

Question	Intel Corporation Response
<p><b>Question 1:</b> Do you agree with the prioritisation of the agenda items, as shown in Annex 5, and if not why?</p>	<p><b>WRC-19 AI 1.16</b></p> <p>Intel is concerned to see that WRC-19 AI 1.16 has been classified as “medium”. We would have expected this AI to be “high” noting wireless data traffic is projected to continue to grow dramatically during the 2018 – 2025 timeframe [Cisco Systems VNI].</p> <p>New and high growth application areas such as 4k/8k HD video, AR/VR, gaming and low latency industrial applications, combined with the significant increase of the number of Mobile Broadband wireless devices in homes, schools businesses and public spaces, are expected to be significant drivers of additional traffic.</p> <p>UK based Quotient Associates conducted projected traffic patterns based analysis and concluded that in Europe there will be a Wi-Fi spectrum shortfall of between 345 MHz and 753 MHz in 2020 and between 655 MHz and 1 713 MHz in 2025 [Wi-Fi Alliance Spectrum Needs Study].</p> <p>An analysis conducted by Qualcomm on spectrum requirements to enable 1 Gbit/s coverage in dense deployment scenarios concluded that a total amount of around 1 280 MHz of licence exempt spectrum will be required around the 5 GHz band [Qualcomm Spectrum Needs Study].</p> <p>While Intel acknowledges WRC-19 AI 1.16 will not deliver any new significant spectrum to meet these anticipated spectrum demands we believe that the UK need to retain, as a priority, the need to support identification of additional spectrum for WAS/RLAN and relaxation of constraints in existing bands, as well as promoting the use of 5725-5850 MHz based on current regulation (as already decided in the UK) by other countries to broaden the market for WAS/RLAN in that band.</p> <p>Intel also suggests to change the priority for WRC-19 AI 9.1.5 from “medium” to “high” to reflect the importance of this issue and the potential risk for WAS/RLAN use of the 5 GHz frequency range if the wrong regulatory measures are taken under this AI.</p> <p>Setting both AI 1.16 and AI 9.1.5 to “high” priority also reflects the UK ongoing UK support and engagement in ITU-R on these issues.</p>
<p><b>Question 2:</b> Ofcom is supporting the following three priority bands for IMT identification in the RRs:</p> <ul style="list-style-type: none"> <li>24.25 – 27.5 GHz</li> <li>40.5-43.5 GHz (as part of a wider global 37-43.5 GHz tuning range)</li> <li>66 – 71 GHz</li> </ul> <p>If you don’t agree with any of these bands, or</p>	<p><b>AI 1.13 IMT above 24 GHz</b></p> <p><b>24.25-27.5 GHz</b></p> <p>Intel supports IMT identification for the 26 GHz band (24.25-27.5 GHz) noting this band has already been adopted as a “pioneer band” for 5G in Europe and is necessary for very high data rates and capacity.</p> <p>Leveraging equipment development in other regions e.g. US, Korea and Japan (26.5-29.5 GHz) will help enable wide harmonisation, low handset complexity, economies of scale and early equipment availability (at least for the top part of the 26 GHz band).</p> <p>Intel notes that most countries are considering making at least 1 GHz of mmWave spectrum available per operator for initial rollouts. European Administrations should ensure the whole 26 GHz band is made available</p>

think we should be promoting other bands, please provide justification for your views.

for 5G use before WRC-19 but where this is not available for early release 26.5-27.5 GHz should be considered as a priority.

It is important that technical conditions for the 26 GHz band are not over-restrictive and do not stifle development and implementation of 5G networks and services, and ideally are aligned with other parts of the world to enable Europe to benefit from global economies of scale.

Intel is concerned that restrictions on unwanted emissions in the frequency band 23.6-24.0 GHz, for protection of passive services as now decided for Europe, will prevent usage of the lower part of the 26 GHz 5G Pioneer band in Europe. Intel believes that appropriate and least restrictive protection levels need to be identified to sufficiently protect the passive services while still enabling a proper and timely deployment of 5G in Europe. Therefore, Intel is of the view that the current European limits should not be included in the Radio Regulations at WRC-19 as global limits and instead less restrictive limits should be included based on proposals from other regions. Subsequently, the restrictive European limits could be revisited in CEPT after WRC-19.

#### **40.5-43.5 GHz (part of a wider global 37-43.5 GHz tuning range)**

Intel supports IMT identification within the 37-43.5 GHz range to enable 5G deployments noting that not all Regions/counties will enable access to the whole range but with an appropriate tuning range economies of scale can still be achieved.

Intel therefore supports the view of the UK for an IMT identification within 40.5-43.5 GHz (as part of a wider global 37-43.5 GHz tuning range).

#### **66-71 GHz**

Intel believes that both 3GPP-based and IEEE 802.11 based technologies will play an important role in supporting 5G services and applications. We consider 5G as much more than just IMT-2020.

Intel notes that 5G applications envisaged in the 66-71 GHz band are likely to encompass both fixed and mobile use cases. While we acknowledge 66-71 GHz will be important from a 5G perspective and should be made available on a licence exempt basis as planned in the UK, like the 57-66 GHz band which is being made available in many countries for licence exempt use by multi-gigabit applications, our preference is **not** to seek an "IMT" identification for either band.

We are concerned that if 66-71 GHz is identified for IMT that other technologies currently accessing the 57-66 GHz band today could be deliberately precluded from accessing the 66-71 GHz band. Furthermore, licence exempt use of the 66-71 GHz band by multi gigabit applications, can be implemented in a similar way as for the 57-66 GHz band, based on the existing allocation to the Mobile Service in the ITU Radio Regulations as further detailed in Recommendation ITU-R M.2003 "Multiple Gigabit Wireless Systems (MGWS) in frequencies around 60 GHz" for which extends up to 71 GHz already.

License exempt use of a frequency band by both non-IMT and IMT technologies does not require an IMT identification for an ecosystem to develop as can be seen in the 5 GHz frequency range. On the contrary, an IMT identification of a frequency band has in the past always led to licensed use (and in many cases spectrum auctions) which, for 66-71 GHz would prevent MGWS technologies from accessing this frequency band as an extension of the current 57-66 GHz band. Intended synergies in

	<p>ecosystem development for the full 57-71 GHz frequency range would thus be at risk.</p> <p>A fully technology neutral use of the 66-71 GHz band (similar to the 57-66 GHz band that does not have an IMT identification) to allow all IMT and non-IMT technologies on an equal basis indeed requires that the 66-71 GHz band is <b>not</b> identified for IMT at WRC-19.</p> <p>As a compromise we would be OK with an identification of the 66 -71 GHz frequency band for <b>IMT and MGWS/WAS</b> via a new footnote together with an associated WRC Resolution.</p>
<p><b>Question 3:</b> 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?</p>	<p><b>AI 1.14 Regulatory conditions for High Altitude Platforms</b></p> <p>After Facebook and Goggle stopped their drones for Internet programs, we could postulate to assign this spectrum to terrestrial IMT bands</p> <p><b>26 GHz band (24.25-27.5 GHz)</b></p> <p>Intel is opposed to considering the 26 GHz band (24.25-27.5 GHz) for potential use for HAPs since we believe, along with the 28 GHz band (27.5-29.5 GHz), the 26 GHz band is better utilised to support the development of 5G services on a global basis. If the 26 GHz band is to be further considered for HAPs at WRC-19, then it should be strictly limited to Region 2 only (as defined in Resolution 160 (WRC-15) and any regulatory action for HAPs in the 26 GHz band in Region 2 2 under this Agenda item should not limit the possibility to identify the band for IMT on a global level under Agenda item 1.13 as stated in the preliminary CEPT Position for WRC-19 AI 1.14.</p> <p>Furthermore, any use of the 26/28 GHz and 38 GHz bands for HAPs must ensure protection of the MS and FS based on protection requirements defined by the incumbent services.</p>
<p><b>Question 4:</b> 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.</p>	<p><b>AI 1.16 RLANs</b></p> <p><b>5725-5850 MHz</b></p> <p>Intel supports the Wi-Fi Alliance position in applauding the recent Ofcom decision to extend Wi-Fi access in the 5 GHz band to an additional 125 MHz in the 5725-5850 MHz band (“5.8 GHz band”). With this action, UK joined several Region 2 and 3 countries that allow RLAN operations in the 5.8 GHz band. Billions of WAS/RLANs have been deployed in this frequency range without any cases of interference reported to the ITU. In the meantime, the need for additional Wi-Fi spectrum in mid-band is significant and continues to grow (see <a href="#">Wi-Fi Spectrum Needs Study</a>). Intel believes it would be appropriate for UK, at WRC-19, to propose extension of RLAN operations in the 5.8 GHz band to Region 1 countries consistent with its domestic decision.</p> <p><b>5150-5250 MHz</b></p> <p>Intel supports the Wi-Fi Alliance position noting that WRC-03 adopted constraints on RLAN systems in the 5150-5250 MHz (“5.1 GHz band”) in order to protect a single Mobile Satellite Service network feeder-uplink operations, i.e. Globalstar. Since WRC-03, some countries (e.g. Canada, Japan, US) have authorized RLAN operations at higher EIRP level and</p>

relaxed the indoor-only restriction in the 5.1 GHz band. With appropriate power limits and antenna elevation angle constraints, these countries have demonstrated that it is possible to limit power radiated towards satellite receivers in this band, while allowing much needed spectrum access for RLANs. It is interesting to note that one administration, i.e. US, that allowed RLAN outdoor operations in 5.1 GHz band is also the notifying administration for the Globalstar network (HIBLEO-4FL. Intel is therefore of the view that based on years of real-world operational experience, there is no reason to constrain RLAN operations to indoors-only based on theoretical limits developed over 15 year ago. This EIRP modification is also essential to in-vehicle RLAN operation.

**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)?

**AI 9.1.5 Operational studies wrt ITU-R Recommendations referred to in 5250-5350 and 5450-5725 MHz**

**ITU-R Recommendation ITU-R M. 1849-1**

Wi-Fi Alliance is opposed to the inclusion of ITU-R M.1849-1 in footnotes No. 5.447A and 5.450A because it is unnecessary and at the same time would increase the protection criteria for met radars from -6 dB to -10 dB and thus result in additional constraints for incumbent services which is contrary to the conditions as stipulated in Resolution 764 (WRC-15). First, it is important to note that ITU-R M.1849-1 is outdated. Currently Revision 2 is the ITU-R working version of Recommendation M.1849. Thus, incorporation by reference of ITU-R M.1849-1 in to Radio Regulation at WRC-19 would require subsequent regulatory revision(s) at future WRCs. Second, for the bands referenced in footnotes No. 5.447A and 5.450A, the coexistence between WAS/RLAN and the radiolocation service is regulated by No. 5.446A. Inclusion of ITU-R M.1849-1 will not provide any additional protection to the meteorological radar systems but would simply perpetuate regulatory confusion and ambiguity.

Therefore, Intel suggests that the UK supports the French proposal to replace the reference to Recommendation ITU-R M.1849 in footnotes No. 5.447A and 5.450A by the sentence “No. 5.43A does not apply”.

**ITU-R Recommendation ITU-R M. 1638-1**

Wi-Fi Alliance is opposed to the inclusion of ITU-R M.1638-1 in footnotes No. 5.447A and 5.450A. CEPT has carried out a significant amount of work to study coexistence between RLANs and new radar systems (not included in Recommendation ITU-R M.1638-0), in particular bi-static radars and fast frequency-hopping radars which operate in 5250-5850 MHz range. Neither CEPT Report 57 nor Report 64, however, provide recommendation on appropriate mitigation techniques necessary to protect these radars. In fact, currently, the only realistic mitigation technique identified to protect radars from RLAN interference is the Dynamic Frequency Selection (DFS). However, the existing DFS techniques at 5 GHz have not been designed to protect radars that are referenced in ITU-R M.1638-1 (e.g., bi-static radars and fast frequency-hopping radars). Thus, inclusion of ITU-R M.1638-1 in in footnotes No. 5.447A and 5.450A would impose an impossible regulatory requirement which would preclude existing and future RLAN operations in the 5 GHz band. This, of course, would be detrimental to billions of RLAN devices already deployed in 5 GHz and to the future of RLAN industry as a

	<p>whole. Moreover, such action would contradict Resolution <b>764</b> (WRC-15), objective to ensure that no undue constraints are imposed on the services referenced in Nos 5.447F and 5.450A footnotes.</p> <p>Therefore, Intel suggests that the UK supports the French proposal to replace the reference to Recommendation ITU-R M.1849 in footnotes No. 5.447A and 5.450A by the sentence “No. 5.43A does not apply”.</p>
<p><b>Question 6:</b> Do you agree that UK support a position of not making changes to the Radio Regulations to reference specific bands for M2M/IoT usage?</p>	<p><b>AI 9.1.8 Narrowband and Broadband machine-type (i.e. IoT) communication infrastructures</b></p> <p>Intel supports the proposed UK position not to have specific RR identification for M2M/IoT.</p>
<p><b>Question 7:</b> What are your views on the potential removal of the limitations listed above?</p>	<p><b>AI 1.4 Satellite Networks under Appendix 30</b></p> <p>Intel has not responded to this question.</p>
<p><b>Question 8:</b> 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?</p>	<p><b>AI 1.5 Earth Stations in Motion (ESIM) or Earth Station on Moving Platforms (ESOMP) in 17.7-19.7 and 27.5-29.5 GHz</b></p> <p>Intel is concerned that protection of FS and MS in the band 27.5-29.5 GHz must be ensured as outlined in Resolution 158 (WRC-15) through appropriate PFD limits and other measures based on the protection requirements as defined by the incumbent services. Furthermore, it needs to be clarified in the Radio Regulations that ESIM operate under non-protection / non-interference conditions as outlined in the draft CPM text for WRC-19 AI 1.5.</p> <p>It is also important to ensure that the current band segmentation of the 27.5-29.5 GHz in CEPT between FS and uncoordinated FSS is maintained (see ECC Decision (05)01) and no attempts should be made to use the results of WRC-19 AI 1.5 to undermine and change this band segmentation in CEPT.</p>
<p><b>Question 9:</b> 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?</p>	<p><b>AI 1.6 Non-GSO Fixed Satellite Systems 37.5-51.4 GHz</b></p> <p>Intel concurs with UK that while it is acknowledged that some of the bands discussed under Agenda Item 1.6 overlap with those 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.</p>
<p><b>Question 10:</b> 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)?</p>	<p><b>AI 7 Satellite Coordination Procedures and Processes</b></p> <p>Intel has not responded to this question.</p>
<p><b>Question 11:</b> What are your views on Agenda Item 9.1.1?</p>	<p><b>AI 9.1.1 Compatibility between terrestrial and satellite component of IMT in 1885-2025 MHz and 2110-2200 MHz</b></p> <p>Intel is of the view that no changes are required to the Radio Regulations under this AI and the regulatory status of the satellite and terrestrial components of IMT (on equal basis) in these bands should be maintained as outlined in Resolution 212 (Rev.WRC-15). Any coordination required can be done on a bilateral basis between the concerned countries.</p>



<p><b>Question 12:</b> What are your views on the potential establishment of satellite pfd limits, in the 1 452 – 1 492 MHz band, to protect terrestrial use?</p>	<p><b>AI 9.1.2 Compatibility between IMT and the broadcasting satellite service (sound) in 1452-1492 MHz</b> Intel supports the inclusion of PFD limits for BSS(sound) into the Radio Regulations to protect terrestrial IMT usage in this band.</p>
<p><b>Question 13:</b> 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?</p>	<p><b>AI 9.1.3 Studies relating to new non-geostationary satellite orbit systems between 3700-7025 MHz allocated to FSS</b> Intel has not responded to this question.</p>
<p><b>Question 14:</b> 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?</p>	<p><b>AI 9.1.7 Studies to assist administrations manage unauthorised operation of earth station terminals</b> Intel has not responded to this question.</p>
<p><b>Question 15:</b> What are your views on the need for additional fixed satellite service allocations in the band 51.4 – 52.4 GHz?</p>	<p><b>AI 9.1.9 Studies on 51.4-52.4 GHz to FSS (Earth-to-space)</b> Intel has not responded to this question.</p>
<p><b>Question 16:</b> 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?</p>	<p><b>AI 1.8 GMDSS and potential new satellite providers</b> Intel has not responded to this question.</p>
<p><b>Question 17:</b> What are your views on Agenda Item 1.9.1, particularly the need to respect the current integrity of the AIS?</p>	<p><b>AI 1.9.1 Autonomous maritime devices in 156-162 MHz</b> Intel has not responded to this question.</p>
<p><b>Question 18:</b> 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?</p>	<p><b>AI 1.9.2 Maritime VHF Data Exchange System (VDES): satellite</b> Intel has not responded to this question.</p>
<p><b>Question 19:</b> What are your views on Agenda Item 1.10 and do you think that any changes to the Radio Regulations may be necessary?</p>	<p><b>AI 1.10 Global Aeronautical Distress and Safety System (GADSS)</b> Intel has not responded to this question.</p>
<p><b>Question 20:</b> What are you views on Agenda Item 1.11, and do you agree that no specific identification for rail communications is required in the Radio Regulations?</p>	<p><b>AI 1.11 Rail Communications: train to track in the mobile service</b> Intel supports the UK view that we do not believe that specific Radio Regulations identification is necessary. Intel would support a No Change European Common Position as discussed in CEPT.</p>

<p><b>Question 21:</b> 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?</p>	<p><b>AI 1.12 - Intelligent Transport Systems (ITS)</b>  Intel supports UK view that it does not seem necessary or attractive to have a specific ITS frequency band (or bands) identified for ITS in the Radio Regulations. Intel would support a No Change European Common Position as discussed in CEPT.  On this occasion we should remind the administrations that any regulation should be implemented TN, see the current battle in EU, where one part of the administration counters the general principles, i.e. DG MOVE mandates a specific radio system in the 5.9GHz band which is not TN.</p>
<p><b>Question 22:</b> What are your views on Agenda Item 9.1.4 concerning radiocommunications for sub-orbital vehicles?</p>	<p><b>AI 9.1.4 - Radiocommunications for sub-orbital vehicles</b>  Intel has not responded to this question.</p>
<p><b>Question 23:</b> 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?</p>	<p><b>AI 1.1 - Possible allocation to Amateur service in 50-54MHz in Region 1</b>  Intel has not responded to this question.</p>
<p><b>Question 24:</b> 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?</p>	<p><b>AI 1.2 Power limits for Metsat and EESS earth stations in 400 MHz band</b>  Intel has not responded to this question.</p>
<p><b>Question 25:</b> What are your views on Agenda Item 1.3, particularly on any limits required to protect terrestrial use?</p>	<p><b>AI 1.3 Possible upgrading of Metsat and EESS allocation at 460-470 MHz</b>  Intel has not responded to this question.</p>
<p><b>Question 26:</b> 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?</p>	<p><b>AI 1.7 Studies for short duration satellite missions</b>  Intel has not responded to this question.</p>
<p><b>Question 27:</b> What are your views on Agenda Item 1.15, particularly on the protection needs of passive services?</p>	<p><b>AI 1.15 Possible use of 275-450 GHz by landmobile and fixed services</b>  Intel has not responded to this question.</p>
<p><b>Question 28:</b> What are your views on Agenda Item 9.1.6, particularly on the categorisation of WPT and whether WRC action is required?</p>	<p><b>AI 9.1.6 Studies concerning Wireless Power Transmission (WPT) for electric vehicles (EV)</b>  Intel has not responded to this question.</p>
<p><b>Question 29:</b> Do you have any comments concerning the Standing Agenda Items, where not covered elsewhere in this document?</p>	<p><b>Standing Agenda Items</b>  Intel has not responded to this question.</p>
<p><b>Question 30:</b> 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?</p>	<p><b>AI 9.2 Difficulties or inconsistencies encountered in the application of the Radio Regulations</b>  Intel has not responded to this question.</p>
<p><b>Question 31:</b> Do you have any comments on Agenda Item 9.3 considering Resolution 80?</p>	<p><b>AI 9.3 Action in response to Resolution 80</b>  Intel has not responded to this question.</p>

**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?

#### **AI 10 Future WRC Agenda Items**

Intel would be **very** concerned if the 5925-6425 MHz band, which is currently being progressed under the EC Mandate, were to be assigned a new Agenda Item for consideration at WRC-2023 (either for WAS/RLAN or IMT). We do not believe that a WRC Agenda Item is needed considering previous WRCs agreed a MOBILE allocation for this range. We have already expressed concern associated with the 2020 timescale assigned to the EC Mandate so having a 2023 date assigned to any WRC Agenda Item would raise even more concern particularly since this would mean a third WRC. We urge the UK to oppose any attempts to have a new Agenda Item associated with the 5925-7125 MHz band either for WAS/RLAN or IMT).

Furthermore, Intel is of the view that the UHF agenda item 2.5 of the preliminary WRC-23 agenda should be maintained as currently written and any attempts to broaden the frequency range for possible regulatory changes (470-694 MHz) should be rejected.