Enabling mmWave Spectrum for New Uses

Cellnex UK Response

April 2022

Overview of Cellnex UK

Cellnex Group

This response is submitted by Cellnex UK (link), which is part of Cellnex Group (link) which:

- Supports over 420 million mobile connections across Europe
- Operates >70,000 mobile sites today, which will grow to >130,000 by 2030
- Is Europe's leading neutral host mobile infrastructure provider, covering 12 countries: Austria, Denmark, France, Ireland, Italy, Netherlands, Poland, Portugal, Spain, Sweden, Switzerland and the UK
- Provides mobile infrastructure services, private and mission-critical networks, distributed antenna systems & small cells and smart/IoT & innovative services
- Had an annual turnover of €2.5bn in 2021
- Is a member of the FTSE4Good, Standard Ethics, United Nations Global Compact

Where possible, we have sought to provide international examples from the wider Cellnex Group in our response.

Cellnex UK

We are the trusted partner of all the major UK mobile network operators, hundreds of private businesses, the emergency services, as well as the UK Government, specifically Cellnex UK:

- Is the UK's leading independent wireless connectivity infrastructure company
- Operates >7,000 mobile sites today, which will grow to >13,000 by 2031
- Has deployed over 1,000 small cells to date
- Is a provider of private networks in campus and indoor environments
- Is an indoor mobile coverage provider, most notably in the Etihad stadium in Manchester
- Is deploying contiguous mobile coverage and capacity along the 81km Brighton to London Mainline and three major stations
- Has won three DCMS 5G competitions, working collaboratively with universities and start-ups to deliver 5G innovation
- Employs 300 people across four major UK locations – Reading, Manchester, Scotland and Leamington Spa
- Has invested £6.1bn in the UK since 2016

Basis of Response

Cellnex UK is primarily a neutral host infrastructure and service business that serves the UK mobile network operators ('MNOs'), other communications providers, and more recently wider businesses/enterprises. Consequently, we have focused our response to this consultation within our domains of business to business expertise – namely passive macro infrastructure, neutral host active RAN, indoor coverage, outdoor small cells, private networks and communications needs of the transportation sector.

Where we have felt qualified or compelled to make a comment on areas outside this focus (e.g. end consumer considerations), we have typically provided bullets point and/or directional answers.

1. Do you have any comments on our assessment of potential use cases, demand and deployment strategies for new uses of mmWave spectrum?

Cellnex broadly agrees with Ofcom's assessment and would highlight the following three areas:

1.1. MNO Network Densification

Cellnex UK view this, along with Private Network applications, as the primary use case for mmWave spectrum.

To date densification in the UK has been constrained largely by four factors:

- Limited capacity uplift from densification, typically 100's Mbps via 1.8 GHz to 3.6 GHz small cells
- Economics of sub-macro solutions including backhaul
- Prioritisation of macro upgrades within constrained network expenditure by mobile network operators ('MNOs')
- Challenging economics of UK mobile sector and associated relative poor financial performance of UK MNOs

Release of mmWave spectrum offers the potential to remove the first constraint as deployment of 100's MHz spectrum in a local area will transform network performance for eMBB and enable new use cases for consumers and enterprises. Hence the 'bang' element in the 'bang for buck' equation has been dramatically increased.

Regarding the second (the 'buck') neutral host solutions, which optimise the economics of densification will be particularly impactful in enabling deployment in areas of high mobile traffic density/requirement; Cellnex and other neutral hosts have demonstrated that the required cost points vs. macro deployments can be achieved and these wont be significantly impacted mmWave vs. current 1.8 to 3.6 GHz deployments.

Changes to the third constraint is more difficult to predict but with the bulk of macro 5G upgrades in dense urban environments forecast to be undertaken in the next 18 to 24 months this is likely to reduce and the nature of mmWave propagation does not lend itself to rooftop deployments/wide area coverage.

We cover the forth constraint in our response to *Question 16*.

1.2. Private Networks

Cellnex UK believes the majority of private network deployments will be in indoor and campus environments, as opposed to wide area coverage. Emerging high bandwidth use cases (e.g. virtual/augmented reality, massive data transfer etc.) will require significant spectrum allocation to enable. The mmWave bands are the best spectrum options to achieve this, supported by associated device and network equipment harmonisation.

Given likely campus/indoor deployments it is important that exclusion zones and power levels are set appropriately, balancing the interference/sterilisation equation. An accurate deployment database with the ability to offer solutions where initial requirements cannot be met will be critical.

We note in our response to *Question 14* the importance of (a) access to high power spectrum (b) effective spectrum searching tools (c) licencing regime which recognises the significant and long term investment horizon for private network deployment and associated operational transformation.

1.3. Fixed Wireless Access

Whilst FWA usage is growing globally[1] the nature of the UK fixed connectivity landscape, namely large scale FTTH deployment, means Cellnex UK does not see this as a significant use case. There is potential for it to support nomadic/temporary accommodation users in dense urban areas – but issues such as the lack of indoor penetration would need to be solved (e.g. window mounted solutions, shared external antennas) which to date have not been solved

[1] https://www.ericsson.com/en/reports-and-papers/mobility-report/dataforecasts/fwa-outlook

We envisage that in low density areas which contain 'high density' housing clusters (e.g. an isolated village) then use cases may emerge where mmWave is utilised as the 'last mile' of connectivity; however we note other spectrum bands are also capable of supporting this requirement.

1.4. Integrated Access and Backhaul

Cellnex UK has deployed over 1,000 small cells across the UK to date[2], our experience has been that MNOs have preferred to install fixed connectivity (i.e. fibre) to each location to maximise capacity, minimise additional load on existing macro sites and provide upgrade potential (e.g. for 5G). We have undertaken a limited number deployments where mmWave has been utilised in a P2P/P2MP fixed link set up but these have typically been replaced over time via direct fibre connectivity.

Given the reduced propagation of mmWave spectrum as an access layer we could see IAB/wireless backhaul playing a larger role in mmWave deployments, but this may be tempered by the widescale deployment of fibre in urban areas; assuming a competitive and economically viable market emerges for provision of this on a dark fibre basis, which will be crucial for maximising the benefit of mmWave spectrum volumes and associated technologies.

1.5. Other

Cellnex UK does not foresee any other near term use cases, however others are likely to emerge and the mix of licencing approaches Ofcom is proposing would appear to cater for most potential eventualities.

[2] https://www.cellnex.com/gb-en/news/are-small-cells-becoming-mainstream/

2. Do you have any comments on our proposed overall approach to mmWave spectrum (including our aim to make the 26 GHz and 40 GHz bands available for new uses on the same or a similar timeframe)?

Cellnex UK is supportive of Ofcom's aim to making the 26 GHz and 40 GHz band available for new uses on the same or similar timeframe but note that availability across Europe within a similar timeframe will be required for the hardware ecosystem, both network and device side to commit to production.

An example of this is the allocation and commitment to commercial deployment of 28 GHz in the USA and Japan which has resulted in mmWave chipsets in mobile devices (e.g. iPhone 12, Samsung S22 etc.) and availability of small cells from the major vendors (e.g. Nokia, Ericsson etc.).

Achieving the same for 26 GHz and 40 GHz will require a pan European commitment to spectrum release and crucially commitment to deployment from the mobile network operators; the later can be facilitated via auction design and licencing regime that Ofcom selects, we detail this in our response to *Questions 14, 16 and 17.*

3. Do you agree with our approach of specifying high and low density areas in the UK, and authorising new uses differently in those areas?

Cellnex UK agrees with Ofcom's approach of specifying high and low density areas in the UK and a differential authorisation/licencing approach being used for each. However we believe there are several factors that Ofcom needs to take into account when (a) determining high vs. low density areas (b) its licencing approach in both areas - please see our response to *Question 4* for further details regarding this.

Ofcom needs to take further factors and information sources into account when determining high vs. low density areas.

4. Do you agree with our overall authorisation approach in high density areas for the 26 GHz band (i.e. to grant Shared Access licences on a first come, first served basis) for the bottom 850 MHz of the 26 GHz band, (24.25-25.1 GHz), and to auction citywide licences for the rest of the 26 GHz band (25.1-27.5 GHz)?

Cellnex UK agrees in principle with Ofcom's approach, but notes the following.

4.1. Split of Shared Access vs. Citywide Licences

We note Ofcom's view that individual/isolated deployments (i.e. building or campus based private networks) are likely to require between 200 MHz and 1 GHz of spectrum; Cellnex UK agrees with this range in terms of likely short and medium term requirements.

However we note that this results in a remaining allocation of 2.4 GHz of spectrum to citywide/high density licences. If equally allocated between the four UK MNOs would result in only 600 MHz of spectrum per MNO. This is likely to be below the optimal threshold of 800 MHz to 1 GHz of contiguous spectrum per MNO; though we note there is the potential for MNOs to choose between 26 GHz and 40 GHz in an area if they are licenced in a combined auction.

Overall Cellnex agrees that allocation of 850 MHz of contagious spectrum at the bottom of the band on a first come, first served basis is least worst compromise.

4.2. Share Access Licences

We agree a shared access regime, on a first come first served basis is an appropriate method of licencing for the bottom 850 MHz of spectrum in the 26 GHz band, the regime for this needs to be fit for purpose for both high and low density areas as outlined in our responses to *Questions 5 and 14*

5. Do you agree with our overall authorisation approach in low density areas for the 26 GHz band (i.e. to grant Shared Access licences on a first come, first served basis)?

Cellnex UK agrees with this approach, but notes, as per our other responses to other recent Ofcom consultations, that the regime, dataset and tools that enabling shared access licencing need to be fit for purpose in both high and low density area; please see our response to *Question 14* for further details.

6. Do you agree with adopting a similar approach to authorising the 40 GHz band as our proposals for the 26 GHz band, if we were to decide to re-allocate the 40 GHz band?

Cellnex is supportive of a similar approach being taken to authorising the 40 GHz band as per the 26 GHz band, on the basis of comments we have made in our responses to *Questions 3, 4, 5, 7, 8, 14, 16 and 17* also being taken into account ref. 40 GHz.

7. Do you agree with our proposed methodology for identifying and defining high density areas?

Cellnex UK broadly agrees with the overall methodology Ofcom has utilised, but given the high cost and complexity of clearing a 'low density' area if it needs to become a 'high density' area in the future, we believe Ofcom needs to take into account three further factors (a) potential constraints on current ability to consume (b) future growth in mobile data volumes (c) likely changes to traffic

7.1. Determining Existing High Density/Consumption Areas

There may be other areas that have a high propensity to consume mobile data, but are currently not captured by Ofcom's analysis due to lack of availability to consume (i.e. lack of mobile network presence/capacity), as a result population density and crowd sourced performance information should be utilised/cross checked with the existing network data approach used to date.

7.2 Future Growth

Future forecasts of growth should be factored into the analysis, to identify locations which are currently low density but have the potential to become high density over the c.10 to 15 year time horizon referenced in the document. Given the expense/cost of clearing a low density area to enable it to become a high density area a more cautious approach where potential future high density areas are selected now as high density may be preferable.

7.3. Changes in Traffic Patterns

Cellnex UK believes a significant shift is likely to have occurred in the (i) location of demand (ii) peak(s) of demand as a result of Covid-19, and the associated current and potential future changes this has made to where consumers work, rest and play.

Cellnex UK does not have access to network data but would hypothesise the following may have occurred:

- Usage in suburban locations has increased in absolute and proportionate terms, due to greater home working and daily presence near and around consumers' home locations
- Rural usage has increased in absolute terms due to relocation of individuals and potential use of mobile instead of fixed services for work activity due to either greater speed or commercial reasons (e.g. employer-provided)
- The daily 'peak' in urban locations and transportation hubs is likely to have flattened due to changes in the frequency (reduced) and timing (stretched over more hours) of commuting

Other trends may also have been observed, with the MNOs best placed to provide input on these and their likely longevity. The first bullet in particular may have an impact on high vs. low density determination.

Ofcom should factor existing network constraints, future growth and potential changes in traffic patterns in to its analysis where the cost/complexity of future reclassification is considered (i.e .take a cautious approach which potentially identifies a greater number of areas as high density).

8. Do you agree with our proposed cut-off point of 40 high density areas?

Cellnex does not agree this is necessarily the correct cut off point, as per our response to *Question 7* we believe Ofcom should undertake further analysis and factor in future growth in data requirements before finalising the split of high/low growth areas given the potential cost and complexity of subsequent clearance of 'low density' areas if they need to be reclassified as 'high density' in the future. Our hypothesis is an approach which factors in current capacity constraints, future growth and changes to demand patterns would result in a higher cut off point than 40 high density areas.

Ofcom should undertake further analysis and factor in future growth before it sets the 'cut-off' point for high density areas.

9. Do you agree with our proposal to clear the fixed links in and around high density areas from the 26 GHz band?

Cellnex UK does not have a comment to make or input to provide on this question.

10. Do you agree with our estimates of the cost of migrating fixed links into alternative spectrum bands?

Cellnex UK does not have a comment to make or input to provide on this question.

11. Do you agree with the proposed approaches we have outlined to manage coexistence between new 5G users and the different existing users in the 26 GHz band? In particular, do you have any views on our proposals to limit future satellite earth stations in this band to low density areas only, and to end access to this band for PMSE users with five years' notice?

Cellnex UK does not have a comment to make or input to provide on this question.

13. Do you agree with our analysis of the impact on existing 40 GHz licensees, including our estimates of the cost of moving fixed links under the options involving revocation (options 2, 3 and 4)?

Cellnex UK does not have a comment to make or input to provide on this question.

14. Do you have any comments on our high-level Shared Access proposals (including technical and non-technical licence conditions and proposed approach to setting fees)?

Cellnex agrees with Ofcom's approach of utilising the shares access licence product and delivering a lost cost licencing regime. As per our responses to the Future Approach to Mobile Markets and Meeting Future Demand for Mobile Data we note again in this response that this licence product needs improving to ensure a viable ecosystem and maximum of outcomes.

14.1. Spectrum Allocation/Identification Toolset

As Ofcom notes use cases in mmWave are likely to require access to significant spectrum holdings (i.e. 100's of MHz of spectrum) as a result the coordination requirements are likely to be more onerous than current shared access bands; noting Cellnex UK and other parties are already experiencing delays/complexity in securing sufficient spectrum allocation in existing bands (e.g. 3.8 GHz to 4.2 GHz). The key to improving this situation in an easily accessible, searchable, up-to-date and solution-orientated (i.e. ability to suggest alternatives) database. This should be coupled with minimum separation distances/exclusion zones based on empirical/fact-based evidence and crucially regular review of these to reflect technological improvement.

Ofcom should develop a solution-orientated spectrum database and licencing tool for mmWave and other shared-access (e.g. 3.8 GHz to 4.2 GHz) bands.

14.2. Access to Higher Power Spectrum

As per our responses to other recent Ofcom consultations we note the significant positive impact that can occur from accessing high power spectrum under shared access arrangements. This type of access is not envisaged by Ofcom within its consultation and has the potential to impede deployment of mmWave based private networks. Ofcom should review this and take account of the fact that organisations may be willing to pay a premium licence fee for this access given the transformative impact this can deliver to the wider private network business case for deployment as detailed below:

- Economic base station counts are often only achievable via high power spectrum access

  Example: A UK port recently shifted from WiFi to a 4G/5G private network, as a result of securing higher power spectrum the solution was delivered with c.3 base stations, had this not been available the base station count would have been c.120 – 160 which may have made the business case unviable, noting the old suboptimal WiFi solution had in excess of 300 access points deployed

- System performance and use cases will be constrained without access to high power spectrum

  Example: A current Cellnex UK private network campus based deployment will have limited performance due a lack of ability to access sufficient high power spectrum; this will restrict use cases that can be utilised.

Ofcom should develop an efficient method for organisations to access high power mmWave spectrum.

14.3. Licence Duration, Recall Period and Band Certainty

Investment cases for private networks and other envisaged mmWave use cases are multi-faceted, payback often exceeds five years, and involve considerable investment beyond the communications layer (e.g. operational transformation, new plant/machinery, consumer end points etc,); hence long term band allocation and certainty are critical. The indefinite nature of the licence subject to fee payment and usage is commensurate with these investment case features. However Ofcom's proposal of a 1 month revocation period for shared access licences in this band is not and revocation should ideally be multiple years.

Band certainty is also critical for development of the mmWave ecosystem in terms of hardware, software and use cases. Ofcom should commit to at least 15 years of shared access, as it is doing for the non-shared access element of the band.

Ofcom should set shared access licence revocation to years and provide band certainty for at least 15 years.

15. Do you agree with the overall approach we have set out to coordination and coexistence between new Shared Access users in the 26 GHz band and existing users?

Cellnex UK does not have a comment to make or input to provide on this question.

16. Do you have any comments on our initial views in relation to auction design?

To date densification in the UK has been constrained largely by four factors:

- Limited capacity uplift from densification, typically 100's Mbps via 1.8 GHz to 3.6 GHz small cells
- Economics of sub-macro solutions including backhaul
- Prioritisation of macro upgrades within constrained network expenditure by mobile network operators ('MNOs')
- Challenging economics of UK mobile sector and associated relative poor financial performance of UK MNOs

Release of 28 and 40 GHz will help address the first bullet, industry has largely solved the second one and Ofcom has the potential to create an auction and licencing structure which addressed at least does not worsen the third and fourth.

16.1. Ensuring Spectrum Utilisation and Maximisation of Economic Benefit

The largest economic benefit of mmWave spectrum release will be the densification of public mobile networks and emergence of other use cases as detail by Ofcom and our response to *Question 1*. We note that the shared access licences are subject to a 'use or lose' provision but the same is not proposed for the auctioned high density licences. This opens up the risk that spectrum secured but not deployed by the licence holders and hence the major economic benefits for the UK are not realised. We believe that there should be a requirement for all licence holders to launch an appropriate scale commercial service within a realistic timescale within each licence area.

Auctioned licences (i.e. high density) should contain provisions that compel licensees to undertaken 'scale' deployment, over realistic timescale regarding ecosystem and technology development.

16.2. Avoiding Fees Reducing MNO Propensity to Densify Networks

Given the challenging economics that UK MNOs face – see our response to *Future Approach to Mobile Markets* – Cellnex UK believes that upfront and ongoing fees need to be minimised, whilst ensuring the economic value of spectrum is recognised.

Cellnex UK currently believes given the top level economics of the UK MNOs the balance of achieving economic benefit from deployment vs. one-off annual/ongoing licence fees is currently weighted too far towards the later and this is inhibiting network densification activity.

We encourage Ofcom to think about more innovative approaches to auction design and fee structure, some of which have been utilised in other international markets, for example:

- Upfront fee refunded when initial roll out targets have been achieved, subject to ringfencing of 'refund' for further network densification activity
- Graduated/tiered annual fees beyond initial licence period based upon ongoing levels of densification activity
- Automatic renewal of licences beyond initial term if deployment criteria are met, see our response to *Question 17*

Upfront auction fees and eventual ongoing fees should not have a negative impact on MNO funding for network densification, Ofcom should consider innovative approaches to auction design including those used to date in other countries.

17. Do you have any comments on the licence duration options we have considered in this section for new licences for the 26 GHz and 40 GHz bands that we would auction?

As per our response to *Question 16* the critical success criteria is high levels of spectrum utilisation and in the case of the citywide licences continued densification of the MNO networks to support new use cases.

We note Ofcom's proposal to issue 15 year licences. We would suggest this is combined with auto-renewal criteria if certain conditions that demonstrate effective utilisation and economic benefit is being derived from the spectrum are met (e.g. scale deployment achieved in a licence area, X% of network traffic being provided by spectrum etc.).

This would represent a balanced approach which avoids auto renewal of spectrum licences where its being used sub optimally but critically also avoids the risk of a 'cliff edge' where investment in service expansion/further network densification stalls around the 10 year mark due to a lack of certainty regarding return on investment, which we believe to typically be 5 to 7 years for current network densification activity.

Ofcom should consider auto renewal provisions for auction to ensure continued investment in network densification throughout the whole of the proposed 15 year initial term.

Regarding the share access licences we have noted in *Question 14* that their duration and notice periods need to be commensurate with the wider investment case including operational transformation.

Ofcom should set shared access licence revocation to years and provide band certainty for at least 15 years.

18. Do you agree with our assessment of potential competition concerns and that it may be appropriate to impose a competition measure such as a 'precautionary cap'?

Cellnex UK does not have a comment to make or input to provide on this question.