Consultation title	Fixed wireless spectrum strategy: Consultation on proposed next steps to enable future uses of fixed wireless links
Organisation name	Intel Corporation

Response

Question 1: Do you agree that we have identified the key drivers likely to have a significant impact on the spectrum demand for fixed wireless links? If not, please provide further detail and evidence to support your answer. **Do you have other comments to make/points to raise with us on these issues?**	Confidential? – N **Intel Response** Intel is of the opinion that while optical fibre may be the preferred choice for connectivity where available cost effectively, fixed wireless links will continue to be relied on where the cost of laying fibre is considered prohibitive, to ramp the connectivity business quickly but will be replaced by fibre as usual when the demand for throughput, latency and reliability grows. While increases in traffic carried over fixed wireless links due to greater mobile backhaul is likely to continue to meet anticipated future demand, this doesn't necessarily mean that there will be more fixed wireless link deployments as increases in traffic could be met through deploying more spectrally efficient equipment and / or network sharing. However, it is not expected that the fix links capacities will met or surpass in the future the data transport capacities offered by the optical fibre backhauls already today. Intel believes it is important to ensure, where possible, new mobile services and applications are enabled. We recognise that this does not necessarily mean there will be mobile services and applications in all bands currently used for fixed wireless links therefore the access to bands including 57-66 GHz and 66-71 GHz should not be constrained unnecessarily.
Question 2: Do you agree with our conclusions on spectrum implications and our proposed strategy/next steps for each band? **Are there any other considerations of significance that you feel we should have included or do you have other comments to make/points to raise with us on these issues?**	Confidential? – N **Intel Response** Intel agrees with Ofcom that **1492-1517 MHz** band is a high priority for mobile. We are supportive of initiatives to harmonise this band on an EU wide basis under EU harmonisation measures for SDL in the

Please provide as much detail as possible to support your answer.	1427-1452 MHz and 1492-1518 MHz bands. While we note suggestions to possibly relocate existing users from 1492-1517 MHz to 6 GHz we urge caution that this should not jeopardise initiatives enabling access to the 5925-6425 MHz range for RLANs which is currently under study. An alternative solution is to migrate these links to optical fibre. Intel supports Ofcom's intended approach to expanding spectrum access for future mobile services in the **3.6-3.8 GHz** band in order to enable consumers and citizens across the UK to benefit from future mobile services including 5G. We are supportive of Ofcom's proposals to revoke current authorisations for fixed links in the 3.6-3.8GHz band with a notice period of 5 years; to vary existing authorisations for receiving satellite earth stations and from 1 June 2020 no longer take registered satellite earth stations with a receive component in this band into account for frequency management purposes; and aim for fixed links operations to migrate to alternative frequencies by 1 June 2020 where possible. Intel is supportive of further exploring enhanced sharing in the **3.8-4.2 GHz** band based on geographically defined authorisations while continuing to allow current and future deployments of incumbent Fixed and Fixed Satellite Services. We look forward to contributing to any future Ofcom consultations during 2018 with a view to enabling innovative uses. Intel is fully supportive of initiatives associated with **5925-6425 MHz** and **6425-6925 MHz** relating to finding new spectrum for RLANs. Intel is proactively engaged with the two recently created CEPT project teams ECC SE45 and ECC FM57 to study the feasibility of RLAN use at 5925-6425 MHz and the different coexistence issues with incumbent services. We have some concerns however that the Radio Spectrum Committee (RSC), the European Commission, and Member States took a decision to limit the European Commission mandate to CEPT to look at the feasibility of RLAN use in only the 5925-6425 MHz range and did not consider a wider range up to 6925 MHz or even 7125 MHz (as

	referred to “upper 6GHz” in the consultation). Intel supports **24.25-27.5 GHz** being prioritised across Europe as the first high frequency band pioneer band for 5G in Europe. We note that currently there are only fixed link deployments in 24.25-26.5 GHz. Noting that there are ~2800 of them throughout the UK, Intel suggests that if coexistence is problematic in geographical areas where 5G at 26 GHz is likely to be deployed maybe consideration should be given to migrate these fixed links to an alternative band(s) over a suitable timescale or directly to optical fibre which will likely be necessary over the mid-term. However, it is important to first understand exactly to which extent coexistence might be problematic by carrying out sharing studies under realistic assumptions when it comes to the 5G / IMT network modelling. The limited range of operation in the mmWave spectrum, combined with new technologies being developed for 5G, could facilitate greater geographic reuse of spectrum and thus contribute positively to coexistence with fixed links in the 26 GHz band if necessary. Intel agrees that the **37-40.5 GHz** and **40.5-43.5 GHz** bands have the potential to become globally harmonised for 5G through an appropriately large tuning range but while we see these bands as promising we consider the 24.25-27.5 GHz band has a higher priority band for study for 5G in Europe. In line with our response to Q4, Intel agrees that achieving a single authorisation approach to facilitate fixed outdoor use across the full **57-66 GHz** band is desirable which would mean changing the current authorisation regime for fixed point to point use in the **64-66 GHz** band to a licence exempt approach. We see benefits to manufacturers/ stakeholders/citizen consumers from economies of scale provided by a harmonised availability of spectrum across the wider European market and already existing products. Intel supports efforts to make the **66-71 GHz** band available for licence exempt use but we do **not** believe it is necessary to have

	an IMT identification for this band to allow 5G licence exempt deployments. We are concerned that if 66-71 GHz is designated for IMT that other technologies currently accessing the 57-66 GHz band today and are also standardized for operation in the extended band 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 in frequencies around 60 GHz" which includes a revision to extend the frequency range up to 71 GHz. Intel believes **71-76/81-86 GHz** is an important band for 5G overall but more for backhaul noting regulations for such usage are already in place (both at ITU and CEPT level) based on the existing FIXED allocation. While it is feasible to consider options to make usage of this band easier e.g. light licensing, this is not an ITU issue but a regional regulatory issue. Intel is aware that some Administrations are looking at this band for flexible access/backhaul if coexistence can be ensured but even for that usage an IMT identification is **not** required. We believe it is possible to realize such flexible usage through appropriate regional licensing conditions since the regulatory framework is already in place due to the MOBILE allocation.
Question 3: Do you agree with the items we have identified for further consideration? Are there any other significant areas that you believe should be included? If so, please include all necessary evidence to support your view.	Confidential? – N **Intel Response** Amongst other areas identified by Ofcom it is Intel's opinion that there is a need for further review and discussion relating to the 57-66 GHz and 66-71 GHz band (V band). We believe that an appropriate regulatory framework is needed to enable alternative fixed wireless topologies such as point to multipoint, mesh, as well as mobile applications and services.

Question 4: Do you agree with our proposal to change the authorisation regime in the 64 – 66 GHz band to licence exempt to create a common authorisation approach across the 57 – 66 GHz band for fixed outdoor installation use and that this would be a benefit to UK citizens and consumers?	Confidential? – N **Intel Response** Intel agrees that achieving a single authorisation approach to facilitate fixed outdoor use across the full 57-66 GHz band is desirable which would mean changing the current authorisation regime for fixed point to point use in the 64-66 GHz band to a licence exempt approach. As Ofcom states manufacturers/ stakeholders/citizen consumers will benefit from economies of scale provided by a harmonised availability of spectrum across the wider European market and already existing products. Intel would also like to add that the current technical conditions for wideband data transmission for road transport and telematics (SRD) with a maximum EIPR of 40 dBm for operation in a non-fixed outdoor installation remain appropriate to facilitate outdoor mobile/portable devices however they should be moved into the Channel 4 (63.72-65.88 GHz) to align it with WiGig channel arrangement. We also believe that mobile applications and services should not be precluded considering that this range already has a co-primary Mobile allocation at a Global and Regional level.
Question 5: **a) Do you agree with the proposed new technical conditions in Table 6 to facilitate equipment intended for fixed outdoor installation in the 57 – 66 GHz band? Please provide evidenced views /alternatives if you disagree with our proposal. Do you consider any additional conditions should be mandated as part of a licence exemption to manage the interference environment?** **b) Do you agree with our assessment that the proposed changes in technical conditions will have minimal impact on existing use and are appropriate to manage the future outdoor interference environment?** **c) Are there likely to be any fixed outdoor installation use cases that will require operation at eirp levels above 55 dBm? If so,**	Confidential? – N **Question 5: a)** **Intel Response** To facilitate new outdoor use cases across the 57-66 GHz band, Intel supports revision to the appropriate technical conditions while ensuring users of equipment installed outdoor can operate with a low probability of interference under a licence exempt approach. For equipment operating at EIRP level of 40 dBm and below, Intel supports the Ofcom proposal to relax the existing minimum antenna gain requirement of 30 dBi to 20 dBi and to remove the maximum output power limitation. For higher power operation, Intel supports Ofcom's proposal to retain the existing minimum antenna gain requirement of 30 dBi and maximum output power of 10 dBm

please provide evidence of how the coexistence with the different outdoor users could be ensured?	for equipment operating at EIRP levels of 40 dBm to 55 dBm since this will maintain the current co-existence environment as is presently in place for higher power operation. **Question 5: b) Intel Response** Intel in general supports Ofcom's position related to Short Range Devices in the 57-66 GHz band in so much that the impact to mobile/portable SRD will not be greater than that experienced currently. Wireless multi-gigabit access points that could be installed outdoor to provide access and offload would be enabled by the proposed relaxation in technical conditions. These would operate in a similar interference environment to other outdoor uses such as small cell backhaul and fixed wireless access. Intel confirms that there is a new work item recently initiated in ETSI on technical characteristics of multiple gigabit wireless systems (MGWS) in radio spectrum between 57-71 GHz including proposal to move the existing road transport and telematics (ITS) in the 63- 64 GHz band to a single MGWS channel. **Question 5: c) Intel Response** Intel is not aware of any fixed outdoor installation use cases that will require operation at EIRP levels above 55 dBm.
Question 6: **a) What are the use cases and technical parameters envisaged for the 66 - 71 GHz band? Are they likely to be similar to those in the 57 – 66 GHz band? If so, what are your views on extending the same or similar technical conditions as described above for the 57 - 66 GHz band (both existing wideband data transmission (SRD) and new fixed outdoor technical conditions) to the 66 – 71 GHz band to facilitate both fixed and mobile use cases.** **b) Please provide your view on whether the technical parameters of wideband data transmission (SRD) as shown in Figure 4 are suitable to facilitate mobile/portable equipment including use outdoor? If you do**	Confidential? – N **Question 6: a) Intel Response** Intel agrees 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, 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 designated for IMT that other technologies currently accessing the 57-66 GHz band today could be deliberately precluded from

not consider they are suitable, what alternative technical parameters do you think should be considered? **Please provide as much detail to your answer as possible and your considerations on the co-existence aspects.**	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 in frequencies around 60 GHz" for which a revision extends the frequency range up to 71 GHz. **Question 6: b) Intel Response** Intel has not responded to this question.
Question 7: Do you agree that there is a continued need for future low capacity fixed link applications? **If so, please provide information to support your view and what alternatives you would consider appropriate should the upper 1.4 GHz band no longer be available.** **Please provide clear evidence to support the reasons for your views.**	Confidential? – N **Intel Response** Intel does not consider it spectrally efficient to migrate narrow 3.5 MHz channel fixed links from 1.4 GHz to the 6 GHz band. It is also not clear what is meant by "the use of smaller channels in the gaps within 6 GHz spectrum". We are also aware that there is a lack of equipment availability for narrow band deployment at 6 GHz. The 3.5 MHz channel fixed links at 1.4 GHz was a technology of the last century already replaced by 5 MHz and wider channels due to increased throughput demand. Meanwhile in the majority of areas where the fixed links at 1.4 GHz were deployed there is sufficient density of optical fibre backhaul where these links could be migrated to.
Question 8: **Do you consider there is merit in considering making the bands 52 GHz and 55 GHz available under alternative authorisation approach(es) such as block assignment? If so, what would you consider to be the best approach(es)? Please provide detailed views to support your response.**	Confidential? – N **Intel Response** Intel has not responded to this question.
Question 9: **Do you think we should review our authorisation approach to any other band used for fixed wireless links?**	Confidential? – N **Intel Response** Intel has not responded to this question.
Question 10:	Confidential? – N

a) How do you envisage W band and D band will be used for mobile backhaul provision and the likely timescales? Please provide as much detail as possible on deployment scenarios and whether this would include indoor use. Are there any other types of applications (other than mobile backhaul) that could be suited for these bands? **b) What are your views on the most appropriate authorisation approach for the W and D bands? Please provide as much detail and technical evidence as possible in your answer.**	**Question 10: a) Intel Response** Intel has not responded to this question. **Question 10: b) Intel Response** For **D band (between 23 GHz and 45 GHz)** Intel prefers Intel generally prefers exclusive nationwide or large area dedicated licenses for MNO deployments. However, we recognise that for in some Member States, smaller geographical area or use-case defined licences may be more appropriate for mmWave frequency bands. Where exclusive dedicated licenses are not feasible there may be some circumstances where complementary ways to access spectrum could be considered (i.e. Licensed Shared Access could facilitate access to spectrum for mobile broadband). For **W band (75 to 110 GHz)** Intel prefers license-exempt access under general authorization framework e.g. the 66-71 GHz frequency band is an ideal candidate for license-exempt use as it is immediately adjacent to the 57-66 GHz which is already widely utilized for multiple gigabit wireless systems (e.g. WiGig).
Question 11: Which capacity enhancing technique(s) are you using or planning to use? Please provide detail / evidence and clearly explain why and how each technique is planned to be used and if you consider there are any other aspects that should be considered.	Confidential? – N **Intel Response** Intel has not responded to this question.