Your response

Introduction

The GSMA thanks Ofcom for the opportunity to respond to its consultation on "Expanding access to the 6 GHz band for commercial mobile and Wi-Fi services". Mobile can deliver optimal public benefit in terms of socio-economic impact and efficiency of spectrum utilisation in the upper 6 GHz.

Mobile network traffic continues to grow year on year. European operators project that the urban mobile networks used by citizens and enterprises will reach saturation levels by 2030[1]. With current traffic growth projections, existing mobile spectrum will be needed to sustain 5G services and would not be available to launch 6G.

6G is being designed to operate with 200 MHz carriers, and provisioning less than 600 MHz for IMT in 6 GHz will prevent networks to operate efficiently and maximise service benefits. Without the full availability of the upper 6 GHz for mobile networks, any future 6G services in this band would be significantly curtailed.

The 6 GHz band at 6425-7125 MHz should be made available for licensed, full-power, macro-cell mobile services, without any additional constraints. The phased approach proposed as a potential option by Ofcom carries risks to the UK's opportunity to lead the 6G future. It may be recalled that, unlike some other EU countries, the UK released the 3.4-3.8 GHz band for 5G in a piecemeal fashion in auctions separated by 3 years and with fragmentation in operators' spectrum holdings. GSMAi analysis shows that today the UK lags behind some comparable countries in its 5G networks, as illustrated in the GSMAi Connectivity Index study published last year[2]. Availability of sufficient spectrum for future mobile capacity growth and introduction of 6G is important to support operator investments. Identifying the whole U6 GHz band for mobile networks would position UK well in the development of 6G and would benefit UK businesses and consumers.

For phase 1, where it is proposed that unlicensed Wi-Fi is introduced across the full band , there are concerns around the legacy equipment management. Once W-Fi equipment is introduced into the band, it becomes extremely difficult, if not impossible, to remove Wi-Fi transmissions from the range at a later date. There are currently no standards, regulatory and product requirements for this, and significant development and longer-term standardisation work would be required. It is not at all clear that sharing will be feasible or work effectively with the potential for a significant and detrimental impact on the user experience. It is also unclear how the Wi-Fi vendors, service providers, Ofcom and Government would enforce unlicensed Wi-Fi access points to cease transmissions in the upper 6 GHz band.

Similar to phase 1, in phase 2, where there is a prioritised band split with mobile access to (part of) the band in the future, the feasibility of removing Wi-Fi equipment remains difficult in the exclusive range for IMT, entirely risking the introduction of 6G in the UK.

The intention to allow each technology to opportunistically use (parts of) the upper 6 GHz spectrum on a shared basis, using some mechanism that has yet to be developed and standardised, is yet to be proven as feasible.

Analysis of indoor signal strength shows mid-bands delivering higher capacity indoors than low bands and a higher percentage of connections as a result of technological advances like massive

[1] See Connect Europe (former ETNO), GSMA, Telefónica and Vodafone Group responses to RSPG questionnaire on long-term vision for the upper 6 GHz band.
[2] https://media-assets-prod.gsmaintelligence.com/content/210224-The-State-of-5G-2024-compressed.pdf

MIMO. 6 GHz tests showed similar behaviour to 3.5 GHz, that currently carries 71% of the urban indoor mobile connectivity[3].

Even if any sharing solution were to be possible in principle, it appears to be highly unlikely that this would be timely implemented in all Wi-Fi equipment, along with the capability of stopping transmissions by legacy Wi-Fi equipment in the non-shared range.

Additionally, although we recognise Ofcom's understanding that full power is needed for the deployment of IMT in 6 GHz, the proposed BS EIRP value of 73 dBm/100 MHz is not sufficient to meet the needs of operators, while a value in excess of 80 dBm/100 MHz is required while still enabling protection of other radio services.

In summary, the proposal to allow unlicensed Wi-Fi in the upper 6 GHz band prior to the introduction of 6G mobile technology leads to avoidable self-induced downstream issues. These can be mitigated by adopting a balanced approach with unlicensed use in the lower 6 GHz band and IMT in the upper 6 GHz, thereby leveraging the benefits of both solutions.

Therefore, the GSMA kindly requests that Ofcom:

1. Takes a balanced approach with Wi-Fi usage in the lower 6 GHz band (5925-6425 MHz) and IMT in the upper 6 GHz (6425-7125 MHz).
2. Delays the decision on the upper 6 GHz until European harmonisation is a reality to avoid a UK-only approach.
3. Considers the spectrum capacity needs for 6G deployments with 200 MHz carriers and the opportunity for the UK's leadership.
4. Makes the full upper 6 GHz (6425-7125 MHz) available to full-power macrocell IMT, without any additional power restrictions or sharing mechanisms.

Question	Your response
Question 1: What interest do you have in deploying outdoor or standard power Wi-Fi or other licence exempt RLANs in the Lower 6 GHz band? Please provide details of the types of expected deployments.	N/A
Question 2: Are you interested in providing or developing AFC databases for use in the Lower 6 GHz band in the UK?	N/A
Question 3: Do you have any views on the operational considerations of setting up and running AFC databases?	N/A

[3] See Mobile Evolution in 6 GHz, GSMA, September 2024. https://www.gsma.com/connectivity-for-good/spectrum/wp-content/uploads/2024/09/GSMA_Mobile-Evolution-in-6-GHz.pdf

Question	Your response
Question 4: Do you have any views on how we should manage the approval process for AFC databases and, in particular, whether we should rely on parts of the FCC process rather than requiring the whole process to be re-run in the UK?	N/A
Question 5: Please provide any other comments on our proposals for extending access to standard power Wi-Fi and outdoor use, including the overall approach, any details on technical parameters and the running of the AFC databases in this band.	N/A
Question 6: Do you have any comments on our proposal to use a "phased" approach, or on the alternative to wait for European harmonisation?	The 6 GHz band at 6425-7125 MHz should be made available for licensed, full-power, macro-cell mobile services, without any additional constraints. The phased approach proposed by Ofcom carries risks to the UK's opportunity to lead the 6G future. On phase 1, if Wi-Fi is introduced in the full band imminently, our concerns revolve around the legacy equipment management. Once Wi-Fi equipment is introduced into the band, it becomes extremely difficult, if not impossible, to remove Wi-Fi transmissions from the range at a later date. There are currently no standards for this, and much development and long-term standardisation work would be required, while it may not be feasible or work effectively. Similar to phase 1, in phase 2, where there is a prioritised band split with mobile access to (part of) the band in the future, the feasibility of removing Wi-Fi equipment remains difficult in the exclusive range for IMT, entirely risking its implementation. The intention to allow each technology to opportunistically use (parts of) the upper 6 GHz spectrum on a shared basis, using some mechanism that has yet to be developed and standardised, is yet to be proven as feasible. Analysis of indoor signal strength shows mid-bands delivering higher capacity indoors than low bands and a higher percentage of connections as a result of technological advances like massive MIMO. 6 GHz tests

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	showed similar behaviour to 3.5 GHz, that currently carries 71% of the urban indoor mobile connectivity[4]. Even if any sharing solution were to be possible in principle, it appears to be highly unlikely that this would be timely implemented in all Wi-Fi equipment, along with the capability of stopping transmissions by legacy Wi-Fi equipment in the non-shared range. Therefore, the GSMA believes that the most appropriate and beneficial approach is to delay the decision on the upper 6 GHz until European harmonisation is a reality, while limiting the Wi-Fi usage to the lower 6 GHz band (5925-6425 MHz) in order to make the full upper 6 GHz (6425-7125 MHz) available to full-power macrocell IMT, without any additional power restrictions or sharing mechanisms at the right time.
Question 7: Do you have any comments on the above suggestion to manage any "legacy" Wi-Fi devices, or alternative suggestions?	Once W-Fi equipment is introduced into the band, it becomes extremely difficult, if not impossible, to remove Wi-Fi transmissions from the range at a later date. There are currently no standards for this, and much development and long-term standardisation work would be required, while it may not be feasible or work effectively. Similar to phase 1, in phase 2, where there is a prioritised band split with mobile access to (part of) the band in the future, the feasibility of removing Wi-Fi equipment remains difficult in the exclusive range for IMT, entirely risking its implementation. This issue should be considered before introducing large-scale Wi-Fi expansion in the full 1.2 GHz of 6 GHz spectrum. While the analysis from Ofcom for this consultation suggests that Wi-Fi equipment is typically refreshed every 5-7 years, we highlight that Wi-Fi 4 devices remain widely in use, indicating that upgrade cycles may vary. The GSMA has analysed the Wi-Fi generations and bands in use with the support from Ookla[5]. In London, numbers are still 17% on Wi-Fi 4 presence and 48% in Wi-Fi 5,

[4] See Mobile Evolution in 6 GHz, GSMA, September 2024. https://www.gsma.com/connectivity-for-good/spectrum/wp-content/uploads/2024/09/GSMA_Mobile-Evolution-in-6-GHz.pdf
[5] See Mobile Evolution in 6 GHz, GSMA, September 2024. https://www.gsma.com/connectivity-for-good/spectrum/wp-content/uploads/2024/09/GSMA_Mobile-Evolution-in-6-GHz.pdf

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	while the 6 GHz range is used only by 2% of the connections. This strongly suggests either prolonged refresh cycles and/or the continued sale and deployment of legacy equipment. The proposal to allow unlicensed Wi-Fi in the upper 6 GHz band prior to the introduction of 6G mobile technology leads to avoidable self-induced downstream issues. These can be mitigated by adopting a balanced approach with unlicensed use in the lower 6 GHz band and IMT in the upper 6 GHz, thereby leveraging the benefits of both solutions.
Question 8: Do you have a view on the amount of spectrum that should be prioritised for Wi-Fi under the prioritised spectrum split option? Please provide evidence for your view.	GSMA members are major providers of both Wi-Fi and mobile services. The GSMA supports making additional spectrum available for Wi-Fi and mobile, with a balanced approach with unlicensed use in the lower 6 GHz band and IMT in the upper 6 GHz. Wi-Fi 6 (and 7) using 2.4 GHz and 5 GHz bands is a standard commercial offering today, supporting throughputs up to 2.4 Gbps for a single device or up to 9.6 Gbps in total (i.e. it supports access to gigabit speed network already). However, as presented above in Question 7, Wi-Fi 4 continues to represent a significant percentage of connections. Technology upgrades for Wi-Fi equipment, not additional spectrum, are required. Wi-Fi capacity can be met through the use of the existing 2.4 GHz, 5 GHz, and lower 6 GHz ranges with the latest technology. Wi-Fi should therefore not be prioritised beyond the already available lower 6 GHz band (5925-6425 MHz). Further expansion of licence-exempt spectrum is unwarranted and would be inefficient use of the scarce resource that is spectrum.
Question 9: Do you have any comments on our plan for a "phase 1" when Wi-Fi will be introduced?	On phase 1, when Wi-Fi is introduced in the full band imminently, our concerns revolve around the legacy equipment management. Once W-Fi equipment is introduced into the band, it becomes extremely difficult, if not impossible, to remove Wi-Fi transmissions from the range at a later date. There are currently no standards for this, and much development and long-

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	term standardisation work would be required, while it may not be feasible or work effectively. Wi-Fi 6 (and 7) using 2.4 GHz and 5 GHz bands is a standard commercial offering today, supporting throughputs up to 2.4 Gbps for a single device or up to 9.6 Gbps in total (i.e. it supports access to gigabit speed network already). However, as presented above in Question 7, Wi-Fi 4 continues to represent a significant percentage of connections. Technology upgrades for Wi-Fi equipment, not additional spectrum, are required.
Question 10: One variation on "phase 1" would be to only authorise Wi-Fi in client devices to "seed" the market. Would you have any views on this, or suggestions for other variations?	Although licenced Wi-Fi solutions can mitigate part of the concerns presented in previous responses, any proposal to allow Wi-Fi in the upper 6 GHz band prior to the introduction of 6G mobile technology leads to avoidable self-induced downstream issues related to the risk of a continued presence of Wi-Fi transmissions at a later date. The GSMA suggests a firm decision that guarantees both services will deliver their full capabilities, with an excellent user experience, without the need to manage legacy equipment or depend on a yet not available possible sharing solution.
Question 11: Do you have any comments on our plan for a "phase 2" when mobile will be introduced?	The 6 GHz band already has a mobile allocation in the ITU Radio Regulations and WRC-23 has laid out the conditions for its use by IMT technologies globally, including the identification in Region 1. Several national regulators are now placing the band in their national frequency allocation tables and incorporating it into their spectrum planning processes. Hong Kong and the UAE have already licensed the band to MNOs, while vendors have started to receive orders for IMT equipment for the full upper 6 GHz, generating economies of scale. Regulatory developments in Brazil, China, India as well as other countries indicate that the Upper 6 GHz will become a global IMT band for 5G advanced and 6G and that the UK has the opportunity to leverage these global economies of scale for 6G leadership. This of course means that UK only solutions should be avoided. Additionally, successful trials have been conducted for the upper 6 GHz band by operators, while radio

Question	Your response
	component and network infrastructure providers have been trialling equipment for the past two years. Mobile networks are already densified, but 6 GHz can enable the growth of sustainable mobile capacity on existing macro-cell sites. Timely availability of 6 GHz, at reasonable conditions and price, will drive cost-efficient network deployment, help lower the broadband usage gap and support digital inclusion. Having that said, the use of the upper 6 GHz for mobile is the most appropriate future for the band and a full-power unrestricted use of the range is needed to deliver what is necessary for the introduction of 6G in the UK. Similar to phase 1, in phase 2, where there is a prioritised band split with mobile access to (part of) the band in the future, the feasibility of removing Wi-Fi equipment remains difficult in the exclusive range for IMT, entirely risking its implementation. The intention to allow each technology to opportunistically use (parts of) the upper 6 GHz spectrum on a shared basis, using some mechanism that has yet to be developed and standardised, is yet to be proven as feasible. Analysis of indoor signal strength shows mid-bands delivering higher capacity indoors than low bands and a higher percentage of connections as a result of technological advances like massive MIMO. 6 GHz tests showed similar behaviour to 3.5 GHz, that currently carries 71% of the urban indoor mobile connectivity[6]. Even if any sharing solution were to be possible in principle, it appears to be highly unlikely that this would be timely implemented in all Wi-Fi equipment, along with the capability of stopping transmissions by legacy Wi-Fi equipment in the non-shared range. Additionally, although we recognise Ofcom's understanding that full power is needed for the deployment of IMT in 6 GHz, the proposed BS EIRP value of 73 dBm/100 MHz is not sufficient to meet the needs of operators, while a value in excess of 80 dBm/100 MHz is required.

[6] See Mobile Evolution in 6 GHz, GSMA, September 2024. https://www.gsma.com/connectivity-for-good/spectrum/wp-content/uploads/2024/09/GSMA_Mobile-Evolution-in-6-GHz.pdf

Question	Your response
	Phase 2 - as planned - is not appropriate. There is a risk that mobile services will not be able to be introduced due to interference and the impossibility of clearing the band later, as no solutions have been demonstrated and proven to make sharing viable. Therefore, the GSMA believes that the most appropriate and beneficial approach is to delay the decision on the upper 6 GHz until European harmonisation is a reality, while limiting the Wi-Fi usage to the lower 6 GHz band (5925-6425 MHz) in order to make the full upper 6 GHz (6425-7125 MHz) available to full-power macrocell IMT, without any additional power restrictions or sharing mechanisms at the right time.
Question 12: Do you have a view on the amount of spectrum that should be prioritised for mobile under the prioritised spectrum split option? Please provide evidence for your view.	Mobile network traffic continues to grow year on year. European operators project that the urban mobile networks used by citizens and enterprises will reach saturation levels by 2030. With current traffic growth projections, existing mobile spectrum will be needed to sustain 5G services and would not be available to launch 6G. 6G is being designed to operate with at least 200 MHz carriers, and provisioning less than 600 MHz for IMT in 6 GHz will prevent networks to operate efficiently and maximise service benefits. Without the full availability of the upper 6 GHz for mobile networks, any future 6G services in this band would be significantly curtailed. The 6 GHz band at 6425-7125 MHz should be made available for licensed, full-power, macro-cell mobile services, without any additional constraints. The phased approach proposed by Ofcom carries risks to the UK's opportunity to lead the 6G future. Additionally, as mentioned above, the 6 GHz band already has a mobile allocation in the ITU Radio Regulations and WRC-23 has laid out the conditions for its use by IMT technologies globally, including the identification in Region 1. Several national regulators are now placing the band in their national frequency allocation tables and incorporating it into their spectrum planning processes. Hong Kong and the UAE have already licensed the band to MNOs, while vendors have started to receive orders for IMT equipment for the full upper 6 GHz, generating economies of scale.

Question	Your response
Question 13: Do you have any evidence or views about the geographical extent of mobile networks' likely deployment in Upper 6 GHz?	While 5G and 6G can and will be deployed across a variety of spectrum resources from sub-1 GHz to mmWave bands, mid-band frequencies in the 1-7 GHz range are especially crucial as these offer the capacity and city-wide coverage to enable mobile networks to offer reliable performance. Analysis of indoor signal strength shows mid-bands delivering higher capacity indoors than low bands and a higher percentage of connections. This can be the result of technological advances applied to upper mid-bands like massive MIMO and beamforming that significantly improves the bands performance. This is expected to be valid not just for 5G but also for 6G. The upper 6 GHz band also performed comparably to 3.5 GHz on tests done in real environments confirming the above results. As an example, in Germany, indoor coverage was tested at 200 meters distance from the site obtaining download speeds of 1.7 Gbps, with a measured building entry loss of 25 dB even for thermally active windows. Peak download speeds of 3 Gbps were achieved using just a 100 MHz bandwidth. Even at the outdoor cell edge, 500 meters away from the roof-top site, 0.5 Gbps were obtained with a stable uplink signal in the same band. Throughout the cell coverage the averaged download speed outdoor was almost 2 Gbps. 3.5 GHz is used heavily for provision of mobile connectivity indoors as well as outdoors, and 6 GHz is expected to be as well. Overall, the trial showed the viability of upper 6 GHz for macro rollout, indoor service provision and coverage equivalence to 3.5 GHz. Initial expectations for 6G deployment in the upper 6 GHz range is to overlay it on the existing 3.5 GHz grid, primarily targeting urban and suburban areas. Additionally, campuses, science parks, distribution centres, factories, etc., will benefit from this deployment outside or inside those perimeters.
Question 14: Do you have any comments on our proposed phased approach to authorisation of both Wi-Fi and mobile in the Upper 6 GHz band?	See response to Question 11 The GSMA believes that the most appropriate and beneficial approach is to delay the decision on the upper 6 GHz until European harmonisation is a reality, while limiting the Wi-Fi usage to the lower 6 GHz band (5925-6425 MHz) in order to make the full upper 6 GHz (6425-7125 MHz) available to full-power macrocell IMT,

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	without any additional power restrictions or sharing mechanisms at the right time.
Question 15: Do you have any comments on our proposal to not include very low power portable devices in the Upper 6 GHz band at this stage, but to keep this under review?	See response to Question 6. The GSMA believes that the most appropriate and beneficial approach is to delay the decision on the upper 6 GHz until European harmonisation is a reality, while limiting the Wi-Fi usage to the lower 6 GHz band (5925-6425 MHz) in order to make the full upper 6 GHz (6425-7125 MHz) available to full-power macrocell IMT, without any additional power restrictions or sharing mechanisms at the right time.
Question 16: Do you have any comments on our proposal to authorise the use of low-power indoor Wi-Fi access points and client devices to use 6425-7125 MHz?	See response to Question 10. The GSMA suggests a firm decision that guarantees both services will deliver their full capabilities, without the need to manage legacy equipment or depend on a yet not available possible sharing solution.
Question 17: Do you have any comments on the proposed technical conditions?	See responses to Question 6 and 11.
Question 18: Do you have any comments on the proposed VNS draft?	N/A
Question 19: Do you have any suggestions for an appropriate mechanism for enhanced sensing, or comments on the proposed solution above?	N/A
Question 20: Do you agree with our proposal to restrict Wi-Fi from transmitting in the 6650-6675.2 MHz band to protect the radio astronomy service? Please provide any technical evidence to support your view.	N/A
Question 21: Do you agree with our assessment of Wi-Fi coexistence with existing users of the band? If not, please provide details.	N/A

Question	Your response
Question 22: Do you have any evidence about the costs to operators of moving fixed links in and around "high density" areas (such as urban centres) to other bands?	N/A
Question 23: Do you have any comments on our initial assessment of our likely approach to coexistence between future mobile use and current users in the Upper 6 GHz band?	N/A
Question 24: Do you have any other comments on our policy proposals or any of the issues raised in this document?	The proposal to allow unlicensed Wi-Fi in the upper 6 GHz band prior to the introduction of 6G mobile technology leads to avoidable self-induced downstream issues. These can be mitigated by adopting a balanced approach with unlicensed use in the lower 6 GHz band and IMT in the upper 6 GHz, thereby leveraging the benefits of both solutions. The phased approach proposed by Ofcom carries risks to the UK's opportunity to lead the 6G future. Therefore, the GSMA kindly requests that Ofcom: 1. Takes a balanced approach with Wi-Fi usage in the lower 6 GHz band (5925-6425 MHz) and IMT in the upper 6 GHz (6425-7125 MHz). 2. Delays the decision on the upper 6 GHz until European harmonisation is a reality and to avoid a UK-only approach. 3. Considers the spectrum capacity needs for 6G deployments with 200 MHz carriers and the opportunity for the UK's leadership. Makes the full upper 6 GHz (6425-7125 MHz) available to full-power macrocell IMT, without any additional power restrictions or sharing mechanisms.