MLL Telecom Ltd and MLL 40 GHz Limited.

Response to Ofcom 26 GHz and 40 GHz consultation

Introduction to the responses

MLL is building a Broadband Fixed Wireless Access ("BFWA") offering for the UK which will rely upon the use of its 40 GHz national license and will be a much-needed alternative to fibre. MLL will target hard-to-reach locations that fibre cannot service as well as those regions where consumers will benefit from a competitor to fibre. Furthermore, part of the MLL plan is a wholesale BFWA offering that will enable smaller local connectivity providers, thereby encouraging small businesses and extending the BFWA offering. Details of this business plan are contained the accompanying support deck to MLL's response to Ofcom's consultation paper[1]. MLL submits that promoting BFWA is consistent with Ofcom's general duties under section 3 of the Communications Act as well as the specific strategy set out in the DCR for ensuring widespread availability of ultrafast broadband.

MLL highlights the lack of development of the 40 GHz band to date[2] and the many uncertainties that exist as to its optimal use. Given these uncertainties MLL believes that revocation and re-auction of the band is unlikely to yield the optimal result. Instead, liberalisation of the band followed by trading are the most effective means of allocating spectrum. Some simple trades would be required to reorganise the band for future use, and we believe that these are entirely practical[3]. To the extent that Ofcom has competition concerns related to the holdings of H3G and/or MBNL, those should be addressed in a targeted manner. In combination, this will yield a superior outcome over the considerable period of time that it will take for the 40 GHz band to be fully utilised.

MLL Spectrum Development Activity- Leading BFWA in the UK

MLL has worked hard to identify products and use-cases for its 40 GHz spectrum. Following pandemic delays through 2020/2021 BFWA hardware was delivered to the UK in early-spring 2022. MLL has completed testbed validation and will start field trials of its BFWA product in July 2022[4]. MLL is committed to further investment in the BFWA solution to implement the product into a comprehensive direct and wholesale service offering. This will be underwritten by MLL's core functions in telecoms professional services, delivering a fully supported gigabit broadband service, wholesaled to other retail providers and possibly also retailed direct to consumers and businesses. This service would be backed by an established network operations function, field support, logistics and premises support.

MLL sees itself as the only UK mmWave innovator, developing a viable use-case and positive business case for the spectrum. Following frequency band adaptation, product launch could be as soon as 2023.

BFWA has significant benefits over fibre delivery in the traditional fibre geography and excels in those geo-locations to which fibre cannot deliver, **economically or practically**.. BFWA provides an economical and stable gigabit broadband service to urban, sub-urban, rural and remote users with rollout that is significantly faster than a fibre solution. The service provides a range of use-cases both domestic and commercial, in-home use, office connectivity, security connectivity, data-centric telemetry, etc. Enabling BFWA will greatly

[1] Confidential – MLL Telecom Ofcom submission support file.pdf pages 19 to 32
[2] Policy Tacker 40 GHz report for MLL_update.pdf
[3] Confidential – MLL Telecom Ofcom submission support file.pdf pages 33 to 37
[4] Confidential – MLL Telecom Ofcom submission support file.pdf pages 2 to 14

facilitate economic growth in those areas in the UK which currently do not have access to gigabit broadband service.

MLL will enter the broadband sector as a credible competitor to fibre broadband providers, thereby supporting Ofcom's goal of using network competition to drive investment. MLL is an established, stable, well-funded and credible challenger in providing BFWA services. MLL will promote its investment in practical capabilities to develop mmWave spectrum and advance user benefits of BFWA.

Furthermore, in some geographies, MLL's BFWA proposition may be the only cost-effective means of delivering ultrafast broadband. MLL has a credible business plan and the capabilities[5] to address the demand for gigabit broadband solutions for the Broadband UK Gigabit Programme hard-to-do and very-hard-to-do areas.

Timing of Ofcom Intervention and the Uncertainty of Development of mmWave in the UK

At 26 GHz there is uncertainty as to the demand for mmWave services. The band was designated more than 5 years ago as a 'pioneer band' for 5G in Europe. In July 2017 Ofcom consulted on making spectrum available, but most responses suggested that it was too early. Ofcom agreed and adopted a holding position, by offering pioneer licenses on a 'first-come first-served' basis. Only one such license has been awarded.

Other European countries have auctioned spectrum at 26 GHz, and some devices are available, but there have been no commercial launches. Even in the US, where development of 28 GHz is more advanced, there has still been no large-scale take-up of services[6]. Despite this, there is a good case for taking the obvious next step of making 26GHz spectrum available in the UK but doing so cautiously. This should be more than adequate to meet foreseeable demand.

The position at 40GHz is even less certain than 26GHz. The band is likely to be used for BFWA, but it is unclear at present whether that will be based on the TDD technology standardized as IMT, or by FDD technology. BFWA is certainly a credible use case for the 40 GHz band[7]. MLL's extensive research in 40 GHz use cases worldwide in 2015 to market test the value of the spectrum[8] clearly indicated that there is no certainty in the customer or vendor sectors as to the development of any specific 40 GHz products.

MLL considers FDD to be ideal for the proposed BFWA solution supporting MLL's 40 GHz BFWA business case. It would be counterproductive to clear the 40 GHz band for TDD use at this time. Ofcom cannot assume TDD is the optimal use of this band without credible market demand data. From a technical standpoint, MLL considers FDD to be a current and futureproof technology. In addition to accommodating MLL's FDD BFWA plan, room for TDD use can be made available in the 40 GHz band through the straightforward trades that MLL suggests for consideration[9].

The Ofcom statement that 26 and 40GHz are "functionally substitutable in the long run" is not supported by the evidence. So the case for a combined auction of the two bands is weak. Considering the current lack of development of 40GHz systems in the UK, and indeed the world, 40GHz is certainly not a substitute for 26GHz now. It may become a closer

[5] MLL History of Innovation.pdf and MLL Capability Set.pdf
[6] Policy Tacker 40 GHz report for MLL_update.pdf
[7] Policy Tacker 40 GHz report for MLL_update.pdf
[8] Confidential - MLL 40 GHz submission 3rd Party Spectrum Value.pdf
[9] Confidential – MLL Telecom Ofcom Submission Support File.pdf pages 33 to 37

substitute in the future, or the technologies used in the band may diverge. In any case, there is no immediate need for the capacity provided by 40 GHz, and time and market trading will guide the best decisions surrounding its future development.

Impact of Revocation and Ineffectiveness of Proposed 40GHz Auction

Ofcom's proposition to clear the 40 GHz band to 'reset' the spectrum by means of revocation and reauction faces difficult challenges. All of the uncertainties that affect mmWave and 40 GHz in particular make it difficult to configure the band for auction to meet the needs of the future. It is likely that Ofcom will need to rely on trading after the re-auction, combined with direct interaction with license holders to adjust to mmWave developments and achieve optimal results, just as it could today.

Clearing the 40 GHz band of its current license holders will effectively cease development, innovation and investment, for 5 years, due to the revocation notice period, and even thereafter up to the point where an alternative use case to MLL's BFWA is developed. This may be many years later[10]. What, if any, intervention is required to achieve optimal use will be much clearer as the technology and market further develop. In this developing environment the flexibility of market trading will adapt to changes far more effectively than revocation and re-auction today.

Revocation will impact future investment incentives, as current investments are seen to be undermined. The market expectation is that revocation will only take place if there is clear evidence of alternative demand and of higher value than the current use, which can only be met through revocation. Future investors will be cautious in allocating capital if revocation is driven by more speculative scenarios. This would discourage future innovation and investment and delay the timely use of the spectrum for the benefit of the public.

In the aftermath of revocation, there would be a period of uncertainty before any auction. Even after the auction, it is unlikely that there would be co-operation between incoming spectrum owners and incumbents, unless a current owner had paid to reacquire its spectrum. This is an improbable outcome for MLL which is an SME with limited capital resources. There is no incentive to cooperate given that the two companies are likely to be competitors. The result will be to suspend innovation, development and investment and to delay spectrum utilisation and the resultant economic growth and benefit to the public.

Market Trading is a More Effective Solution

The most practical strategy is to utilise trading. MLL does not agree that the trading required in the 40 GHz band would require "a number of complex, multilateral trades across both the 26 GHz and 40 GHz bands" as stated by Ofcom. **Two simple trades to move the MLL FDD spectrum to the top and bottom of the band would allow FDD services to continue and make the centre of the band available for allocation to TDD-based IMT;** the 40 GHz users' FDD/TDD determination would define if further trades would be required[11] There is certainly insufficient evidence at this time to objectively and justifiably conclude that a market trading approach cannot achieve an efficient allocation of 40GHz spectrum or that redirecting the 40 GHz band into the hands of the MNOs through revocation and reauction will achieve optimal use of the band.

The only credible concern identified is that one of the larger established players might refuse to trade part of its larger 40 GHz holding to keep it out of the hands of its competitors. A precautionary cap appears to be a proportionate means of addressing

[10] Policy Tacker 40 GHz report for MLL_update.pdf
[11] Confidential – MLL Telecom Ofcom Submission Support File.pdf pages 33 to 37

competition concerns while retaining the principle of market trading. An appropriate cap applied to a 26 Ghz auction can be expected to result in established operators reducing their holdings in 40 GHz because 26 GHz will likely be of greater value to them. This band can be more readily utilised for IMT applications. For its part, MLL is incentivised to engage in trading which results in the efficient and competitive use of spectrum. MLL has a long history of providing services, including spectrum access, to the UK MNOs to enable mobile connectivity[12].

National Licenses

National licenses in 40 GHz are the optimal allocation of spectrum if it is desired to improve availability in rural areas. A national licence allows high-power deployment for BFWA services, improving coverage. It allows rural areas to be serviced at incremental cost, since urban areas cover the fixed costs of deployment.

Forcibly defining high density versus low density and high power versus low power regions will make it difficult for operators who are planning national coverage to generate an optimal operating model. . In the limited geographic footprint of the UK these divisions will prove over the long term a significant constraint of investment and success.

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[12] MLL History of Innovation.pdf and MLL Capability Set.pdf

Question 1: (Section 2) Do you have any comments on our assessment of potential use cases, demand and deployment strategies for new uses of mmWave spectrum?

The main potential use case for 26 GHz is mmWave IMT-2020 due to its widespread adoption as the pioneer 5G band. That said, although equipment is available, and some countries have allocated spectrum, it seems there are few commercial deployments (reference: Policy Tacker 40 GHz report for MLL_update.pdf).

There are several possible use cases for 40 GHz band for broadband wireless access providing gigabit bandwidth services. It could do so either in competition with fibre networks, providing consumers with additional choice, or it could do so in locations where fibre is unavailable, contributing to universal availability. Only equipment based on FDD technology is available to support this application, with TDD unlikely for many years.

The standards do exist to support IMT-2020 at 40 GHz and it is feasible to develop equipment, as shown by the US experience at 39GHz. But we are not aware of any equipment that supports IMT-2020, or indeed any 40 GHz equipment of any type. MLL has completed extensive research since 2015 into currently available and planned 40 GHz hardware and found only one product manufacturer willing to undertake a 40 GHz development within a price range that maintains a positive business case. We are not aware of any other existing or road-mapped use cases for 40 GHz with any manufacturer or service provider[13] . There are manufacturers with equipment in the 39 GHz band, but we understand developing this for 40 GHz would take 3-4 years of R&D and an investment more than USD $10M.

This uncertainty about future use cases, equipment availability, and future demand by consumers was proven in an extensive programme MLL undertook between August 2019 and June 2021 to market test the value of its spectrum. We needed to fully understand the best use scenario: do we develop the band ourselves, would a 3rd party place greater value in it, or would a mixture of developing it ourselves with an external investor yield better value. We undertook a comprehensive worldwide process, including hiring financial advisors. More than 100 potential purchasers/ investors/ partners were contacted and only two very low indicative expressions of interest were received for MLL's spectrum. This was essentially because investors and operators could see little immediate value in exploiting the spectrum in the UK. A common theme was the need to invest in the development of equipment, and the competitive nature of the market for fibre services[14]. This outcome is reflected in the lack of actual deployments in other countries with respect to 40 GHz mmWave[15].

In our view the most credible use case for mmWave spectrum is BFWA. While this use case is also in the early stages of development a notable precedent can be found in Italy with Eolo, where there has been a very successful roll-out of BFWA services using FDD in 28 GHz. Eolo now provides service to 600k+ subscribers after operating for 8+ years.

Question 2: (Section 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 similar timeframe)?

MLL does not consider that the bands are 'functionally substitutional' as suggested by the Ofcom consultation paper – now or in the medium term. Firstly, equipment, software and deployment are different between the two bands and secondly, 26 GHz is assigned for FDD

[13] Confidential - MLL 40 GHz submission Equipment Providers.pdf
[14] Confidential - MLL 40 GHz submission 3rd Party Spectrum Value.pdf
[15] Policy Tacker 40 GHz report for MLL_update.pdf

and proposed to be assigned TDD, while 40 GHz is assigned for both FDD and TDD. The accommodation of FDD in the 40 band greatly enhances the strength of a BFWA offering and business case by dramatically extending the reach of the service from each site.

There is some limited deployment of IMT-based BFWA in 26 GHz with a small ecosystem and devices, but 40 GHz is in the early stage of device and use case development[16]. Therefore, the development of 40 GHz at scale is many years away.

By way of an example, MLL has researched for 7+ years for 40GHz equipment. During the last three years it has found very few hardware options even for the most obvious use case, which is BFWA, and no hardware options for any other use case.

Auctioning 26 GHz and 40 GHz together will not resolve such uncertainty. Indeed, MLL believes that auctioning them together increases uncertainty. The lack of incentive to deploy services during the revocation period will hold back the development of 40GHz equipment, against a background where the focus of most manufacturers will already be on 26 GHz and 28GHz, as the 'Pioneer' bands for mmWave development. Furthermore, auctioning 26GHz and 40 GHz together risks being inefficient, since Ofcom will need to make decisions regarding spectrum band allocations and technology with a lack of information.

With respect to spectrum availability timescales, and assuming that the Ofcom strategy is to clear 40 GHz for TDD use cases, MLL considers that the two bands should be developed on separate timelines. FDD technologies currently exist in 40 GHz have a considerable development window and useful lifespan. We do not envisage any current triggers or road mapped events that would define a closure of 40 GHz spectrum to FDD use cases.

Question 3: (Section 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?

MLL acknowledges the strategy of geographic licensing for selected use cases and business cases.

However, MLL's business case at 40 GHz for BFWA would be severely undermined by creating a high density/low density licencing structure[17]. The business case has high fixed costs and risks that need to be funded or managed by being able to address both high-demand and low-demand areas. Indeed, many of the low demand areas depend on the Government subsidies that are currently being offered to roll out services to these areas. Bifurcating the market in this way will relegate the low-density areas to some form of external support, or sub-optimal services.

Further, the business case is only positive when the hardware can be used in high-power configuration to deliver good coverage from each base station. This would also be impacted by a geographically constrained licensing strategy. The need for high-power use is best supported by a national license.

We can see that small service providers could benefit from a rural licensing scheme, but in addition to this MLL believes that a high-quality infrastructure could be developed if sufficient scale is allowed that would allow services to be offered on a wholesale basis to these smaller local operators.

[16] Policy Tacker 40 GHz report for MLL_update.pdf
[17] Confidential – MLL Telecom Ofcom Submission Support File.pdf pages 19 to 32

Question 4: (Section 3) 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))?

MLL confirms that it has no plans for 26 GHz, and we have previously responded to the questions referring to 40 GHz.

Question 5: (Section 3) 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)?

MLL confirms that it has no plans for 26 GHz and we have responded to the questions referring to 40 GHz.

Question 6: (Section 3) 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?

We refer to our comments on question 3. We recommend that the licensing strategy include the possibility of national licenses – this allows high-power deployment for BFWA services and allows rural areas to be serviced at incremental cost.

MLL supports national licenses for the deployment of a BFWA offering. The approach proposed by Ofcom would require purchasing of licenses for all city areas and be at risk of non-availability of licenses for specific urban/rural areas. This would present an unacceptable risk to the deployment plan and hence void the business case.

With a low-density/rural licensing, a first-come-first-served strategy could cause pockets of customers not to be served. Ofcom will need to consider the complexity of FDD/TDD coexistence and power management at the same frequency.

MLL questions the strategy of reallocating 40 GHz; the spectrum is configured for shared FDD and TDD technologies, with FDD a current and sustainable technology. Reallocating the 40 GHz spectrum would mean that MLL will likely not be able to proceed with its proposed use case and therefore consumers will not benefit from us providing BFWA services to them[18].

Question 7: (Section 4) Do you agree with our proposed methodology for identifying and defining high density areas?

MLL's business case and use case trial is based on a national strategy, we have not considered and cannot comment on a high-density methodology.

[18] Confidential – MLL Telecom Ofcom Submission Support File.pdf pages 9 to 14

Question 8: (Section 4) Do you agree with our proposed cut-off point of 40 high density areas?

MLL's business case and use case trial is based on a national strategy, we have not considered and cannot comment on a high-density methodology.

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

Based on activities in the EU and worldwide standards and the fact that the re-purposing of 26 GHz has been mooted for many years, MLL understands the need for the process and that there are other bands that these links can be migrated to.

Question 10: (Section 5, Annex 8) Do you agree with our estimates of the cost of migrating fixed links into alternative spectrum bands?

While MLL cannot comment on other operators cost base, it is widely accepted across the telecoms sector and based on MLL's own experience of owning and operating 1000's of microwave links, that a 5–7-year timeline is the refresh/upgrade cycle for the majority of microwave links. MLL does not see the direct cost for all fixed links being migrated as the correct methodology as it doesn't take into consideration as to how long the microwave links have been operational and the natural hardware refresh that would occur outside of the influence or impact of policy change.

Question 11: (Section 6) 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?

MLL has no specific comments on the coexistence issues at 26 GHz.

Question 12:(Section 7) Do you agree with our initial assessment on which option for enabling the 40 GHz band for new uses would best achieve our objectives?

<u>Option 1</u>

MLL believes Ofcom's objectives will be best met by Option 1 versus all the other options:

Given the uncertainty around use of mmWave and the technology solutions available for 40 GHz, MLL believes that greater allocation efficiency is achieved by leaving current participants to trade. This will allow the optimum allocation to emerge over time, as uncertainty reduces. An auction would require a series of technology decisions to be taken by Ofcom at a point in time when there is very little hard information, merely speculation as to the possible uses of the band.

Trading is a better option in principle. It encourages existing holders to develop spectrum, and it permits new companies to enter the market where they are best placed to do so. It reassures investors that if other investors identify a better use of spectrum that they can then trade the

spectrum they have invested in with that alternative investor. It creates a risk mitigation or 'exit strategy' for investors.

Trading also avoids the severe delays in developing new services that result from revocation. Little development is likely to occur during the 5-year notice period.

And trading is practical. Ofcom suggests that efficient reallocation of the 40 GHz band cannot readily be achieved through trading (7.40 & 41) due to the complexity of trades and the incentives of some operators to trade. Firstly, we do not believe that those trades need to be complicated. Secondly, any lack of incentive can be addressed in a targeted way.

As to the practicality of trading, the likelihood is that there will be a small number of spectrum holders. A small number of trades can be used to reallocate spectrum efficiently between these. We provide some practical examples in the confidential annex[19].

To the extent there is a concern that current ownership reduces incentives to trade, revocation of all licenses is a disproportionate means of addressing this concern because it causes unnecessary collateral damage. There is precedent for this being addressed in a targeted manner, for example, by applying caps to spectrum holdings.

The current lack of a worldwide or European standard with respect to the 40 GHz band with respect to IMT is an underlying issue which will impact the willingness of MNOs and other 5G investors due to the same uncertainty, causing a lack of network and device investment by hardware manufacturers

Option 2

MLL does not believe option 2 to be an efficient strategy for best use of the spectrum and future development.

Ofcom have asserted that the amount of spectrum available under each option is different. We do not agree with this position. Our view is the amount available under all scenarios is the same, the difference is the mechanism by which it is allocated among licence holders.

We also believe that the uncertainty regarding the future use of 40 GHz could cause issues in the auction strategy. For instance, FDD and TDD technologies will continue to evolve, and a decision would have to be made on the future use of FDD/TDD as a pre-requisite to a revocation and auction. We believe that FDD technologies are current and have development potential. In addition, there are no significant technical issues in the co-existence of FDD and TDD technologies in the same bands.

In our view, option 2 provides the least flexibility to deal with uncertainty because the auction is a one-time event whereas trading can continuously adjust to circumstances.

Revocation will cause stagnation for at least 5 years from notification of revocation in the 40 GHz spectrum band as existing license holders will be denied sufficient investment horizon to build a business and generate a return.

Ofcom claim that revocation could enable more operators to access mmWave spectrum than Option 1 because more will have access to the spectrum (7.63 & 7.64). However, the most likely outcome of the auction is that the spectrum will be purchased by established MNOs, who are likely to acquire it for defensive and speculative reasons, even if they have no current

[19] Confidential – MLL Telecom Ofcom Submission Support File.pdf pages 32 to 37

plans to deploy. At the same time, revocation of MLL's licence will certainly remove the one credible challenger that is currently in the market. The overall effect on competition is clearly detrimental.

Demonstrating a willingness to revoke in this way increases the risk profile for potential investors because the bar is set quite low for such revocation. The market expectation is that revocation only take place when there is clear objective evidence of demand for spectrum, of a higher value than its current use, and this demand cannot be met through trading. Lowering the bar will reduce the willingness of market players to make long-term investments in the development of new bands

Currently MLL is the only challenger /new entrant owner of spectrum in the UK[20] Ofcom. There is no clearly defined use-case for mmWave spectrum at this point, so an auction would favour larger players, who, could bid based on keeping their options open rather than based on nearer term more efficient use cases. This behaviour would crowd-out smaller players like MLL. This is consistent with our participation in the auction of TDD spectrum at 2.6 GHz in 2012, where we were rapidly priced out of the market.

Option 3

Option 3 is discriminatory against MLL and there is no objective justification for this discrimination. Ofcom aims to limit the future cost to a single licence holder without fully assessing the future costs to the other licence holders. MLL has invested in building capabilities for 40 GHz and this investment will be lost by the application of this option.

If Ofcom does intend to discriminate between licence holders, then our view is that it should have a bias in favour of new entrants. In this respect option 3 fails because it considers MLL to have equal scale as to the other licence holders[21]. In terms of materiality, it should be considered that MLL only has 25% of the holding of the largest holding and yet our business plan could have a significantly positive outcome for broadband services in the UK.

As previously stated within our response to option 2, MLL is unlikely to win the mmWave spectrum back in a competitive auction against the MNOs or investors with significant reserves. In effect, this option would take the spectrum away from MLL and hand it to the MNOs who could shelve the spectrum speculatively. This would be both discriminatory and restrictive on MLL's business practices.

MLL's BFWA business case and the outcome of years of research and investment is dependent on the MLL 40 GHz, 2 x 250GHz, spectrum holding in an FDD compliant configuration.

Option 4

As stated above, MLL's business case will be voided by a partial revocation, 40 GHz is planned to be utilised as capacity spectrum over MLL's lesser 32GHz spectrum holding. The requirements of spectrum as set out by our business case[22].

[20] Confidential – MLL Telecom Ofcom Submission Support File.pdf pages 2 to 8, also pages 32 to 36
[21] Confidential – MLL Telecom Ofcom Submission Support File.pdf pages 2 to 8, also pages 19 to 32
[22] Confidential – MLL Telecom Ofcom Submission Support File.pdf pages 37

Summary table of MLL responses to each option

	Efficiency of allocation	Investment and Innovation	Timeliness of availability	Competition	Impact on existing users
Option 1 variation of all licences	are uncertainties that can't be resolved by auction design.	investors will understand that risk can be mitigated by trading. Consumers will benefit from new and	will immediately be able to utilise or trade their spectrum for the highest	locations. Faster and more cost effective. MLL as an entrant has a track record of taking on MNOs	undertaken will be seen through to launch in the
Option 2 revocation of all licences	Auctions are efficient as a is the right answer.	Investment will be stifled for 5 years, and investor long-term confidence will be undermined by revocation threat being exercised with 'low bar	Availability will be locked out for 5 years. Without knowledge of how the auction would play out, we would continue to develop it but probably at a slower	Under this scenario smaller players will get eliminated and likely players with deeper pockets will bid for spectrum on speculative	Significant sunk
Option 3 partial revocation of licences (H3G and MLL, but not MBNL)				Competition is hindered be favouring one significant player who is backed by two very large Operators.	Ofcom cost estimates for relied on.
Option 4 partial variation & revocation of licences (half of H3G and MLL, no revocation of MBNL)	This option has merit in that it is not as inefficient as options 2 & 3.	Investment and innovation opportunity would be constrained by sub-optimal spectrum assets.	Partly resolves timeliness issues of options 2 & 3.	Competition would be better managed by more targeted management of the spectrum holders.	Will not be able to deliver our current plan because that requires 500 MHz.

[23] Confidential – MLL Telecom Ofcom Submission Support File.pdf pages 2 to 14
[24] Confidential – MLL Telecom Ofcom Submission Support File.pdf pages 15 to 25

Question 13: (Section 7, Annex 8) 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)?

MLL has included its consideration of Question 13 in our 'confidential' file submission

Question 14: (Section 8) 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)?

Refer to previous answers

Question 15: (Section 8) 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?

MLL recognises the benefits of shared access but believes that it should coexist with national licenses for the reasons outlined previously.

Question 16: (Section 9) Do you have any comments on our initial thinking in relation to auction design?

MLL does not believe that combining the 26 GHz and 40 GHz spectrum bands in a single auction will result in the bets outcome for the UK consumer.

i) The bands are not functionally substitutable for the reasons given above, so there is no need for a combined award.
ii) The combined award risks proceeding with 40 GHz too early. We recognise the need to make 26 GHz available soon, but the level of uncertainty associated with 40 GHz suggests it would be better to wait.
iii) Specific risks associated with proceeding too early with 40 GHz including taking flawed decisions on both the band plan and coexistence rules.

In a 5-year notice period for revocation the bands will be sterilised with respect to deployment and development and have the effect of delaying the usage of those bands for the notification period, which is directly in conflict with Ofcom's objective to encourage investment and innovation and to ensure that the spectrum is available to the public as soon as possible.

Question 17: (Section 10) 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?

MLL believes that indefinite licenses should be granted in all cases to provide a dependent foundation for innovation, technology development and business continuity. The market expectation is that revocation will only take place if there is clear evidence of alternative demand and of higher value than the current use, which can only be met through revocation. Revocation should not be applied in a way that is arbitrary or speculative.

Question 18: (Section 11) 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'?

MLL's views on the potential competitive concerns are set out below under each option being considered by Ofcom. Our comments concern mainly the actions being considered with respect to 40 GHz.

Option 1: This option is the most positive in terms of promoting competition in the UK, because it will support the BFWA services that MLL is developing. MLL is uniquely placed to deliver these services in competition with established operators. While we are a small business, we have been operating in this market for more than 30 years and have developed significant engineering and service delivery capabilities during this period[25]. We are one of the few credible challengers in a market dominated by a small number of incumbents.

The precautionary cap appears to be a proportionate means of addressing competition concerns while retaining the principle of market trading. An appropriate cap applied to a 26 Ghz auction can be expected to result in established operators reducing their holdings in 40 GHz because 26 GHz will likely be of greater value to them. This band can be more readily utilised for IMT applications.

Option 2: This has the least positive competitive outcome because it likely to eliminate MLL from the market. MLL is a credible challenger at present but revocation and reauction will favour bidders with large reserves who might purchase the spectrum speculatively and retain a holding until a future roadmap is defined. This would effectively sterilise that spectrum from innovation and development by businesses with a genuine interest and service proposition.

Option 3: This option has the same detrimental competitive outcome as option 2, but in this case is also discriminatory towards MLL for reasons we have previously outlined.

Option 4: This option has the same detrimental competitive outcome as option 2, and is also discriminatory as with option 3, but perhaps less so. While it aims to compromise, MLL would not be able to deliver the same BFWA service it has planned if it is left with the bandwidth suggested by this option. MLL might be able to develop different services, with different spectrum holdings, but it has not thus far had any reason to explore this.

[25] MLL History of Innovation.pdf and MLL Capability Set.pdf

The current state of the 40 GHz band and expected future developments

Research commissioned by MLL Telecom

July 2022

PolicyTracker

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1. How are countries outside the UK using or planning to use 40 GHz?

Worldwide, the 40 GHz band is not extensively used for mobile services. The band is only used for 5G in the United States, which awarded it in 2020. Since then, no other country has awarded the band for 5G services.

While many countries have explored assigning the band, most have since dropped the idea. In our analysis we identified only four countries that have recently reiterated plans to assign 40 GHz. Even in these countries however, plans are in early consultation stages. This lack of demand is reflected in an immature 40 GHz device market which we will touch on later.

This chapter charts the state of the 40 GHz band in terms of harmonisation and lists countries that have either assigned the band or have serious plans to do so.

Harmonisation

An agreement to harmonise a band for mobile cellular use – or IMT to use the ITU terminology – does not guarantee that this band will become widely used, but it is widely seen as a necessary precursor. The value of harmonisation is that encourages regulators to make the band available for IMT, which should provide the required scale needed to make the production of chipsets sufficiently cheap for them to be incorporated into consumer products.

An agreement to harmonise a band for mobile cellular use – or IMT to use the ITU terminology – does not guarantee that this band will become widely used.

40 GHz has recently been harmonised at the global level and is soon expected to be harmonised in Europe, as explained below, but it could be many years before it is widely used for mobile, if at all.

ITU harmonisation

At the 2019 World Radiocommunication Conference (WRC-19), countries agreed to identify a large swath of mmWave spectrum for International Mobile Telecommunications (IMT) use. This identification opens up the path for countries to use the spectrum to provide 5G services.

It was decided that the entire 40 GHz range between 37 – 43.5 GHz would be identified for IMT. The agreement urges countries to protect Fixed Satellite Services. This included a decision on out of band emissions. Countries should limit emissions to -23 dB(W/GHz) to protect passive weather sensing allocation at 36 – 37 GHz.

Regional harmonisation in Europe

In Europe, the EU has started a process designed to encourage its member states to assign the 40 GHz band for mobile. In March 2020, the EU mandated the European telecommunications regulatory group CEPT to develop harmonised technical conditions for 40.5 – 43.5 GHz. These were published this month and relate to the use of the band for Mobile/Fixed Communications Networks (MFCN). MFCN is a broad definition that also

includes fixed services. This includes existing FWA and fixed links that may operate in the band.

CEPT's draft decision – also released this month - will require countries to designate the band for mobile and fixed use, once it has been is adopted by the EU.

The European Commission notes in its mandate that this was a follow-up to a previous mandate which required the CEPT to develop technical conditions for the EU "pioneer bands". The pioneer bands are 700 MHz, 3.5 GHz, and 26 GHz. At least one of these bands has since been assigned in the vast majority of EU member states.

… the European Electronic Communications Code refers to the importance of studying these bands for high capacity 5G networks.

In this mandate, the Commission notes that European Radio Spectrum Policy Group (RSPG) has identified 40.5 - 43.5 GHz and 66 - 71 GHz bands as "priority bands" for the rollout of 5G. The Commission also says that the European Electronic Communications Code refers to the importance of studying these bands for high capacity 5G networks.

3GPP work

The standards setting body, the 3rd Generation Partnership Project (3GPP) has identified the 40 GHz band as n260. n260 is included in frequency range 2 (FR2). This range also contains other mmWave bands such as 26 GHz and 47 GHz bands.

Schedules for the award of 40 GHz

In early 2020, the United States regulator the Federal Communications Commission (FCC) assigned the 37.6 – 39.8 GHz band as part of its Spectrum Frontiers auction. Mobile operators Verizon and AT&T won the majority of the licenses in this band. Other bands sold in this award include the 39 GHz and 47 GHz band.

Since then, no other assignments of 40 GHz have taken place. However, four other countries have announced their intention to award the band. These are described in the table below.

Country	Description	Estimated date of assignment
Austria	• Austrian regulator RTR said in its spectrum release plan that it will assign • RTR has not yet set a firm date for this spectrum plan is not binding. • The regulator's immediate focus is the	After 2026
Canada	• In 2019, the Canadian regulator Development Canada (ISED) decided to release a variety of mmWave bands • In June 2022, the regulator published a further consultation about the planned • The auction is planned for 2024. • There are 27 existing license holders in expire in 2025. The regulator is considering transferring these licenses to other bands when they expire.	2024
Hong Kong	Authority (OFCA) announced in its spectrum release plan for 2022-2024 that it plans to assign the 39.5-43.5 • OFCA says its consultation on these bands is "subject to technology and market developments". • The spectrum release plan is not binding and is designed to give industry an overview of potential assignments.	2023 or 2024
United Kingdom	• In June 2022, UK regulator Ofcom launched a consultation on awarding • The 40 GHz band is currently assigned to companies that use the band for fixed links. Ofcom is considering revoking these licenses.	2024

[1] RTR has not specified which portion of the 42 GHz band it might assign.

[2] ISED is referring to the 37.6 – 40.0 GHz band.

[3] Ofcom is referring to the 40.5 – 43.5 GHz band.

This list only considers countries that have recently reiterated serious plans to award the band. Several other countries have considered assigning the 40 GHz band but have not provided updates since first announcing their intention in around 2019. This suggests that interest from regulators has decreased in recent years. Countries that have at some point considered assigning the band include Nigeria, Belgium, and Taiwan.

Most recently, in February 2022, Norway announced it was considering assigning the 40 GHz band. In a statement, Norwegian regulator Nkom said it was inviting stakeholders to meet with the regulator to discuss various bands for 5G use, including the 700 MHz, 26 GHz and 40 GHz bands. However, this was only a preliminary discussion, and Nkom has not provided an update since.

2. How soon is 40 GHz likely to be needed for 5G?

We expect that the 40 GHz band is likely to be assigned for 5G in the medium term (2-10 years). 40 GHz is currently not extensively used for 5G, and the availability of equipment remains low: on iPhones the band is currently only supported in the US.

As discussed in the next chapter, 26 GHz, the first European mmWave 5G band, has yet to be assigned in most countries and it seems reasonable to expect that operators would seek to use that before using 40 GHz. We therefore expect that any widespread usage of 40 GHz in Europe is likely to take about five years.

However, there are several factors which may increase momentum and demand for the band going forward.

These include the extensive support by mobile network operators for the band, as well as future use cases such as 5G fixed wireless access (FWA). The previously mentioned CEPT and EU harmonisation efforts could also be a driving force for the band.

This section will assess how readily available 40 GHz equipment is. It will then touch on why mobile operators consider the band important and what some future use cases may be for 40 GHz.

…out of all 1,276 recently announced 5G devices, only 71 devices are known to support the n260 5G band which operates in the 37.00 – 40.00 GHz band.

Equipment availability

Slow pickup in consumer device support

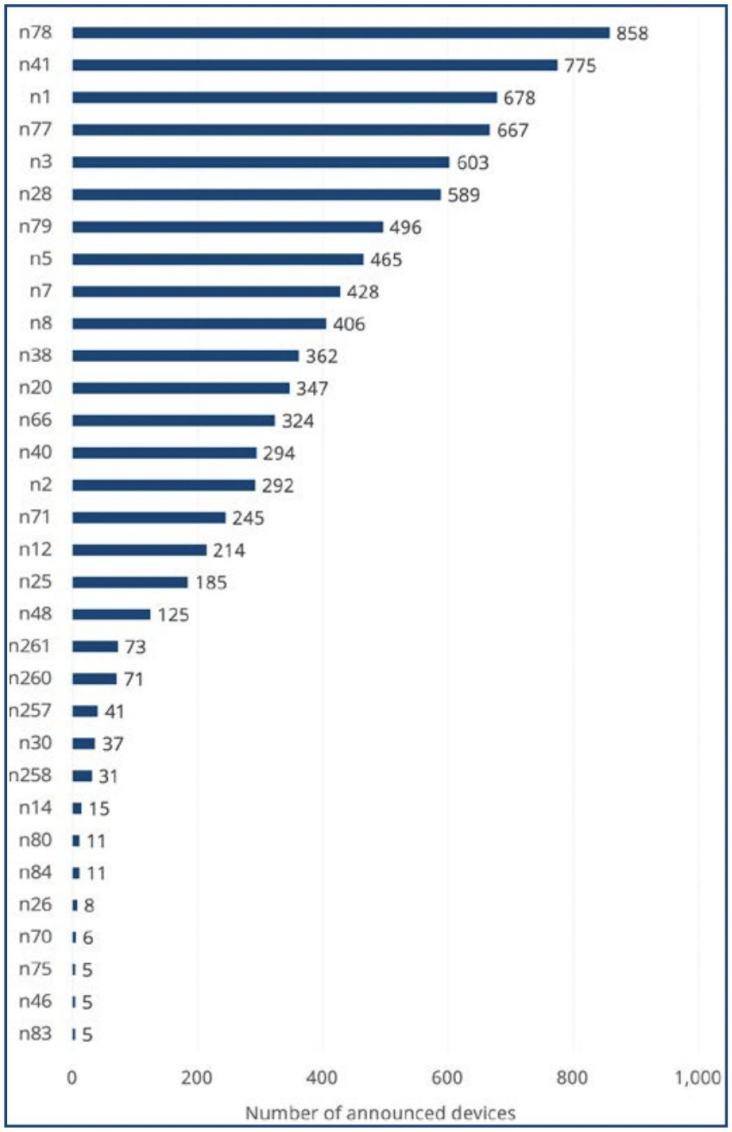
The Global Mobile Suppliers association (GSA), which represents mobile equipment sellers tracks the number of announced 5G devices. The organisation also notes which 4G/5G bands these devices support. In its February 5G Ecosystem report, the company notes that out of all 1,276 recently announced 5G devices, only 71 devices are known to support the n260 5G band which operates in the 37.00 – 40.00 GHz band (See figure 1).

The more widely assigned 26 GHz and 28 GHz bands also saw little support by device manufacturers. Only 145 devices are known to support these frequencies, which use the n257, n258 and n261 5G bands.

Meanwhile, Apple, which is one of the world's largest phone manufacturers only supports the 40 GHz (i.e. n260) band in iPhones sold in the United States. iPhone sold in all other markets, however, do not support 40 GHz.

Figure 1: Number of announced devices with support for each 5G band - Source: GSA

Figure 5. Announced 5G spectrum support, number of models by band, for bands supported by five devices or more (data not available for all devices)



Momentum behind 40 GHz

Importance to MNOs and Vendors

In a recently published report the GSMA, which represents mobile operators stresses the importance of mmWave frequencies. The organisation refers to the 26, GHz, 28 GHz, 40 GHz and 66 GHz bands collectively as mmWave.

The GSMA says mmWave will be vital in complementing low and mid-band spectrum in dense urban areas. It says the bands will be important for three key technologies: enhanced mobile broadband (eMBB), fixed wireless access (FWA) and enterprise networks. The organisation also outlines how much mmWave spectrum each of these technologies will need:

The GSMA says mmWave will be vital in complementing low and mid-band spectrum in dense urban areas.

- eMBB: An average of 4.5 GHz
- FWA: Between 350 MHz and 1.2 GHz
- Enterprise networks: Approx. 150 MHz

The GSMA notes that although it had previously advocated for at least 800 MHz of spectrum to be awarded to each operator in 26 GHz and 28 GHz, it does not believe this amount of spectrum is sufficient in the long term. This implies that assignments of the 40 GHz and 66 GHz bands will be vital in meeting the GSMA's spectrum requirements.

Telecommunications equipment vendor Samsung also echoes the GSMA's perspective. In its 6G spectrum paper, the company says mmWave will be important to accommodate continued growth of mobile data traffic. It also suggests that mmWave spectrum will "play a very important role in 6G". The company expects a consensus around 6G spectrum bands to form by 2030.

Emergence of FWA

One possible use case for the 40 GHz band could be 5G fixed wireless access services (FWA). Telecommunications vendor Ericsson's recent June 2022 mobility report predicted huge growth in the 5G FWA field. The company says that the number of FWA connections will exceed 100 million in 2022, a figure that is forecast to more than double by 2027, reaching almost 230 million.

Additionally, new guidelines for a wide-ranging $42 million broadband funding programme in the US confirmed that 5G FWA-based broadband providers will be eligible for funding. The new rules for the Broadband Equity, Access and Deployment (BEAD) programme say that broadband can be provided by "terrestrial fixed wireless technology utilizing entirely licensed spectrum or using a hybrid of licensed and unlicensed spectrum". If FWA grows as predicted, the 40 GHz band could be more widely used.

CEPT perspective

In the draft CEPT decision on 40 GHz, the ECC notes that it does not expect the 40 GHz band to be used in rural areas or on a national basis. Instead, it expects the band to be used in urban and suburban areas only.

The ECC also considers that due to differences in market demand, CEPT countries are likely to have different timescales concerning the introduction of MFCN in the band. The report reads "some administrations may wish to

implement MFCN in parts of this frequency band on a progressive basis depending on national market demand.”

3. How widely used are existing 5G mmWave bands, particularly 26 GHz?

Globally, 26 GHz and 28 GHz are the most widely used mmWave 5G bands. Despite this, the number of assignments is slowing. Additionally, mobile operators appear not to be using these bands extensively. Many major markets such as China have yet to assign these bands.

In Europe, only a small minority of countries have awarded the 26 GHz band despite EU pressure. This contrasts with the popularity of 3.6 GHz awards.

In Europe, only a small minority of countries have awarded the 26 GHz band despite EU pressure.

	Date auctioned	
Country	**3.6 GHz**	**26 GHz**
France	2020	**Not awarded**
Germany	2021	**Not awarded**
Finland	2018	2020
Italy	2018	2018
Sweden	2021	**Not awarded**
Denmark	2021	2021
Czech Republic	2017	**Not awarded**
Austria	2019	**Not awarded**
Greece	2020	2020
Luxembourg	2020	**Not awarded**
Hungary	2020	**Not awarded**
Slovakia	**Not awarded**	**Not awarded**
Spain	2018	**Not awarded**
Latvia	2018	**Not awarded**
Croatia	2021	2021
Cyprus	2021	**Not awarded**
Portugal	2021	**Not awarded**
Slovenia	2021	2021
Netherlands	**Not awarded**	**Not awarded**
Ireland	2017	**Not awarded**
Bulgaria	2021	**Not awarded**
Malta	2021	**Not awarded**
Romania	2021	**Not awarded**
Belgium	2022	**Not awarded**
Estonia	**Not awarded**	**Not awarded**
Lithuania	**Not awarded**	**Not awarded**
Poland	**Not awarded**	**Not awarded**

Table 1: 3.6 GHz and 26 GHz pioneer bands: date auctioned in EU countries

Additionally, in the countries that have assigned 26 GHz we are not aware of any mobile operator announcing that they are offering commercial services in the band. In contrast, the 3.6 GHz band is widely used, for example there are over 5,000 base stations using the band in Germany.

In the US, the FCC has characterised its initial focus on mmWave spectrum as a mistake. Mobile operators in the country have also recently turned their focus to C-band spectrum.

The waning enthusiasm for 26 GHz could impact the speed of deployment of 40 GHz. All mmWave spectrum has challenging propagation characteristics, and this only becomes more difficult the higher the frequency. Additionally, it is likely that countries will first turn their focus on assigning 26 GHz before they consider 40 GHz.

Slowdown in interest for mmWave

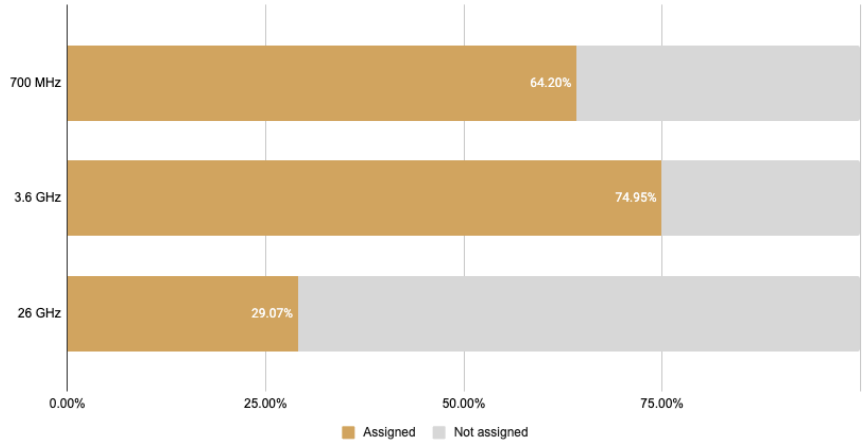
Slow European deployment of 26 GHz

In Europe, the 26 GHz band is one of the EU's pioneer bands. The band is also included in the European Communications Code. This means that European Union countries must assign the band if there is demand. Additionally, European legislators have also urged countries to assign these bands.

Despite this regulatory push, only eight EU countries[4] (29%) have assigned at least part of the 26 GHz band (see figure 2). This leaves 19 member states who have not yet assigned the band. In contrast, the 3.6 GHz and 700 MHz bands have both been assigned by the majority of EU countries. Even in countries where 26 GHz has been assigned, we are not aware of commercial deployment by mobile network operators.

Even in countries where 26 GHz has been assigned, we are not aware of commercial deployment by mobile network operators.

Figure 2: Percentage of bands assigned on average in EU27 - Source: 5G Observatory



[4] It has been auctioned in six EU countries but two – Germany and Sweden - have awarded it for local licences

Belgium, which was one of the most recent countries to complete its 5G auction decided not to include the 26 GHz band in its award. The regulator BIPT says there was a lack of demand from operators.

US mmWave regret

The United States was early to award large swaths of mmWave spectrum. The regulator has awarded a total of 4,950 MHz of spectrum in these bands. In recent years however, there has been a recognition by the chairwoman of the FCC that this focus on mmWave may have been a mistake.

… there has been a recognition by the chairwoman of the FCC that this focus on mmWave may have been a mistake.

Chairwoman Jessica Rosenworcel has said that the focus on mmWave has exacerbated the digital divide as operators could not use these frequencies to deploy in rural and suburban locations. The FCC is now in the process of awarding several bands in the C-band range.

Mobile operators have also increasingly focused on their C-band deployment, as shown in their marketing campaigns. AT&T for example, brands its new C-band 5G as “5G+”.

4. Is there likely to be a shortage of 5G mmWave spectrum in the short to medium-term?

There is no imminent shortage of mmWave 5G spectrum in the short to medium term. As previously mentioned, mmWave remains unused in many countries where it has been assigned.

There is no imminent shortage of mmWave 5G spectrum in the short to medium term.

Additionally, the limited propagation characteristics of mmWave spectrum mean that the band is usually used in very localised and small areas. It would take significant time before there would be a shortage, considering the vast majority of landmass has yet to be covered by mmWave 5G. Although more local shortages are possible in countries where each operator does not have access to large enough chunks of spectrum in a specific area.

The GSMA argues that although there is currently no mmWave spectrum shortage, current assignments are not sufficient when it comes to the future. The organisation wants to see more mmWave spectrum assigned to mobile operators by 2030.

5. Conclusions

In the report we have considered the use of 40 GHz outside the UK; how soon it is likely to be needed for 5G; the use of existing 5G mmWave bands like 26 GHz; and whether there is likely to be a shortage of 5G mmWave spectrum.

We concluded that in global terms 40 GHz is very little used for 5G. Out of over 200 countries, it has been assigned in only one, the US. Four other countries, including Austria, Canada, Hong Kong and the UK have active plans to make the band available for 5G, but from 2024 at the earliest.

40 GHz is likely to be needed for 5G only in the medium term and we estimate that any widespread usage in Europe would take at least five years. This is because the band is not widely available in handsets and is currently only supported in US iPhones.

A further reason for delays is the likely timescales for the award of the band. EU countries were required to have released 26 GHz by 2020, yet by 2022 only six had auctioned the band, often citing a lack of demand. We are at the start of a similar process for an EU 5G designation for 40 GHz, so widespread assignment is likely to be several years away. Furthermore, European operators are more likely to use the first mmWave band to be made available – 26 GHz – before they turn to 40 GHz.

… we estimate that any widespread usage in Europe would take at least five years.

Regarding the usage of 5G mmWave bands, particularly 26 GHz, enthusiasm amongst regulators and operators has been declining over the past couple of years. The number of assignments is slowing, and China has not assigned any mmWave bands for 5G. The US has characterised its initial focus on mmWave as a mistake and the FCC is now concentrating on C-band for 5G. In Europe the small number of countries awarding the band contrasts with the large number which have awarded 3.6 GHz (22/27 Member states).

We therefore conclude that there is unlikely to be any shortage of 5G mmWave spectrum in the short to medium term. In most European countries mmWave has not been assigned for 5G and where it has, it is not being used commercially. Furthermore, the very limited propagation characteristics associated with mmWave favour sharing and re-use, factors which mitigate against any shortage.

MLL Innovation and Development Timeline – 1991 to 2022

1991

Founded to provide connectivity to Vodafone cell sites. At the time BT and Cable & Wireless had a duopoly on the provision of PTP microwave links and it was the start of the UK's cellular network build. These incumbents charged exorbitant prices and provided a poor service which had a significant impact on Vodafone and their build out.

Our founder, Godfrey Wilson, applied for and received a licence and spectrum to provide PTP links. MLL then won a contract with Vodafone which helped them to roll out their network faster and fostered more competition for wireless services in the UK.

2002-2005

Pioneered out-of-bound management for managed microwave links using 2G remote management units.

2008

Successfully bid on Spectrum licences for 32GHz and 40GHz with a view offering point-to-point services and other services as technology developed.

2010

MLL successfully bid to build and roll out the Suffolk Public sector network working as a sub-contractor to BT, this utilised MPLS technology network services. This required significant investment in skills, systems, and security accreditations (CAS-t, ISO27001).

Since this time the business transformed from providing purely backhaul support to Vodafone to offering a full complement of services to all the major MNO's from acquisition, installation, de-installation, audit and maintenance.

MLL developed small cell networks with these operators and has installed run and managed a O2's WiFi for many years.

A key component of the MLL strategy from 2010 onwards was to look at how we could support the rural and underserved communities through microwave solutions, using our own spectrum and leveraging off fibre that we had or might build.

2014

MLL launched a trial in underserved business parks using 5GHz FWA, but this failed due to unsatisfactory results in network performance with the 5GHz technology.

Launched a spectrum wholesale service in partnership with largest WISP reseller to package point-to-point services

2015

Successfully won a place on RM1045 Lots 1 (Data Access) and Lot 10 (integrated communications) with Crown Commercial services which meant we could bid directly.

MLL create a joint venture with Spanish company Eurona to provide broadband services to underserved communities in the UK starting with Northumberland.

MLL successfully won funding from DCMS to investigate and document appropriate OSS and BSS systems to build a wholesale platform that would benefit and support existing small ISP providers in rural and remote communities.

During this period, we also examined alternative technologies utilising white space to support remote communities. This trial proved unsuccessful due to capacity constraints.

To provide these services MLL invested in a delivery hub at Silverstone and acquired and runs its own in-house engineering workforce of more than 60 highly skilled engineers.

2017

In March 2017, we became the first company to gain HSCN compliance (RM3825) enabling MLL to deliver connectivity services to the NHS. In October 2017 we connected the first customer to a live HSCN network service.

These accreditations indicate a track record of innovation and delivering customer service and a willingness to be a disrupter in the market.

2019

Successful on RM3808, the successor to RM1045 and across many more product lots:

(Lot 1: WAN, Lot 2: LAN, Lot 3: Traditional Telephony, Lot 4: Inbound Voice, Lot 5: IP Telephony, Lot 6: Mobile Voice and Data, Lot 8: Video Conferencing, Lot 10: Integrated Communications, Lot 13: Contact Centre)

Gain accreditation on RM6103, the education technology framework.

2020

By the middle of July 2020 our team of experts had migrated 881 of the 890 total sites awarded to MLL which means 99% sites are now migrated from N3 to the HSCN. We can proudly say we have been the fastest migrating Connectivity Network Service Provider (CNSP) reaching the 90% completion mark ahead of any other large provider in the HSCN market.

Detailed research on use cases and development of both 32GHz and 40GHz spectrum, by post code and connectivity speed across the country. Worked to connect with partners and build a BFWA case.

Began our first SD Wan (latest generation wide-area network connectivity) trials with a council in the UK.

2021

Won our first schools' contract under RM6103 to deliver fibre connectivity and content management services to more than 40 schools in the South-East.

Began rolling out SD Wan services in the UK with a 350-site win.

2022

Launched a pay-as-you-go Session Border Controller service in the UK – enabling secure voice connectivity between the customer's voice infrastructure and collaboration services such as Teams.

Trials begin for mmWave BFWA service launch. Successful bench-trials in April 2022, field trials begin July 2022.

MLL Telecom Capabilities

Operating in the UK for over 30 Years, MLL has developed a deep network support capability set for both wireless and wired networks. We have built up significant investments in systems and processes over this period and currently employ more than 180 people across the country to carry out the functions outlined below.

Service Provider:

Our service provider division supports all the UK's national mobile operators as well as underlying service providers such as tower infrastructure operators, and other smaller-scale wireless network operators.

- **Backhaul services**: A wide range speeds and technologies including Spectrum based services for point-to-point services using MLL spectrum assets.
- **Network Design Services**: These technologies include fibre, copper, microwave radio connectivity and other technologies. MLL has been instrument on transport designs for the MNOs from the original Airwave through to ESN and SRN. This has brought together MLL's in house developed planning tools, industry leading technical skills and site acquisition planning capabilities
- **Property Services**: Our property and tower service can design and acquire rights to deploy equipment on existing infrastructure, build new sites obtain temporary consents for particular functions. Our specialist, in-house team is fully qualified to obtain the required approvals quickly and efficiently and are experts at removing the barriers to equipment deployment
- **Site Services**: Following the acquisition of a new radio site, our Site Enablement service ensures the site is fully prepared and built, ready for the installation of the new equipment so you can get your site up and running as soon as possible. The service can include such elements as power provision, provision of street works, cabinet provision, monopole, tower or mast structure provision or climate control for cabins. Installation: There are a number of activities that must be undertaken prior to the physical deployment of any equipment. Site access arrangements are made, and a site-specific risk assessment and method statement is produced. After installation, everything is tested to an agreed test plan. Finally, a handover pack is prepared, and the services are moved over to be managed. Migration Services: The migration process is the final stage of bringing a new site or link(s) into full operation. Radio links are checked for stability, no errors are received by the NOC, power is stable, and the site is secure. Once the migration is agreed, the site is locked down and all traffic re-routed. Finally, the site is unlocked and five days later an acceptance certificate is generated by MLL Telecom and sent to the customer to sign.
- **Field Engineering Team**: All our engineers have many years' experience maintaining radio and IP networks. With qualifications such as Spanhoist Rope Descent and Rope Access IRATA 1, the field maintenance engineers are certified and accredited to undertake interventions; either at ground level or at height, to diagnose and resolve on-site network problems. What's more, our engineers have direct access to MLL's solution and network architects, the expertise of a radio specialist network designer, and a technical support manager. As a

result, our support teams deliver a joined up approached to fault management that keeps your downtime to a minimum.

- **Network Operations**: Network Operations Management Services. MLL Telecom's complete management of 3rd party providers offers fast resolution to the complex problems of system interaction. Our Network Operations Centre (NOC) provides a full range of services for all MLL Telecom managed network links: The NOC has responsibility for the following areas:
    - Proactive Network Monitoring
    - First, Second & Third line technical support
    - Emergency support
    - Planned Engineering Works
    - Third party provider management
    - Configuration and asset management

Public Sector:

Our public sector division provides telecommunications network services to public sector bodies in the UK.

- **Infrastructure Services**:
    - Full Range of Site Access Choices – Fibre, Ethernet, Broadband & Microwave
    - Flexible Network Provision – MPLS, VPLS, point-to-point & hybrid
    - Server & Application Management
    - Internet Services
    - SD WAN
    - WIfi
    - CCTV
    - Fibre Network Deployments

- **Voice Services**
    - Unified Communication
    - Collaboration
    - IP Telephony
    - Mobile
    - SIP Trunking
    - Land Lines and Calls
    - Conferencing

- **Security**
    - Managed Security Services
    - Managed Firewall & UTM
    - Remote Access & Two Factor Authentication
    - Content Filtering
    - Intrusion Prevention & Detection
    - DDoS Mitigation
    - BYOD

    - Virus, Malware & Exploit protection

- **Professional Services**
    - Design
    - Security
    - Network Assessments
    - Programme Management

- **Cloud Integrations**
    - AWS
    - Azure
    - Internet Peering
    - Smoothwall Content Filtering

- **Gateway Integrations**
    - HSCN
    - PSN
    - Janet
    - SIP