Non-Confidential

Enabling sharing in the upper 6 GHz band

Shared licences for local, low-power indoor use of the upper 6 GHz band (6425 – 7070 MHz)

BT's response to the consultation published on 28 February 2022

Issue: v1.0

Date: 11 April 2022

Executive summary

1. BT does not support Ofcom's proposals to open the U6 GHz band for *licensed indoor* Wi-Fi applications, or other technologies that the technology neutral approach may allow, by adding this band to Ofcom's existing shared access licence framework.
2. The U6 GHz band is an important candidate band for future mobile services that is being considered for international harmonisation at the upcoming ITU World Radiocommunication Conference in 2023 (WRC-23) and is important mid-band spectrum that would support much needed additional capacity for public mobile networks in the next few years.
3. BT considers the current consultation proposals to be contrary to the specific requests of UK industry stakeholders for access to the U6 GHz band for future mobile services as well as the alternative option of licence-exempt use that some other industry players have advocated.
4. It is unclear what is the extent of demand for what Ofcom proposes and why, if there is demand, it cannot already be supported in the existing licence-exempt L6 GHz band that was recently made available? This recently opened L6 GHz band has quite similar technical conditions to the U6 GHz band in terms of available channel bandwidths and power levels and is lightly used. In all there is already well over 1GHz of spectrum available for Wi-Fi in the 2.4GHz, 5GHz and L6GHz bands. The addition of U6GHz would represent nearly 50% further increase and far exceeds the amount of spectrum available for public mobile networks.
5. BT is particularly concerned that the proposals are a distraction to the ongoing consideration of the possible international harmonisation of the band for licensed mobile use for mobile services that is underway in CEPT and ITU in preparation for decisions at the ITU WRC-23. We believe that 5G mobile would be the most efficient future use of the band and is something that Ofcom should actively support and pursue.
6. We do not agree that the sharing situation with respect to other services, particularly satellite services, is the same in the U6 GHz band as in the L6 GHz band and that similar technical constraints would need to apply to the U6 GHz band. In any case, in addition to the technical considerations of sharing and consideration of protection of existing services, the relative economic benefit of the alternative uses of the band should be considered before reaching any final policy conclusions.
7. Ofcom says that the proposals do not preclude a later decision to make the U6 GHz band available for either licence-exempt use or for licensed 5G mobile use, but that it might be necessary to revoke licences for indoor use that it may have issued if it is ultimately decided to make the band available for higher power mobile use. This could be true in theory, but in practice could be problematic as well as unnecessary if such indoor applications can be accommodated under the existing licence-exemption regime, e.g., in the L6 GHz band.
8. Ofcom's stated reason for its proposal for licensing indoor Wi-Fi use in U6 GHz is because of the possibility that it may later have to remove these systems if they were incompatible with a future decision to make the band available for 5G mobile. We agree that licensing would otherwise be unnecessary for the indoor Wi-Fi application that Ofcom proposes to enable in the U6 GHz: this further supports our view that the L6 GHz band is sufficient for such applications, if there is demand for those.
9. Finally, the existing sharing framework would benefit from improvements before adding further frequency bands, for example automating and speeding up issue of licences and modifying the available power limits. We would argue that it would be better to expend resources on that and to allow the nascent ecosystem at 3.8 - 4.2 GHz to develop, rather than seeking to expand the scope of the new spectrum sharing framework at this time.

1 Introduction

We are pleased to provide our views on Ofcom's proposals[1] for authorising use of indoor Wi-Fi in the U6 GHz band for industrial and other applications.

The future use of this band has been extensively discussed within industry and with regulators. It is a high priority issue for the UK at the forthcoming ITU WRC-23 conference where under the conference agenda item 1.2 the possible identification of the band for IMT within the mobile service is to be decided. BT is supportive of that initiative, which it considers to be preferable to the other alternative requested by some parties of making the band licence-exempt and suitable for Wi-Fi. We understand that Ofcom will consult separately on this ITU WRC-23 issue and we will provide our views on that in due course.

Given our interest in the U6 GHz band for future capacity provision in our national mobile network, and our support for the identification of the U6 GHz band for IMT under the WRC-23 agenda item, we have a strong interest in Ofcom's present consultation proposals. We elaborate on why we believe U6 GHz is important for mobile use in **Section 2**.

We set out our views in more detail in our responses to the consultation questions in **section 3** and in **section 4** discuss the next steps that we believe Ofcom should take in developing its policy for this spectrum band.

2 Future options for U6 GHz spectrum

Need for additional mid-band licensed spectrum for mobile networks

The U6 GHz band is widely seen as the only realistic option for identifying additional mid-band licensed spectrum suitable for use by national mobile networks. This is needed to meet the growing demand for additional capacity on these networks in areas where existing spectrum resources are fully deployed, and it is not feasible to deliver additional capacity with the additional smaller cells and technology upgrades alone.

The GSMA[2] has estimated future spectrum demand in the 2025-2030 timeframe at mid-band (i.e., bands in the range 1500-7125 MHz) in 36 examined cities worldwide where population density exceeds 8,000 per km^2. These estimates show total requirements of between 1260 MHz and 3690MHz, and an average of 2020 MHz. This compares to the current 927 MHz of mid-band spectrum assigned on a national basis to public mobile network operators in the UK. The estimated spectrum requirements would allow 5G to deliver a user-experienced mobile data rate of 100 Mbps in the downlink and 50Mbps in the uplink. The exact requirement varies depending on factors such as the population density, extent of 5G take-up and off-load to high bands.

Spectrum availability for WiFi

We recognise that 1152 MHz of spectrum is already held by MNOs in bands below 3.8 GHz for provision of national mobile networks. We recognise that this is a substantial quantity of spectrum, but note that low power Wi-Fi, for which frequencies can be re-used within shorter distances than is possible with higher power mobile networks, already has access to a similar amount of licence-exempt spectrum, much of it unused in most places as it was only recently made available.

[1] https://www.ofcom.org.uk/__data/assets/pdf_file/0022/233194/spectrum-sharing-6ghz.pdf
[2] https://www.gsma.com/spectrum/wp-content/uploads/2021/07/Estimating-Mid-Band-Spectrum-Needs.pdf

Ofcom is now proposing to make an additional 645 MHz available for *licensed* Wi-Fi, representing nearly 60% more spectrum for low power WiFi systems than is available for public networks today. This is in addition to other licence-exempt spectrum in bands such as 60 GHz.

We accept that making more spectrum for WiFi would in the longer-term bring benefits, such as increased throughput in some places where there is a high density of WiFi networks in very close proximity, operating in the same band / channels and each simultaneously carrying very high throughput of traffic, although such scenarios may be rare. In any case it would be important to demonstrate that the net benefits of making the spectrum available for low power WiFi are greater than if the spectrum were licensed for higher power mobile networks use.

Future options

We do not agree that the benefits of making the U6 GHz band available for Wi-Fi are greater than making it available for other higher power mobile networks. We do not favour Ofcom's proposals to facilitate indoor *licenced* Wi-Fi in the U6 GHz band and believe Ofcom should instead prioritise looking at the possibilities to make U6 GHz available for licenced mobile use and support action at the ITU WRC-23 to facilitate this.

The balance of national licences, local licences and licence-exempt (WiFi) mobile spectrum if Ofcom implements its current proposals can be seen in the Figure 1 below.

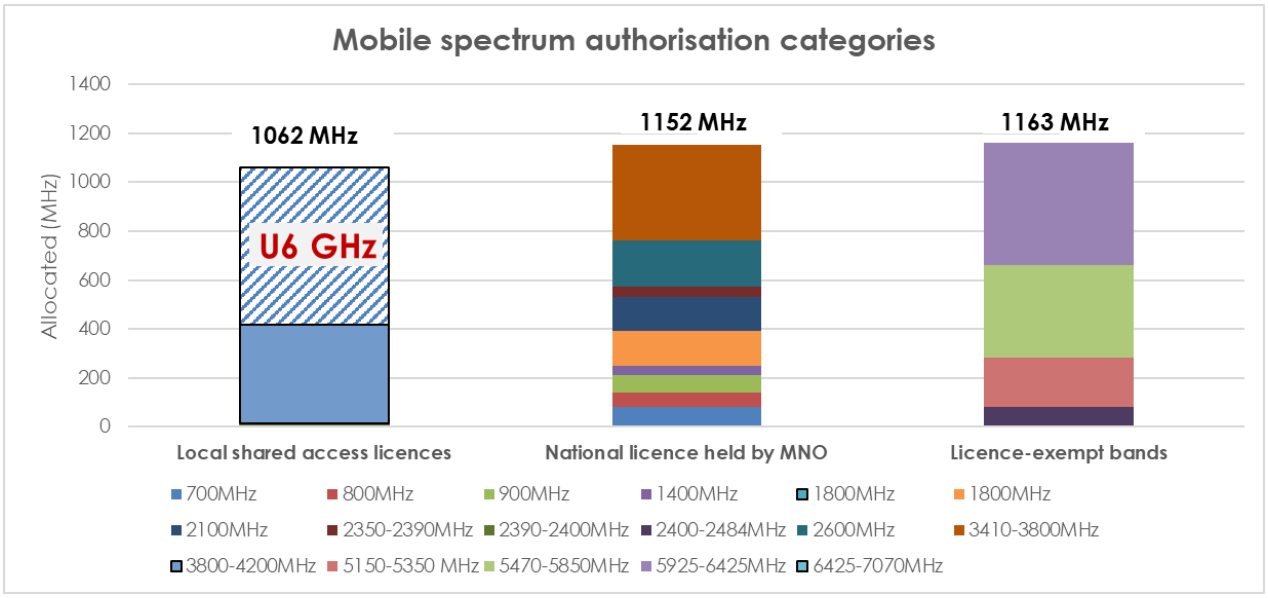


Figure 1: Analysis of authorisation methods for mobile spectrum under Ofcom's proposals

We don't agree that making about a third of the mobile spectrum below 7GHz available for shared access local licences is appropriate, given the current low levels of use of the spectrum already reserved for that purpose. When compared to the c. 100m mobile devices supported over the 4 national mobile networks that would have access to a similar amount of spectrum, and where traffic demand projections show that more spectrum is needed to meet the needs of consumers, this proposal does not seem appropriate. The proposal also would represent 26% of all sub-7GHz spectrum being available for either licensed WiFi or licence-exempt WiFi.

We recommend that a further analysis of the benefits should be undertaken before assigning more spectrum to Ofcom's spectrum sharing framework (or licence-exempt use).

Only If a positive outcome from the WRC-23 agenda item 1.2 were not achieved, in terms of harmonising the band so that it is suitable for public mobile networks use and assigning it for this

purpose in the UK with workable sharing conditions, licence-exemption on a technology neutral basis should be considered.

3 Responses to the consultation questions

Question 1: Do you agree with our proposals to add the 6425-7070 MHz band to the Shared Access framework?

No, we do not agree with the proposal to add 6425 – 7070 MHz to the Shared Access framework.

Ofcom should take its decision on future use of the U6 GHz band only after the ITU-R WRC-23 Agenda Item 1.2 outcome is decided. In the meantime, Ofcom should work to secure a positive outcome of that agenda item by supporting the allocation to mobile and identification for IMT. It should pursue harmonised technical conditions for Europe that will maximise the economic benefits that can be derived from use of that spectrum band for 5G mobile (and future evolutions).

BT considers the consultation proposal to be contrary to the specific requests of industry for both of the well debated alternative options of either licence-exempt use or licensed 5G use. It is unclear to us to what extent there is demand for what Ofcom has proposed and why, if there is such demand, it cannot already be supported in the existing licence-exempt L6 GHz band that was recently made available since 2020. That band has quite similar technical conditions in terms of available channel bandwidths and power levels and is lightly used at present.

BT is particularly concerned that the proposals are a distraction to the ongoing consideration of the possible international harmonisation of the band for licensed mobile use for IMT that is underway in CEPT and ITU. We believe that this would be the most efficient future use of the band and is something that Ofcom should actively support and pursue.

Ofcom says that the proposals do not preclude a later decision to make the U6 GHz band available for either licence-exempt use or for licensed 5G mobile use, noting that it might be necessary to revoke licences for indoor use that it may have issued if it is ultimately decided to make the band available for licences higher power mobile use. This could be true in theory but in practice could be problematic as well as unnecessary if such indoor applications could have been accommodated under the existing licence-exemption regime.

Ofcom's stated reason for its proposal for licencing indoor Wi-Fi use in U6 GHz is because of the possibility that it may later have to remove these systems if they were incompatible with a future decision to make the band available for 5G mobile. We agree that licensing would otherwise be unnecessary for the indoor Wi-Fi application that Ofcom proposes to enable in the U6 GHz; this further supports our argument that the L6 GHz band is sufficient for such applications if there is demand for those.

Finally, the existing UK spectrum sharing framework would benefit from improvements before adding further frequency bands, for example automating and speeding up issue of licences and modifying the available power limits. We would argue that it would be better to expend resources on that rather than seeking to expand the scope of the spectrum sharing framework at this time. It would also allow the nascent ecosystem in 3.8 – 4.2 GHz to develop rather than risk dilution of efforts to build this by introducing more spectrum bands to the sharing framework at this time.

Question 2: Do you have any comments on potential uses for this licence?

Given the cost of up to £320 per annum we don't see this licence as relevant to consumers and a mass market. We are unclear of the demand for the licensed use of U6 GHz for indoor industrial Wi-Fi given that equivalent licence-exempt spectrum is already available for such applications?

Question 3: Do you have any comments on our proposed licence conditions, licence fee or minimum separation distance?

We agree that Ofcom should recover its costs for managing the U6 GHz spectrum if it were to proceed with its proposals.

We have no comments on the proposed technical licence conditions.

As regards the coordination arrangements, we note that the licence will authorise use of any of the U6 GHz band rather than specific channels within it and that Ofcom will require a minimum separation of 100m between the centre points of any two 50m radius areas assigned to different operators. This means that in theory two operators could have near co-located access points if they are each at the edge of their respective areas. This is a similar scenario as to what could occur in licence-exempt Wi-Fi use, so has limited advantage. We do, however, agree with Ofcom that interference would be low risk and could be mitigated by the Wi-Fi protocols.

Question 4: Do you have any comments on our technical analysis?

We do not agree that the sharing situation with respect to other services, particularly satellite services, is the same as in the L6 GHz band and that similar technical constraints would need to apply to the U6 GHz band.

We accept that the currently proposed technical constraints for licensed indoor Wi-Fi (or other) systems that Ofcom proposes don't present unacceptable risk of interference to other services.

When considering future licensed mobile 5G use of the band we would emphasize that the present constraints Ofcom is proposing to apply are not appropriate. In any case, in addition to the technical considerations of sharing and consideration of protection of existing services, the relative economic benefit of the alternative uses of the band should be considered before reaching any final policy conclusions on the future use of the U6 GHz band.

We have looked at the protection of existing services in the band in the context of what the band is being used for in the UK at present, considering fixed service and fixed satellite-service deployments as recorded in Ofcom's online Wireless Telegraphy Register (WTR). Our views are set out below.

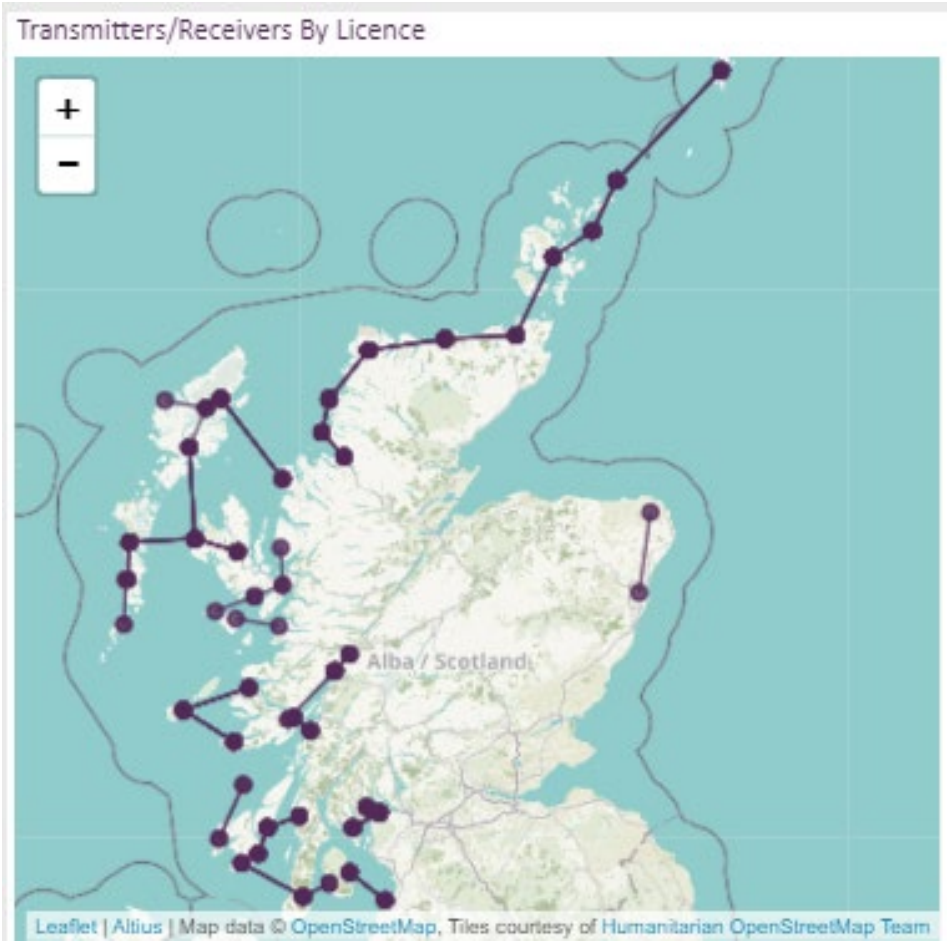
Sharing with fixed links

According to Ofcom's online Wireless Telegraphy Register there are 980[3] fixed link transmitters operating in the U6 GHz band. Of these more than half (*c.* 500 transmitters, or *c.*250 bi-directional links) are operated by BT. Most of these BT links are in fact multi-frequency hops and cover less than 100 unique paths.

We note most of the U6 GHz links are in more rural areas or outside the UK mainland, which should simplify sharing with future mobile applications away from these areas. In BT's case the U6 GHz links

[3] After correcting for apparent duplicate entries in the WTR of BT's licence no.1014784

are almost entirely in Scotland and mainly in very remote areas, as illustrated in the screenshot from Ofcom's Spectrum Information System.



Source: Ofcom Spectrum Information Portal

Figure 1: BT U6 GHz fixed links in Scotland

Unlike the BT links, the links operated by other companies are generally single channel links individually occupying just a small fraction of the U6 GHz band and so coordination with high power mobile might be feasible if they are required in the long-term.

An analysis of the Ofcom U6 GHz fixed links licences shows that depending on the size of the frequency blocks that is considered for future national mobile networks use, the number of fixed links that would need to be considered in a co-frequency coordination varies.

In the case of national 100 MHz spectrum blocks between c. 80 and 140 links may be relevant, as illustrated in Figure 2.

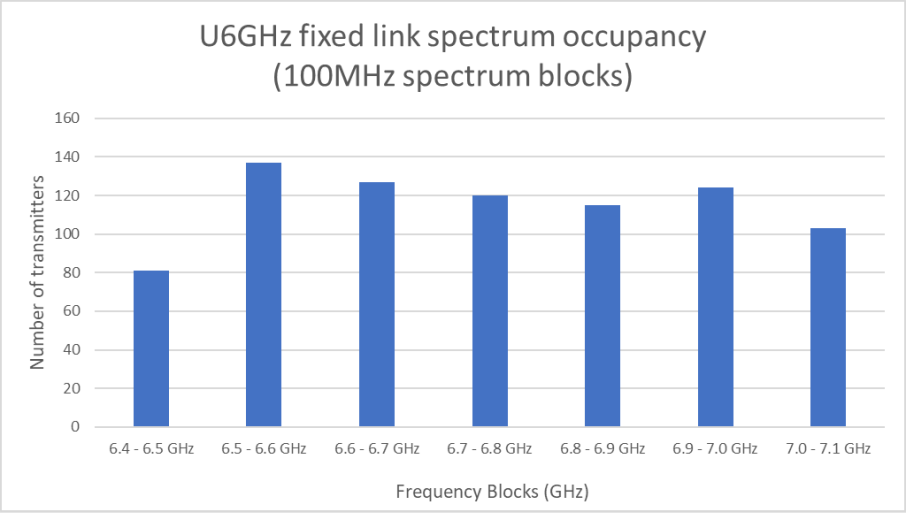


Figure 2: Frequency utilisation of fixed links operating in the U6 GHz band (100 MHz intervals)

At a more granular level the number of co-channel links that would need to be coordinated with mobile use reduces. When considering national 20 MHz spectrum blocks, c. 40 - 100 fixed links would be relevant for co-frequency coordination assessments, as illustrated in Figure 3.

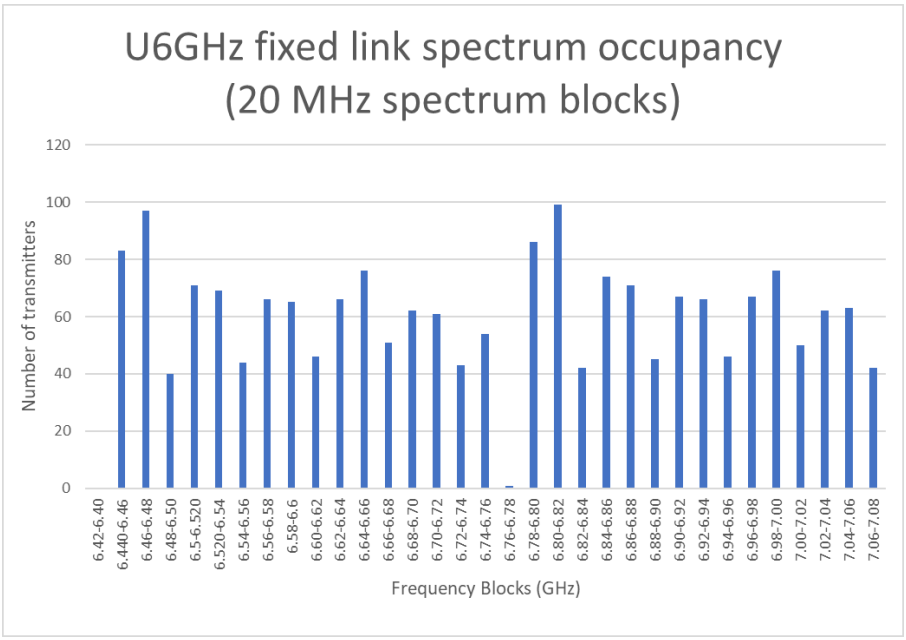


Figure 3: Frequency utilisation of fixed links operating in the U6 GHz band 20 MHz intervals)

In summary, we agree with Ofcom's analysis that the risks of interference to fixed links for indoor Wi-Fi would be low. However, we also consider that sharing with future licensed mobile networks would be feasible in the future, operating at far higher power levels, with suitable co-ordination and mitigation techniques.

Sharing with fixed satellite services

We note Ofcom's statement that "FSS operation in the upper 6 GHz band (6425 - 7075 MHz) is very similar to operation in the lower 6 GHz band (5925 - 6425 MHz) and we believe the assumptions and analysis presented in ECC Report 302 for the lower band can equally be applied to sharing in the upper 6 GHz band."

BT does not fully agree with this statement and believes it is important to carefully look at actual satellite use in the U6 GHz band and weigh the benefits of that use compared to potential alternative uses in arriving at the solution for the U6 GHz band that generates the greatest (economic) efficiency or how the U6 GHz spectrum is used. This will be important in Ofcom's work in relation to possible support for internationally harmonised use of the band for licensed 5G. We note that the U6 GHz embraces the ITU Radio regulations Appendix 30B planned satellite band and that some downlink frequencies that it would naturally be paired with are not available for satellite use as they are already used for mobile, which may be a reason for the limited use of the U6 GHz satellite uplink frequencies. We note that studies in ITU-R are ongoing, but the indications to date are positive in terms of feasibility of sharing between mobile networks and satellite uplinks[4].

According to Ofcom's published Wireless Telegraphy Register[5], the use of fixed satellite service in the in U6 GHz (6425 – 7075 MHz) band in the UK is very limited: there is only one site and just a small fraction of the U6 GHz band is used.

It appears that the U6 GHz is only used for fixed satellite-service uplink transmissions in the UK from a location in Cornwall. The transmissions comprise 30MHz (centred on 6,660 MHz) and 10 MHz (centred on each of 7026.5 MHz, 7,030 MHz and 7034 MHz). This covers just 47.5 MHz out of 650 MHz, i.e., 7% of the U6 GHz band.

BT recognises that interference to satellite uplinks is an international matter and other parts of the fixed-satellite service uplink band that are not in use from the UK may still need to be protected from interference from UK. However, our point is that a careful analysis of *actual* satellite use is important to understand the sharing possibilities, whether coordination is feasible, and to assess the economic benefits of various alternative uses of the band if sharing were not considered feasible.

4 Suggested way forward

Ofcom should not proceed to implement its consultation proposals for local shared access licences that would enable immediate use of the band for indoor Wi-Fi. Ofcom should instead pause the process while it formulates its position on the ITU WRC-23 Agenda Item 1.2, where the U6 GHz band is being considered for mobile / IMT. Ofcom already plans a consultation on the WRC-23 positions and that should form an important input to Ofcom's decision process on how the U6 GHz band may in future be used.

[4] For example, see the current working document in the ITU-R WP5D Group at https://www.itu.int/dms_ties/itu-r/md/19/wp5d/c/R19-WP5D-C-1078!H4-N4.16!MSW-E.docx

[5] https://static.ofcom.org.uk/static/radiolicensing/html/register/WTR.csv


BT