is currently of low priority for the UK. We support the removal of unnecessary regulatory restrictions which could lead to more efficient use of spectrum/orbit resources.

**Question 7: What are your views on the potential removal of the limitations listed above?**

## **Agenda Item 1.5 - Earth Stations in Motion (ESIM) in 17.7-19.7 and 27.5-29.5 GHz**

- 5.6 WRC-15 agreed on a framework for earth stations in motion (ESIM or Earth Station on Moving Platforms - ESOMP) to communicate with geostationary satellites in the fixed satellite service in the frequency bands 19.7-20.2 GHz and 29.5-30 GHz.
- 5.7 The aim of this WRC-19 agenda item is to create a regulatory environment under which the frequency range in which earth stations in motion (ESIM) can communicate with FSS space stations can be increased to include 17.7-19.7 GHz and 27.5-29.5 GHz. Advances in technology have greatly improved antenna design to the extent that, with appropriate regulations and technical standards, it is possible to deliver satellite broadband communications to consumers when ESIM terminals are moving (for example on a ship, plane or moving vehicle).
- 5.8 Ofcom has provided for usage of ESIMs within the UK and we implemented national provisions in 2014<sup>13</sup>. We feel that a clear international regulatory environment, taking into account the necessary interference management aspects for other services, is required for

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<sup>13</sup> "Boats and planes to join the superfast lane " <https://www.ofcom.org.uk/about-ofcom/latest/media/media-releases/2014/boats-and-planes-to-join-the-superfast-lane>

ESIMs and will help new global satellite broadband services develop. We explained this further in our space spectrum strategy published last year<sup>14</sup>.

- 5.9 The regulatory and technical environment that is applied to ESIM operation needs to ensure protection of the services that share the same bands and needs to be as simple and practicable as possible so that administrations can ensure compliance.
- 5.10 Presently we feel the most practical regulatory measures are:
- for land mobile ESIM, that provisions are a matter for national administrations to consider;
  - for aeronautical ESIM, that these are best managed through satellite network control facilities that automatically monitor and control the ESIM transmit power to meet a Radio Regulatory power flux density limit at the ground; and
  - for maritime ESIM, that these are best managed through spatial separation from land-based terrestrial services in conjunction with the technical characteristics of the maritime ESIM. In practice this will mean setting a distance from the coastline inside which maritime ESIM must stop transmitting automatically so that terrestrial services are protected.
- 5.11 For maritime ESIM, the principle of using a single distance from the coastline was tested under a similar item discussed at WRC-15<sup>15</sup>. This resulted in the retention of a distance from the coastline for Earth Stations on Vessels (ESVs).
- 5.12 Finally, in respect of the protection of terrestrial services, Ofcom is of the view that the short-term interference protection criteria should be one that has been agreed in both CEPT and ITU. To that end we support using ITU-R Recommendation SF.1719 which forms the basis of the criteria used by the UK in the planning of its fixed service links.

**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?**

## Agenda Item 1.6 - Regulatory framework for non-GSO fixed satellite systems operating in bands between 37.5 and 51.4 GHz

- 5.13 As the commercial interest in non-GSO (non-geostationary orbit) satellite systems continues to increase, attention has focused on the suitability and consistency of the regulatory framework across all bands. This led to the establishment of this agenda item at WRC-15

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<sup>14</sup> <https://www.ofcom.org.uk/consultations-and-statements/category-1/space-spectrum-strategy>

<sup>15</sup> WRC-15 Agenda Item 1.8 “to review the provisions relating to earth stations located on board vessels (ESVs), based on studies conducted in accordance with Resolution 909 (WRC-12)”;

- 5.14 Currently the Radio Regulations set out certain provisions (equivalent power flux density limits in Article 22) to ensure compatibility of non-GSO FSS operations with GSO networks in the frequency bands at 6/4 GHz, 14/11 GHz and 30/20 GHz. This is necessary as these two types of satellite system differ greatly and they consequently have potential to interfere with each other.
- 5.15 There are currently no equivalent power flux density limits defined between non-GSO systems and GSO networks in the 50/40 GHz frequency bands. Furthermore, there are currently no ITU-R defined protection requirements for 50/40 GHz band GSO networks. This agenda item will develop a framework covering both of these aspects.
- 5.16 Whilst it is acknowledged that some of the bands discussed under this agenda item overlap those Ofcom is supportive of under Agenda Item 1.13, it should be clarified that any changes to the Article 22 provisions under this agenda item do not change the limits any satellite system (be it non-GSO or GSO) can radiate towards the ground in respect of terrestrial systems. The limits that are set for satellite systems in the direction of the ground in respect of terrestrial systems are documented in RR Article 21 and amendment of those is not within the scope of this agenda item. We support that position and do not support any discussion of the Article 21 limits under this agenda item. Finally we are supportive of the need to protect the radio astronomy service operating in the frequency bands 42.5 - 43.5 GHz, 48.94 - 49.04 GHz and 51.4 - 54.25 GHz, and the protection of the Earth Exploration Satellite Service (EESS) (passive) operating in the frequency bands 36-37 GHz and 50.2 - 50.4 GHz.

**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?**

## Agenda Item 7 - Satellite coordination procedures and processes

- 5.17 Resolution 86<sup>16</sup> is a standing item to deal with “deficiencies and improvements” in the satellite filing procedures. There is potential for significant issues to be raised under this agenda item which may impact existing satellite users and operators, noting also the complexity of these procedures.
- 5.18 There is a relationship between this agenda item and ITU initiatives to improve implementation of the satellite filing procedures, as seen through ITU Radiocommunication Bureau (BR) Circular Letters and Workshops on the efficient use of satellite resources.
- 5.19 Issues under this agenda item tend to increase in number as the preparatory process advances. At this stage a number of issues have been identified on a variety of aspects of the satellite procedures.

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<sup>16</sup> RESOLUTION 86 (Rev.WRC-07) Implementation of Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference [https://www.itu.int/dms\\_pub/itu-r/oth/14/02/R14020000010001PDFE.pdf](https://www.itu.int/dms_pub/itu-r/oth/14/02/R14020000010001PDFE.pdf)

- Issue A** Bringing into Use (BiU) of non-geostationary satellite networks
- “Introduce a regulatory mechanism to test the validity/operation of non-geostationary satellite networks”
- Ofcom feels that a transparent system, that tests the validity of non-GSO systems, is required. Any process should be sufficiently flexible so as to accommodate existing and planned networks, and encourage efficient use of scarce spectrum and orbital resources. To that extent, we feel that the current process<sup>17</sup> for Bringing into Use of frequency assignments to non-GSO systems can be left unchanged but a milestone based deployment methodology be adopted for maintenance of the assignments in the Master International Frequency Register. Further consideration needs to be given as to the most appropriate length of period during which a satellite needs to operate in one of the notified orbital planes of the non-GSO system to confirm BiU.
- Ofcom will continue to discuss this issue with relevant parties. We expect to engage actively in this debate at WRC-19 and seek a solution which balances the need to avoid spectrum warehousing with provisions allowing reasonable time to fully deploy a non-GSO constellation. Ofcom supports identification of the full list of frequency bands and services to which the new BiU arrangements should apply.
- Issue B** Application of coordination arc in the Ka-band to determine coordination requirements between FSS and other satellite services
- This issue concerns the possibility of introducing a coordination arc for coordination cases of FSS vs. MSS networks and of MSS vs. MSS networks. We continue to support further study on this issue for a method that encourages efficient use of scarce spectrum and orbital resources. This coordination arc method would be used in place of the  $\Delta T/T > 6\%$  criteria that currently applies, thereby, we feel, improving and making more efficient the coordination procedures (in addition to requesting coordination via the  $\Delta T/T$  criteria under RR No 9.41).
- Issue C** Issues for which consensus was readily achieved in ITU-R
- There are several issues on the detail of the procedures on which consensus has already been reached. We believe that this consensus should be supported by both the UK and CEPT.

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<sup>17</sup> Rule of Procedure for No. 11.44, Section 2 (MOD RRB16/58)

**Issue D** ITU Bureau identification of coordination requirements for those specific satellite networks and systems with which coordination needs to be effected under RR Nos. 9.12, 9.12A and 9.13.

The objective is to provide more information to administrations without fundamentally changing the current processes. We support Method D2 in the draft CPM text which adds the definitive list of networks/systems into the CR/D.

**Issue E** Harmonization of AP30B with AP30/30A

This issue proposes to introduce a maximum period of operation of 15 years with a possible extension of a further 15 years for assignments in the AP30B List. We support continued study of this issue. In CEPT the current view is that any modification of Appendix 30B should be based on the practical difficulties of applying existing Appendix 30B procedures faced by administrations or the Bureau. CEPT could support further modifications of Appendix 30B only in the case of such modifications leading to simplifications of regulatory procedures while ensuring protection of existing networks. CEPT opposes introducing a limit on the period of operation of 15 years with a possible extension of a further 15 years. Issue M has been created to address the issue more specifically and, as a result, this issue is provisionally suspended until the resolution under Issue M is finalised.

**Issue F** Concerns with the lack of implementation of certain provisions of the Radio Regulations that can lead to difficulties during the process of entering an assignment into the RR Appendix 30B List

Concerns have been raised that the way Administrations are currently using AP30B does not respect certain provisions in 2 areas of the RR – namely the exhortation in AP4 to align coverage area with service area and the limitations in AP30B on orbital position and spectrum. The issue is split into 2 sub-issues to cover the 2 areas and modifications are proposed which aim to strengthen these provisions. As mentioned above, however, CEPT could support further modifications of Appendix 30B only in the case of such modifications leading to simplifications of regulatory procedures while ensuring protection of existing networks. CEPT opposes introducing these proposed modifications to AP4 and AP30B and is instead proposing that they remain unchanged. Due to the complexity of this issue, we supported splitting Issue F into 2 topics for study: Issue F1: Service areas for steerable beams; and Issue F2: multiple AP30B additional systems with overlapping service areas. As above, Issue M has been created to address the issue more specifically and, as a result, this issue is provisionally suspended until Issue M is finalised.

- Issue G** Updating the AP30/30A reference situation
- Under current procedures, provisionally recorded AP30 and AP30A List assignments become definitive once the Bureau is informed that the new and existing networks have co-existed for four months with no complaints of harmful interference. In AP30B the reference situation is updated only once all agreements have been obtained. We share the CEPT view that when a network enters the List (under § 4.1.18 of Appendix 30 or 30A of the Radio Regulations), the reference situation of the “victim” network shall only be updated if and when the Bureau is informed that the agreement has been obtained.
- Issue H** New AP4 data elements to model NGSO systems not subject to coordination
- The current set of data elements to be provided in the API for NGSO systems not subject to coordination is insufficient to be able to properly model the orbital characteristics of the system, leading to difficulties for administrations to identify interference scenarios. It is proposed to add new data elements to fully describe the orbital characteristics. We support continued consideration of this issue in order to better understand the data elements that would be most appropriate to include.
- Issue I** New AP4 data elements to model NGSO systems
- Linked to the previous issue, in order to aid modelling of NGSO systems filed with multiple orbital planes, this issue seeks to add new data elements for such NGSO systems. The new elements would clarify the number of possible configurations of the system and the number of orbital planes in each configuration. These parameters are not fully described within the current set of AP4 parameters required to be provided. We support continued study of this issue.
- Issue J** Modification of pfd limits in AP30 to facilitate future HDTV
- To allow the limit of  $-103.6 \text{ dB(W/m}^2/27 \text{ MHz)}$  of an Appendix 30 List assignment to be exceeded only over the national territory of the notifying administration provided that the assignment does not overlap the established AP30 guardbands. We support continued study.
- Issue K** Consideration of PART B submissions under § 4.1.12 or 4.2.16 of RR Appendices 30 and 30A and 6.21 c) of RR Appendix **30B**
- In order to avoid over protection of senior networks based on its Part A characteristics, which could be obsolete and no longer valid, it is proposed that examinations under § 4.1.12 or 4.2.16 of RR Appendices 30 and 30A and 6.21 c) of RR Appendix **30B** for a Part B submission contains an additional step whereby, if examinations using Part A characteristics of senior network

result in an unfavourable finding, additional examination should be conducted based on PART B characteristics of the senior network. We support continued study.

- Issue L** Update to Appendix 4 data elements required for RR Article 22 EPFD verification after revision of Recommendation ITU-R S.1503
- This issue proposes an update to Appendix 4 data elements as a result of a new revision of Recommendation ITU-R S.1503 which came into force in Jan 2018 for examination under RR Article 22 (EPFD limits). We support an update to the relevant Appendix 4 data elements.
- Issue M** Resolution related to RR Appendix 30B
- This new issue was identified to create a new WRC Resolution that would provide additional measures for satellite networks in the fixed-satellite service in frequency bands subject to Appendix 30B for the enhancement of equitable access to these frequency bands. Issues E and F are provisionally suspended until a solution under this Issue is finalised.
- Issue N** Measures to facilitate entering new assignments into the RR Appendix 30B List
- This issue was identified to alleviate difficulties for an administration wishing to convert its national Allotment in RR Appendix 30B to assignments with characteristics beyond those of the initial allotment or wishing to introduce a new network by providing an update to coordination triggers. We support continued study of this issue.

**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)?**

### **Issue Item 9.1.1 - Compatibility between the terrestrial and satellite component of IMT in the frequency bands 1 885 - 2 025 MHz and 2 110 – 2 200 MHz**

- 5.20 This agenda item was predominantly because of a Chinese input into WRC-15 as a matter for further study. It relates to the coexistence and compatibility issue between the satellite and terrestrial components of IMT in 1 980 – 2 010 MHz and 2 170 – 2 200 MHz frequency bands. If terrestrial mobile systems were to operate in the opposite direction from the current European frequency arrangement (i.e. if base stations transmitted in the 1 980-2 010 MHz band), there would be risk of interference to satellites operating in accordance with the Radio Regulations. At present, some countries wish to exercise their national rights to use this band for terrestrial services (as internationally allocated) using different

band plans. However, it also remains a band internationally harmonised for mobile satellite services meaning there is an international element to consider.

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

### **Issue Item 9.1.2 - Compatibility between IMT and the broadcasting-satellite service (sound) in the frequency band 1 452 – 1 492 MHz**

- 5.21 This agenda item was the result of a European Common Proposal (ECP) into WRC-15 under Agenda item 1.1. The CEPT contribution to WRC-15, which proposed identifying the band 1 452 – 1 492 MHz for IMT, further proposed the introduction into Radio Regulation Article 21 of a power flux-density limit from space stations into terrestrial services. That Conference concluded that it was not within the scope of the agenda item to make this change.
- 5.22 Currently two ITU groups (ITU-R WP 4A and WP 5D) have joint responsibilities for studies under this Agenda item. At a national level the UK does not have any interest in broadcasting satellite use of this band, and this is the case in much of Europe where the expectation is that the band will be made available for terrestrial mobile broadband usage. Consequently, we support having proportionate pfd levels to protect the terrestrial, including mobile IMT, use in the band. Ofcom will work closely with interested parties, including any that are interested in broadcasting use in this band, to seek to establish appropriate pfd limits.

**Question 12: What are your views on the potential establishment of satellite pfd limits, in the 1 452 – 1 492 MHz band, to protect terrestrial use?**

### **Issue Item 9.1.3 - Studies relating to new non-geostationary-satellite orbit systems in bands between 3 700 and 7 025 MHz allocated to the fixed-satellite service**

- 5.23 Mainly following US proposals at WRC-15, this issue looks at the concept of establishing a regulatory mechanism for non-geostationary satellite use in bands that have traditionally been used only by geostationary satellites. The fixed satellite service (FSS) allocations can be used, from a regulatory perspective, by either GSO or non-GSO satellites.
- 5.24 Whilst both types of satellite can use bands allocated to FSS, there needs to be a clear regulatory environment for both. The current power flux density limits that apply to the 3 700 – 4 200 MHz, 4 500 – 4 800 MHz and 5 925 – 6 725 MHz bands were developed at the WRC in 2003 and assumed that the systems operating in those bands make use of highly-elliptical orbits (HEOs) only. New non-GSO systems that might operate in these frequency bands may use different types of orbits.

**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?**

### **Agenda Item 9.1.7 - Studies around the possible methods that will assist administrations in managing the unauthorised operation of earth station terminals deployed within its territory**

- 5.25 At the Radiocommunication Assembly 2015 and subsequently at WRC-15, several administrations felt that there was a need to look at possible regulatory measures to manage the use of unauthorised satellite earth station terminals deployed in their territory.
- 5.26 One of the fundamental principles of the Radio Regulations is that the licensing/authorisation of stations within an administration's territory is a national matter. These aspects are covered in Article 18 of the Radio Regulations and go some way to illustrate how national administrations authorise stations in their territory. Thus, it also remains a national matter for an administration to enforce those national authorisations as it sees fit.
- 5.27 Whilst the RRs state that stations should be licensed or authorised, we do not believe that there are any aspects of Article 18 of the RRs that limit the ability of administrations to exercise their individual national requirements.
- 5.28 Within CEPT there is a majority view that there does not appear to be any need to amend any aspect of the RRs. Any possible methods to assist administrations to manage unauthorised satellite earth stations operating in their territory is best addressed via ITU-R Reports and handbooks. Finally, we do not see a link between this issue and the agenda item on ESIM and consider that any issues related to ESIM operation should be captured in discussion under that 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?**

### **Agenda Item 9.1.9 - Studies relating to spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space).**

- 5.29 There is now some interest in using the higher Q/V bands to accommodate the feeder links to satellites where the capacity is delivered via the Ka band. In contrast to satellites that

operate in C and Ku band, where those bands are used for both the feeder links and the service links, it is argued that the greater throughput capacity of Ka band satellites is disadvantaged by having both feeder and service links in the same band.

- 5.30 Proponents of this agenda item state that the existing FSS uplink allocation in 42.5-43.5 GHz would be difficult to use from a technical perspective since the band below 42.5 GHz is allocated to FSS downlinks and consequently it will be difficult to ensure sufficient isolation between uplinks and downlinks.
- 5.31 We are considering these arguments and want to understand the demand and the justification for additional FSS spectrum before developing a view on possible regulatory actions. Whilst we acknowledge the technical studies currently underway, which will determine the conditions to protect earth exploration satellite service (EESS passive) in the band above and the impact on radio astronomy observations in the band 51.4-54.25 GHz, we do not think that sufficient evidence yet exists to justify additional allocations at this stage. We addressed this point in our January 2017 Space Spectrum statement<sup>18</sup> where we noted that the benefits from this additional capacity are likely to be less certain and more distant than the benefits of feeder links in the bands currently available. Therefore, at present, this remains a relatively low priority for our WRC-19 work.

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

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<sup>18</sup> <https://www.ofcom.org.uk/consultations-and-statements/category-1/space-spectrum-strategy>

## 6. Transport

- 6.1 This section addresses the following WRC-19 agenda items:
- 1.8 Global Maritime Distress & Safety System (GMDSS) and potential new satellite providers
    - 1.9.1 Autonomous maritime devices in 156-162 MHz
    - 1.9.2 Maritime VHF Data Exchange System (VDES), satellite component
  - 1.10 Global Aeronautical Distress and Safety System (GADSS)
  - 1.11 Rail Communications: train to track applications in the mobile service
  - 1.12 Intelligent Transport Systems
  - 9.1.4 Regulatory provisions for suborbital vehicles, “Space Planes”

### **Agenda Item 1.8 - Global Maritime Distress & Safety System (GMDSS) and potential new satellite providers**

- 6.2 WRC-19 will consider the results of ITU-R studies into any regulatory provisions necessary to support the modernisation of the Global Maritime Distress & Safety System (GMDSS). The GMDSS plays a critically important role in providing a globally supported distress and safety service for the maritime sector. The GMDSS uses a number of radio platforms including in the HF and VHF bands as well as satellite platforms, with an Inmarsat system currently being the only satellite network that is officially recognised in the GMDSS.
- 6.3 Much of the procedural requirements for GMDSS are a matter for the International Maritime Organisation (IMO) and the IMO has been assessing how to address the modernisation of the GMDSS. The UK’s Maritime and Coastguard Agency (MCA) is the UK’s representative in the IMO and has been involved in that debate. Although Ofcom is not responsible for maritime safety in the UK, we do have a role in representing the UK’s view when addressing spectrum matters and obviously this is an important aspect in the effective operation of the GMDSS.
- 6.4 Leaving aside the matters that fall to the IMO, Ofcom would fully support any modernisation of the GMDSS. We also want to ensure that any spectrum use respects the conditions under which it is allocated and provisions to protect adjacent band users.
- 6.5 One of the proposals is to add a new satellite service provider into the GMDSS. This is the Iridium platform which operates through a non-geostationary satellite system in the frequency range 1618.25-1626.5 MHz. This spectrum, where used by satellite services, is allocated on a secondary basis in the space-to-Earth direction and a primary allocation in the Earth-to-space direction. The Radioastronomy Service (RAS) operates under a primary allocation in the band 1610.6-1613.8 MHz. Over the years that Iridium has been in

operation, the international Radio Astronomy community has experienced interference from out of band emissions from the Iridium satellites in the 1610.6-1613.8 MHz band, which is at variance to the provisions of the Radio Regulations.

- 6.6 Some have argued that the space-to Earth allocation under which Iridium operates would need to be upgraded to meet the international Radio Regulations provisions of a primary service, before it could be included into the GMDSS. However, we are concerned that such an approach would risk compromising the protection afforded to the RAS in the adjacent band.
- 6.7 One solution would be for the operation of the Iridium satellite service to continue with the status of the allocation unchanged. However, if an assessment of the benefits indicates that the inclusion of the Iridium platform into the GMDSS would be very beneficial to the maritime sector then we would look to try to accommodate any necessary changes to the Radio Regulations. In doing this we would also want to understand and, as best we can, address the implications for the operation of services in adjacent bands.
- 6.8 We also note the outputs from the recent meetings of IMO's NCSR (Sub-Committee on Navigation, Communications and Search and Rescue<sup>19</sup>) which is considering whether the Iridium platform meets the criteria, as specified by IMO, for inclusion into the GMDSS mechanism. Any decision on this matter in IMO will have a material influence in determining whether or not ITU-R action is needed. The issue will be discussed further in IMO during 2018.

**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?**

## **Agenda Item 1.9.1 - Autonomous maritime devices in 156-162 MHz**

- 6.9 Over the past few years, there has been increasing market and consumer interest in having maritime devices that automatically report their location. These are typically onboard objects which are not linked to a coast station or a vessel, such as systems used by scuba divers, life jackets and even fishing nets. These devices would make use of either the Global Maritime Distress & Safety System (GMDSS) or the Automatic Identification System (AIS). Some early devices made use of the GMDSS which has led to a concern that such autonomous use might cause issues for the GMDSS where devices might continue to operate in an emergency or distress manner, even where no such emergency was occurring. Due to the need to protect the integrity of GMDSS, there is a view that it is

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<sup>19</sup> <http://www.imo.org/en/MediaCentre/MeetingSummaries/NCSR/Pages/default.aspx>

inappropriate for these kind of uses to be operating on channels subject to RR Appendix 18<sup>20</sup>.

- 6.10 This agenda item is not limited to AIS uses, but the issues are best illustrated by AIS. The purpose of AIS is to help identify vessels; assist in target tracking; simplify information exchange (e.g. reduce verbal mandatory ship reporting); and provide additional information to assist situation awareness. In general, data received via AIS will improve the quality of the information available to those in charge of vessels.
- 6.11 There is a view that many additional uses of AIS may materialise, noting that many vessels already have receivers which can relay the received data to navigation and other equipment (including computers). In addition, Application Specific Messages have been developed to exchange data privately, e.g. data from buoys measuring sea or weather conditions.
- 6.12 Many of these AIS uses are not covered within the Radio Regulations and so changes are required to deal with this. In addition, some of the uses of AIS are outside the intended use described by IMO and may harm navigational decision making. One concern is that more pervasive use of non-vessel AIS devices might lead to loading of the AIS network and in turn situational awareness issues. Maritime organisations have reported that loading is likely to reach this point within 10 years, in some coastal areas.
- 6.13 We are aware that there could potentially be some consumer interest in these new devices. However we believe that these new devices should use frequencies not currently used by vessels for AIS and consider that an alternative frequency solution should be explored.

**Question 17: What are your views on Agenda Item 1.9.1, particularly the need to respect the current integrity of the AIS?**

## **Agenda Item 1.9.2 - Maritime VHF Data Exchange System (VDES): satellite component**

- 6.1 Over the past few decades, some of the services that made use of the maritime VHF spectrum band, as documented in RR Appendix 18, have been replaced by other services. This is the case for the VHF public correspondence service (“link calls”), a service which allowed for ships to connect with the telephone network via the VHF band. This service has been decommissioned and alternatives (i.e. mobile cellular and mobile satellite) now provide virtually global coverage, while VHF public correspondence did not. As a result a portion of the maritime VHF band has seen limited use over the past few the years.

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<sup>20</sup> Radio Regulations: Appendix 18 (revised at WRC-15) Table of transmitting frequencies in the VHF maritime mobile band which defines the channel numbering for maritime VHF communications based on 25 kHz channel spacing.

- 6.14 Whilst some countries have assigned other uses to these parts of the VHF band, which is clearly their prerogative, ITU and other maritime organisations (i.e. International Associations of Lighthouse Authorities – IALA) have been looking at a potential new application for use in this band. This subject was debated at WRC-15, but agreement could not be reached. Now under this agenda item, WRC-19 will consider the results of ITU-R studies of sharing and compatibility between VDES satellite components and services in the same (156.0125-157.4375MHz and 160.6125-162.0375MHz) and adjacent (154-156MHz and 162-164MHz) frequency bands to determine potential regulatory actions, including MMSS allocations, for VDES applications.
- 6.15 Noting this would require changes to Appendix 18, which has seen a number of changes at the two previous conferences, there is a difference of views internationally (hence the non-agreement at WRC-15). Some industry stakeholders are supportive and feel there is a growing need for the establishment of a future VDES satellite component which would offer potential enhancements to maritime safety (although at this time VDES is not part of the GMDSS and would need to go through an assessment process in the International Maritime Organisation – IMO, before it could be). However, there remains some uncertainty as to how the system would work in practise.
- 6.16 From an Ofcom perspective, we need to take due consideration of the current users in the Appendix 18 frequency band. In the UK, we have permitted some national variations and hence we will need to take these into account before taking any final decision.

**Question 18: What are your views on Agenda Item 1.9.2, particularly the need to take into account current national users in the bands defined by RR Appendix 18?**

## **Agenda Item 1.10 - Global Aeronautical Distress and Safety System (GADSS)**

- 6.17 As a result of the losses of Malaysia Airlines flight MH370 in 2014 and Air France flight AF447 in 2009, and subsequent to the action taken by WRC-15 to allocate spectrum at 1090 MHz for satellite reception of existing ADS-B transmissions from aircraft, the International Civil Aviation Organisation (ICAO) has developed a Concept of Operations for a Global Aeronautical Distress and Safety System (GADSS). This is envisaged to be a system of systems which will perform various functions depending on the conditions of the flight.
- 6.18 In normal conditions the system will be able to track aircraft in all phases of flight with a reporting rate of once every 15 minutes. Should an aircraft develop behaviour that if left uncorrected may result in an accident, the system would initiate autonomous distress tracking, automatically increasing the location reporting rate to once per minute, thereby providing a location accuracy to within 6 nautical miles. Should an accident occur, the system would initiate the post-flight localisation and recovery function, with a Rescue

Control Centre being alerted and given access to aircraft position information, and systems on the aircraft being activated to assist recovery of flight data recorders.

- 6.19 Within the Concept of Operations document, the GADSS functions are ascribed to categories of spectrum, with normal tracking and non-real-time data retrieval able to use any type of spectrum properly allocated for the function being performed, surveillance requiring protected aeronautical safety spectrum and distress tracking being able to use only either protected aeronautical safety spectrum or protected distress spectrum (e.g. 406.1MHz)
- 6.20 ICAO has concluded that it does not envisage that changes to Article 5 of the RRs (i.e. the part of the Radio Regulations that specify to what service a spectrum band is allocated) are necessary in order to facilitate the introduction of the functionality described in the GADSS Concept of Operations. However, some changes to the later Chapters of the RRs may be necessary (where these aviation matters are covered) to facilitate certain autonomous actions by the aircraft under the GADSS.
- 6.21 Studies in ITU-R have concurred with the ICAO conclusion that no changes to Article 5 are necessary, while consideration of changes to other Chapters of the RR is ongoing. We currently support those conclusions and ongoing actions.

**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?**

## **Agenda Item 1.11 - Rail Communications: train to track applications in the mobile service**

- 6.22 This item was added to the WRC-19 agenda following a proposal from China. The scope of this agenda item is to look at the potential for global or regional harmonised frequency bands, to support railway radiocommunication systems between train and trackside within existing mobile allocations. This agenda item is not intended to cover the provision of spectrum allocations for data services to passengers on trains.
- 6.23 Neither CEPT or the UK supported the addition of this agenda item as the services in Europe, used for train to trackside communications, are already accommodated within the mobile service without the need for specific international radio regulatory identification. These train to trackside communications would generally be considered as an application of the mobile service and therefore Radio Regulation identification is not required.
- 6.24 Harmonisation for Railway Radiocommunication Systems between Train and Trackside (RSTT) can be achieved by the development of appropriate non-mandatory ITU-R Recommendations containing regional harmonisation measures. In Europe the existing framework for train radio RSTT is via GSM-R (Global System for Mobile Communications – Rail) systems, which serves interoperable cross-border railway operations. Outside Europe there are other standards/technologies and frequency bands providing for RSTT.

- 6.25 Taking these considerations into account, we do not believe that specific Radio Regulations identification is necessary. This view is shared in Europe where a No Change European Common Position has been discussed and provisionally accepted within CEPT.

**Question 20: What are your views on Agenda Item 1.11, and do you agree that no specific identification for rail communications is required in the Radio Regulations?**

## Agenda Item 1.12 - Intelligent Transport Systems (ITS)

- 6.26 Primary support for this agenda item came from Japan with a scope to consider Radio Regulation identification, for Intelligent Transport Systems (ITS).
- 6.27 Within Europe ECC spectrum harmonisation measures<sup>21</sup> have harmonised the use of the frequency band 5 855 - 5 925 MHz for ITS. ECC has also harmonised the use of the frequency band 63-64 GHz for ITS<sup>22</sup>. ITS operates, under these frameworks, in primary mobile service allocations on a non-exclusive basis and ITS devices cannot claim protection from existing systems operating under other current primary services. Additionally, there are EU harmonisations measures, with the principle instrument being EC Decision 2008/671/EC “Commission Decision of 5 August 2008 on the harmonised use of radio spectrum in the 5 875-5 905 MHz frequency band for safety-related applications of intelligent transport systems (ITS)”<sup>23</sup>.
- 6.28 Whilst global interest in ITS applications are increasing, It does not seem necessary or attractive to have a specific ITS frequency band (or bands) identified for ITS in the Radio Regulations. Part of this is linked to other options that might support the wide range of vehicle services (i.e. applications within a 5G network). Therefore, in similar manner to the case for train to trackside communications, harmonisation for ITS can be achieved by the development of appropriate non-mandatory ITU-R Recommendations containing regional harmonisation measures. This means that these instruments can be updated and revised without the need to use the WRC processes to enact any changes.
- 6.29 Taking these considerations into account, we do not believe that specific Radio Regulations identification is necessary. This view is shared in Europe where a No Change European Common Position has been discussed and provisionally agreed within CEPT.

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<sup>21</sup> <http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC0801.PDF> & <http://www.erodocdb.dk/Docs/doc98/official/pdf/REC0801.PDF>

<sup>22</sup> <http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC0901.PDF>

<sup>23</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008D0671&from=EN>

**Question 21:** What are your views on Agenda Item 1.12 and do you agree that there is no requirement for specific identification to ITS in the Radio Regulations?

## **Agenda Item 9.1.4 - Radiocommunications for sub-orbital vehicles**

- 6.30 The Director of the ITU Radiocommunications Bureau reports to each WRC on results of studies in the ITU-R on technical and operational measures that have happened between each WRC. Part of the report to WRC-19 will cover studies in relation to sub-orbital vehicles and how they can be operated while avoiding causing harmful interference to other radiocommunication services. This arises since these vehicles operate both in conventional airspace and also beyond the earth's atmosphere and it is not clear under which radiocommunication service(s) they are considered to operate in the various phases of their flight.
- 6.31 Studies in ITU-R are ongoing and are focused on establishing whether the operation of sub-orbital vehicles presents a regulatory issue which would need to be brought to WRC-19 in order for an Agenda Item for WRC-23 to be established. We support continued study of this issue.

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

## 7. Scientific use of spectrum

- 7.1 This section addresses the following WRC-19 agenda items:
- 1.1 Amateur Radio, in Region 1, in the 50-54 MHz band
  - 1.2 Power limits for Metsat and EESS earth stations in the 400 MHz band
  - 1.3 Possible upgrading of the Metsat and EESS allocation in the band 460-470 MHz
  - 1.7 Studies in relation to conditions for short duration satellite missions
  - 1.15 Possible use of the band 275-450 GHz by land-mobile and fixed services
  - 9.1.6 Studies concerning Wireless Power Transmission (WPT) for electric vehicles

### Agenda Item 1.1 - Possible allocation to the Amateur service in 50-54MHz in Region 1

- 7.2 The 50-54MHz frequency band is allocated to the Amateur service in Regions 2 and 3 but not in Region 1, where instead it is allocated to Broadcasting as part of the 47-68MHz band. However, Broadcasting use of this band in Region 1 has diminished significantly over recent years (indeed the UK ceased using this band for Broadcasting in the 1980s) and the fact that this band is allocated to Amateur in the rest of the world means that allocating to Amateur in Region 1 would result in a globally harmonised amateur band between existing amateur allocations at 28 MHz and 144 MHz. Support for this Agenda Item came from CEPT and the Arab Group, at WRC-15.
- 7.3 In the UK, licensed amateur operators already have access to spectrum in the 50 - 52 MHz range. Within CEPT, most countries already permit access to parts of this range. Recognising this already permitted UK use and use in a number of CEPT countries, the UK position is to monitor but not to actively participate in this debate. Those countries in Region 1 who do not permit national access to the band would appear to have greater interest in this item.

**Question 23:** What are your views on Agenda Item 1.1, recognising that licensed amateur operators in the UK already have access to parts of the 50 – 54 MHz band?

### Agenda Item 1.2 - Power limits for Metsat and EESS earth stations in the 400 MHz band

- 7.4 This agenda item is looking to establish (subject to studies) technical, operational and regulatory in-band power limits for earth stations covering a number of services (i.e. Earth Exploration Satellite Service (EESS), Meteorological Satellite Service (MetSat) and the Mobile Satellite Service (MSS) across the frequency bands 401 – 403 MHz and

399.9 - 400.05 MHz. This was a CEPT supported agenda item for WRC-19 and was supported by the UK.

- 7.5 Power limits are considered necessary as there is a growing use of these bands for the telemetry, tracking, and command (TT&C) of small satellites. These satellites tend to operate at much higher power levels than the traditional EESS/MetSat/MSS applications. The key applications of EESS, MetSat and MSS systems are monitoring & predicting climate change, weather forecast, water resources, and improving maritime security.
- 7.6 This agenda item has linkage to WRC-19 AI 1.7 on spectrum requirements for small satellites where bands around 400 MHz are among those under consideration. Whilst we are generally supportive of establishing in-band power limits to protect MSS in the band 399.9-400.5MHz and EESS/MetSat in the band 401-403MHz, there are existing users in these bands that require higher eirps than those proposed for this agenda item. One solution to this would be to migrate some of those relatively higher power users (such as satellite earth stations) into bands agreed under agenda item 1.7. Without such a solution to AI 1.7 it is difficult to envisage how limits could be applied to such services in bands under this agenda item.

**Question 24: What are your views on Agenda Item 1.2 concerning power limits for MetSat, Mobile Satellite and EESS, and the linkage to agenda item 1.7?**

### **Agenda Item 1.3 - Possible upgrading of the Metsat and EESS allocation in the band 460-470 MHz**

- 7.7 This item is considering an upgrading of the secondary MetSat (Space-Earth) allocation and consideration of a primary allocation to EESS in the band 460-470MHz. This consideration is seen by those involved with EESS and MetSat operation as providing regulatory certainty for long term continuity for these services. This agenda item was supported by CEPT and UK supported this position at WRC-15.
- 7.8 It is argued that the space and meteorological sectors, whilst looking to invest more in these platforms, state that the current regulatory position does not give sufficient clarity for them to obtain future investment. The key application for MetSat is Data Collection Platforms (DCPs). DCPs are essential for monitoring and predicting climate change, monitoring oceans and water resources, weather forecasting and assisting in protecting biodiversity and improving maritime security. One of the main technical studies, related to this agenda item, is to work on developing a power flux density (pfd) mask to protect terrestrial services.
- 7.9 In the UK this band is also used for Programme Making and Special Events (PMSE), business radio and fixed scanning telemetry links, while the band also has international use for on-board maritime communications. We have highlighted that we have significant interests in

continuing terrestrial use of the band and that any limits should respect that continued use.

**Question 25: What are your views on Agenda Item 1.3, particularly on any limits required to protect terrestrial use?**

## Agenda Item 1.7 - Studies in relation to conditions for short duration satellite missions

- 7.10 The issue of spectrum needs for short duration satellites has now reached the international regulatory arena. Innovative design techniques have meant that much smaller satellites can be produced at a much lower cost than larger communication satellites. These smaller satellites can make opportunistic use of launches and the missions tend to be much shorter.
- 7.11 This agenda item considers the results of ITU-R studies on spectrum requirements for telemetry, tracking and command (TT&C) in the space operation service (SOS) for the growing number of non-GSO satellites with short duration missions. For traditional satellite systems the process of acquiring international rights for access to spectrum can take several years to complete. This is understandable for longer satellite missions, however for these short duration systems the shorter mission length means the current process for spectrum access, and the spectrum bands normally used, do not fit well for these types of platforms.
- 7.12 In the UK we have seen interest in these short duration missions and the question over spectrum access has been raised. We covered this point in our Space Strategy statement in January 2017<sup>24</sup>. As a result, this agenda item was proposed under the European Common Proposal (ECP) for new agenda items to WRC-15, and this position was supported by the UK.
- 7.13 The initial phase of the international work has been analysing the suitability of existing allocations to the SOS in the frequency range below 1GHz. If the findings of the initial study indicate that the spectrum requirement cannot be met through use of the existing SOS allocations below 1GHz, work will focus on an upgrade to existing or a possible new allocation. In terms of a new allocation, possible options initially put forward for consideration focused on the 150.05-174 MHz and 400.15-420MHz bands.
- 7.14 Following discussions it is felt that parts of the frequency range 150.05-174 MHz are not suitable as a result of the large exclusion zones required to protect the radiolocation service and the radio astronomy service due to their co-primary status at ITU RR level in relevant parts of the band. In addition, the diverse and varied use of mobile (e.g. PMR, PAMR, etc.) in the band makes this an unattractive candidate. The UK has proposed,

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<sup>24</sup> <https://www.ofcom.org.uk/consultations-and-statements/category-1/space-spectrum-strategy>

internationally, to consider an allocation to the space operation service in the lower end of the 403-406 MHz band. This would mean a 1 MHz wide allocation which would accommodate the worst-case spectrum requirement and protect Met Aids (radiosondes) use. This option is included in the proposals to satisfy the principle of the agenda item, as discussed and outputted from the most recent ITU meeting (Working Party 7B) held in October last year.

- 7.15 More recently there has been consideration of two additional bands: 137-138 MHz (allocated to Space Operations in the space-to-Earth direction) and 148-148.9 MHz (allocated to the Mobile Satellite service in the Earth-to-space direction). Discussions are at an early stage but, with the justified relaxation of certain historical RR restrictions, we believe these bands could offer a further possibility to resolve this agenda item.
- 7.16 As mentioned in Agenda Item 1.2, there is currently high-powered UK usage in the band 401-403MHz, which could be migrated to a band agreed under this agenda item. Without that it is unlikely that this high-powered use would meet the pfd requirements currently being discussed under AI 1.2.

**Question 26: What are your views on Agenda Item 1.7 considering spectrum needs for short duration satellites, noting also the potential linkages to Agenda Item 1.2?**

## **Agenda Item 1.15 - Possible use of the band 275 – 450 GHz by land-mobile and fixed services**

- 7.17 Currently the spectrum above 275 GHz is not allocated to individual services. However the Radio Regulations do identify, via Radio Regulations footnote 5.565, bands within this range as being for use by administrations for passive services. These passive services include uses such as radio astronomy and earth exploration satellite.
- 7.18 Whilst the same footnote does not preclude use by other active services, to provide some regulatory certainty WRC-19 is to consider this range, particularly noting technology advances mean that the usability of this band for active services has made it more attractive.
- 7.19 Any changes need to consider passive use in the band: in the UK this is primarily meteorological aids used in weather and climate forecasting. Further UK interests in these frequency ranges have been identified by academia. This is where the design and development of sensor instruments and/or their subsystems for EESS and Radio Astronomy is being undertaken.
- 7.20 This was a CEPT and Asian Group supported proposal. In the UK we are monitoring the studies and working with UK stakeholders to better understand the requirements of all interested parties.

**Question 27: What are your views on Agenda Item 1.15, particularly on the protection needs of passive services?**

## **Agenda Item 9.1.6 Studies concerning Wireless Power Transmission (WPT) for electric vehicles (EV)**

- 7.21 WPT-EV applications cover electric passenger cars, buses, lorries, trams and other heavy vehicles with an energy requirement of between a 2 – 200 kW. The initial concept is that electric vehicles would receive power/charge through WPT-EV, when stationary. As this is a wireless application it would remove the need for direct wired connections.
- 7.22 We consider the WPT should be regulated as a radio and treated as a radio application. Internationally the regulatory status of WPT remains unclear, there are currently no explicit provisions in the Radio Regulations for WPT and there is a general view that that it should not be treated as a radio service. There are some views that some WPT may be an Industrial, Scientific and Medical (ISM) application, noting that outside designated ISM bands it cannot cause harmful interference to radiocommunications services. Creating additional ISM identifications for WPT in the Radio Regulations could be challenging as all radio services in that frequency range would need to tolerate interference from ISM.
- 7.23 A number of frequency bands are being considered internationally, for WPT-EV, currently Korea is supporting 19-25 kHz, 55-65 kHz, Japan, who originally proposed this as a WRC item, is supporting 79-90 kHz and China is supporting 81.38–90 kHz as WPT-EV candidates. In Europe, both CEPT and ETSI have been focusing work on the 79-90 kHz band. WPT-EV works better in the lower frequencies of the LF (Low frequency) range due to its characteristics and it allows for higher power, a greater charging rate and efficient power electronics.
- 7.24 We do not support the inclusion of any range that covers the frequency 60 kHz. This is an important frequency for the UK, used for the transmission of an accurate time standard maintained by the National Physical Laboratory (NPL). This time standard is receivable in UK, and Western Europe, in many different time dependant devices.
- 7.25 Studies are currently underway in Working Parties 1A and 1B looking at the impact of WPT-EV on a number of different radiocommunication services for the in-band case (on the same fundamental frequency), adjacent bands case and also looking at the effect of harmonics and ways to resolve the regulatory issue. These studies may carry on beyond this study cycle. At this stage we do not have a firm view on both the preferred frequency range or the regulatory provisions applicable to WPT-for Electric Vehicles, but our initial view is that there is no need for changes to the Radio Regulations to cover WPT-EV. We continue to engage with other administrations to work towards an outcome.

- 7.26 The UK is supportive of finding global frequency ranges and agreeing technical conditions for WPT-EV as it has benefits to citizens and consumers, there is an increasing consumer demand for electric vehicles. We see clear benefits in having a coordinated and global approach and important that this is done with urgency. Equally the UK considered that impact of WPT on radiocommunication services needs to be considered and studied and where necessary we support measures to limit, proportionately, the impact on other radiocommunication services.

**Question 28: What are your views on Agenda Item 9.1.6, particularly on the categorisation of WPT and whether WRC action is required?**

## 8. Standing Agenda Items

This section addresses some of the standing Agenda Items which cover a range of recurring, reporting and housekeeping issues. Some of the more significant of these agenda items are discussed below while others are dealt with in other parts of this consultation (in particular in Section 5 dealing with satellite issues).

8.2 The UK view on many of these Agenda Items will be developed much closer to the start of WRC-19. In particular, the following standing Agenda items will be addressed later in the process:

- Agenda Item 2 - ITU-R Recommendations incorporated by reference;
- Agenda Item 3 - Consequential changes to the Radio Regulations;
- Agenda Item 4 - Review of WRC Resolutions and Recommendations;
- Agenda Item 5 - Report from the Radiocommunication Assembly;
- Agenda Item 6 - Items requiring urgent action by the study groups.
- Agenda Item 8 – Deletion of, or removal of names from, country footnotes

8.3 The above Agenda items cover the housekeeping activities related to the Radio Regulations. For example, when a Recommendation which is referenced in the Radio Regulations is updated, should the reference be to the old or new version. The purpose of these agenda items is to cover the areas where action may be needed but is not addressed in other areas. This is an important but not usually controversial exercise.

8.4 Agenda Item 8 concerns the deletion of, or removal of names from, country footnotes. Such footnotes to the table of frequency allocations in the Radio Regulations provide alternative arrangements for named countries. The removal of names from country footnotes under this agenda item presents a relatively straightforward exercise in checking the need for the various footnotes in which the UK appears and as such is a low priority. However, it should be noted that there is also a need to check proposals from other countries to ensure that there is no adverse impact to the UK, e.g. if a country withdraws from a footnote which was giving a more favourable co-ordination situation than the table allocation. This can normally only be done relatively late in the process and sometimes during the conference itself.

**Question 29: Do you have any comments concerning the Standing Agenda Items, where not covered elsewhere in this document?**

### Agenda Item 9.2 – difficulties or inconsistencies encountered in the application of the Radio Regulations

8.5 Agenda Item 9 concerns a Report from the Director of the Radiocommunication Bureau. One aspect of this is Agenda Item 9.2 which deals with the part of the Director's Report which summarises the experiences of the Radiocommunication Bureau in administering

the Radio Regulations. This includes any difficulties and inconsistencies encountered in the application of the relevant provisions.

- 8.6 An initial version of this part of the Director's Report is normally made available shortly before the second session of the Conference Preparatory Meeting (CPM), to be held in early 2019. A final version is then made available between the CPM and the WRC. The Report can cover a very wide range of issues and contains the Bureau's suggestions for how these might be addressed. The Bureau cannot make formal proposals to the WRC, and so any suggestion made in this part of the Report needs to be supported by a proposal from at least one administration in order to be considered by the WRC.

**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?**

### Agenda Item 9.3 - Action in response to Resolution 80

- 8.7 Resolution 80, which links certain general provisions of the ITU Constitution and the Preamble with the coordination and notification procedures in the Radio Regulations, can prove highly controversial. However, any such issues are likely to arise later in the preparatory process and possibly only at the Conference itself. There has been little activity on this topic to date in the preparations for WRC-19 and no firm CEPT or UK positions have so far emerged.

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

### Agenda Item 10 - Future WRC Agenda Items

- 8.8 Agenda Item 10 is a standing item that prepares the provisional agendas for future WRCs. Given the continuing pressure on the finite spectrum resource and the constant pace of development, discussion around future agendas can be contentious and time consuming. Whilst the focus of this agenda item is on the preparation of the agenda for the next WRC (in this case WRC-23), the agenda item also looks at potential proposals for the conference 8 years ahead.
- 8.9 Discussions within CEPT on this topic started this year and initially only considered the approach for developing European positions. Therefore, no decisions have yet been made, either in the UK or CEPT. The UK will be taking an active role in discussions under this Agenda Item and will expect to work closely with UK industry and other stakeholders, as well as colleagues in CEPT.
- 8.10 Contained in the preliminary agenda for WRC-23 (Resolution 810) are a number of proposals for agenda items, agreed at WRC-15. These proposed agenda items are still up

for debate and can be removed/amended at WRC-19 so some thought is still needed on their merits.

- 8.11 One preliminary agenda item for WRC-23 is the review of the spectrum used, and needs of, existing services in the 470-960 MHz (UHF) band. This is a high-profile issue which may have implications for the future of DTT free-to-view TV in the UK. The agenda item aims to review the usage of both broadcasting and mobile services in the band. Other preliminary agenda items are contained in the relevant ITU Resolution<sup>25</sup>.
- 8.12 As was noted in the introduction to this document, a WRC amends the Radio Regulations to facilitate global or regional spectrum use for services where it is considered that such harmonisation is necessary. In addition, the Radio Regulations provide for countries to divert from these provisions and to exercise national decisions, where they do not impact other countries use.
- 8.13 Therefore, any changes to the Radio Regulations need to be taken in that context and any proposals for changes, to this treaty level document, should be appropriately justified and demonstrated to be necessary.

**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?**

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<sup>25</sup> <https://www.itu.int/en/ITU-R/study-groups/rcpm/Pages/wrc-23-preliminary-studies.aspx>

# A1. Responding to this consultation

## How to respond

- A1.1 Ofcom would like to receive views and comments on the issues raised in this document, by 5pm on 13 September 2018.
- A1.2 We strongly prefer to receive responses via the online form at <https://www.ofcom.org.uk/consultations-and-statements/uk-preparations-wrc-19>. We also provide a cover sheet (<https://www.ofcom.org.uk/consultations-and-statements/consultation-response-coversheet>) for responses sent by email or post; please fill this in, as it helps us to maintain your confidentiality, and speeds up our work. You do not need to do this if you respond using the online form.
- A1.3 If your response is a large file, or has supporting charts, tables or other data, please email it to [WRC-19@ofcom.org.uk](mailto:WRC-19@ofcom.org.uk), as an attachment in Microsoft Word format, together with the cover sheet (<https://www.ofcom.org.uk/consultations-and-statements/consultation-response-coversheet>). This email address is for this consultation only and will not be valid after 13 September 2018.
- A1.4 Responses may alternatively be posted to the address below, marked with the title of the consultation:
- Georgina Cowley  
Ofcom  
Riverside House  
2A Southwark Bridge Road  
London SE1 9HA
- A1.5 If you would like to submit your response in an alternative format (e.g. a video or audio file), please contact Georgina Cowley on 020 7981 3000, or email [Georgina.Cowley@ofcom.org.uk](mailto:Georgina.Cowley@ofcom.org.uk)
- A1.6 We do not need a paper copy of your response as well as an electronic version. We will acknowledge receipt if your response is submitted via the online web form, but not otherwise.
- A1.7 You do not have to answer all the questions in the consultation if you do not have a view; a short response on just one point is fine. We also welcome joint responses.
- A1.8 It would be helpful if your response could include direct answers to the questions asked in the consultation document. The questions are listed at Annex 4. It would also help if you could explain why you hold your views, and what you think the effect of Ofcom's proposals would be.

- A1.9 If you want to discuss the issues and questions raised in this consultation, please contact Stephen Talbot on 020 7891 3000, or by email to [WRC-19@ofcom.org.uk](mailto:WRC-19@ofcom.org.uk)

## Confidentiality

- A1.10 Consultations are more effective if we publish the responses before the consultation period closes. In particular, this can help people and organisations with limited resources or familiarity with the issues to respond in a more informed way. So, in the interests of transparency and good regulatory practice, and because we believe it is important that everyone who is interested in an issue can see other respondents' views, we usually publish all responses on our website, [www.ofcom.org.uk](http://www.ofcom.org.uk), as soon as we receive them.
- A1.11 If you think your response should be kept confidential, please specify which part(s) this applies to, and explain why. Please send any confidential sections as a separate annex. If you want your name, address, other contact details or job title to remain confidential, please provide them only in the cover sheet, so that we don't have to edit your response.
- A1.12 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and try to respect it. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.
- A1.13 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's intellectual property rights are explained further at <https://www.ofcom.org.uk/about-ofcom/website/terms-of-use>.

## Next steps

- A1.14 Following this consultation period, Ofcom plans to publish a update of UK positions, taking into account International meetings and their timing.
- A1.15 If you wish, you can register to receive mail updates alerting you to new Ofcom publications; for more details please see <https://www.ofcom.org.uk/about-ofcom/latest/email-updates>

## Ofcom's consultation processes

- A1.16 Ofcom aims to make responding to a consultation as easy as possible. For more information, please see our consultation principles in Annex x.
- A1.17 If you have any comments or suggestions on how we manage our consultations, please email us at [consult@ofcom.org.uk](mailto:consult@ofcom.org.uk). We particularly welcome ideas on how Ofcom could more effectively seek the views of groups or individuals, such as small businesses and residential consumers, who are less likely to give their opinions through a formal consultation.

A1.18 If you would like to discuss these issues, or Ofcom's consultation processes more generally, please contact Steve Gettings, Ofcom's consultation champion:

Steve Gettings

Ofcom

Riverside House

2a Southwark Bridge Road

London SE1 9HA

Email: [corporationsecretary@ofcom.org.uk](mailto:corporationsecretary@ofcom.org.uk)

## A2. Ofcom's consultation principles

### Ofcom has seven principles that it follows for every public written consultation:

#### Before the consultation

- A2.1 Wherever possible, we will hold informal talks with people and organisations before announcing a big consultation, to find out whether we are thinking along the right lines. If we do not have enough time to do this, we will hold an open meeting to explain our proposals, shortly after announcing the consultation.

#### During the consultation

- A2.2 We will be clear about whom we are consulting, why, on what questions and for how long.
- A2.3 We will make the consultation document as short and simple as possible, with a summary of no more than two pages. We will try to make it as easy as possible for people to give us a written response. If the consultation is complicated, we may provide a short Plain English / Cymraeg Clir guide, to help smaller organisations or individuals who would not otherwise be able to spare the time to share their views.
- A2.4 We will consult for up to ten weeks, depending on the potential impact of our proposals.
- A2.5 A person within Ofcom will be in charge of making sure we follow our own guidelines and aim to reach the largest possible number of people and organisations who may be interested in the outcome of our decisions. Ofcom's Consultation Champion is the main person to contact if you have views on the way we run our consultations.
- A2.6 If we are not able to follow any of these seven principles, we will explain why.

#### After the consultation

- A2.7 We think it is important that everyone who is interested in an issue can see other people's views, so we usually publish all the responses on our website as soon as we receive them. After the consultation we will make our decisions and publish a statement explaining what we are going to do, and why, showing how respondents' views helped to shape these decisions.

## A3. Consultation coversheet

### BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

### CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing

Name/contact details/job title

Whole response

Organisation

Part of the response

If there is no separate annex, which parts? \_\_\_\_\_

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

### DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.

Name

Signed (if hard copy)

## A4. Consultation questions

### UK preparations for the World Radiocommunication Conference 2019 (WRC-19)

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

**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.

**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?

**Question 4:** What are your views on the bands within scope of Agenda Item 1.16 and their suitability for Wi-Fi and Wi-Fi like services? Do you agree that Ofcom should support the CEPT position of No Change? If not, please provide evidence to support your view.

**Question 5:** Do you agree that UK support the inclusion of the updated Recommendation M.1849-1 ("Technical and operational aspects of ground-based meteorological radars") in footnote No.5450A? What are your views on the requirement to include a reference to ITU-R Recommendation ITU R M.1638 1 in footnotes No.5447A and 5.450A and the potential impact upon Wi-Fi (and similar technologies)?

**Question 6:** Do you agree that UK support a position of not making changes to the Radio Regulations to reference specific bands for M2M/IoT usage?

**Question 7:** What are your views on the potential removal of the limitations listed above?

**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?

**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?

**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)?

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

**Question 12:** What are your views on the potential establishment of satellite pfd limits, in the 1 452 – 1 492 MHz band, to protect terrestrial use?

**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?

**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?

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

**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?

**Question 17:** What are your views on Agenda Item 1.9.1, particularly the need to respect the current integrity of the AIS?

**Question 18:** What are your views on Agenda Item 1.9.2, particularly the need to take into account current national users in the bands defined by RR Appendix 18?

**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?

**Question 20:** What are your views on Agenda Item 1.11, and do you agree that no specific identification for rail communications is required in the Radio Regulations?

**Question 21:** What are your views on Agenda Item 1.12 and do you agree that there is no requirement for specific identification to ITS in the Radio Regulations?

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

**Question 23:** What are your views on Agenda Item 1.1, recognising that licensed amateur operators in the UK already have access to parts of the 50 – 54 MHz band?

**Question 24:** What are your views on Agenda Item 1.2 concerning power limits for MetSat, Mobile Satellite and EESS, and the linkage to agenda item 1.7?

**Question 25:** What are your views on Agenda Item 1.3, particularly on any limits required to protect terrestrial use?

**Question 26:** What are your views on Agenda Item 1.7 considering spectrum needs for short duration satellites, noting also the potential linkages to Agenda Item 1.2?

**Question 27:** What are your views on Agenda Item 1.15, particularly on the protection needs of passive services?

**Question 28:** What are your views on Agenda Item 9.1.6, particularly on the categorisation of WPT and whether WRC action is required?

**Question 29:** Do you have any comments concerning the Standing Agenda Items, where not covered elsewhere in this document?

**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?

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

**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?

## A5. Agenda of WRC-19

A5.1 The full Agenda for WRC-19 is shown below. In addition, we have indicated in the final column the current priority that we have assigned to each Agenda Item. The definitions of high, medium and low, are given in Section 3.6.

WRC-19 Agenda Item	Title	Current UK priority
1	on the basis of proposals from administrations, taking account of the results of WRC 15 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the frequency bands under consideration, to consider and take appropriate action in respect of the following items:	N/A
1.1	to consider an allocation of the frequency band 50-54 MHz to the amateur service in Region 1, in accordance with <b>Resolution 658 (WRC-15)</b> ;	Low
1.2	to consider in-band power limits for earth stations operating in the mobile-satellite service, meteorological-satellite service and Earth exploration-satellite service in the frequency bands 401-403 MHz and 399.9-400.05 MHz, in accordance with <b>Resolution 765 (WRC-15)</b> ;	Medium
1.3	to consider possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a possible primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz, in accordance with <b>Resolution 766 (WRC-15)</b> ;	Medium
1.4	to consider the results of studies in accordance with <b>Resolution 557 (WRC-15)</b> , and review, and revise if necessary, the limitations mentioned in <b>Annex 7 to Appendix 30 (Rev. WRC-15)</b> , while ensuring the protection of, and without imposing additional constraints on, assignments in the Plan and the List and the future development of the broadcasting-satellite service within the Plan, and existing and planned fixed-satellite service networks;	Low
1.5	to consider the use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service and take appropriate action, in accordance with <b>Resolution 158 (WRC-15)</b> ;	High
1.6	to consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with <b>Resolution 159 (WRC-15)</b> ;	Low
1.7	to study the spectrum needs for telemetry, tracking and command in the space operation service for non-GSO satellites with short duration missions, to assess the suitability of existing allocations to the space operation service and, if necessary, to consider new allocations, in accordance with <b>Resolution 659 (WRC-15)</b> ;	High

1.8	to consider possible regulatory actions to support Global Maritime Distress Safety Systems (GMDSS) modernization and to support the introduction of additional satellite systems into the GMDSS, in accordance with <b>Resolution 359 (Rev.WRC-15)</b> ;	Medium
1.9/1.9.1	to consider, based on the results of ITU-R studies: regulatory actions within the frequency band 156-162.05 MHz for autonomous maritime radio devices to protect the GMDSS and automatic identifications system (AIS), in accordance with <b>Resolution 362 (WRC-15)</b> ;	Low
1.9/1.9.2	to consider, based on the results of ITU-R studies: modifications of the Radio Regulations, including new spectrum allocations to the maritime mobile-satellite service (Earth-to-space and space-to-Earth), preferably within the frequency bands 156.0125-157.4375 MHz and 160.6125-162.0375 MHz of Appendix 18, to enable a new VHF data exchange system (VDES) satellite component, while ensuring that this component will not degrade the current terrestrial VDES components, applications specific messages (ASM) and AIS operations and not impose any additional constraints on existing services in these and adjacent frequency bands as stated in recognizing d) and e) of <b>Resolution 360 (Rev.WRC-15)</b> ;	Low
1.10	to consider spectrum needs and regulatory provisions for the introduction and use of the Global Aeronautical Distress and Safety System (GADSS), in accordance with <b>Resolution 426 (WRC-15)</b> ;	Medium
1.11	to take necessary actions, as appropriate, to facilitate global or regional harmonized frequency bands to support railway radiocommunication systems between train and trackside within existing mobile service allocations, in accordance with <b>Resolution 236 (WRC-15)</b> ;	Medium
1.12	to consider possible global or regional harmonized frequency bands, to the maximum extent possible, for the implementation of evolving Intelligent Transport Systems (ITS) under existing mobile-service allocations, in accordance with <b>Resolution 237 (WRC-15)</b>	Medium
1.13	to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with <b>Resolution 238 (WRC-15)</b> ;	High
1.14	to consider, on the basis of ITU R studies in accordance with <b>Resolution 160 (WRC-15)</b> , appropriate regulatory actions for high-altitude platform stations (HAPS), within existing fixed-service allocations;	Medium
1.15	to consider identification of frequency bands for use by administrations for the land-mobile and fixed services applications operating in the frequency range 275 450 GHz, in accordance with <b>Resolution 767 (WRC-15)</b> ;	Low
1.16	to consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands between 5 150 MHz and 5 925 MHz, and take the appropriate regulatory actions, including additional spectrum allocations to the mobile service, in accordance with <b>Resolution 239 (WRC-15)</b> ;	Medium
2	to examine the revised ITU R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with <b>Resolution 28 (Rev.WRC-15)</b> , and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in Annex 1 to <b>Resolution 27 (Rev.WRC-12)</b> ;	Low

3	to consider such consequential changes and amendments to the Radio Regulations as may be necessitated by the decisions of the conference;	Low
4	in accordance with <b>Resolution 95 (Rev.WRC-07)</b> , to review the resolutions and recommendations of previous conferences with a view to their possible revision, replacement or abrogation;	Low
5	to review, and take appropriate action on, the Report from the Radiocommunication Assembly submitted in accordance with Nos. 135 and 136 of the Convention;	Low
6	to identify those items requiring urgent action by the radiocommunication study groups in preparation for the next world radiocommunication conference	Low
7	to consider possible changes, and other options, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, an advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with <b>Resolution 86 (Rev.WRC-07)</b> , in order to facilitate rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary satellite orbit;	Medium
8	to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account <b>Resolution 26 (Rev.WRC-07)</b> ;	Low
9	to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention:	
9.1	on the activities of the Radiocommunication Sector since WRC-15;	
9.1.1	<b>Resolution 212 (Rev.WRC-15)</b> Implementation of International Mobile Telecommunications in the frequency bands 1 885-2 025 MHz and 2 110-2 200 MHz;	Low
9.1.2	<b>Resolution 761 (WRC-15)</b> Compatibility of International Mobile Telecommunications and broadcasting-satellite service (sound) in the frequency band 1 452-1 492 MHz in Regions 1 and 3;	Medium
9.1.3	<b>Resolution 157 (WRC-15)</b> Study of technical and operational issues and regulatory provisions for new non-geostationary-satellite orbit systems in the 3 700-4 200 MHz, 4 500-4 800 MHz, 5 925-6 425 MHz and 6 725-7 025 MHz frequency bands allocated to the fixed-satellite service;	Low
9.1.4	<b>Resolution 763 (WRC-15)</b> Stations on board sub-orbital vehicles;	Medium
9.1.5	<b>Resolution 764 (WRC-15)</b> Consideration of the technical and regulatory impacts of referencing Recommendations ITU R M.1638-1 and ITU R M.1849-1 in Nos. 5.447F and 5.450A of the Radio Regulations;	Medium
9.1.6	<b>Resolution 958 (WRC-15)</b> Urgent studies required in preparation for WRC-19 – Studies concerning Wireless Power Transmission (WPT) for electric vehicles;	Medium

9.1.7	<b>Resolution 958 (WRC-15)</b> Urgent studies required in preparation for WRC-19 – Unauthorized operation of earth station terminals (Res. ITU-R 64);	Low
9.1.8	<b>Resolution 958 (WRC-15)</b> Urgent studies required in preparation for WRC-19 – Narrowband and broadband machine-type communication infrastructures;	Medium
9.1.9	<b>Resolution 162 (WRC-15)</b> Studies relating to spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space)	Low
9.2	on any difficulties or inconsistencies encountered in the application of the Radio Regulations*; ____  * This agenda item is strictly limited to the Report of the Director on any difficulties or inconsistencies encountered in the application of the Radio Regulations and the comments from administrations.	Low
9.3	on action in response to Resolution on action in response to <b>Resolution 80 (Rev.WRC-07)</b> ;	Low
10	to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the <i>preliminary agenda</i> for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention.	Medium

## A6. UK Contacts for WRC-19 Agenda Items

A6.1 The following table gives contacts for WRC-19 agenda item.

Robert Cooper (robert.cooper@ofcom.org.uk)	Bharat Dudhia (bharat.dudhia@ofcom.org.uk)
1.11 (Rail: train to track comms.)	1.2 (Earth station tx limits at 400 MHz)
1.12 (Intelligent Transport Systems)	1.3 (Upgrade of Met Sat status in 460-470 MHz)
1.13 (IMT>24 GHz)	1.7 (Small satellites, status and new allocations)
1.16 (RLAN in the 5 GHz band)	1.14 (High Altitude Platforms: review and new)
9.1.1 (IMT: SAT and Terrestrial in 2 GHz MSS bands)	1.15 (Land mobile and fixed in 275-450 GHz)
9.1.2 (IMT & Broadcasting SAT in 1452-1492 MHz)	2 (Review of incorporated ITU-R Recs)
9.1.5 (Applicable Recommendations in 5 GHz)	4 (Review of WRC Resolutions)
9.1.8 (IoT and M2M considerations)	8 (Footnotes: deletion)
	9.1.6 (Wireless Power Transfer)
Nandan Patel (nandan.patel@ofcom.org.uk)	Wesley Milton (wesley.milton@ofcom.org.uk)
1.4 (Review of orbital position limitations)	1.1 (Amateur radio in Region 1 in 50-54 MHz)
1.5 (ESIMs in the 28/18 GHz bands)	1.8 (Maritime Safety: new satellite provider)
1.6 (Conditions for non-GSO FSS > 37.5 GHz)	1.9.1 (Autonomous maritime devices in 156-162 MHz)
7 (Satellite coordination procedures)	1.9.2 (Satellite part of ship data sys ~ 157 MHz)
9.1.3 (Limits for non-GSO ~ 3.7 – 7.025 GHz)	1.10 (Aeronautical Distress and Safety System)
9.1.7 (Limiting unauthorised tx earth stations)	9.1.4 (Consideration of “Space Planes”)
9.1.9 (Poss. FSS allocations in 51.4 – 52.4 GHz)	10 (Future Agenda Items)
9.2 (Inconsistencies in the RRs via ITU Dir. Rpt)	
9.3 (Check satellite processes are equitable)	

## A7. Timeline of key events

The following table shows some of the key meetings and important dates from May 2018 related to WRC-19 where Ofcom, in its role as UK representative, plans to participate and contribute.

<b>Date</b>	<b>Event</b>	<b>Description</b>
26 <sup>th</sup> – 29 <sup>th</sup> June 2018	Conference Preparatory Group (CPG) Meeting 6	European: CEPT preparations
20 <sup>th</sup> – 29 <sup>th</sup> August 2018	TG 5/1	WRC-19 agenda item 1.13 preparations
31 <sup>st</sup> August 2018	CPM Text deadline	Deadline for text to be incorporated into the CPM Report to WRC-19
November 2018	Conference Preparatory Group (CPG) Meeting 7	European: CEPT preparations
18 <sup>th</sup> – 28 <sup>th</sup> Feb 2019	CPM19-2	Second Session of the Conference Preparatory Meeting for WRC-19
May 2019	Conference Preparatory Group (CPG) Meeting 8	European: CEPT Approval and agreement on 1 <sup>st</sup> set of ECPs
Sept 2019	Conference Preparatory Group (CPG) Meeting 9	European: CEPT Agreement on remaining ECPs
21 <sup>st</sup> – 29 <sup>th</sup> Oct. 2019	RA-19	Radiocommunication Assembly (RA-19)
28 <sup>th</sup> Oct – 22 <sup>nd</sup> Nov 2019	WRC-19	World Radiocommunication Conference (WRC-19)
End November 2019	CPM23-1	First Session of the Conference Preparatory Meeting for WRC-23

## A8. Glossary of terms

<b>5G</b>	5th generation wireless systems: the next generation of mobile technologies, designed to provide greater capacity for wireless networks, offer greater reliability, and deliver extremely fast data speeds, enabling innovative new services across different industry sectors. This is also addressed in the ITU work around IMT 2020.
<b>Administration(s)</b>	term used to indicate the body or organisation representative that is able discharge a countries obligations/activities in the International Telecommunications Union (ITU)
<b>AIS</b>	Automatic Identification System: a broadcast transponder system operating in the VHF maritime mobile frequency band, capable of sending ship's navigation information to other ships and to shore receiving stations.
<b>API</b>	Advance Publication Information: a set of initial data about a proposed satellite network published on the BR IFIC
<b>BiU</b>	Bringing into use: when used in connection with satellite services, describes the metric used to establish whether a satellite system has been brought into active operation
<b>BR IFIC</b>	International Frequency Information Circular of the Radiocommunication Bureau of the ITU published every two weeks
<b>BSS</b>	Broadcasting Satellite Service, a radiocommunication service in which signals transmitted or retransmitted by space stations are intended for direct reception by the general public
<b>C Band</b>	A term used to describe frequencies in the range 3 to 8 GHz
<b>CEPT</b>	European Conference of Postal and Telecommunications Administrations
<b>CPM</b>	Conference Preparatory Meeting: the ITU meeting which produces a Report to the WRC explaining the background and the various methods proposed to resolve the agenda items
<b>DCP</b>	Data Collection Platform
<b>DTT</b>	Digital Terrestrial Television: broadcasting delivered by digital means. In the UK and Europe, DTT transmissions use the DVB-T and DVB-T2 technical standards
<b>ECC</b>	Electronic Communications Committee: the highest level spectrum policy body in the CEPT
<b>ECP</b>	European Common Proposal: a proposal submitted to a WRC, which is supported by a qualified number of CEPT countries

<b>EESS</b>	Earth Exploration Satellite Service: a radiocommunication service between earth stations and one or more space stations, used for collecting information relating to the characteristics of the Earth, its natural phenomena, and data related to environmental issues. This information is obtained from active or passive sensors on Earth orbiting satellites
<b>e-navigation</b>	An IMO strategic vision to integrate existing and new maritime navigational tools, in particular electronic tools, in an all-embracing system that will contribute to enhanced navigational safety for the maritime sector
<b>ESIM</b>	Earth Station in Motion: Satellite Earth Stations, that operate in spectrum allocations made to the fixed satellite service, but which can be in motion
<b>ESOMP</b>	Earth Station on-board a Moving Platform: this is now more commonly referred to as an ESIM
<b>ESV</b>	Earth Station on-board a Vessel
<b>EV</b>	Electric Vehicles: motorised vehicles that use electric energy as their sole means of power
<b>FSS</b>	Fixed-Satellite Service: a radiocommunication service between earth stations at given positions, where one or more satellites are used; the given position may be a specified fixed point or any number of fixed points within specified areas
<b>GADSS</b>	An ICAO concept for a new Global Aeronautical Distress and Safety System, to ensure timely detection of aircraft in distress, timely initiation of effective search and rescue actions, tracking of aircraft in distress, timely and accurate location of aircraft at end of flight and timely automated retrieval of flight recorder data
<b>GHz</b>	Gigahertz, a unit of frequency of one billion ( $10^9$ ) cycles per second
<b>GMDSS</b>	Global Maritime Distress & Safety Service: an international system which uses terrestrial and satellite technology and ship-board radio-systems to ensure rapid, automated, alerting of shore-based communication and rescue authorities, in addition to ships in the immediate vicinity, in the event of a marine distress situation
<b>GSM-R</b>	Global System for Mobile Communications – Railway (or GSM-Railway): a wireless communications standard for railway communication and applications. GSM-R is built on GSM technology, and benefits from the economies of scale of GSM
<b>GSO</b>	Geostationary-Satellite Orbit is an orbit in the plane of the Equator at an altitude of 35786km. A satellite placed in this orbit revolves around the same axis about which the earth rotates, and its orbital period is 24 hours and thus it appears stationary in the sky to an observer on the earth

<b>HAP</b>	High Altitude Platform: an airborne platform used for the purposes of radio transmission, located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth.
<b>ICAO</b>	International Civil Aviation Organisation: a specialised agency of the United Nations dealing with operational civil aviation matters
<b>IFPG</b>	International Frequency Planning Group: Ofcom chaired committee which discusses UK positions for the WRC: membership is open to government, relevant regulatory bodies and industry stakeholders with a UK presence
<b>IMO</b>	International Maritime Organisation: a specialised agency of the United Nations dealing with operational maritime matters
<b>IMT</b>	International Mobile Telecommunications: the ITU term that encompasses 3G, 4G and 5G (IMT 2020) wireless broadband systems/services
<b>IoT</b>	Internet of Things: the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data.
<b>ISM</b>	Industrial Scientific and Medical, a term used to describe the use of locally generated radio frequency for purposes other than communication (e.g. heating, battery charging)
<b>ITS</b>	Intelligent Transportation System (ITS): an application which, without embodying intelligence as such, aims to provide services directly related to different modes of transport and traffic management. This is with the objective of making transport users better informed and able to make safer, more coordinated and 'smarter' use of these networks.
<b>ITU</b>	International Telecommunication Union: a specialised agency of the United Nations for information and communication technologies – ICTs, consisting of 193 Member States and over 700 private-sector entities and academic institutions, headquartered in Geneva
<b>ITU-D</b>	The Telecommunication Development Sector of the ITU
<b>ITU-R</b>	The Radiocommunication Sector of the ITU
<b>Ku Band</b>	A term used to describe frequencies approximately in the range 10 to 18 GHz
<b>Ka Band</b>	A term used to describe frequencies approximately in the range 26 to 40 GHz
<b>L-band</b>	Frequencies approximately in the range 960 - 1800 MHz
<b>LF</b>	A term used to describe frequencies in the range of 30 to 300 kHz
<b>M2M</b>	Machine to Machine: a broad description for both wired and wireless technologies which, as part of a common network, are able to communicate with each other.

<b>MetSat</b>	Meteorological-Satellite Service
<b>MHz</b>	Megahertz, a unit of frequency of one million ( $10^6$ ) cycles per second
<b>MMSS</b>	Maritime Mobile-Satellite Service
<b>MSS</b>	Mobile-Satellite Service: a radiocommunication service between mobile earth stations and one or more space stations, or between space stations (used by this service) or between mobile earth stations by means of one or more space stations
<b>NCSR</b>	The Sub-Committee on Navigation, Communications and Search and Rescue (NCSR) of the IMO deals with all matters related to navigation and communication, including the analysis and approval of ships routing measures and ship reporting systems; carriage requirements and performance standards for navigational and tracking, and communication equipment
<b>non-GSO</b>	Non-Geostationary Orbit: an orbit around the earth in which the object does not appear stationary in the sky to an observer on the earth (i.e. object would be in motion with respect to a point on the ground). Non-GSO satellite systems, that make use of this orbit, are normally made up of numerous individual satellites with orbits at heights lower the GSO systems (i.e. from several 100 to several 1000 kms above the ground)
<b>PFD</b>	power flux density: radiated power passing through a given area
<b>PMSE</b>	Programme Making and Special Events: radio applications that support a wide range of activities in entertainment, broadcasting, news gathering and community events.
<b>Radio Regulations or RRs</b>	International regulations governing the use of radio spectrum and satellite orbits. Together with the Telecommunications Regulations and the Constitution and Convention of the ITU, they form an intergovernmental treaty to which ITU Member States are bound
<b>Q Band</b>	A term used to describe frequencies in the range between 33 and 50 GHz
<b>RAS</b>	Radio Astronomy Service: astronomy based on the reception of radio waves of cosmic origin
<b>RLAN</b>	Radio Local Area Network: broadband radio local area networks used for fixed, semi-fixed (transportable) and portable computer equipment for a variety of broadband applications
<b>RRB</b>	Radio Regulations Board

<b>RSTT</b>	Railway Radiocommunication Systems between Train and Trackside: a concept to provide improved railway traffic control, passenger safety and security for train operations. This would carry train control, command, and operational information as well as monitoring data between on-board radio equipment and related radio infrastructure located along trackside
<b>SOS</b>	Space Operations Service
<b>TT&amp;C</b>	Telemetry, Tracking and Control: links between an earth station and a satellite through which the orbit and operation of the satellite are controlled
<b>UA</b>	Unmanned Aircraft: an aircraft which has no pilot on-board
<b>UAS</b>	Unmanned Aircraft System: a communications system comprising a unmanned aircraft control station (UACS) on the ground and an unmanned aircraft
<b>UHF</b>	Ultra-High Frequency: the range of frequencies between 300MHz and 3GHz
<b>V Band</b>	A band of frequencies in the range 40 to 75 GHz
<b>VDES</b>	VHF Data Exchange System: a new maritime concept VHF Data Exchange System (VDES) is a radio communication system that operates between ships, shore stations and satellites on Automatic Identification System (AIS), Application Specific Messages (ASM) and VHF Data Exchange (VDE) frequencies in the Marine Mobile VHF band
<b>VHF</b>	Very High Frequencies, term to describe the frequency range 30 to 300 MHz
<b>Wi-Fi</b>	Commonly used term to refer to radio local area network (RLAN) technologies, that conform to the IEEE 802.11 family of standards. Such systems typically use one or more access points connected to wired Ethernet networks and, in turn, the Internet. The term “Wi-Fi®” is a trademark of Wi-Fi Alliance <sup>26</sup> .
<b>WPT</b>	Wireless Power Transmission: transmission via radio-frequency beam, of a magnetic field induction, resonant transmission, for the purposes of wireless transmission of power directly or to storage devices such as batteries
<b>WRC</b>	World Radiocommunication Conference: a meeting of the ITU-R, held approximately every 4 years, which has the authority to partially or completely revise the Radio Regulations according to a predefined agenda

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<sup>26</sup> “Wi-Fi Alliance – <http://www.wi-fi.org>