Request for variation of licence 1295901 issued to UK Broadband Limited for the use of 3925-4009MHz

Non-confidential

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Executive Summary.

Making the licence variation request will allow consumers to reap the benefits of cheaper and faster fixed wireless access services.

UK Broadband Limited ("UKB"), which was acquired by Hutchison 3G UK Limited ("3UK") in 2017, holds a spectrum licence authorising it to use the 3925 – 4009 MHz frequency range. UKB is seeking permission to vary Schedule 1 of the 3.9GHz licence. The variations will align the technical conditions of the 3.9GHz licence with UKB's 3.6GHz holding but keeping the same power level as existing 3.9GHz licence.

Following the variation, 3UK will hold 84MHz of contiguous spectrum in the band to improve and expand its Fixed Wireless Access (FWA) service in the UK. The licence variation would allow 3UK to deploy 5G and Adaptive Antenna System (AAS).

The proposed licence variation will enhance capacity of 3UK's 5G FWA service and enable high-speed connectivity– directly benefiting 3UK's customers and increasing competition in the fixed broadband market.

The variation would therefore benefit UK consumers by encouraging innovation, investment, and the availability and use of high-speed data services throughout the UK; and improve choice, price, quality of service and value for money for consumers.

For the reasons set out in this document, we consider that granting the variation requested meets Ofcom's duties to further interests of citizens and consumers and to promote the efficient management and use of the spectrum.

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1. Background

Executive Summary

This section describes the regulatory position of the 3.8-4.2 GHz frequency band, part of which UKB is licensed to use, as well as the key features of UKB's licence and history of past variations.

3.8-4.2GHz band – International and UK regulatory position

In ITU Region 1, which includes Europe, the 3.6GHz to 4.2GHz band is allocated to the Fixed Satellite and Fixed services on a primary basis, and to the Mobile Service on a secondary basis. There is no EU harmonisation legislation governing the 3.8GHz to 4.2GHz band.

The European Commission mandated CEPT to study harmonisation of the 3.8-4.2 GHz band for low and medium power applications on a local basis. In the UK, Ofcom introduced a new licensing approach to provide localised access to a number of spectrum bands supporting mobile technology. This made spectrum in the 3.8-4.2 GHz, 1800 MHz, 2300 MHz and 24.25-26.5 GHz (for indoor-only deployment) bands available through local licenses (Shared Access licenses).

New users can apply to Ofcom for coordinated access to these bands in specific locations on a first-come-first-served basis.¹ In the UK, the 3.8-4.2 GHz band is mainly used by Shared Access licensees, satellite earth station, point-to-point fixed links, private network providers and fixed wireless access (FWA) provided by 3UK.

Ofcom has stated in its Evolution of Shared Access Licence Framework consultation that the popularity of the 3.8-4.2 GHz band reflects its suitability for a range of newer 5G use cases, with a developing 5G ecosystem and significant bandwidths available.² However, with the current licence conditions, obtaining 5G equipment is currently difficult.

UKB's 3.9 GHz licence

UKB holds a Wireless Telegraphy Act licence to use the frequencies 3925-4009 MHz³ (the "3.9 GHz Licence"). The 3.9 GHz licence is indefinite in duration, continuing in force until revoked by Ofcom in accordance with the licence provisions or otherwise until surrendered by the licensee. The rights and obligations under the 3.9 GHz licence can be leased.

Statement: Supporting the UK's wireless future (ofcom.org.uk)

 ² Evolution of the Shared Access Licence Framework (of com.org.uk)
³ Licence no. 1295901 issues on 1st November 2022 as a replacement for the licence issues to 3UK on 18th May 2021.

UKB is the latest in a long succession of companies to have held the 3.9GHz licence since it was initially granted in 1992 by the Radiocommunications Agency to Millicom. The licence originally gave access to 2 x 84MHz of spectrum at 3605-3689 MHz and 3925-4009 MHz for use in FDD form and was subsequently partitioned into two separate licences as part of Ofcom's decision to vary UKB's spectrum access licence for 3.6 GHz spectrum.

The licence was traded several times during the 1990s, eventually to a company called GX Networks. In 2003, Pipex Communications (which subsequently changed its name to Freedom4) acquired GX Networks. Freedom4 then sold the licence to UKB in 2010.

Past Licence variations

In 2004, when the licence was owned by Pipex, it went through its first variation. This allowed the liberalisation of multiplexing previously restricted to FDD. The main justification was to allow Pipex to develop WiMAX for broadband wireless access.

In 2009, the licence was further varied to allow higher base station power, the use of mobile terminals, and the non-coordination of terminals with emission power lower than 25dBm ("the 2009 variation"). Again, the variation was permitted after consultation to allow Freedom4 (Pipex was rebranded as Freedom4 by now) to develop its WiMAX proposition.

In 2010, UKB bought the licence from Freedom4 (Daisy Group) as it considered the larger channel width requirements for 4G to complement its existing 2x20MHz holding in the 3.4GHz band. Whilst UKB had been deploying WiMAX to that point, lack of device support in the future was one of the reasons it had started turning to LTE for its continued fixed wireless access rollout.

After the 3UK acquisition of UKB in 2017, the licence was varied for a third time in 2018. 3UK requested:

- A shift in holding of the lower band from 3605-3689MHz to 3600-3680MHz, allowing for a 4MHz loss to facilitate the shift.
- Provision of new technical conditions to allow 5G to be used in the band.
- No change in the upper frequency band (3925-4009MHz).

2. 3UK's variation request

Executive summary

UKB is seeking to vary Schedule 1 of the 3.9GHz licence. The variations will align the technical conditions of the 3.9GHz licence with UKB's 3.6GHz holding but keeping the same power level as existing 3.9GHz licence. UKB is asking Ofcom to vary the 3.9GHz licence as follows:

- Align format of the "Maximum power within the permitted frequency blocks" with UKB's 3.6GHz licence but keeping same power level as existing 3.9GHz licence. (the First Element)
- Align the "Maximum power of base stations outside the permitted frequency blocks" with UKB's 3.6 GHz licence. (the "Second Element");

Rationale for the request

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Figure 1: [X]

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Source: 3UK

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3UK plans to offload 5G FWA traffic from 3.4-3.8 GHz to dedicated 3.9 GHz. As explained in greater detail in Section 3, [\gg]. Moreover, this will

enable 3UK to provide a high-speed 5G FWA service for UK consumers, bringing new network competition to the fixed line incumbents (BT and VMO2) in many areas of the UK that currently have little or no choice of fixed broadband provider.

Due to the existing licence conditions in the 3.9 GHz spectrum, 3UK faces limitations in deploying 5G and Adaptive Antenna Systems (AAS). The current conditions include an outdated and restrictive emissions mask, preventing 3UK from utilising standard equipment for any 5G deployment. Furthermore, the current licence lacks specific AAS conditions for base station maximum power and out-of-band emissions masks. Without these AAS conditions, 3UK will be unable to deploy Massive MIMO.

Proposed licence variation request

The First Element: Maximum power within the Permitted Frequency Blocks

UKB requests that Ofcom deletes paragraph 6 of Schedule 1 to the existing 3.9GHz Licence and replace them with the format of paragraph 8 of UKB's 3.6GHz Licence but expressed with the below power level.

Radio Equipment	Maximum mean power	
Non-AAS base station	60 dBm/5 MHz EIRP per cell (53	
	dBm/MHz)	
AAS base station	39 dBm/5 MHz TRP per cell	
Mobile or nomadic terminal station	28 dBm TRP	
Fixed or installed terminal station	35 dBm/5 MHz EIRP	

UKB is not requesting to increase the power level but keep the same power level as existing 3.9GHz but also add power limit conditions for AAS base station which is expressed in TRP (Total Radiated Power).

The Second Element: Maximum power of base stations outside the Permitted Frequency Blocks

UKB requests Ofcom delete paragraph 7 of Schedule 1 of the existing 3.9GHz Licence and replace them with paragraphs 9, 10, 11, 12 and 13 of the 3.6GHz Licence. This would allow for more standard equipment to be used, in line with other 5G licences (AAS) and Shared Access licences (Non-AAS).

The proposed changes would require an update to the interface requirement (introduce TRP/AAS conditions in IR2015), introduce AAS

conditions expressed in TRP for base station max power within permitted frequency block and outside permitted frequency block and introduce specific transmission masks.

Making these changes would make the 3.9GHz Licence consistent with the requirements of the 2018 decision⁴ and align it with the 3.6GHz Licence, facilitating the use of the 3.9GHz spectrum for 5G technology and Massive MIMO.

⁴ <u>Statement-UK</u>-Broadbands-spectrum-access-licence-3.6-GHz.pdf (ofcom.org.uk)

3. Assessment of the proposed variation

Executive Summary

We consider that the proposed 3.9GHz licence variation meets Ofcom's duties to further the interests of citizens and consumers, to secure optimal use of the spectrum, to promote competition, and to promote the efficient use of the spectrum. In particular:

- There will be no **adverse impact on spectrum users** in the 3.8-4.2 GHz band as 3UK is not proposing to increase the base station power levels and has been routinely coordinating deployments with Ofcom and adjacent users in the band.
- 3UK customers will benefit from faster FWA speeds and less degradation in the quality of experience than would otherwise be the case as 3UK's future 5G network becomes more heavily loaded.
- The proposed licence variation will have a **positive impact on competition**, as 3UK will be able to use its 3.9GHz spectrum to provide 5G FWA services in direct competition with cable and fibre broadband providers.
- The proposed licence variation will allow **more efficient use of the spectrum** as it will enable 3UK to deploy the latest technology.

Impact on spectrum users in the 3.8-4.2 GHz bands

The proposed variation to the technical requirements in the 3.9 GHz licence will allow 3UK to align technical conditions with other 5G licences and with Shared Access Licences. This need not, however imply any adverse impact for spectrum users in the 3.8-4.2 GHz band for the following reasons:

- 3UK is proposing to vary the technical requirements of the 3.9GHz licence with other 5G licences such as 3.6 GHz but is not proposing to increase the base station power levels. As a result, this should be of no concern.
- In its Shared Access Licence Guidance document Ofcom have said that in situations where licences in the 3.8-4.2 GHz band operating in very close proximity to each other happen to be using adjacent channels within the band, which is causing interference

with each other, both parties should work together and reach a mutual agreement on how to avoid this.⁵

- We previously have had experience in handling coordination with adjacent and other users in the band. For example,
 - The coordination process for the 3.6 GHz and the 3.9 GHz is the same. Having successfully co-ordinated public mobile deployments in the 3.6 GHz band with satellite stations in the early stages of deployment⁶, we would not expect the 3.9 GHz deployments to cause any significant interference if the same co-ordination process is followed.
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 - Our approach to recent 3.9 GHz co-ordination applications where we have down-tilted and powered down where necessary.

Benefits for consumers and citizens

3UK operates its FWA service to provide broadband connectivity at a fixed location (typically a home or office) without the need for a fixed line service. [\gg]

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3UK must carefully manage sales of its FWA product carefully to ensure that mobile customers do not experience congestion. 3UK offers FWA to customers in a specific location only if there is sufficient capacity on its network in that location to serve additional FWA customers, through a carefully managed sales process.

This involves checking that (i) a particular location is within an area of sufficient network quality (including coverage level) to deliver the service level required for 5G FWA; and (ii) the sector that serves the specific location has sufficient capacity and provides sufficient speeds to serve FWA customers in addition to mobile customers.

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⁵ Shared Access Licence: Guidance document (ofcom.org.uk)

⁶ Satellite stations were eventually moved out of the band to accommodate for 5G mobile.

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Consequently, 3UK needs to offload FWA traffic from its 3.4-3.8GHz to dedicated 3.9 GHz spectrum, leaving 3.4-3.8GHz to serve mobile services and providing new capacity and faster speeds to customers of both services. Absent the variation, 3UK would be unable to use its 3.9GHz and would have no offload solution for 5G FWA.

Figure 2: [**≻**]

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Source: 3UK

An addition, as stated in section 2, without the proposed variation 3UK would not be able to deploy 5G and AAS using current 3.9 GHz licence conditions. In the current licence specifications, a different mask/filter solution is required compared to 3.6 GHz spectrum.

Producing a UK-specific variant to meet our licence conditions is not justifiable due to low volumes and increased production costs. As a result, approving the proposed licence variation would allow 3UK to deploy a dual-band Massive multiple-input multiple-output (massive MIMO) solution capable of supporting with 3.4-3.8 GHz and 3.9 GHz band, thereby reducing the requirement for specialized equipment.

The effect of AAS for consumers could be a higher quality of service in busy areas. This is because AAS enables use of Massive MIMO antennas, which can increase the capacity of the radio access network in areas where deployed. This technology has the potential to significantly increase the spectral efficiency and network capacity through the use of beamforming (re-using frequencies to send data to different users) and other techniques which take advantage of the location of people and their devices.

Impact on competition

Approving the proposed licence variation will promote competition. The proposed licence variation will enhance the capacity of 3UK's 5G FWA service and enable high-speed connectivity, enabling it to compete strongly with fixed home broadband providers (such as BT, Virgin Media, TalkTalk, etc).

[>] Although dependent on the quality and coverage of the underlying 5G network, 5G FWA can provide fibre-like speeds (and surpass the speeds of copper and fibre-to-the-cabinet) where mobile network has sufficient capacity.

Figure 3: [≫]

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Source: 3UK

3UK is currently the only MNO in the UK pushing FWA strongly, as we have no fixed broadband service that could be cannibalised. [>]⁷

It is worth highlighting that FWA is driving a fundamental shift in the home broadband market in the US, bringing choice to more US households at a lower cost. FWA is not a new technology, but recent advancements in 5G have led to a FWA boom in the US.

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Press reports indicate that US MNOs are taking share from cable and fibre for the first time ever. Broadband players in the US (cable, fibre and FWA) acquired c3.5m net broadband adds in 2022, and FWA accounted for 90% of those. FWA players (T-Mobile, Verizon) added 3.2m subscribers, whereas cable added c515k subscribers and fibre lost 180k subs.⁸

Optimal spectrum use

The proposed licence variation would make more efficient use of 3UK's 84 MHz in the 3.8-4.2 GHz band. Due to restrictions placed in the 3.9 GHz licence, 3UK is unable to efficiently utilise the band for 5G FWA customers. The proposed variation as set out in section 3 will allow 3UK to make more efficient use of this spectrum. This would improve spectrum efficiency and make greater use of this valuable resource.

The current technical provisions in the licence prevents 3UK/3UK from being able to deploy the latest technologies and the benefits it brings. The deployment of Active Antenna Systems (AAS) and higher order massive Multiple Input Multiple Output (MIMO) can enable substantial capacity gains.

⁸ FWA captures 90% of all new US customers, pleasing around 90% of them (lightreading.com)