Consultation title	Fixed wireless spectrum strategy: Consultation on proposed next steps to enable future uses of fixed wireless links
Organisation name	Blu Wireless Technology Ltd

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. In addition to the key drivers identified by OFCOM we also believe that two additional drivers will create a major opportunity to exploit the 57-64 and 66-71 GHz bands for 5G gigabit services for two major application areas: 1. Fixed Wireless Access for gigabit broadband delivery directly to homes and businesses. Economic analysis based on emerging mmWave modems being developed for CE and Telecoms applications shows that the CAPEX costs for gigabit grade services can be reduced by >4x compared to the equivalent fibre grade services. Such mmWave modems (aka WPONS) will emerge from leading OEMs (e.g. NOKIA[1]) which will be capable of delivering 2 Gbps over 300m, with support for p2p/p2mp and mesh network topologies at cost effective volume price points. 2. Dedicated vertical applications especially in the Transport sector – for example track to train delivery of gigabit / train capacity using a network of towers and on train receivers. Here the 66-71 GHz band offers improved performance due to the reduced atmospheric absorption loss. We believe that there is a strong economic case to increase the allowable EIRP limit in order to reduce the number of trackside towers required to deliver this service (see also our answer to Q6). In both cases a common network approach is emerging based on the use of 5G network technologies (L2+) such as SDN and NFV – independent of the spectrum and air interface. Such approaches allow flexible definition

[1] https://www.nokia.com/en_int/news/releases/2017/10/16/nokia-demonstrates-first-pon-solution-with-integrated-wireless-drop-alternative

	functionality such as x-haul, self-backhauling, p2p/p2mp and mesh architectures.
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?** **Please provide as much detail as possible to support your answer.**	Confidential? – N. In general we agree and also note that we would encourage OFCOM in two respects. 1. To support the submission made by ETSI mWT ISG in August 2017 to CEPT SE19 to modify 60 GHz regulations to encourage the use of active phased array for 60 GHz applications (generally in line with similar regulations already in place in the USA under FCC Part15.255 rules). We also strongly support the OFCOM initiative for 65 GHz to align with license free rules applicable to 57-64 GHz. 2. To further encourage consultation on 66-71 GHz band for increased EIRP levels compatible with active electronically steerable phased array solutions for applications such as transport as discussed in Q1.
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 We agree with the areas listed by OFCOM and would add that additional urgent priority should be given to consultation on regulations for the 66-71 GHz band.
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 Yes we strongly agree with OFCOM's proposal to designate the 57-66 GHz band as a license free band. Moreover, we would like to see the +40 dBmi limit applicable to non-fixed SRD applications also apply to fixed applications for example as shown in V Band use case diagram shown in Fig 5. We also believe that robust self-organising interference mitigation techniques will be embedded within flexible V band WPON modem technology which will support self-coordination of systems within this band.
Question 5: **a) Do you agree with the proposed new technical conditions in Table 6 to facilitate**	Confidential? – N 5a. We support OFCOM's proposal to reduce the minimum antenna gain for fixed

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?	installations to +20 dBi up to a max EIRP of +40 dBmi. We would also emphasise that no restriction on channel bandwidth should be imposed in order to allow flexible and wide bandwidth support (typically 2 GHz or higher) to enable the use of low order modulations (QPSK/16QAM) to achieve acceptable link distances with the link budget afforded by this EIRP/Gain regulation. Regarding operation up to +55 dBmi EIRP with min gain +30 dBi and max power +10 dBm we believe that there are some 5G use cases – for example track to train for railway broadband access and automotive V2X which justify increased EIRP above +40 dBmi but below the +55 dBmi limit. We therefore suggest that OFCOM consider a more tapered regulation regime where the allowable EIRP above +40 dBmi is increased by+1 dB for every +1dB increase in antenna gain above +20 dBi. This would provide further flexibility for the deployment of active phased array antenna solutions (e.g. using combinations of multiple RF active phased array tiles) which have higher gain than +20 dBi but lower EIRP than +55 dBmi. By way of comparison the US regulations for V band under FCC Part15.255 provide for increased EIRP levels up to +82 dBmi for antenna gains >+30 dBi +40 dBmi on the basis of an additional 2 dBm for each 1dB increase in antenna gain up to +51 dBi. Regarding the proposed minimum gain of +20 dBi we also suggest that OFCOM consider a reduction to +15 dBi as this would support the use of low cost 3D phased array antennas for use cases such as short range (<100m) outdoor links from street level to high rise buildings. In this case steerability in both azimuth and elevation domains is beneficial with typical elevation scan ranges of +/- 30 degrees.
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?	5b. Due to the current low levels of use of the 57-64 GHz band we agree with OFCOM's assessment that the proposed rule changes will have minimal impact on existing use. Moreover, the combination of self-organising dynamic network techniques in emerging V band WPON modem products will provide robust protection for outdoor interference.
c) Are there likely to be any fixed outdoor	5c. Increased EIRP levels above +55 dBmi could

installation use cases that will require operation at eirp levels above 55 dBm? If so, please provide evidence of how the coexistence with the different outdoor users could be ensured?	deliver extended range operation for broadband fixed p2p links at ranges of several km. Specific relevant use cases include V2X and track to train rail where signals are naturally constrained to transport corridors. Once again we believe that robust self-organising interference mitigation techniques will enable co-existence of users within this support self-coordination of systems for these use cases.
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 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.**	[redacted]
Question 7: Do you agree that there is a	Confidential? – Y/N

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.**	We do not a have a view on this question.
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 We believe that the reason that these bands have not been utilised in the UK is the lack of available radio technology at economic price points. Since the development of such technology requires evidence of market volume we believe that such low utilisation is likely to continue.
Question 9: **Do you think we should review our authorisation approach to any other band used for fixed wireless links?**	Confidential? – N We do not believe that any changes to other bands for fixed wireless links are appropriate at this time.
Question 10: **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.**	Confidential? – N We are aware of several advanced active phased array radio technology developments in W band (94 GHz) which would enable the same flexible modem technology to be deployed as being considered for operation at V band. We are also aware that that primary use operation at W band may be restricted due to being reserved for government use (e.g. in the USA). Similarly, D Band is being considered by several OEMS and Operators within the ETSI mWT working group for high capacity mobile backhaul. This is aimed at expansion of backhaul capacity to support extended increased traffic for 5G mobile applications. Our general view is that operation at D band should be based on a lightly licensed regime suitable for mobile operator backhaul deployment. Operation at W band requires further consultation with government users before any authorisation approach can be determined.

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 We note that relevant and emerging wireless industry standards such as IEEE 802.11ay[2], aimed at ratification during 2019, will support band aggregation (from 4.3 to 8.6 GHz) and MIMO operation (up 3x3) to deliver increased speeds of over 100 Gbps. This standard is aimed at both outdoor (fixed wireless) and indoor (video streaming) applications. Therefore, to what extent the full applicability of such methods to fixed wireless applications is yet to be fully determined. This standard is being supported by leading industry actors such as Intel, Huawei, Facebook (TIP) and Deustche Telecom. We therefore recommend that OFCOM monitors developments in this forum to anticipate any impact on required regulations

[2] http://www.ieee802.org/11/Reports/tgay_update.htm