An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Non-Confidential Submissions to Documents 21/07 and 21/07a

Submissions to Consultation

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An Coimisiún um Rialáil Cumarsáide
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Submissions Received from Respondents

Document No:	21/47
Date:	13 May 2021

Consultation:	21/07 and 21/07a

Introduction

1. On 21 January 2021, ComReg published an Information Notice (Document 21/07) relating to “The 26 GHz Band 5G Study” (Document 21/07a) prepared by Plum Consulting and IDATE which considers among other things, the requirements to ensure the continued provision of existing services, as appropriate, while also seeking to facilitate WBB deployments, including “5G”, through the introduction of appropriate licensing framework(s).

2. In Document 21/07, ComReg invited submissions from interested parties on the matters discussed in The 26 GHz Band 5G Study. ComReg received ten submissions to Document 21/07a.

3. As outlined in Next Steps of Document 21/07, ComReg indicated that it would publish all non-confidential submissions received and may invite comments on same to facilitate extensive consideration on all matters raised.

4. ComReg will further consider the Study, along with the views of interested parties, as part of its deliberations for its next Radio Spectrum Management Strategy Statement (2022-24) which is currently scheduled for consultation during the third quarter of 2021.

5. All ten non-confidential submissions to Documents 21/07 and 21/07a are now contained below in the following order:

    1. Dense Air
    2. Eir
    3. Eoin O’Connell
    4. Imagine
    5. Netmore Group
    6. Qualcomm
    7. SpaceX
    8. Three
    9. Viasat; and
    10. Vodafone

1: Dense Air

26GHz Band 5G Study – Open Consultation

Market Framework Division
Commission for Communications Regulation
One Dockland Central,
Guild Street, Dublin 1, Ireland,
D01 E4X0

Email: marketframeworkconsult@comreg.ie

Reference: Submission re ComReg 21/07

Date: **22nd February 2021**

Respondents for Dense Air: Graham Currier (COO) and Frazer McKimm (Secretary/GM)

Dense Air generally agrees with Point 10 of the ComReg Summary on the Plum Report that "There is little usage of the band internationally or in Europe as there is limited demand to use these bands brought about by business case uncertainty". In Dense Air's opinion this is because the economics of standalone mmWave 5G deployment are poor and other 5G deployment solutions are easier and cheaper to bring to market. We also agree with the statement that "any approach adopted requires sufficient flexibility for ComReg". We agree that for the 26GHz band, a light licensing approach should be adopted rather than a license-exempt model, subject to detailed review of proposed regulations. **The Plum Report** identifies three frequency ranges; **Low, Mid & High** with multiple frequency bands within these ranges that have been identified for 5G WBB ECS.

A critical point is made on page 68-69; "Of great importance as part of this consideration is the multiband award in 2021 for the 700MHz, 2.1, 2.3 and 2.6GHz bands which is making available 470MHz of spectrum. The availability of a considerable amount of spectrum in the very near future will serve to meet coverage and capacity requirements required by the current market players as well as for any potential new entrants (big or small). This will further reduce any short to medium term requirement for the capacity options provided for by the 26GHz band."

The emergence of COVID-19 and the additional demands the resulting crisis has placed on current spectrum users underlines the importance of the efficient use of mid-band frequencies for the continued provision of existing services as well as 5G, the roll-out of which has significantly slowed during the crisis.

Dense Air agrees that it's important to cater for any future demand for WBB ECS "5G" deployments but believes there should be prioritization and timely delivery of mid-band spectrum to the market. Detailed feedback is contained in the attached Appendix.

Dense Air recommends that this auction takes place as soon as possible in 2021.

Yours Sincerely

Frazer McKimm

Appendix 1. ComReg Document 21/07 Jan 2021 & Plumb Report Comments

Respondents for Dense Air: Graham Currier (COO) and Frazer McKimm (Secretary/GM)

General Comment: 26GHz mmWave spectrum is ideally suited for dense urban deployment in high footfall areas where it is provided via shared networks or 5G neutral host. We are very positive about the future applications of this spectrum in Ireland.

ComReg 21/07 Page 8: Timescales "assignment of the upper 1GHz of the 26GHz Band could be 2023-2027 depending on the type of award (local, regional or national) used" & "250MHz of the 26GHz"

DA Comment: 2023-2024 would be a more appropriate target date for both the 1GHz & the 250MHz allocation.

ComReg 21/07 Page 8:Page 8 "ComReg should indicate a date when it will review the development of WBB-ECS in Ireland…for example 2025"

DA Comment: We think the review should take place earlier in 2022-2023.

Plumb Report Page 6. Frequency bands within the mid-band and high band ranges can usually provide more contiguous spectrum than frequency bands in low band range and are therefore ideal to meet capacity requirements. The mmWave bands provide very limited coverage ranges in comparison with lower frequency bands….. mmWave bands also have limited potential to provide indoor coverage from outdoor base stations due to building losses but this means they have unlimited potential for indoor use.

DA Comment: Agree, especially in the light of the COVID-19 crisis, that priority for spectrum release should be given to the mid-bands.

Plumb Report Page 8. Enhanced Mobile Broadband (eMBB) services "Enhanced Mobile Broadband (eMBB) based-services for high capacity are the first commercial 5G services offering mobile services and Fixed Wireless Access (FWA) which is significantly faster than ADSL (around 100 Mbps) but slower than FTTH. It has been targeted at locations not covered by a fixed network (emerging countries, rural areas)"

DA Comment: FWA for mid as well as high band opportunities should be considered due to general delays in delivering FTTH.

Plumb Report Page 9.

Ultra-reliable and low latency communications (URLLC). "Various industries have expressed a view that mmWave bands will be required for the provision of 5G services in vertical sectors such as manufacturing/industrial automation, automotive, other transportation (trains and buses for direct access from the 5G network), energy grid communications, smart cities, and medical application"

Services for vertical sectors. "Spectrum bands are generally not the most important factor for vertical users of 5G except if they need very large bandwidth that only mmWave can offer.

Services for critical services. "Critical services are part of 5G standardisation. Very high reliability and low latency networks enabled by 5G unlocks the ability to control critical services and infrastructure. New opportunities for public safety, government, city management and utility companies will appear soon"

DA Comment: The Key question is how soon will the demand for these services emerge using mmWave?

Plumb Report Page 11 Private networks. "There is also interest from verticals in acquiring spectrum rights of use and deploying their own tailored stand-alone networks"

DA Comment: What roles do Plum see mmWave & High Bands play here?

Plumb Report Page 19 3.1.2 BEREC. "The Body of European Regulators for Electronic Communications (BEREC) has released studies and consultations dealing with 5G issues as outlined in Figure 3.1." **"**To solve coverage issues and exploit mmWave frequencies, small cells should be deployed in many areas. Site owners may gain power due to small cells. Deployment of sites would be encouraged by Governments".

DA Comment: Small Cells will play a vital role in the roll-out of efficient 5G networks. Not just for **High Band** but also for **Mid Band.** The poor indoor & outdoor propagation/penetration of these frequencies means that a coordinated and consistent approach needs to be taken to the deployment of small cells on public infrastructure. This is especially true for the utilization of publically owned assets such as traffic lights, street lights and power infrastructure (ESB power poles). The utilization of this infrastructure significantly reduces cost, increases the speed of deployment and prevents "Radio Blight" associated with multiple radio deployments on single pieces of suitable public infrastructure. Recent EU legislation on the matter (commonly known as Article 57, See DA Comments Plum Page 124) complicated the matter as it allows for multiple small cell deployments potentially on the same piece of infrastructure instead of favoring Neutral Host! This has caused some confusion in public bodies trying to evolve a consistent 5G small cell deployment strategy. Public policy should be coordinated across disciplines (energy & communications) and emphasize the importance of Neutral Host solutions to avoid the above. Currently, we believe Ireland is lacking a coordinated approach to small cell infrastructure and is potentially missing an opportunity for network and infrastructure efficiency.

Plumb Report Page 20 Harmonisation of the 26GHz band in Europe. "2016, the European Commission mandated CEPT to determine the harmonised technical conditions required to facilitate the use of 5G technologies in the 3.5GHz and 26GHz bands". ECC Report 303 also notes that one study shows that coexistence conditions between indoor 5G systems and outdoor FS improve significantly due to higher values of building entry signal loss at 26GHz compared to lower bands".

DA Comment: This fall off can be can be compensated for with innovative technology such as DA is employing on 3.5GHz. If so, it would emphasize the importance of using Neutral Host technologies in these High Bands.

Plumb Report Page 22 The European Electronic Communications Code (EECC, 2018) **"**Flexibility on spectrum authorisation, spectrum sharing, spectrum trading, infrastructure sharing".

(Implementing regulation (EU) 2020/991 of 30 June 2020) "The regulation is not directly related to spectrum management but rather defines the physical and technical characteristics of small cells, which must be exempted from any individual town planning permit or other individual prior permits". "The overall exposure with the rollout of 5G networks will, therefore, be comparable to existing levels – it will be well below the strict EU exposure limits, set out in Council Recommendation"

DA Comment: We agree that the overall effect of 5G will be broadly comparable with existing 4G levels.

Plumb Report Page 26 - Benchmarking of awards, planned awards and licensing frameworks for the 26GHz Band in Europe "The UK has adopted a different approach by initially issuing local licences for indoor use in the 24.25 – 26.5GHz band. This approach seeks to enable deployment of new 5G indoor applications with little to no impact on existing services and without prejudice to future outdoor use of the band. Based on this approach, users will be allowed to apply for a 26GHz Shared Access licence for indoor use".

DA Comment: This seems like an innovative approach and perhaps worth considering in the Irish context, especially if combined with an emphasis on the use of Neutral Host.

Plumb Report Page 32-48 - FWALA

'There is currently spectrum allocated for FWALA in the upper adjacent band. At the date of publication of this report, there are no live 26 GHz FWALA licences". "Member States are only permitted to designate and make the band available on a non-exclusive basis to WBB ECS and that Member States are obligated to consider if it is necessary to impose additional technical conditions in order to ensure appropriate co-existence of WBB ECS with other services in the band". "The implications of co-existence with space services and licence-exempt devices needs to be considered". "There is no current use of the band by earth stations in Ireland"

"There is a steady trend in the market for automotive short-range radars towards new deployments in the 77-81GHz frequency band harmonised at Union level"

"ComReg Document 18/12 states that "P2P links in the 26GHz band have increased from 1,300 National Block Links in 2011 to 2,800 National Block Links in 2017 (driven mainly by the two MNOs with National Block Licences, Vodafone and Three). Further, the potential for continued use of this portion of the 26GHz band for fixed links in the future is supported by incumbent licensees who have all requested extensions to their existing licences".

DA Comment: Generally we agree with ComReg policy in this section, FWA is currently part of the DA Strategy for Band 42 (3.6 GH) however, DA is interested in any implications relating to Fixed Wireless Access Local Area (**FWALA**) and its implications on evolutions in 5G service delivery. We are also interested in developments in the low latency 77-81GHz frequency band and all its implications for autonomous vehicle projects as DA is already running 5G Autonomous Vehicle trials and is interested to track ComReg policy in this

sector. This does not impact on anything 3.6GHz Spectrum Holders are doing now there may be implications further down the road.

Plumb Report Page 50-52 - 5.6 Conclusions 'the more likely scenario is that currently unassigned spectrum will be the initial starting place for WBB ECS services". **"**The current RSMSS is due for revision in 2021". **"**regulatory flexibility for the progressive release of the 26GHz band was underlined in order to avoid negative impacts on the current users of the band and that in doing this progressive release".

DA Comment: Generally we agree with this "progressive Release" approach**.**

Plumb Report Page 52 Figure 6.1: Irish market data – telecommunications sector

Role of neutral host(s)	Dense Air has a licence in the 3.6GHz band	25MHz in rural regions and 60MHz in the five main Irish cities

Page 53: "Fibre is still at a low penetration level, but we expect to see an increase in fibre as the National Broadband Plan is rolled out, in which 90% of premises in the State will have access to high speed broadband within the next four years".

DA Comment: We re-confirm with our role as Neutral Host providers. In the light of the COVID Crisis and the mass reallocation of work to the home we believe this four year time line for FTTH under NBP is unrealistic given the delays and difficulties in getting access to power and poles. We estimate that the FTTH roll-out under NBP will take a decade, if not longer to complete its mission. Certainly we need a coordinated policy for High Band release, however far more urgent is additional capacity Mid Band spectrum. For which an auction is urgently needed in order to alleviate existing problems.

Plumb Report Page 56 - 6.1.2 The Irish population, economy and the enterprise market in Ireland "Ireland has one of the most widely distributed and rural populations in Europe. Ireland's population density of 70.9 people per km2 is considerably lower than the EU28 average of 118 people per km2 (Eurostat)"

DA Comment: As per previous comments on FWALA & NBP this is why release of mid-band Spectrum thought Public Auction and a coordinated approach with the Energy Regulator on quick and efficient access to Power & Poles is of paramount importance.

Plumb Report Page 56 - 6.2.1 Fixed technologies "Fixed networks, including fibre, xDSL and cable networks, have the potential to compete with some 5G services in the coming years. Our market forecasts (homes passed) for fibre suggest a significant increase for the years to come". **"**As far as the 26GHz potential is concerned, it is likely that the development of fixed broadband will reduce the potential for 5G fixed wireless services in areas where fibre is available in the coming years**".**

DA Comment: The consideration is the time to deliver and total cost of FTTH deployment, especially in rural areas. In this case there will be a high demand for Wireless Fibre Extension

Plumb Report Page FWA based on 4G "Many mobile operators in Europe currently provide fixed wireless access services with their 4G networks but the economics will be much better with 5G as it will provide a lower bit per hertz cost and will be able to provide Gbps services. The 4G bands could later be used by 5G with higher throughputs and a better business model".

DA Comment: Does 4G FWA not pave the way for 5G, if so Is this not another justification for releasing the 2.1-2.6GHz spectrum for Auction sooner rather than later?

Plumb Report Page 59 "The DotEcon Axon report for BEREC on "Implications of 5G Deployment on Future Business Models" provides many details on drivers and hurdles related to 5G: 5G densification with small cells is likely to favour newcomers such as neutral hosts".

DA Comment: Agreed.

Plumb Report Page 59 - 6.3.1 relevant information from ComReg's consultations Document ComReg 19/59R (Study on Terrestrial BB-PPDR Spectrum Options - a report from LS Telcom – published 18/06/2019) mentions the possible use of the 26GHz band: "While 5G will therefore require spectrum in high frequency bands, existing frequency bands will also be used. The 700MHz band, being green-field spectrum, is expected to be at the forefront of providing the initial wide area coverage layer for 5G and will be used in combination with higher frequency bands (i.e. 3.6GHz and 26GHz) to deliver the mix of coverage and capacity necessary to meet 5G's service ambitions."

DA Comment: The 700MHz band can be at the forefront but so can 2.1-2.6GHz in providing the initial wide area coverage layer for 5G?

Plumb Report Page 58- 59 - 6.3.1 Relevant information from ComReg's consultations "There is not an immediate requirement to award spectrum for 5G in the 26GHz band"

DA Comment: Agreed.

Plumb Report Page 59 "On 20 December 2019, ComReg issued Document 19/124, a response to consultation and Draft Decision on a Proposed Multi Band Spectrum Award for the 700MHz, 2.1GHz, 2.3GHz and 2.6GHz Bands".

DA Comment: We are waiting for an update on when the 700MHz - 2.6Mhz auction will take place to plan our potential participation.

Plumb Report Page 60-61 Fixed Wireless Access "Fixed wireless access market in Ireland has been quite flat during the past five years. However, in relation to the 3.6GHz band, during the COVID-19 pandemic, ComReg has observed a significant increase in data usage of FWA services". **"**72% of the Irish population live in NUTS 3 areas that are defined as predominantly rural areas" "these factors must be considered in light of the rollout of FTTH in many of the commercially viable areas in Ireland and the National Broadband Plan

in all other areas by 2022" "FWA services in Ireland will be composed of existing FWA customers moving to 5G FWA offers and of new residential and business customers attracted by the high speeds offered by 5G FWA services where these services cannot be cost effectively covered by fibre rollout" "26GHz band could be used to provide FWA services as an alternative to fibre networks. It is likely that the 3.6GHz band will be widely used in sub-urban and rural areas and optimistically, the potential for the 26GHz to be used in rural areas is unlikely because of the economic challenges of deploying 26GHz in low density areas".

DA Comment: As discussed earlier in our response, given the limitation of 26GHz spectrum in rural areas, the short to medium term option to reduce COVID-19 Crisis and home working derived pressures is to make 2.1-2.6GHz spectrum available ASAP.

Plumb Report Page 62 Figure 6.10: 5G Fixed Wireless Access in mmWave bands characteristics

Hurdles	No areas in Ireland with an adequate population density to make any service economically viable currently. Adequate spectrum for the limited take up of FWA in the 3.6GHz, 2.6GHz and 2.3GHz bands.

DA Comment: We fully agree.

Plumb Report Page 63 "Given the population density in Ireland, the amount of spectrum available in the 3.6GHz band, and the release of the vacant 2.6GHz, 2.3GHz and 700MHz bands it is unlikely that the 26GHz band will be required for capacity purposes in Ireland in anywhere near the same time period"

DA Comment: It's important to make the "vacant" 2.6GHz, 2.3GHz and 700MHz bands available ASAP.

Plumb Report Page 68 - Potential licensing approaches for Ireland - 7.1 Introduction "There may be some limited demand for FWA services due to increased home working and the lack of fibre and cable broadband services across the full geography of Ireland but limited in extent by the competition from FTTH and the NBP. In addition, a lot of potential demand for FWA could be soaked up in rural and semi-rural areas via FWA services in the 3.6GHz band, the roll out of which, has not yet been the focus of Irish MNOs".

DA Comment: We believe there will be considerable FWA demand and given extended NBP and FTTH time lines will require additional spectrum from the 2.1-2.6GHz Bands.

Plumb Report Page 68 "In Ireland, there are currently five licensees (eir, Three, Vodafone, Dense Air and Imagine) who can use the 3.6GHz band to provide both fixed and mobile 4G / 5G services under their spectrum rights of use.

It is likely that they could all be interested in access to the 26GHz band in the medium to long term to augment their current 3.6GHz offerings if capacity constraints ever occurred and deployment of small cells becomes an economic option".

DA Comment: In the longer term certainly.

Plumb Report Page 68 Of great importance as part of this consideration is the multiband award in 2021 for the 700MHz, 2.1, 2.3 and 2.6GHz bands which is making available 470MHz of spectrum. The availability of a considerable amount of spectrum in the very near future will serve to meet coverage and capacity requirements required by the current market players as well as for any potential new entrants (big or small). This will further reduce any short to medium term requirement for the capacity options provided for by the 26GHz band.

DA Comment: We totally agree with this comment.

Plumb Report Page 76 "In the baseline scenario (2021-2027), there would be 25,000 5G FWA subscriptions and a few hundred 26GHz small cells deployed each year after 2023. This limited demand could readily be met by the 1GHz of 26GHz spectrum available in Ireland during the coming years".

DA Comment: These time lines seem reasonable.

Plumb Report Page 81 Figure A.3: Distribution of announced 5G devices by range of frequency band* 2019-2020.

Figure A.3: Distribution of announced 5G devices by range of frequency band*

Frequency band range	Number of devices announced	Average progress in the category March 20 / Dec 19
39 GHz (mainly US)	22	37,5%
28 GHz (mainly US)	41	51,9%
n257 (JP, SK and US)	13	62,5%
n258 (Australia, China, Europe)	5	66,7%
n261 (Verizon)	23	43,8%
between 3.5 and 5 GHz (Global)	190	5,4%
between 1.8 and 2.6 GHz (Global)	351	56,6%
< 1.8 GHz (Global)	148	43,7%

Source: gsacom, halberdbastion and IDATE * Note that one same device might be listed several times in different category when supporting several bands at the same time

DA Comment: Availability of hardware is a critical factor in meeting short to medium term demand @5.4% 3.5GHz is a fraction of 56.6% in1.8-2.6GHz.

Plumb Report Page 81 - A.2 Private networks "In September 2020, Mercedes Benz announced that its latest factory with private 5G network was provided by Ericsson and Telefonica Germany".

DA Comment: We believe this will become an increasingly important segment of the Irish and International markets.

Plumb Report Page 109 Appendix C.7 Italy

Italy has been the first country to auction 5G mmWave spectrum. The multi band auction that included the 700MHz and 3.5GHz bands has ended in October 2018 with 1000MHz in the 26GHz band being assigned to Telecom Italia, Illiad, Fastweb, Wind and Vodafone. Licenses are valid until 2037 and Licence fees are due in instalments between 2018-2022.

The Italian regulator has adopted an innovative regulatory framework based on a "Club use" model and is working with the Ministry of Economic Development (MiSE) and the mmWave spectrum licensees on its practical implementation. Under this framework, we particularly note the following:

- Licensees can share spectrum on a geographical basis when frequencies are not used, and each licensee would still have priority access to its own block.
- Licensees can stipulate reasonable commercial agreements combining spectrum sharing and infrastructure sharing policies.
- Licensees could also make agreements with a trusted third party ("Neutral Host") to manage concurrent installations or develop of the physical network's infrastructures.
- Additional provisions have been put in place to define how a licensee can lease spectrum to vertical players.

DA Comment: There is a lot of merit in the Innovative Italian approach to 5G, some of which could be adopted for the Irish market.

Licensees could also make agreements with a trusted third part **("Neutral Host") to manage concurrent installations** or develop of the physical network's infrastructures.

Plumb Report Page 124 Article 57 paragraph 2 of Directive (EU) 2018/1972 of the European Parliament and the Council of 11 December 2018 establishing the European Electronic Communications Code.

Article 57 of the European Electronic Communications Code deals with "Deployment and operation of small- area wireless access points". It states that:

- Competent authorities shall not unduly restrict the deployment of small-area wireless access points. Member States shall seek to ensure that any rules governing the deployment of small-area wireless access points are nationally consistent. Such rules shall be published in advance of their application.
- In particular, competent authorities shall not subject the deployment of small-area wireless access points complying with the characteristics laid down pursuant to paragraph 2 to any individual town planning permit or other individual prior permits.

By way of derogation from the second subparagraph of this paragraph, competent authorities may require permits for the deployment of small-area wireless access points on buildings or sites of architectural, historical or natural value protected in accordance with national law or where necessary for public safety reasons. Article 7 of Directive 2014/61/EU shall apply to the granting of those permits.

DA Comment: The intention is laudable but this section of A57 is causing difficulty for City & Town Authorities in Ireland seeking to implement a coherent roll out of 5G small Cells on their Infrastructure particularly in build a distributed Neutral Host network there by minimizing road opening disturbances and utilization of exist City Assts rather than relying on new pole builds.

ComReg & The Department of Communications should make representations to the EU on the restrictive nature of this article.

2: Eir

eir

Comments on ComReg Information Notice:

26 GHz Band 5G Study

A study by Plum Consulting and IDATE regarding the future use of the 26 GHz Band.

ComReg Document 21/07

23 February 2021

DOCUMENT CONTROL

Document name	eir response to ComReg 21/07
Document Owner	eir
Status	Non-confidential

The comments submitted in response to this consultation document are those of Eircom Limited and Meteor Mobile Communications Limited (trading as 'eir' and 'open eir'), collectively referred to as 'eir Group' or 'eir'.

26Ghz Band 5G Study

eir comments

1. eir has reviewed the Study report with interest and broadly agrees with its observations and conclusion. In particular eir agrees that there is no significant or urgent requirement to award the spectrum for 5G purposes.

2. It is therefore appropriate to allow existing use of the spectrum to continue in the short to medium term. However we agree with the authors of the Study report "*as there is no current use of the FWALA bands it might be an ideal opportunity to consider their future use and establish a roadmap to avoid any downstream migration or co-existence issues.*"

3. eir also agrees with the observation that ComReg should set a date for a review of the development of WBB-ECS in Ireland and that an appropriate time for such a review might be around 2025.

4. eir looks forward to further engagement with ComReg on the future use of the 26GHz band in due course.

3: Eoin O’Connell

Dylan Groarke

From: Eoin.OConnell <[redacted]>
Sent: 23 February 2021 16:09
To: Market Framework Consult
Subject: Submissions to ComReg Document 21/07a

Follow Up Flag: Follow up
Flag Status: Flagged

Dear ComReg,
I would like to add my voice to the allocation of spectrum for 5G, and I would like to highlight how the current allocation model has hampered my research in this area to date. I am a researcher in the SFI centre for Smart Manufacturing, CONFIRM. We have been working on deploying a 5G testbed for manufacturing for the last 2 years. The problems we have encountered around the allocation of spectrum has severely hampered us. We applied for a test and trial license and while all of the relevant telco's said we could utilise their unused spectrum, they were not willing to allow use for windows of more than three months. Accordingly, we embarked on getting a more secure spectrum allocation for our research purposes but the charges being asked for by the telcos were punitive and effectively were in my opinion being used as a barrier to entry. We eventually secured an n78 channel through our supplier NETMORE, for use at the University of Limerick campus but the allocated bandwidth is only 60MHz, our initial analysis shows that for the projects we are deploying, to meet the specifications of high speeds and low latency we will require a 100MHz allocation.

As a research performing organisation (CONFIRM) we need to be able to duplicate our research across multiple sites, the CONFIRM centre has 8 partner sites across the Island of Ireland. We also have in excess of 100 industry partners all looking at research in the area of Smart manufacturing. The way that the current allocation of spectrum is managed nationally is not amenable to future networks research in our space. 5G has the potential to become the underlying digital fabric connecting all elements of the manufacturing world. Eliminating the need for wired connectivity, 5G will supplement the high-speed manufacturing environment allowing for a far greater degree of flexibility. For companies, it is very difficult to assess the viability of 5G in manufacturing as most literature to date has been written by companies providing 5G infrastructure. The companies we are engaging with are eager to compare the "hype versus reality" for manufacturing and as such want to engage with a neutral research body, to undertake targeted research projects in this area and by availing of the CONFIRM testbed allow them to do so in an environment that doesn't interrupt their everyday production.
I note that Germany and the UK have already recognised that leasing spectrum from telcos for manufacturing is not a good solution and they have accordingly created a light licensing of the spectrum for 5G industrial use, effectively creating an open (lightly licensed) spectrum, I would be advocating that a similar system be deployed in Ireland. However, I would ask that the channels allocated be of sufficient bandwidth, preferably 100MHz minimum. I am aware that this will require a very substantial allocation of spectrum, but the benefits to the manufacturing, education, and health sector will be enormous as Ireland will be able to realise its digital transformation.
I look forward to seeing the outcomes of the consultation process.
Regards
Eoin O'Connell
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4: Imagine

Imagine Non-Confidential Response to:

ComReg 21/07, 26 GHz Band 5G Study Information notice

22nd February, 2021

Imagine Communications Group Ltd.
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Contents

1 Introduction

Imagine welcomes the opportunity to respond to the 26 GHz Band 5G Study Information Notice[1] and associated study document by Plum and IDate[2].

Imagine shares the view[3] that spectrum is

> *"a national resource underpinning important economic, social and communications activities"*

And that

> *"The 26 GHz Band is an important band, given that it is one of the three pioneer radio spectrum bands identified as being suitable for the deployment of "5G"services in Europe."*[4]

Imagine's 3.6 GHz FWA network continues to grow with current network performance in terms of average monthly traffic per subscriber equal or higher than levels reported on fibre-based cable and FTTx networks demonstrating that FWA networks can provide high performance broadband services equivalent to those on fibre networks.

Despite many of the reservations expressed in the report that 26 GHz has limited application in the short term and economic challenges, particularly in areas without adequate population density, examples of 26 GHz use cases such Verizon in the US, NBN in Australia and Fastweb in Italy suggest otherwise and also show that there is significant potential for 26GHz FWA to be deployed in a manner complementary to existing 4G and 5G FWA deployments in the sub 6GHz bands such as 3.6GHz.

The study also references[5] the fact that: -

> *"The economy of Ireland is described as a knowledge economy (application of knowledge to generate tangible and intangible value) which mainly focuses on financial services, high tech, and life science101. Major sectors are industry, information and communication, public administration, education and health, distribution, transport."*

To ensure Ireland can meet its ambitions in this regard it is imperative that unassigned spectrum with no significant impediments to its assignment should be allocated in a timely manner along with suitable conditions to ensure its use.

If the allocation of the 26 GHz band is delayed it will place Ireland and its knowledge economy at a disadvantage compared to other countries with superior broadband and wireless service and although demand may be low initially allocating the spectrum will allow demand to be stimulated

[1] ComReg 21/07, 26 GHz Band 5G Study Information Notice
[2] ComReg 21/07a, 26 GHz Band 5G Study
[3] ComReg 21/07, Section 1 Background
[4] RSPG16-032 FINAL - Opinion on spectrum related aspects for next-generation wireless systems (5G), November 2016.
[5] ComReg 21/07a, Section 6.1.2 The Irish population, economy and the enterprise market in Ireland

in the same way that the once unpopular 3.6 GHz spectrum has now become highly sought after for the delivery of fixed and mobile broadband services.

2 Imagine's Comments on the Recommendations

With regard to the recommendations[6] Imagine has the following comments: -

> ***Recommendation 1:***
>
> *While ComReg's approach in all harmonised ECS bands to date has been towards national or large regional awards, there is not a strong basis for such an approach on this occasion or at least at this time.*
>
> ***Recommendation 6:***
>
> *Licence regimes, including licence-exemption, that cater for small cells either on an individual or local area basis should only be considered in the currently unassigned spectrum*

Imagine agrees with Recommendation 1 and Recommendation 6.

> ***Recommendation 2:***
>
> *If additional unencumbered spectrum is required in the future, then the spectrum identified for FWALA (not currently licensed) and for individual fixed links licensing would logically be the first to be considered.*

Imagine agrees that beyond the initial licensing of the currently unassigned blocks[7] the spectrum identified for FWALA (not currently licensed) would logically be the next to be considered in the future. Regarding the individual fixed links, a suitable mechanism for migrating these that does not disadvantage smaller operators who do not have block licences would need to be agreed.

> ***Recommendation 3:***
>
> *Currently, there is no foreseeable case to consider taking any interventionist steps in relation to the national block licences. Any decision should be made closer to licence expiry in 2028. Facilitating the establishment of a block licence regime in other band(s) as well as allowing migration to these other band(s) could form part of ComReg's considerations.*
>
> ***Recommendation 9:***
>
> *At this stage there is insufficient WBB ECS demand to consider reconfiguring the 26 GHz band and migrating fixed links and national block licences from the band to release further spectrum especially considering the robust demand for national block links.*

Imagine agrees with Recommendations 3 and 9.

[6] ComReg 21/07a, Section 7.2 Recommendations, 7.3 Licensing approaches in Ireland and further recommendations
[7] ComReg 21/07a, Figure 5.1: Current use of the 26 GHz band and allocations in adjacent bands in Ireland

Recommendation 4:

The use of market mechanisms such as spectrum trading and spectrum leasing should be considered as one possible method to determine how and when incumbents could move out of the band.

Imagine agrees with Recommendation 4.

Consideration 5:

Our analysis of potential demand for the 26 GHz band in Ireland indicates that demand for small cells in the band is not likely until at least after 2023 and will likely be few in number, see Figure 6.16. Small cells could be deployed to address any FWA demand that may develop after that time and other usage scenarios that may develop after 2025 at the earliest.

Recommendation 5:

Consider consulting on making available some or all the currently unassigned spectrum within the next Radio Spectrum Management Strategy Statement period to cater for any demand for niche 5G services in this band.

Imagine believes that whilst the volume of demand may well be low in the initial stages there will nevertheless be a firm requirement for small cells for FWA in the 26 GHz band much sooner than *"after 2023"* and that therefore ComReg should progress with the process for the allocation of currently unassigned 26 GHz spectrum available as early as possible and perhaps sooner than somewhere between 2023 and 2025 as implied in section 5.6 of the study[8]

Recommendation 7:

Consider releasing the 24.25 – 24.5 GHz band for indoor use using a light licensing regime to provide the flexibility later to allow outdoor use and / or a different licensing approach based on initial experience.

Imagine agrees with Recommendation 7.

Recommendation 8:

Consider releasing the 26.5 – 27.5 GHz band for local area licensing and appropriate licensing approach(es) should be adopted. This can be either once use cases emerge and demand crystallises or earlier to stimulate the market as sufficient numbers of devices become available.

Imagine agrees with Recommendation 8 and believes that this should proceed earlier to support FWA services for which the necessary 5G base station equipment and suitable CPE are already available[9] and which, unlike mobile services, due to the operator led nature of FWA deployments are not dependant on the number of devices available or in use in the market.

[8] ComReg 21/07a, Section 5.6 Conclusion

[9] Devices operating in the n258 band are available from Gemtek, Jaton Technology and Casa systems among others.

3 Imagine's Comments on the Conclusions

With regard to the conclusions[10] Imagine agrees with the following conclusions:

Spectrum

- Only the two larger tranches of currently unassigned spectrum (355 MHz between 24.25 and 24.605 GHz and 1047 MHz between 26.453 and 27.5 GHz) should be currently considered for WBB-ECS.
- The key band for award is 26.5 – 27.5 GHz.
- 24.25 – 24.5 GHz could be made available for indoor use to support the first phase of the indoor applications.

Method of award

- Subject to further consultation, the 26.5 – 27.5 GHz portion should be awarded on a local licensing basis either on a frequency / area basis or using an individual small cell approach.
- 24.25 – 24.5 GHz should be made available using a light licensing approach to allow ComReg to monitor the nature and extent of actual use of the band.

Licensing

- Technical licensing conditions should be those defined in European Commission Implementing Decision (EU) 2019/784, amended by European Commission Implementing Decision (EU) 2020/590.
- Appropriate licence conditions should be applied to ensure spectrum is utilised.

Timescales

- Demand for the upper 1 GHz of the 26 GHz band could emerge from 2023-2027 and the upper 1 GHz of the 26 GHz band could be made available by 2028.
- There is no strong basis currently to limit the use of existing licensing regimes for point to point or national block allocations or announce migration plans.
- As there is no current use of the FWALA bands it might be useful to consider their future use and establish a roadmap to avoid any downstream migration or co-existence issues.

With regard to the conclusion that: -

- Assignment of the lower 250 MHz of the 26 GHz band could be within 2022 – 2023 subject to demand.

Imagine is of the view that not only should the assignment of the lower 250 MHz of the 26 GHz band be within the 2022 – 2023 timeframe but that the assignment of 1047 MHz between 26.453 GHz and 27.5 GHz should also occur within this timeframe.

[10] ComReg 21/07a, Section 7.4 Conclusions

4 Other Comments

In section 2.3 *"Observations"* of the study, reference is made to "an influential report for the European Parliament[11]" which referring to mmWave bands and the relative demand for sub 6 GHz states that: -

> *"the level of enthusiasm in the operators is less than it might be if there were established technology ready to go and offer proven returns. Those who have to invest are unsure of the business case for solid revenues"*

Much has changed in the almost 2 years since that report was published in April 2019, significant progress has been made in the deployment of sub 6 GHz networks and due to the Covid-19 pandemic demand for reliable high speed broadband has increased significantly higher than any previous forecast predicted, also this view does not appear to consider the complimentary use cases such as providing additional hot spot coverage and capacity for sub 6 GHz FWA deployments or as a complement to last mile fibre or copper networks.

According to information in the study document spectrum in the mmWave bands has already been or is in the advanced stages of being licensed in several countries around the globe including the US, Australia, Hong Kong, South Korea, Singapore and in Europe, Denmark, Italy and it is interesting to note that many of these are also amongst those countries who have some of the best broadband services in the world[12].

The study shows[13] that as of Q3 2020 FWA and Mobile Broadband constitutes 20.9% of all broadband subscriptions in Ireland and also states [14] that: -

> *"As shown during the Covid-19 pandemic, mobile broadband is heavily used by people working from home. With higher data rates and falling cost per bit, 5G will certainly become an even more important means to provide broadband at home and for small businesses and enterprises in the coming years."*

Imagine believe that this will drive the demand for 26 GHz based FWA services and that such demand will continue to grow even as fibre becomes more widely available due to the potential for complementary use cases such as extending the reach of fibre networks as they are deployed.

Reference is made in the report [15] [16] to the fact that in recent consultations on spectrum awards (MBSA2) respondents and MNO suggested or agreed with proposals to exclude the 26 GHz band from the award. However, a significant part of this was due to the differences between 26 GHz band and the other sub 6 GHz bands proposed which meant that it is not substitutable for these bands. Furthermore, this was in relation to a process that began almost 3 years ago in 2018 since when much progress has been made in the development of 26 GHz technology and it was also

[11] 5G Deployment, State of Play in Europe, USA and Asia – An in-depth analysis requested by the ITRE committee of the European Parliament,
[12] https://www.speedtest.net
[13] ComReg 21/07a, Figure 6.3: Distribution of broadband subscriptions by technology
[14] ComReg 21/07a, 6.1.1 Reference data on the Irish telecommunications sector
[15] ComReg 21/07a, 6.3.1 Relevant information from ComReg's consultations
[16] ComReg 21/07a, Section 7.1

likely that respondents expected the MBSA2 process to progress faster than it has and that an envisaged separate award process for 26 GHz would be well progressed by now.

In terms of evidence to support the availability and suitability of the 26 GHz band the report references recent tests carried out by Orange and Samsung in Romania[17]

> *"FWA tests carried out by European operators such as Orange in Romania[18] show that the 26 GHz band can provide a sustainable business case for the provision of 5G services in areas where fibre has not been deployed or will not be deployed for economic reasons."*

The results from this trial show that it achieved near Gigabit speeds (954Mbps) at a range of over 1km in "Medium" radio conditions which would be an acceptable performance to provide FWA services in small areas including small rural towns, isolated developments, capacity hotspots etc.

In January 2021 Ericsson, Qualcomm and Casa Systems [19]completed a proof-of-concept test for NBN Australia that demonstrated mmWave transmission close to 1Gbps at a distance of 7.3km.

In December 2020 Qualcomm and Fastweb in Italy announced[20] that

> *"Taking advantage of the flexibility of 5G Fixed Wireless Access technology combined with the performance, capacity and cost-effectiveness of 5G mmWave, Fastweb will provide broadband connections to 12 million homes (i.e. 45% of the population of Italy) with speeds of up to 1 Gbps within 2024 with the aim to close the digital divide in disadvantaged areas of the country."*

In practical real-world deployments of sub 6 GHz FWA networks where there are requirements to provide throughputs and capacity levels closer to FTTx networks than MBB there are several such complementary use cases for 26 GHz deployment including: -

- Providing additional coverage in a small area where there is insufficient density to justify deployment of additional macro site.
- Providing additional capacity in a small area where there is a higher density than can be supported by an existing sub 6GHz macro cell but not sufficient density to justify an additional macro site.
- Providing infill coverage in a small area where due to topology or other obstacles macro level coverage is poor.

[17] ComReg 21/07a, 6.3.2 Inputs from countries which have deployed 5G in 26 GHz
[18] https://www.samsung.com/global/business/networks/insights/case-studies/5g-for-fixed-wireless-access-orange-romania-case-study/
[19] https://www.mobileeurope.co.uk/press-wire/15428-aussie-rules-with-world-record-for-5g-mmwave-long-range-transmission
[20] https://www.qualcomm.com/news/releases/2020/12/18/fastweb-selects-qualcomm-5g-fixed-wireless-access-commercial-launch-italy

- Providing complementary coverage to extend the reach of fibre networks where it is not economically viable to do so.

In addition, the deployment of 26 GHz mmWave as a complement to a sub 6 GHz FWA network also addresses the challenge of providing backhaul for mmWave base stations as they can make use of integrated access and backhaul (IAB) capabilities to backhaul services to the nearest fibre or high-capacity microwave connection at the sub 6 GHz macro site.

Further on in this section[21] the report considers that: -

- the multi-band spectrum award will make available a considerable amount of spectrum, much of it suitable for the delivery of FWA services, in the next few years.
- the 2.6 GHz and 2.3 GHz bands are currently unassigned and that these bands would be initially preferred to the 26 GHz band.

Imagine agrees that the 150MHz of spectrum that will be made available via the upcoming MBSA in the 2.6 GHz and 2.3 GHz bands is significant and is likely to be preferred for deployment of FWA over wider areas.

However, this amount of 2.6 GHz and 2.3 GHz spectrum is only a small fraction of the 1 GHz of suitable spectrum currently unassigned in the 26 GHz band that will be needed to address the unprecedented growth in broadband usage and future proof FWA networks such that they can continue to provide both an alternative and a complementary service to fibre networks.

The study also makes the statement that [22]:-

- the number of FWALA licensees in the 26GHz band has fallen to zero, possibly indicating the lack of a suitable business case.

Elsewhere in the study it references the fact[23] that

> *"there are no live 26 GHz FWALA licences in the current allocation "*

and that[24]:-

> *"Fixed wireless services are offered using FDD (Frequency Division Duplex) with channels of 28 MHz. They are not compatible with the TDD scheme selected for 5G in mmWave bands and will not be able to provide Gbps speeds to the customers. These "first generation" FWA systems are likely to be replaced by 5G FWA in the long term."*

Imagine does not believe that the current lack of 26 GHz FWALA licensees is an indication of the lack of a suitable business case going forward but rather a combination of a previous lack of choice of suitable equipment, though much better and cheaper equipment has since become

[21] ComReg 21/07a, 6.3.3 26 GHz usage scenarios in Ireland, Fixed Wireless Access
[22] ComReg 21/07a, 6.3.3 26 GHz usage scenarios in Ireland, Fixed Wireless Access
[23] ComReg 21/07a, Section titled "Adjacent band co-existence with FWALA"
[24] ComReg 21/07a, 6.2.3 Other Fixed Wireless Access technologies

available, and more recently a preference to deploy standards compliant 5G mmWave equipment.

Imagine agrees that in the short to medium term (2021-2027) demand for the 26 GHz band will mainly come from fixed wireless access services and believes that the usage figures for 26 GHz 5G FWA by 2027 could lie somewhere between the baseline and optimistic levels stated in "Figure 6.16: 26 GHz usage scenarios - Irish market" i.e. between 25,000 and 50,000 subscriptions. However, Imagine are of the view that to achieve such figures would require the allocation of 26 GHz spectrum to occur in 2022 and no later than the start of 2023.

With regard to initial demand for 26 GHz Imagine notes the statements in Section 7 of the study[25] relating to demand for FWA being addressed via services in the 3.6 GHz band and that the availability of a considerable amount of spectrum in the very near future will serve to meet coverage and capacity requirements.

However, as recent events have shown demand for high performance broadband is ever increasing and this will lead to situations in the near term where localised capacity and/or coverage requirements will need be met by deployment of low-cost small cell solutions using mmWave bands to complement the 3.6 GHz and other sub 6 GHz FWA networks.

[25] ComReg 21/07a, Section 7.1

5: Netmore Group

5G RF Spectrum: Importance for Irish Manufacturing Industry.

5G wireless technology is widely considered to be of vital importance to the Manufacturing Industry of the future, and indeed at present.

A critical issue for Industry is access to 5G wireless spectrum. Historically spectrum was auctioned and the highest bidders were awarded licenses – this was done for the 3.5 GHz 5G band in Ireland in 2017 and awarded to only five bidders. These licences are for wide-area (mostly national) telecommunications networks with some geographical limitations.

This method of obtaining licenses is wholly inappropriate for manufacturing industry where the requirement is for very local coverage, i.e. within a building and/or industrial Campus. Indeed, containment of RF signals within a building and/or campus is a distinct advantage by mitigating cross -interference with other wide area RF users, e.g. Mobile Network Operators. The 26GHz low propagation characteristics make it ideal for in building use and re-use in relatively close proximity.

The current situation in Ireland is that 5G spectrum required for manufacturing Industry can only be obtained by leasing from MNO license holders. This results in exorbitant annual fees from 10 – 20 times higher than in the UK or Germany. In many cases, the MNO license holders will not lease spectrum because of their own requirements for wide area 5G coverage in the area.

However, this situation is beginning to change in Europe and the UK.

Germany and the UK, with foresight, have understood that leasing spectrum from MNOs for manufacturing is not a good solution and have created light licencing of spectrum for 5G industrial use.

Because of the importance of manufacturing industry to its economy, Germany has taken the lead by deviating from the traditional license award practice. In Q4 2019 the Government there has "set aside" portions of the 5G spectrum (100MHz between 3.7 – 3.8Ghz) specifically for Manufacturing Industry. Industrial companies there apply for "local access" licenses. Some 100 licenses have been issued to-date at very low cost.

Also, the UK has issued it`s "Location Based License/ Shared spectrum" initiative, making very low-cost 5G spectrum access available to Industry.

Other EU countries are known to be considering similar initiatives. Among others France, Finland, Netherlands, and Sweden have already issued the spectrum for local use for 4G technology while considering frequencies for 5G. In Netherlands spectrum at 3400-3450 MHz and 3750-3800 MHz is intended for the local 5G networks. Similarly, Sweden, after successful auction of 3,5GHz frequencies last month, reserved spectrum from 3720-3800 MHz for local use as per Germany. Finland together with Netherlands and Sweden are considering mmWave spectrum on 24GHz-27GHz (n258) for local use.

If we do not act, Irish Manufacturing Industry will be operating at a competitive disadvantage to other European manufacturing locations. Irish Multinational setups compete hardest with their 'sister' companies - within multinational group ownership – rather than industry competitors.

Netmore Group and Netmore Ireland

Wirefree Communications is a subsidiary of Netmore Group of Sweden. Wirefree/Netmore is installing a 5G mobile private network (MPN) for Confirm Smart Manufacturing Centre of University of Limerick. Confirm is funded by the Science Foundation of Ireland and Industry. Access to frequency was an issue for Confirm Limerick and only less than ideal spectrum has been expensively leased from one of the 5 3.6 GHz owners to run the 5G MPN. Ideally, 5G carriers of 100Mhz size would be used for innovative trial manufacturing (digital twin etc.) processes. However, that is not possible or suitable with the existing configuration of 3.6GHz band

Netmore is also installing a 5G network in the UK with, Nottingham Council, Nottingham University and UK Government funding. Frequency for private 5G is not an issue in the UK.

The Netmore is a full, niche, mobile network operator (MNO) with core network; that has been in business for over a decade. Netmore sees private Networks, 5G, 4G and Internet of Things (Iot) as an exciting opportunity. Netmore installs, sells and maintains local private mobile networks – 2,3,4 and 5G, LoRa and Wi-Fi networks for indoor and outdoor use. Netmore have already built over 20 private mobile networks for companies and individuals throughout Europe.

Netmore personnel come from Ericsson, Cap Gemini, Telia, Cell-C and Vodafone to name a few.

• Full MNO capability with several hundred low power sites in buildings around Sweden and full standard and M2M (international) SIM card offering; Management of 650 - and growing - Wi-Fi access points (APs)

• Several private 4G network contracts including: a test track for vehicle monitoring / control using 4G with 5G in test, a secure 4G network with asset tracking and Push-To-Talk internal voice system for a currency printing works.

Niche operators like Netmore are key to the extensive flexible rollout of 5G. Allowing spectrum to be controlled by only the existing MNOs would be a mistake, prevent competition within Ireland and reduce Irish manufacturing competitiveness relative to fellow European manufacturers.

6: Qualcomm

As part of its submission, Qualcomm also submitted two additional reports[1].

[1] https://data.gsmaintelligence.com/api-web/v2/research-file-download?id=59768858&file=210121-Economics-of-mmWave.pdf; and

https://www.qualcomm.com/media/documents/files/srg-mmwave-whitepaper.pdf

Public consultation on the study by Plum Consulting and IDATE regarding the future use of the 26 GHz Band

Qualcomm Response

Qualcomm would like to thank the Commission for Communications Regulation (ComReg) for the opportunity to provide comments on the study by Plum Consulting and IDATE regarding the future use of the 26 GHz Band.

Qualcomm believes that making at least the 26.5 – 27.5 GHz band available as soon as possible and not later than 2H 2021 will be key for unleashing the full 5G potential in Ireland.

As mmWave adoption continues to spread across the world, handsets and a variety of other devices and CPEs supporting mmWave are being introduced into the markets. In Europe, mmWave momentum is also picking up and an increasing number of countries are planning to make mmWave available in 2021.

Indeed, commercial 5G mmWave service is now available in 55+ U.S. cities and more than 160 areas in Japan. Consumers now have a wide selection of mmWave-enabled devices — smartphones, laptops, hotpots, fixed wireless access CPEs and more.

A list of 5G mmWave commercial devices powered by Qualcomm Snapdragon is provided in the picture below.

Qualcomm would also like to note that 5G Mobile devices including mmWave are starting to cascade to lower price tiers and diffusing to multiple form factors: smartphones, CPE outdoor/indoor units, laptops etc. thus spectrum policy should account for both outdoor and indoor usage of mmWave spectrum.

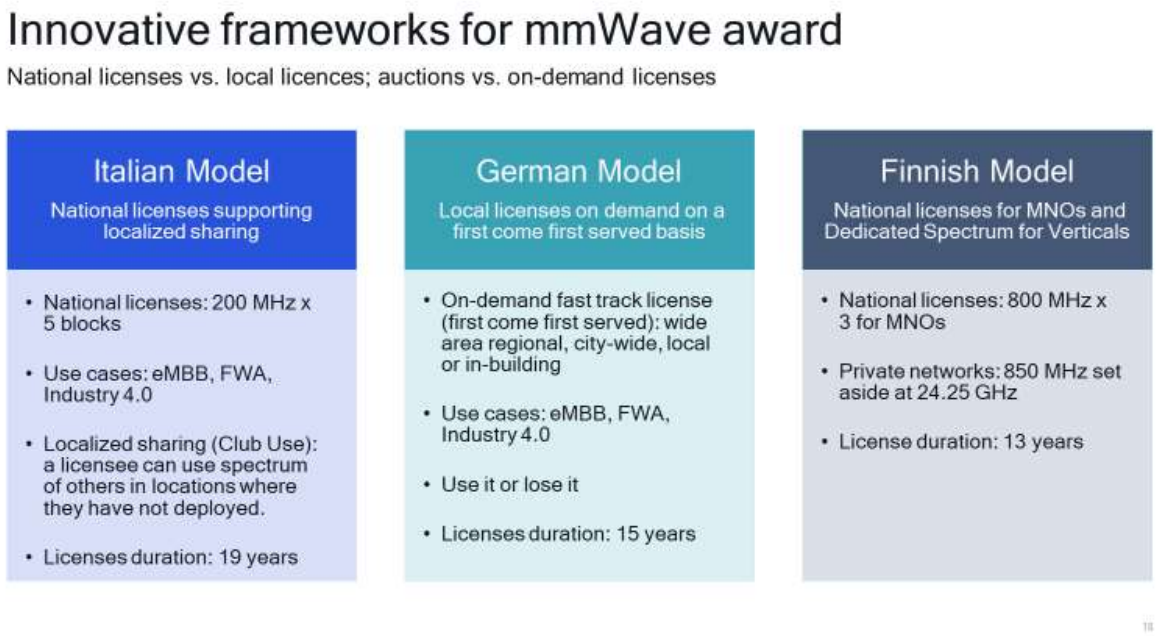
Recently, 5G mmWave is expanding into other territories such as South Korea, Russia, Italy, Singapore, Hong Kong, Taiwan, Thailand, Finland, Germany, and others. In Europe, 26 GHz spectrum so far has been made available in Italy, Finland, UK, Russia, Germany and Greece. Slovenia, Croatia, Denmark, Romania, Montenegro and the Czech Republic are also expected to award mmWave band by 2021. It is important to note that 5G NR equipment supporting the 26.5 – 29.5 GHz band is already widely available and commercial deployments of 5G end-to-end system at mmWave has already started also in Europe.

Some of the current mmWave activities that Qualcomm is involved in Europe are included in the picture below.

When it comes to the authorization framework, Qualcomm strongly believe that the 26 GHz band would have to be awarded on a licensed basis as this would enable a stable network investment environment aimed at providing predicable network performance for MBB and other ultra-reliable, low latency use cases. Uncoordinated deployment of small cells, as would be the case in a license exempt regime, risks a 'tragedy of the commons' situation in which operators are unable to deliver the required capacity and QoS due to excessive spectrum congestion and interference. The risk is increased when the number of unique channels available within the band is small.

Flexibility in spectrum use, ability for MNOs to acquire different spectrum amounts, and ability for verticals and/or other sub-national operators to gain access to spectrum (and/or for new business models to emerge) could be aided if 5G licenses allow for spectrum leasing to occur.

In Italy, Germany, and Finland three different authorization models have been adopted. They are briefly described in the picture below.



German regulator BNetzA recently made 26 GHz available for local licensing, club licenses model is used in Italy, and the spectrum reservations for verticals is adopted in Finland. Qualcomm believe that ComReg should try to strike a balance between providing opportunities for local use in the band and ensuring that high-value mobile network operators can also maximize the potential of the band.

When considering use cases for the mmWave spectrum, Qualcomm expects initial focus on enhanced Mobile BroadBand (eMBB) and Ultra Reliable Low Latency Communications (URLLC) usage scenarios for indoor hotspots in enterprises and factories and outdoor mobile broadband in dense urban and urban areas as well as Fixed wireless access (FWA) in suburban and rural macro scenarios. Applications such as Mobile Virtual/Augmented Reality and Ultra High Definition Video, 5G fixed wireless access services and smart home, smart manufacturing, autonomous vehicle, Health care will all benefit from 5G deployments.

The multi-gigabit data rates possible with mmWave technology and the wide bandwidths available in 26 GHz will likely enable new use cases benefiting from high instantaneous data rates. On one hand, end users, who could be individual consumers and machines), will be able to download large amounts of data very quickly e.g., a movie before boarding a flight, fiber like services on always on laptops, or a high definition map update to a vehicle. On the other

hand, the network will be able to serve a lot of more highly demanding end points as the high instantaneous peak rates combined with Massive MIMO (M-MIMO) will dramatically increase network capacity and hence facilitate traffic offload to the existing 4G networks.

Capacity will be an important metric for 5G, as the amount of traffic will be burgeoning in the coming years with the more widespread adoption of competitive data plans comprising unlimited use of popular apps, video streaming or even full unlimited data usage. The capacity increase, however, will not be uniform across the network, it will rather be concentrated in specific hotspots (cafes, venues, public squares, city centers, etc.) and aligned with the strategic deployment of high-capacity small cells covering the hotspot area.

mmWave technology brings the benefits of Massive MIMO down to a small-cell scale, hence maximizing small cell capacity and hotspot coverage. Deployments will encompass venues (e.g., stadiums) and locations within city centers. The latter case could be the most challenging one, as it would entail covering an area of 1 2 km2. However, depending on traffic patterns, it could be even enough to cover only the main public squares and roads within the city center, as those would be the locations where most traffic is consumed.

Qualcomm has performed several tests and simulations based on over the air testing and channel measurements on 5G NR mmWave deployments at both in outdoor and at indoor locations. The results could be provided upon request to ComReg.

Last but not least, Qualcomm would like to attach a study carried out by GSMA Intelligence on the economics of mmWave. The study amongst others contains important and relevant information on eco-system availability and use cases.

210121-Economics-of-mmWave.pdf

7: SpaceX

SPACEX

February 23, 2021

BY ELECTRONIC FILING

An Coimisiún um Rialáil Cumarsáide
Commission for Communications Regulation
1 Lárcheantar na nDugaí, Sráid na nGildeanna, BÁC 1, Éire, D01 E4X0.
One Dockland Central, Guild Street, Dublin 1, Ireland, D01 E4X0.

Re: *"26 GHz Band 5G Study: A study by Plum Consulting and IDATE regarding the future use of the 26 GHz Band." (ComReg 21/07).*

To Whom it May Concern:

Space Exploration Technologies Corp. ("SpaceX") appreciates the opportunity to respond to the Commission for Communications Regulation ("ComReg") "26 GHz Band 5G Study" ("Study") information notice. SpaceX applauds ComReg's recognition of the importance of the adjacent and internationally harmonized fixed satellite use of the Ka-band. One of these adjacent bands is home to next-generation satellites services that can provide quality broadband to otherwise unserved consumers across Ireland. As ComReg moves forward to adopt rules for the 26 GHz band, SpaceX encourages it to strike a balance that both promotes new services in that band, while protecting the essential operations in the adjacent bands.

SpaceX looks forward to providing quality broadband service to consumers across Ireland. SpaceX is leveraging its accumulated expertise in space system manufacturing, design, and operations, to deploy Starlink, a constellation of satellites designed to provide high-speed, low-latency, competitively priced broadband service to locations where access to the Internet has been unreliable, expensive, or completely unavailable.

The first Starlink constellation consists of over 4,400 non-geostationary orbit (NGSO) satellites employing advanced communications and space operations technology. To date, SpaceX has launched over 20 times to deploy more than 1,100 Starlink satellites. SpaceX is currently providing Starlink services to communities, demonstrating speeds greater than 100 Mbps at low latency. The company will use this constellation to provide a wide range of broadband and communications services for residential, commercial, institutional, governmental, and professional users.

Starlink has been designed to make efficient use of radio spectrum resources by prioritizing the ability to flexibly share spectrum with other licensed satellite and terrestrial users. The system uses advanced beam-forming and digital processing technologies to ensure compliance with regulations. It relies on frequency ranges that are aligned with international spectrum allocations identified by the International Telecommunication Union (ITU) and national allocations. Starlink links to the customer user terminals in the Ku-band for both uplink and downlink

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spacex.com

frequencies, with gateway links in the Ka-band. A focus on technologically advanced antennas, technologies, and operations also ensure that Starlink has the flexibility necessary to coordinate with other terrestrial and space-based spectrum users, while still delivering robust service, even in a crowded spectrum setting.

The need for high-speed connectivity has never been more urgent, as people increasingly are relying on broadband for any number of services, from remote learning to telework to telehealth. To ensure all consumers in Ireland have access to these critical services, ComReg should adopt policies that promote multiple technologies and guarantee that consumers have access to broadband no matter where they live. Towards that end, SpaceX appreciates ComReg's efforts to encourage the deployment of terrestrial 5G services. But ComReg must also ensure that any policies it adopts in the 26 GHz range do not interfere with the important next-generation satellite services using the adjacent bands.

Specifically, SpaceX's network uses gateway earth stations in frequency bands immediately adjacent to the upper portion of the 26 GHz band, beginning with two that were recently authorized in Ireland. These earth stations are a critical component to SpaceX's network and helps provide the backhaul for the high-speed data traffic used by Irish consumers. To the extent ComReg authorizes new uses of the 26 GHz band, SpaceX urges ComReg to adopt appropriate technical and operational rules that protect next-generation deployments like those of SpaceX in the adjacent band. By striking this careful balance, ComReg can ensure all Irish consumers and businesses have a choice for broadband connectivity in even the farthest reaches of the country.

SpaceX looks forward to further engagement with ComReg as it strives to achieve its goal of connecting all of Ireland's citizens, enterprises, and institutions to high-speed Internet services.

/s/ Gardner Foster

Gardner Foster
Principal, Satellite Policy

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8: Three

26GHz Band 5G Study

Response to Document 21/07

from Three

23rd February 2021

1. Introduction

Three is pleased that ComReg has called for comments on the future of the 26GHz band. As ComReg has pointed out, this will be an important band for a particular category of 5G services which need ultra-high speed and potentially low latency over relatively short distances. The move to use of mmWave frequencies for 5G is relatively new, and the certainty required for an eco-system was only really delivered in WRC-19, nevertheless it is moving rapidly. ComReg has a difficult balance to strike between moving quickly to ensure spectrum is available and making sure that decisions taken now do not hamper the future development of 5G in the mmWave bands.

Three would hope that ComReg will publish the responses received to this consultation and use them to aid a further consultative process. We expect there will a broad range of different interest groups who will have views on the best way to deliver spectrum from the 26GHz band for 5G services. Three is of the view that ComReg should hold an open workshop to discuss the views received in response to this consultation. We expect this would be the fastest means to explore the various views that emerge and would be more effective than a series of written consultations.

Three is aware of considerable interest in use of 5G connectivity to be used in the development of Industry 4.0 solutions in on-campus and indoor settings. This indicates that there is an immediate requirement for access to 26GHz spectrum for this type of application. We encourage ComReg to examine how this can be brought forward so that opportunities are not lost.

2. 5G Services and Bands

There would seem to be broad recognition at this time that 5G services will play an important role in enabling the next iteration of industrial, entertainment, transport, and various other services, bringing new capabilities and greater efficiencies.

Within the 5G spectrum bands there is a distinct difference between the mid and low bands (below 6GHz) and mmWave bands, with the latter providing significantly higher speed, higher throughput per m^2 and the lowest latency. The differences in these performance criteria complement the broad capabilities of 5G and distinguish mmWave bands from the lower bands. As a result, it is expected that they will play a complementary and sometimes unique role in the development of certain key 5G enabled services.

3. 26GHz Band

Within the range of future mmWave bands the 26 GHz Band is the most important for European countries at this time. As ComReg has pointed out, it is one of the three pioneer bands for 5G services in Europe, and the only one of the three capable of delivering the ultra-high speeds and low latency required for new applications. The new European Electronic Communications Code (EECC) requires that a minimum of 1GHz in the 26GHz band is made available for 5G service (subject to certain caveats) by the end of 2020.

While Three believes it is important to make rapid progress towards the availability of 26 GHz for this purpose, it is more important that ComReg make the right decisions now. ComReg should focus on making sure there is adequate bandwidth available when the band is first "opened up" for 5G services. It is acknowledged that there will be other candidate mmWave bands for 5G in the future, however initial deployments are likely to be in 26GHz and it is preferable to provide adequate bandwidth in this band from the start rather than requiring users to aggregate across multiple bands.

Of the mmWave 5G bands 26GHz is the most well progressed, and likely to become the primary band in Europe. It must be borne in mind that the spectrum allocation was only confirmed recently (in WRC '19), and that significant progress has been made since then. The basic "building blocks" for 5G in the 26GHz band (chips and network equipment) are now available, and Three expects that the ecosystem will develop rapidly. While Plum/IDATE have concluded that there is little usage of the band at this time, Three expects that this situation will change rapidly now that uncertainty around whether the band will be available has been largely eliminated. Recent IDA and Irish Manufacturing Institute tenders are already an indication that demand is growing in the area of Industry 4.0, and mmWave connectivity is becoming more prominent as a requirement to support these needs.

4. Progress to Availability

Three is aware of growing interest in the use 26GHz both for conventional access service, and also for on-campus and indoor communications which is expected to facilitate "Industry 4.0" developments. While ComReg's consultants found that "*potential demand in Ireland does not indicate a significant or urgent requirement to award spectrum in the band*", Three is of the view that the demand is now developing rapidly, and that ComReg needs to begin the process that will make the spectrum available by the appropriate time. We do not think that ComReg should focus on 31st December 2020 as a deadline, but rather progress with the steps that need to be taken now to make an appropriate allocation for 5G services in the band.

While it would be great to keep all options open at this time, that might not be possible, and instead ComReg should review current and future use of the band carefully and set out a plan that will provide some certainty to all. Consultation will be required, and Three is of the view that this can be best progresses by ComReg hosting an open workshop following this consultation.

5. Spectrum to be made available for ECS

Three does not agree with the conclusions of Plum/IDATE that only the spectrum in the sub-band 26.5 – 27.5 GHz should be made available for ECS. If we want to maximise the potential of 5G services in this band, then we need bandwidth of at least 800MHz or more per service provider. The proposal can only provide spectrum for one service at any location, which would limit competition. ComReg should instead review the existing use of the band to determine whether additional spectrum can be made available in a reasonably short timeframe. Three had suggested such a review prior to the assignment of National Block licences in 2018, however ComReg did not agree to do so at the time.

The three licensees who hold the Block licences have recently invested in the use of fixed links in part of this band on the basis of their new 10-year licences, so it would be difficult to

now consider any action to release that spectrum for ECS in the short-term. There is some unassigned and unused spectrum in the sub-band though and ComReg could consider how it could be used to provide larger bandwidth for ECS.

The unassigned channels within the upper part of the National Block Licences, and the upper part of the Fixed Links Point-to-Point band should be considered as candidates to provide a guard band and additional spectrum to aggregate to Block A.

The FWALA sub-band (both lower and upper) should be reserved for ECS or localised industrial 5G use. The lower part could be aggregated with Block C to provide a larger aggregate bandwidth.

6. Geographic Scope of Licences

Plum/IDATE has recommended that the licences for the 26 GHz band should be localised and that the 26.5 – 27.5 GHz portion should be awarded on a local-licensing basis, either on a frequency / area basis or using an individual small cell approach. Three is of the view that the same principle should apply here as in the Fixed Link National Block assignments. Operators have made efficient and effective use of these licences and they currently support a large number of individual links. This has been facilitated because operators could plan and implement their network of links without having to contend with other users in the same band. Operators should be given the same freedom to rapidly plan and deploy 5G services in the 26GHz band without the barrier of requiring individual per site licences. This is not compatible with the proposal to have localised licensing – some spectrum should be made available on a National basis.

7. Comments on Specific Points

1) ComReg – 21/07 Paragraph 11 page 7: Three does not share the view Plum/IDATE where spectrum allocation in the 26GHz band is concerned. We believe there are 1792MHz of spectrum used for microwave links, 1097 MHz free for 5G at the upper part of the band descending from 27.5GHz, and we believe there to be 299MHz free from the start of the band at 24.25GHz. This is at odds with Plum/IDATE who indicate there is 355MHz at the start and 1047MHz at the top. We would welcome clarification on this point from ComReg.

2) ComReg – 21/07 Paragraph 10 page 6: Three does not agree with the following comment from Plum "*the potential demand in Ireland does not indicate a significant or urgent requirement to award spectrum in the band*". Spectrum in the mmWave 5G bands will be essential for industry 4.0 applications requiring low latency indoor coverage over controlled and small areas. It will take time to deliver those capabilities and it will be difficult to make progress before there is some certainty regarding the availability of spectrum. Therefore, the longer we wait to start the process of making 26GHz spectrum available, the longer it will take to see these societal and business benefits in Ireland.

3) ComReg – 21/07 Paragraph 11 page 7: Three believes that the lower part of the band recommended for indoor use (24.25 - 24.5 GHz) should be made available immediately so we can start long lasting proof of concept trials to grow the ecosystem in Ireland and then move quickly to assigned spectrum.

4) ComReg – 21/07 Paragraph 11 page 7: Three does not agree with the view that "*currently there are no indications that further spectrum should be considered for award.*" If we want to maximise the potential of 5G services (which will need to provide speeds that are comparable to that of fibre in some cases) then we need bandwidth of at least 800MHz or more per operator. The current indicated bandwidth of approximately 1GHz does not provide for competition at these speeds.

5) ComReg – 21/07 Paragraph 11 page 8: Three disagrees with timescale proposed by Plum/IDATE "*assignment of the upper 1 GHz of the 26 GHz Band could be 2023-2027 depending on the type of award (local, regional or national) used;*" ComReg needs to facilitate Irish industry to be among the leaders in development of Industry 4.0 and other applications that will depend on ultra-fast 5G. This timescale proposed is too slow and will mean that opportunities will be lost.

6) ComReg – 21/07 Paragraph 11 page 8: Thee also disagrees with the statement of Plum/IDATE that "*there is no strong basis currently to limit the use of any existing licensing regimes for point-to-point or block allocations or to announce migration plans*;". ComReg must now consider how it can provide large contiguous blocks of spectrum for 5G service in the 26GHz band. This might well require the re-farming of some spectrum that is currently reserved for fixed services.

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9: Viasat

23 February 2021

Commission for Communications Regulation,
One Dockland Central, Guild Street,
Dublin, D01 E4X0

Submitted to: marketframeworkconsult@comreg.ie

Re: Viasat response to **ComReg Document 21/07a** "A study regarding the future use of 26 GHz band"

Viasat is pleased to have the opportunity to comment on the Commission for Communications Regulation's (ComReg) "26 GHz Band 5G Study. A study by Plum Consulting and IDATE regarding the future use of the 26 GHz Band" (ComReg Document 21/07) and the accompanying Consultant's report (ComReg Document 21/07a) ("Consultation").[1]

The Consultation considers the best approach to organize and manage the 26 GHz (24.25–27.5 GHz) frequency band to ensure the efficient use of the radio spectrum resource for Ireland. The Consultation also considers requirements to ensure the continued provisioning of existing services, as appropriate, while also seeking to facilitate new terrestrial IMT/5G deployments, if and when required, through the introduction of appropriate licensing framework(s).

Viasat's comments below (1) provide information on the broadband services that Viasat and other satellite operators provide in Europe and around the world in the critical 27.5-29.5 GHz (28 GHz) in addition to the rest of the Ka band; (2) support the identification of the 26 GHz band for terrestrial IMT/5G and the preservation of the 28 GHz band for satellite broadband services; (3) recommend conditions that need to be placed on terrestrial IMT/5G services in the 26 GHz band to protect satellite services in the adjacent 28 GHz band; (4) urge ComReg to revise the 26 GHz Fixed Service spectrum block plans in the 26 GHz band to accommodate terrestrial IMT/5G or relocate terrestrial Fixed Services to other bands such as the 32 GHz, if required to introduce terrestrial IMT/5G into the 26 GHz band; and (5) urge ComReg to upgrade its National Frequency Plan for Ireland to authorize satellite user terminals to operate in 27.5-29.5 GHz frequency band as satellite is uniquely suited to meet unmet broadband demand in Ireland

With a European headquarters in Dublin, Viasat is a global leading provider of communications solutions across a wide variety of technologies, both satellite and

[1] *See* ComReg, *26 GHz Band 5G Study* (26 January 2021) at https://www.comreg.ie/publication/26-ghz-band-5g-study.

terrestrial. As the world's only vertically integrated end-to-end satellite operator, Viasat designs and builds every component of our networks—user terminals, satellite payloads and ground stations—to meet the market demand for reliable, effective and affordable, high-speed broadband connectivity.

Viasat's use of the Ka band, specifically the paired frequency bands 27.5-30 GHz (Earth-to-space)/17.7-20.2 GHz (space-to-Earth), is robust as Viasat uses this spectrum to provide millions of high-speed broadband connections to households and businesses in North America, Central America, Latin America,[2] Australia,[3] and across Europe[4].

The 27.5-29.5 GHz (28 GHz) portion of the Ka band, that is adjacent to the 26 GHz band, is a critical element of the satellite broadband connected world. The satellites using the 28 GHz band bridge the digital divide today and will continue to do so in the future. These satellites provide ubiquitous connectivity that no other technology can offer.

In addition to fixed broadband services, Viasat has pioneered mobile broadband services using innovative antenna designs for Earth Stations in Motion (ESIM) service to aircraft, ships and other land-based users. For example, passengers and crew on aircraft, use the 28 GHz band, in addition to the rest of the Ka bands identified above, to meet demand for gate-to-gate, high-speed broadband for communications and entertainment, cabin support, and fleet digitization and maintenance. Global shipping and passenger vessels rely on the 28 GHz band for navigation and broadband communications benefiting passengers and crew and facilitating the transportation of cargo. Trains, buses and other land-based vehicles also rely on satellite broadband services operating in the 28 GHz band for passenger connectivity, operations and maintenance support, and fleet tracking.

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[2] *See* https://viasat.com.mx/community-wi-fi/?lang=en; *Viasat Brings Fastest Home Satellite Internet Service to Mexico*, https://www.viasat.com/news/viasat-brings-fastest-home-satellite-internet-service-mexico; *Viasat Completes Brazilian Residential Internet Service Roll-Out--Now Covers 100% of the Country; Offers New Premium Satellite Internet Service Plan with Highest Speed and Data*, https://www.prnewswire.com/news-releases/viasat-completes-brazilian-residential-internet-service-roll-outnow-covers-100-of-the-country-offers-new-premium-satellite-internet-service-plan-with-highest-speed-and-data-301161443.html.

[3] *See Viasat Wins $286M Satellite Broadband Deal with Australia*, https://spacenews.com/viasat-wins-286m-satellite-broadband-deal-australia/.

[4] *See Viasat's Expansion in Europe Helps Bridge the Gap to Faster Broadband (video)*, https://corpblog.viasat.com/viasats-expansion-in-europe-helps-bridge-the-gap-to-faster-broadband/; *Viasat Affirms Commitments to Bring its Powerful ViaSat-3 Satellite to Europe*, https://www.viasat.com/news/viasat-affirms-commitments-bring-its-powerful-viasat-3-satellite-europe.

Viasat supports the 26 GHz band identification for terrestrial IMT/5G to provide broadband wireless electronic communications services pursuant to European Commission Decisions (EU) 2019/784 of 14.5.2019 and (EU) 2020/590 of 24.4.2020. Viasat also supports the European Conference of Postal and Telecommunications Administrations (CEPT) 5G Roadmap's preservation of the 28 GHz band for satellite broadband services. The CEPT 5G Roadmap (Version 10, Revised 6 March 2020) explains that "Europe has harmonized the 27.5-29.5 GHz band for broadband satellite and is supportive of the worldwide use of this band for ESIM [Earth stations in motion]. This band is therefore not available for 5G."[5]

Viasat notes an additional area not included in the Consultation regarding the use of satellite broadband services. The Consultation does not address the need to protect satellite receivers that have co-primary status in the 28 GHz band under the International Telecommunication Union (ITU)[6] and European[7] tables of frequency allocations. Therefore, Viasat respectfully requests that ComReg take into account the satellite receivers with co-primary status in the 28 GHz frequency band.

As stated above, Viasat, as with many satellite operators, provides broadband services in the adjacent 28 GHz frequency band throughout Europe and the rest of the world. As such, Viasat is concerned about potential out-of-band emissions from the 26 GHz band by terrestrial IMT/5G systems into the 28 GHz band. Increases in power by terrestrial IMT/5G systems in the 26 GHz band could increase out-of-band emissions in the 28 GHz band. The potential impact of increased out-of-band emissions in the 26 GHz band could adversely affect the interference environment in the 28 GHz band by impacting the ability of satellite receivers in space to receive signals from earth stations. Therefore, Viasat respectfully requests that the Consultation and conditions for terrestrial IMT/5G operations in the 26 GHz band also address out-of-band limitations on terrestrial IMT/5G operations to protect satellite broadband service in the 28 GHz band.

Viasat has supported the study and development of reasonable operating parameters for terrestrial IMT/5G in the 26 GHz band throughout the ITU WRC-19 process. To this end, Viasat urges ComReg to conform domestic implementation of terrestrial IMT/5G to the operating parameters decided in Resolution 242 (WRC-19). Among several items, Viasat emphasizes the importance of the portion of Resolution 242 (WRC-19) that requires that terrestrial IMT/5G base stations within the 26 GHz frequency band with high

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5 *See* European Conference of Postal and Telecommunications Administrations (CEPT), *Spectrum for wireless broadband – 5G*, Section B.3 (Version 10, Revised 6 March 2020) at https://www.cept.org/Documents/ecc/57839/ecc-20-055-annex-15_cept_5g_roadmap.

6 The Radio Regulations, Edition of 2020, Article 5 titled *Frequency allocations* at https://www.itu.int/en/myitu/Publications/2020/09/02/14/23/Radio-Regulations-2020 .

7 ERC Report 25 *The European table of frequency allocations and applications in the frequency range 8.3 kHz to 3000 GHz* at https://docdb.cept.org/download/2ca5fcbd-4090/ERCReport025.pdf .

power operations (e.i.r.p. per beam exceeding 30 dB (W/200 MHz)) not to be permitted to point their antenna beams upward at the geostationary satellite orbit, and to maintain a minimum separation angle of ≥ 7.5 degrees. Viasat would like to highlight that these technical limitations for terrestrial IMT/5G base stations included in Resolution 242 (WRC-19) are not mentioned in the ComReg Consultation. These power and separation angle limitations provide more specific conditions to protect satellite services than the harmonized technical condition in EC Decision 2019/784 cited in the Consultation. Therefore, Viasat respectfully requests that the Consultation consider these IMT/5G limitations to protect critical satellite broadband services operating above 27.5 GHz.

In addition to the out-of-band emissions that may be caused by terrestrial IMT/5G deployment on the ground, Viasat is also concerned about deployment of unmanned aircraft in the 26 GHz band because the terrestrial IMT/5G base station antennas pointed upwards to communicate with the unmanned aircraft could transmit signals towards satellite receivers in space and potentially increase out-of-band emissions in the adjacent 28 GHz band. Viasat urges ComReg to ensure that Resolution 242 (WRC-19) 26 GHz band out-of-band limits and pointing requirements are applied to terrestrial IMT/5G operations in order to protect 28 GHz satellite receivers in space.

WRC-19 designated over 17 gigahertz of spectrum for terrestrial IMT/5G in the mmWave bands, including the 26 GHz band.[8] Viasat urges ComReg to take the vast amount of spectrum available for terrestrial IMT/5G in the mmWave bands identified by WRC-19 and the additional low-band and mid-band spectrum being made available in countries around the world for terrestrial IMT/5G into account as part of its overall review of spectrum for terrestrial IMT/5G services.

Viasat agrees with the Consultation conclusion that there is little usage of the 26 GHz band in Europe and internationally due to limited demand for mmWave at this point given business case uncertainty. Viasat supports ComReg adopting a flexible approach that accommodates any future demand for terrestrial IMT/5G services in the 26 GHz band, while also appropriately protecting existing services like satellite broadband services operating in the 28 GHz band.

Viasat is of the view that the use of the 26 GHz band by both Fixed Service point-to-point and terrestrial IMT/5G is possible on a coordinated basis as described in ECC Report

8 *See* ITU Press Release, *WRC-19 identifies additional frequency bands for 5G*, (22 Nov. 2020) (those bands include the following: 24.25-27.5 GHz, 37-43.5 GHz, 45.5-47 GHz, 47.2-48.2 and 66-71 GHz) at https://news.itu.int/wrc-19-agrees-to-identify-new-frequency-bands-for-5g/.

303.[9] Furthermore, industry consensus is that terrestrial IMT/5G in millimeter bands will be used on a very localized and geographically limited basis due to a short signal propagation radius. A UK OFCOM paper titled "5G Spectrum Access in 26 GHz", states that 5G cell radius will only be "50 meters to a few hundred meters."[10] Such small cell radius limits the deployment of terrestrial IMT/5G in the 26 GHz band. As such, the short range and limited deployment of terrestrial IMT/5G limits the occurrences of potential interference with fixed point-to-point links in the 26 GHz band.

Viasat's view is that current operators of Fixed Service Point-to-Point (FS P-P) systems are unlikely to invest in a migration from 26 GHz without significant market demand to justify the investment in equipment upgrades. There is ample spectrum within the 3.25 GHz comprising 26 GHz frequency band for both existing FS P-P and new IMT/5G. Within the 26 GHz band, more than one gigahertz should be considered for terrestrial IMT/5G use only if there is a market demand of more than one gigahertz of spectrum by terrestrial IMT/5G providers. And if market demand is more than the one gigahertz of 26 GHz spectrum as outlined by the ECC, all possible measures should be taken so that new terrestrial IMT/5G systems can use the 26 GHz spectrum on a coordinated basis with existing fixed point-to-point users. In aggregate, the 26 GHz band is more than adequate to accommodate deployment of existing FS and new terrestrial IMT/5G without migration of FS point-to-point links to other bands.

The 26 GHz band is only in the early stages of use by the terrestrial industry allowing for growth in the band for terrestrial IMT/5G. Given the ample room in the 26 GHz band for terrestrial IMT/5G, migration of the FS links from the 26 GHz is not necessary.

Viasat also believes that an individual base station authorization framework for IMT/5G should be the preferred approach to manage national coordination with existing FS links in the shared portions of the spectrum.

Despite the limited usage of the 26 GHz band described above, the Consultation cites difficulty releasing spectrum in the 26 GHz band to terrestrial IMT/5G due to existing terrestrial Fixed Service users. The constraint of introducing terrestrial IMT/5G into the 26 GHz band is caused by the block license regime that reserves or blocks portions of the 26 GHz spectrum for terrestrial Fixed Service. Viasat is of the view that block licensing for fixed links in the 26 GHz band should not prevent the development and future use of

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9 *See* ECC Report 303 (5 July 2019) on "Guidance to administrations for Coexistence between 5G and Fixed Links in the 26 GHz band ("Toolbox")".

10 *See* Ofcom Call for Input, *5G spectrum access at 26 GHz and update on bands above 30 GHz* (July 2017) at https://www.ofcom.org.uk/__data/assets/pdf_file/0014/104702/5G-spectrum-access-at-26-GHz.pdf.

satellite services allocated on a co-primary basis in the 28 GHz band. That is, if ComReg decides that the Fixed Service operations in the 26 GHz band need to be relocated, Viasat opposes the introduction of block assignments in the 28 GHz band to accommodate terrestrial Fixed Service relocation from the 26 GHz band to the 28 GHz band. Viasat supports the bands proposed in ComReg 20/109 (*i.e.*, 32 GHz). That is, Viasat supports the relocation of terrestrial Fixed Services from the 26 GHz band to the 32 GHz band, if that is what ComReg decides is necessary to accommodate the introduction of terrestrial IMT/5G services in the 26 GHz band.

A primary driver to meet the broadband demand is access to adequate spectrum. Viasat's current satellite system is based principally on the use of the Ka band. Ireland's current National Frequency Plan limits satellite user terminal use to 29.5-30 GHz frequency band. Viasat urges ComReg to also make 27.5-29.5 GHz frequency band available for satellite user terminals to meet the needs of Irish citizens.

The need of the Ireland broadband market is clear. Ireland consumer choice of high-quality broadband is limited. One study, conducted by UK research firm Cable.co.uk, found that Ireland broadband speeds where below many other European countries.[11] Also, in an effort to improve the rankings described in the Cable.co.uk study, the Irish Government invested €3bn in broadband project to address the National Broadband Plan in Ireland.[12] At the time of the signing, the Government called it the 'biggest investment in rural Ireland ever' with an aim to provide broadband to over 500,000 homes in Ireland. These homes are geographically dispersed as illustrated in the broadband connection points slated to receive broadband early in the project.[13] The project is expected to take as long as seven years to complete. The project's goal is to deliver fiber to the majority of premises but acknowledges that premises located in the most remote areas must have non-wireline connections. These geographically dispersed premises designated for non-wireline connections and many of the other connections are uniquely suited for satellite. In the United States, Viasat's trenchless quick deploy satellite broadband delivers service to over 600,000 premises today. Satellite is uniquely suited to address Ireland's connectivity, including speeds of up to 50-100 Mbit/s, by addressing unmet residential and small business broadband demand, and also providing high quality service to unserved and underserved locations around the nation. Satellite broadband services can address the

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[11] *See* Cable.co.uk 2020 speed test ranking report https://s3-eu-west-1.amazonaws.com/assets.cable.co.uk/broadband-speedtest/worldwide-broadband-speed-league-2020-data.xlsx.

[12] Irish Times *Signing of €3bn broadband contract is 'biggest investment in rural Ireland ever'* https://www.irishtimes.com/news/politics/signing-of-3bn-broadband-contract-is-biggest-investment-in-rural-ireland-ever-1.4087859

[13] Map of broadband connection points selected to receive high-speed connectivity in the first year of the broadband plan. https://www.datawrapper.de/_/8ai4V/

broadband needs of Ireland with minimal infrastructure and affordable pricing, if the spectrum resources are available, including access to the 27.5-29.5 GHz band.

In conclusion, Viasat urges Ireland to follow global trends and identify the 26 GHz band (as well as numerous other bands) for terrestrial IMT/5G and preserve the 28 GHz band for satellite broadband services. The ITU's WRC-19 terrestrial IMT/5G decision paves the way for terrestrial IMT/5G across the 26 GHz band.

Viasat summarizes the following points and urges ComReg to:

1. Implement terrestrial IMT/5G in the 26 GHz band and maintain the 28 GHz band for satellite services.

2. Conform its domestic spectrum plan for the 26 and 28 GHz bands to the CEPT 5G Roadmap for terrestrial IMT/5G and harmonize and secure the 28 GHz band for satellite broadband service and not make the 28 GHz band available for terrestrial IMT/5G.

3. Recognize the co-primary use of satellite receivers in the 28 GHz band.

4. Adjust ComReg's existing block licensing scheme used in the 26 GHz band to accommodate terrestrial IMT/5G future use should future demand materialize. In any case, do not relocate terrestrial fixed services to the 28 GHz band.

5. Ensure that the aggregate level of terrestrial IMT/5G out-of-band emissions from the 26 GHz band into the adjacent 28 GHz band does not cause harmful interference to satellite receivers in the 28 GHz band.

6. Condition terrestrial IMT/5G base station authorizations on Resolution 242 (WRC-19) out-of-band limits and pointing requirements in order to protect 28 GHz satellite receivers in space.

7. Ensure that the use of terrestrial IMT/5G in the 26 GHz band not constrain the use of the entire 27.5-29.5 GHz band for satellite broadband services, including GSO ESIM.

8. Upgrade the National Frequency Plan of Ireland to extend the use of satellite user terminals from 29.5-30 GHz to 27.5-29.5 GHz frequency band.

Viasat appreciates ComReg consideration of the information above and commitment to the development of satellite broadband services throughout the 27.5-30 GHz and 17.7-

20.2 GHz portions of the Ka band, including the 28 GHz portion of the band. We remain at your disposal to answer any further questions or provide further details as requested.

10: Vodafone

Non-Confidential Version

26 GHz Band 5G Study

A study by Plum Consulting and IDATE regarding the future use of the 26 GHz Band.

ComReg Document 21/07

Introduction

Vodafone welcome this study into the use of the 26GHz band. In the text below we have a number of comments below on the work done so far and look forward to future dialogue on the use of this band.

Our key messages:

1 The large unused segment of the band 26.5 to 27.5 GHz is a valuable national resource. We believe it is too early to decide on a licensing or award process for this part of the band.

2 The parts of the 26GHz currently used for block allocation for radio links have become more important as the fibre connectively has not become readily available to service mobile base-station sites.

1 Mobile

As reflected in your study it is currently too early to decide on the licensing of the 26.5 to 27.5 GHz segment of the band. In our view however it remains likely that this band will become a European standard, and at some future point standard mobile handsets will be equipped to use this band.

We have seen in the last year that changing use patterns, driven by the Covid emergency, have driven a dramatic increase in traffic, but also very rapid changes in use patterns. It is not clear where future traffic pattens will move. Although ComReg plan to award a number of bands this year (700/2300/2600MHz) this additional capacity could be filled more quickly than previously anticipated if current growth patterns continue.

In a high traffic growth scenario, the 26GHz band could be an important overlay network in city centre areas and also support high capacity locations such as concert halls, football stadiums etc.

A solution to provide in-band backhauling may develop in time a as a method of supporting low cost small cell solutions. This application remains uncertain.

We note the consultant's recommendation that local or individual site licences are used for this band. This would potentially be very inefficient if it prevents nationwide provision of new services. Further consideration is needed on this.

The consultants report also discusses 24.25 – 24.5 GHz. We agree that this portion of the band may be useful for the support of local and industrial licences. From our discussions with some potential industry users the applications appears to focus on indoor solution for industrial production and stock management.

In summary a high bandwidth segment of spectrum, coordinated across Europe is an asset. As the business and traffic cases are not clear yet we suggest that ComReg should not take any decisions that would prevent future high-density usage of the band.

2 Radio Links

While not directly the subject of this consultation we include the following as an update on our submission to ComReg 2017-85 on radio links.

It is 3 years since we responded to 17/85, a "Consultation on proposed 26 GHz Spectrum Award 2018". The material we supplied at the time, detailing to cost of moving these links, remains valid. It had been expected that fibre connectivity for base-station sites would become more available, but this has not materialized at a significant scale. Indeed, as network capacity has increased, we have increased our usage of radio links in the 26GHz band.

The replacement of this backhaul capacity in the network with alternative radio links could be a long and expensive process. We suggest that ComReg should identify and award alternative spectrum to at least 5 years in advance of ceasing the block allocations. In addition ComReg should in the same time frame also identity new block allocation in the D or W bands as supplementary capacity.

Comments on section of ComReg document:

1 Background

1. .

2. The 26 GHz Band is harmonised for WBB in Europe under:

    - European Commission Implementing Decision (EU) 2019/784[3], as amended by Decision (EU) 2020/590[4], which obliges Member States by 30 June 2020 to "designate and make available on a non-exclusive basis" the 26 GHz Band for terrestrial systems capable of providing wireless broadband electronic communications services in compliance with the essential technical conditions set out in the Annex; and

    - Article 54(1)(b) of the European Electronic Communications Code ("EECC") Directive (EU) 2018/1972[5] which obliges Member States to take appropriate measures by 31 December 2020 to *"allow the use of at least 1 GHz"* of the 26 GHz Band for terrestrial systems capable of providing wireless broadband services, *"provided that there is clear evidence of market demand and of the absence of significant constraints for migration of existing users or band clearance"*.

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We strongly support the alignment with European standards.

2 The 26 GHz Band 5G Study

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9. The key findings by Plum/IDATE include:

    - there is little usage of the band internationally or in Europe as there is limited demand to use the band brought about by business case uncertainty;

    - an international harmonised approach to releasing the 26 GHz band for

WBB ECS is not evident – again driven by business case uncertainty;

- the potential demand in Ireland does not indicate a significant or urgent requirement to award spectrum in the band; and
- any approach adopted requires sufficient flexibility for ComReg to cater for any future demand for 5G services, that may occur (horizontally or vertically) while also appropriately protecting incumbent services.

We would agree that ComReg should keep a flexible approach to cater for demand for 5G services. It is too early to make final decisions about the usage or licensing of the band.

10. The **specific recommendations** identified by Plum/IDATE include:

Spectrum

- only the two larger tranches of spectrum currently unassigned (355 MHz between 24.25 and 24.605 GHz and 1047 MHz between 26.453 and 27.5 GHz) should be currently considered for WBB-ECS;

This is the case at the moment. We suggest that ComReg shold also review the usage of other part of the 26GHz band and work to an overall plan for the band.

- the key band for award is the 26.5 - 27.5 GHz due to the expected equipment availability including devices and its adoption across Europe and overlap with 28 GHz band frequencies used outside of Europe;

We agree that this is the key part of the band for short term consideration.

- 24.25 - 24.5 GHz could be made available for indoor use to support the first phase of indoor applications, including industrial. Indoor use only would limit potential out of band emissions to the Earth Exploration Satellite Service (EESS) until tighter 5G equipment limits are introduced; and

We would agree with use of this part of the band for industrial applications.

- currently there are no indications that further spectrum should be considered for award.

Recommended methods of award

- While ComReg's approach in most harmonised ECS bands to date has tended towards national or large regional awards[7], there is not a strong basis for such an approach on this occasion or at least at this time. On this basis, it is recommended that the 26 GHz band should be localised and that the 26.5 – 27.5 GHz portion should be awarded on a local-licensing basis, either on a frequency / area basis or using an individual small cell approach;

We do not agree that the data gathered by consultants supports this conclusion. Local or individual cell licensing may result in very inefficient usage of the important part of the band.

- the 24.25 – 24.5 GHz portion should be made available using either a licence- exempt or "light licensing" approach[8]; and

We would agree with this approach.

Timescales

- assignment of the upper 1 GHz of the 26 GHz Band could be 2023-2027 depending on the type of award (local, regional or national) used;

agreed - a clearer picture of this will emerge in the next two years.

- assignment of the lower 250 MHz of the 26 GHz band could be within 2022 – 2023 subject to demand;

agreed

- there is no strong basis currently to limit the use of any existing licensing regimes for point-to-point or block allocations or to announce migration plans;

agreed - we would like to see ComReg aim to produce a plan for the block allocations by the end of 2023.

- as there is no current use of the FWALA bands it might be an ideal opportunity to consider their future use and establish a roadmap to avoid any downstream migration or co-existence issues; and

- ComReg should indicate a date when it will review the development of

WBB- ECS in Ireland, for example 2025, to assess whether there is a need for further spectrum and / or a different licensing approach.

Agreed.

3 Request for comments

11. One of the important issues that arises from the Study is the requirement for clarity regarding potential use cases in Ireland. The Study indicates that for the short to medium term there:

- would be very limited demand to use the 26 GHz band for 5G technologies providing fixed wireless access or widescale mobile services;

We agree that there is no short term demand. However we would not extend this to say that we can foresee the medium term.

- may develop in time a use case for eMBB services for city centres and "hot spots" such as airports, railway stations and malls but it is not clear if any of these "hots spots" exist on a suitable scale in Ireland;

This is as yet unknown.

- may develop in time a requirement for in-band backhauling which is an overlay on other services. However, given the current paucity of use cases, this may not come to fruition.

Whether there will be solution in this space remains unclear. However this technology this may be important in Ireland as there is on-going difficulty adding fibre backhaul to base-stations.