Consultation title	Improving spectrum access for Wi-Fi – spectrum use in the 5 and 6 GHz bands
Representing (delete as appropriate)	Organisation
Organisation name	Broadcom Inc.

Your response

Question	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?	Broadcom strongly supports OfCom's proposal as a first step in opening much needed additional spectrum for license-exempt Wi-Fi use. The 2017 Wi-Fi Alliance Spectrum needs study, looking at demand forecasts, showed a shortfall of up to 1.6 GHz mid band spectrum by 2025. Additional spectrum is pivotal and much needed due to: 1) Constraints of existing 5 GHz spectrum (e.g. DFS requirements) 2) Support the latest generation IEEE 802.11ax (Wi-Fi 6/6E) technologies (and next generation IEEE 802.11be). Wi-Fi 6/6E can achieve data rates beyond one gigabit per second and brings a host of feature enhancements to maximize the user experience in dense environments and address emerging high-bandwidth, low-latency use cases. Wi-Fi 6/6E primarily does this via: • OFDMA — Increasing capacity by up to four times; • MU-MIMO — Servicing multiple devices simultaneously on limited spectrum; • Smarter Access Points — Enhancing indoor and outdoor connectivity; • Spatial Reuse (BSS Coloring) — Maximizing spectral efficiency;

	• Target Wake Time (TWT) — Improving device battery life; and • 160MHz Channels — Enabling multi-gigabit wireless connections. Wi-Fi 6/6E provides greater capacity to connect more devices in more places. More importantly, Wi-Fi 6/6E delivers higher speeds per user enabling more data-intensive applications including 4K UHD video streaming, real-time immersive gaming and mobile augmented reality (AR). Operators are increasingly rolling out broadband gigabit access (i.e. Fiber, DOCSIS 3.1, 5G, VDSL) and Wi-Fi 6/6E is required to prevent the wireless interface from being a bottleneck in the user experience. Additional wide bandwidth channels (80/160MHz) are necessary to support reliable single user gigabit throughput and Ofcom's proposal is a good first step in allowing more suitable channels and promoting investment in these new technologies (e.g., in manufacturing of 160 MHz client devices, high throughput/low latency apps). The propagation characteristics of the 6 GHz band and the proximity to existing 5 GHz services are ideal for a rapid deployment of 5G services in the 6 GHz band. Operators can reuse existing backhaul infrastructure for 5 GHz to put this new technology into the market very quickly and industry is ready to use this spectrum and improve wireless broadband. Broadcom alone have already announced eight Access Point chips and one client device chip capable of supporting the entire 5925-7125 MHz band. Wi-Fi 6E, is ideal for enabling 5G services in the 6 GHz band that require gigabit speeds and very low latencies. Low power indoor and very low power portable devices will quickly enable residential gigabit services and mobile AR/VR. The 2018 study by the Telecom Advisory Service (TAS), which looked at the estimated global economic impact and job creation attributed to Wi-Fi, showed that the associated value to the UK alone will rise by 31.5% to $71

	billion by 2023. So, the societal benefits of the new technology features and economic benefits to the UK of additional spectrum are clear. We hope that Ofcom also see this as a first step and that the benefits and opportunities summarized above will encourage Ofcom to consider opening of additional spectrum in the range up to 7125 MHz to align with what we expect from some other countries. Eventually allowing access in 6425-7125 MHz would enable three 320 MHz channels, which we expect to be a key feature in the upcoming 802.11be standard. 320 MHz channels will not only substantially increase throughput, but will provide a wide variety of other benefits, such as improved location accuracy for on premises navigation and shopping. Noting that ETSI have already created a Systems Reference Doc TR 103 524 up to 6725 MHz and a Technical Report TR 103 631 up to 7125 MHz to support such work and given that the incumbents in the band are the same the CEPT studies already performed up to 6425 MHz could be leveraged to some extent.
Question 2: Do you have any comments on our technical analysis of coexistence in the 5925-6425 MHz band?	Broadcom agrees with Ofcom's conclusions and proposal to open access to the 6 GHz (5925-6425 MHz) band for licence-exempt indoor only Wi-Fi use with EIRP up to 250 mW and for VLP uses (both indoor and outdoor) with EIRP up to 25mW. Regarding the channel plan shown in Figure 4.1 we note that the IEEE 802.11ax standard's channel plan is still evolving and channels may have a start point of 5945 MHz to allow for global harmonization as other countries may encourage a 20 MHz guard band as a means of further protecting ITS systems, instead of requiring draconian emissions limits that would limit the utility of the channels operating adjacent to the ITS spectrum.

	It should be noted that a start point of 5945 MHz would require an emission easement at the 6425 MHz band edge, where there is no guard band proposed, to maximize usable spectrum for Wi-Fi.
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?	Broadcom agrees with the proposal to remove DFS requirements for indoor use (up to 200 mW) in the 5725-5850 MHz band to increase use of the band and reduce congestion in other channels. Allowing access in the 5725-5850 MHz band without DFS constraints at reasonable power levels will allow the UK to harmonize with other countries and regions that do not require DFS for these bands. This would also remove the additional and significant burden and cost required to create, tune and test new algorithms to detect both the EN 301 893 and EN 302 502 radar signatures for the channels that overlap both the 5470-5725MHz and 5725-5850MHz bands. This additional burden is specific to the UK only at this time and creates additional complications with software SKUs.
Question 4: Do you have any comments on other options that may be available for Wi-Fi and RLANs within the 5 GHz band?	Based upon the outcome of WRC-19 to amend the international Radio Regulations for RLAN in the 5150-5250MHz band to allow outdoor operations we encourage Ofcom to consider introducing higher power levels in this band. This is the only globally harmonized 5GHz band that allows non-DFS usage and is therefore particularly important for outdoor applications and use cases. WRC-19 agreed to increase regulations for Wi-Fi outdoor operation up to 1W EIRP and higher levels are being considered by some. Importantly, 4W EIRP outdoor limits have been in some country rules such as the

	US, with certain limitations such as antenna elevation masks, since 2014 and this form of mitigation has been successful in protecting satellites. Broadcom encourages Ofcom to adopt the maximum 4W EIRP outdoor rules that are proven in other countries.