Consultation title	Improving spectrum access for Wi-Fi, Spectrum use in the 5 and 6 GHz bands
Representing (delete as appropriate)	Organisation
Organisation name	Hewlett Packard Enterprise

Your response

Question 1: Do you have any comments on our proposal to open access to the 5925-6425 MHz band for licence-exempt Wi-Fi use?

Hewlett Packard Enterprise (HPE) welcomes Ofcom's proposal to make the band 5925-6425 MHz available for license-exempt Wi-Fi use, and applauds its leadership to set the pace for other European and CEPT countries to follow by moving ahead now to bring the diverse economic, productivity, innovation and social benefits enabled by this band.

HPE is the second largest provider of enterprise- and service provider-class Wi-Fi infrastructure in Europe. With over 2000 employees in the UK, HPE provides Wi-Fi solutions and services to numerous clients for a variety of use cases, such as Public Administration (City of London), retail (Asda), sports venues (Tottenham Hotspur Football Club), and transportation (Gatwick Airport)[1]. HPE expects to rapidly bring 6 GHz products to the UK market following favourable action by Ofcom in this proceeding. Our products are frequently used in high-density environments where we can observe the congestion in the existing Wi-Fi bands highlighted by Ofcom.

The availability of additional wide and contiguous mid-band spectrum for Wi-Fi is critical to meet the rapidly increasing capacity demands of UK consumers and enterprises and achieve the objective of creating a national Gigabit Society. At the same time, with the sensible technical conditions and device classes proposed by Ofcom this band can be safely opened to an underlay of license-exempt usage.

Making available license-exempt spectrum in the 6 GHz band is expected to generate considerable additional socio-economic benefits for the UK, as detailed in this study published by the Wi-Fi Alliance. According to the study, the total economic value of Wi-Fi in the United Kingdom in 2018 amounts to £41.8 billion[2], which is roughly equivalent to the GDP of Slovenia.

[1] More examples of HPE Wi-Fi use cases can be found at https://www.arubanetworks.com/en-gb/resources/case-studies/

[2] Based on the USD to GBP exchange rate as of 10th March, 2020.

Ofcom's leading role in opening the 5925-6425 MHz band for license-exempt use will directly and rapidly benefit consumers and enterprises in the UK by enabling the use of the latest generation Wi-Fi (i.e., Wi-Fi 6E) services in their homes, offices, and public spaces – keeping pace with the higher capacities being offered by next-generation fixed and wireless broadband access technologies. Ofcom publishes regular market research documenting the profound social impact of both broadband and license-exempt applications like Wi-Fi, research which catalogues and confirms that broadband usage actually increases as bandwidths rise.

The Ofcom usage forecast in the Consultation is sobering: a 10X increase in residential Wi-Fi demand and equivalent 15X increase in public venues over 10 years. By enabling up to six gigabit-capable 80 MHz channels, Ofcom will ensure that UK consumers and businesses can keep up with this demand, and that those with gigabit connections are not bottlenecked at the air interface. Ofcom's Connected Nations 2019 report explains that over 53% of UK homes have at least 300 Mbit/s broadband, a performance level that is barely within the capability of 40 MHz channels in the 5 GHz band. For example, a Wi-Fi 5 AP in a clean 40 MHz channel with 2x2 MIMO can deliver an OTA physical data rate of about 300 Mbit/s after considering protocol overhead. However, a Wi-Fi 6 AP using 2x2 MIMO in an 80 MHz channel can deliver a full 1 Gbit/s at layer 4 and nearly 1.2 Gbit/s at layer 1.

Wi-Fi CERTIFIED 6E™, the industry certification programme for the 6 GHz band based on the IEEE 802.11ax standard, provides the capacity, efficiency, coverage, and performance required by users in the most demanding environments, such as stadiums, airports, train stations, and other public venues with hundreds or thousands of connected devices. Enterprise applications such as warehouse management and factory automation will benefit from the larger number of available channels, the very low latencies, and the wide channel bandwidths offered by Wi-Fi 6E in the 5925-6425 MHz "greenfield" band.

Considering that the incumbent users in the UK are essentially the same in the 5925-6425 MHz and the 6425-7125 MHz bands, a guard band at the upper band edge should not be required. A 10 MHz guard band at the lower end of the band would provide sufficient protection for incumbent services operating in the adjacent band. For the sake of international harmonisation, however, it may be advantageous to introduce a 20 MHz guard band at the lower band edge. Therefore, HPE proposes that Ofcom considers modifying the band plan formula specified in Annex 7, paragraph A7.37 of the consultation document as follows:

$$f_{cn} = 5950\ \text{MHz} + (g{*}5)\ \text{MHz where } 1 \leq g \leq 93$$

Additionally, HPE strongly urges Ofcom to consider developing regulatory conditions for the deployment of high-power outdoor Wi-Fi in the 5925-6425 MHz band which could operate in a coordinated manner, e.g. by applying automated frequency coordination (AFC), or under a light-licensing regime. While the UK has a significant number of 6 GHz fixed service (FS) links, they are in well-defined geographies that could be easily protected, allowing targeted outdoor use in areas where it is most needed. While parts of the 6 GHz band may not be usable in some locations due to proximate usage of FS links, a significant amount of the country may well be available for controlled outdoor usage.

This includes serving high capacity outdoor venues that are desperate for additional spectrum that would be otherwise disallowed under the low-power indoor and very-low power mobile categories, and which Ofcom itself forecasts as seeing a 15X increase in demand over the next 10 years. This also includes important outdoor industrial and enterprise environments such as container terminals, rail terminals, oil & gas installations and municipal outdoor hotspot zones. And of course rural

broadband depends on low-cost, license-exempt Wi-Fi to bring high speeds to millions of users who are often underinvested by telecommunications advances. 6 GHz can help avoid the emergence of a "5G digital divide" in the UK by providing the 5G experience to users who otherwise will not see macro service for many years. HPE is a major provider of hardened outdoor Wi-Fi equipment and would welcome the opportunity to work with Ofcom to develop market access rules.

Furthermore, HPE would like to encourage Ofcom to consider evaluating also the 6425-7125 MHz band for licence-exempt use. Considering that the incumbent users in the UK are essentially the same in the 5925-6425 MHz and the 6425-7125 MHz band the compatibility and sharing studies performed within CEPT - which currently indicate that sharing is possible for low power indoor (up to 250 mW) and very low power outdoor (25 mW) Wi-Fi deployments - are equally valid in both bands. By opening the entire 6 GHz band for licence-exempt use the UK could benefit fully from product economies of scale.

Question 2: Do you have any comments on our technical analysis of coexistence in the 5925-6425 MHz band?

HPE commends the approach taken by Ofcom to conduct studies on the actual population of fixed links in the UK and use to the greatest extent possible actual system characteristics and real-world data of the deployment conditions and environment.

As stated in the consultation document, several conservative assumptions were made in the Ofcom analysis, e.g., that all LPI and VLP RLAN devices are operating at maximum EIRP levels, and that building entry loss is merely 12 dB. HPE shares the view expressed by Ofcom that some of the assumptions that were made in ECC Report 302 and adopted in the Ofcom study, such as Busy Hour Factor and 6 GHz Factor (Table A7.6) are conservative in the sense that they possibly lead to an overestimation of 6 GHz Wi-Fi activity. Although not specifically highlighted in the Ofcom analysis, the body loss value of 4 dB applied to VLP device signals can also be considered conservative. Studies conducted by the ECC on handheld and body-worn PMSE devices found considerably higher attenuation values (ECC Report 286).

It is very reassuring that despite using UK building height distributions in their analysis that are different from the US-based distribution applied in ECC Report 302 Ofcom came to the same conclusion, namely that licence-exempt use of the 5925-6425 MHz band by Wi-Fi is feasible.

HPE agrees with Ofcom's conclusion that Wi-Fi can operate indoors with up to 250 mW EIRP, and outdoors with up to 25 mW EIRP on a licence-exempt basis without affecting incumbent services' operations in the 5925-6425 MHz band and that these technical conditions would be sufficient to enable the envisaged low power indoor (LPI) and very low power (VLP) outdoor use cases. It is important to emphasize that the results of Ofcom's analysis are supported by other independent analyses provided in ECC Report 302, Draft ECC Report 316, and CEPT Report 73.

Question 3: Do you agree with our proposal to remove DFS requirements for indoor Wi-Fi up to 200mW from the 5725-5850 MHz band?

HPE strongly supports Ofcom's proposal to remove the DFS requirements for Wi-Fi operation in the 5725-5850 MHz band. We also share Ofcom's view that the risk of undue interference from indoor Wi-Fi use to radars is extremely low.

[✂] *Confidential part of response*

Question 4: Do you have any comments on other options that may be available for Wi-Fi and RLANs within the 5 GHz band?

Confidential? – No

HPE invites Ofcom to consider aligning the regulatory conditions for the 5725-5850 MHz band with those for the 5150-5250 MHz band recently resolved by WRC-19, i.e., to allow unrestricted indoor use with a maximum transmit power of 200 mW e.i.r.p. and controlled indoor and outdoor use with a maximum transmit power of 1 W e.i.r.p.

Considering that a number of countries including Canada, India, Japan, New Zealand, Mexico, South Korea, and the U.S. intend to or already do operate outdoor Wi-Fi in the 5150-5250 MHz band at a higher EIRP level of up to 4 W, we ask Ofcom to review and possibly align the regulatory conditions for Wi-Fi outdoor operation in this band. This would be particularly benefit large outdoor venues such as container terminals, rail terminals, oil & gas installations and municipal outdoor hotspot zones.

With respect to requests made to expand current DFS requirements to include detection of fast frequency hopping radars we would like to express our serious concerns. Fast frequency hopping radars are designed to make detection difficult or avoid it altogether. Requiring a Wi-Fi device, be it a consumer router or enterprise access point to implement the capability to detect the undetectable will result in increased product cost and/or abandoning of the affected bands, thus further aggravating spectrum scarcity.