An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Strategy for Managing the Radio Spectrum 2022 to 2024

Response to consultation on ComReg's draft Radio Spectrum Management Strategy Statement for 2022 to 2024

Response to Consultation

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Chapter 1

1 Introduction

1.1 The Commission for Communications Regulation ("ComReg") is responsible for, among other things, the management of the radio frequency spectrum ('radio spectrum' or 'spectrum') in the State[1]. ComReg is required under Section 31 of the Communications Regulation Act 2012, as amended, to draw up and adopt a strategy statement reflecting its statutory functions every 2 years.

1.2 In September 2021, ComReg set out its draft radio spectrum management strategy for the period 2022 to 2024 ("Consultation 21/90"). In Consultation 21/90, ComReg, among other things, reviewed the previous strategy period (2019 to 2021) and set out its draft radio spectrum work plan for the period 2022 to 2024, while also being reflective of ComReg's current ECS Strategy Statement.[2]

1.3 ComReg sought the views of interested parties. Forty-four submissions were received, non-confidential versions of which are published alongside this document (in Document 21/136s). The list of respondents are listed at Annex 2.

1.4 Readers are advised that only matters where ComReg received consultation responses are addressed in this document.

1.5 Having carefully considered the responses received, this response to consultation document sets out ComReg's assessment of, and views in relation to, the matters raised, which have informed the final Radio Spectrum Management Strategy Statement for the period 2022 to 2024 ("RSMSS"). ComReg is pleased to publish the RSMSS alongside this response to consultation (as ComReg Document 21/136).

1.1 Structure of this document

1.6 The remainder of this document is structured as follows:

Chapter 2: considers issues related to matters discussed in Chapter 2 of Consultation 21/90, namely spectrum policy and management in Ireland.

Chapter 3: considers issues related to Chapter 4 of Consultation 21/90, namely:

- harmonisation of radio spectrum and European Commission harmonisation decisions;

[1] Section 10(1)(b) of the Communications Regulation Act 2002, as amended.
[2] ComReg Document 21/70

- end-user demand for mobile data;
- technology changes and advancements; and
- licences expiring in the near future.

Chapter 4: considers issues related to Chapter 5 of Consultation 21/90, namely the Proposed Radio Spectrum work plan for 2022 – 2024.

Chapter 2

2 The Framework for Spectrum Management in Ireland

2.1 In Chapter 2 of Consultation 21/90, ComReg discussed spectrum policy and management in Ireland, including the importance of radio spectrum, an overview of spectrum policy and management in Ireland, and ComReg's spectrum management activities.

2.2 ComReg also outlined how increased demand from many different services and users requires an effective spectrum management system, and that spectrum management requires careful consideration of a broad range of factors (including administrative, regulatory, social, economic and technical) with a view to ensuring that the radio spectrum is efficiently used.

2.1 Spectrum Policy and Management in Ireland

Summary of 21/90

2.3 In Section 2.1.1 ComReg set out the relevant Government departments' roles in relation to spectrum policy and national broadcasting policy in Ireland - the Department of the Environment, Climate and Communications ("DECC") and the Department of Tourism, Culture, Arts, Gaeltacht, Sports, and Media ("DTCAGSM") respectively.

2.4 Section 2.1.2 set out ComReg's role in relation to its spectrum management responsibilities including the functions, objectives, powers and duties that are relevant to ComReg's management of the radio spectrum. ComReg also outlined its primary spectrum management objective, that is to ensure the efficient management and use of the radio spectrum, while having regard to relevant government policy statements and international developments.

Views of respondents

2.5 One respondent, RTÉ & 2RN, provided a response relating to general matters relevant to spectrum policy and spectrum management in Ireland.

2.6 RTÉ & 2RN submits that:

- in its view, there is heightened pressure that could reduce future access to quality spectrum for important services with high social value such as public service broadcasting, and insightful judgement and clear policy guidance is required to ensure the correct balance is maintained;

- the continued renewal and long-term viability of terrestrial broadcasting depends on long term certainty of access to radio spectrum; and
- although broadcast spectrum policy is the responsibility of the DECC, RTÉ & 2RN would welcome greater regulatory certainty and reassurance from ComReg in its spectrum strategy to support a long-term future for public service broadcasting in Ireland.

2.7 Specifically, in relation to Section 2.1.1, RTÉ & 2RN submits that:

- *"[spectrum policy] is a challenging area with overlapping and competing demands for resources"* and it recommends that ComReg*, "ensure that there is a distinction between senior personnel responsible for broadcasting spectrum policy and the more regular commercial /telecoms spectrum management*". In RTÉ & 2RN's view, this distinction would ensure the special requirements of broadcasting are not overshadowed by commercial demands.
- ComReg *"ensure that DTCAGSM are aware of the implications of any spectrum management activities/spectrum policy implementation that could affect the availability and quality of radio spectrum available for broadcasting and PMSE."*

ComReg's assessment

2.8 ComReg notes the comments from RTÉ & 2RN above on matters related to ComReg's spectrum management role, in particular in support of broadcasting services.

2.9 In relation to RTÉ & 2RN comments that insightful judgement and clear policy guidance is required to ensure the correct balance in relation to the management of spectrum for high social value services, including for broadcasting services, ComReg agrees that an appropriate balancing and judgement is indeed required. In this regard, ComReg emphasises that it carries out its spectrum management activities in line with relevant legislation and policy, and readers are referred to Annex 1 of Document 21/136 for an overview of the legal framework and statutory objectives relevant to ComReg's management of the radio spectrum.

2.10 In relation to RTÉ & 2RN's views regarding broadcasting's need for long term certainty of access to radio spectrum and its request for greater regulatory certainty and reassurance from ComReg to support a long-term future for public service broadcasting in Ireland, ComReg observes that:

- it has already provided long-term access to spectrum for broadcasting services with:

- the issue of a Digital Terrestrial Television ("DTT") licence to RTÉ in December 2019 with an expiry date of December 2031 (12 years);
- the making available of spectrum for a Digital Sound Broadcasting ("DSB") licence should RTÉ or the Broadcasting Authority of Ireland ("BAI") request such a licence; and
- the issue of Analogue Sound Broadcasting ("ASB") licences to RTÉ in May 2019 with an expiry date in May 2029 and to the BAI for up to 10 year durations; and

- to inform ComReg's preparations for the agenda 1.5 of World Radio Conference2023 ("WRC-23"), ComReg is commencing a project specifically to consider spectrum requirements for broadcasting in the 470 – 694 MHz (i.e., sub-700 MHz) band.

2.11 Regarding national broadcasting policy matters, ComReg notes that this is a matter for the DECC and the DTCAGSM, and not ComReg. However, in developing this Radio Spectrum Management Strategy Statement for 2022 to 2024, ComReg has taken account of DECC's Communications and Digital policy[3] and DTCAGSM's Broadcasting and Media policy[4]. ComReg will continue to work with the DECC and the DTCAGSM on broadcasting and other related matters as required. Finally, in relation to spectrum for PMSE, ComReg observes that its consideration of PMSE matters is set out in Section 3.2.1 of this document.

2.2 Spectrum Management

2.12 In Section 2.2, ComReg outlined the importance of radio spectrum, including how it is a limited and valuable national resource that permeates all areas of communications. ComReg also outlined how increased demand for radio spectrum requires an effective system of spectrum management to ensure the efficient assignment and subsequent use of scarce frequencies among competing uses and users.

[3] https://www.gov.ie/en/policy/435802-communications-and-digital/, published – 12 June 2020
[4] https://www.gov.ie/en/policy-information/b151e3-broadcast-media/, published – 12 June 2020 and updated 3 November 2020

2.2.1 The importance of radio spectrum

Summary of 21/90

2.13 In Section 2.2.1, ComReg provisionally estimated that in 2019, the use of radio spectrum contributed approximately €7 billion to the Irish economy (accounting for 3.2% of Modified Gross National Income) and resulted in c. 19,000 directly dependent jobs. ComReg proposed to assess the economic contribution of radio spectrum in greater detail in the Radio Spectrum Management Strategy Statement 2022-2024. ComReg also outlined the considerable social benefits arising from the use of radio spectrum.

Views of respondents

2.14 OneWeb submits that the COVID-19 pandemic highlighted the critical nature of digital infrastructure to the economy and communities of every nation including those in rural and remote areas, and that, in its view, lockdowns and quarantine measures are creating an increasing gulf between the connected and unconnected which is growing larger the longer the pandemic lasts.

2.15 OneWeb believes that partnerships between satellite and terrestrial operators are key to improve access and affordability by enabling remote communities to enjoy the benefits of inclusive connected societies, unlocking digital opportunities, and spurring economic growth. OneWeb considers that its LEO system allows it to provide coverage where terrestrial build out is uneconomical, in addition to being important interim infrastructure in areas where terrestrial services may arrive. Moreover, OneWeb submits that, in its view, satellite-based solutions offer highly robust solutions when facing natural disasters. OneWeb considers that such socio-economic benefits should be reflected in ComReg's spectrum strategy.

2.16 RTÉ & 2RN submits that it supports ComReg's views in Section 2.2.1 and acknowledges what it describes as an improved tone and recognition of broadcasting. However, the text, in its view, should also capture and reflect key messages made with respect to broadcasting in the 2008-2010 spectrum management strategy including:

> *"Public policy goals play a significant role in determining spectrum management priorities. Technical efficiencies may have to be compromised in order to safeguard the provision of certain public services such as safety, defence and public broadcasting services. Technical and economic efficiencies may also be constrained by international obligations related to spectrum use, especially restrictions on the amount of power that can be exported across national borders".*

ComReg's assessment

2.17 ComReg concurs with OneWeb that during the COVID-19 pandemic electronic communications services ("ECS") played an important role in keeping business and people connected, noting among other things, the increased use of mobile data and voice services during this time period (some but not all of which due to Covid-19 measures) and the importance placed on ECS services by consumers[5]. In addition, ComReg notes OneWeb's observations on the potential for partnerships between satellite and terrestrial operators to improve access in remote communities. In line with its statutory objectives, ComReg will continue to facilitate, where appropriate, access to radio spectrum for such services.

2.18 In relation to RTÉ & 2RN comments that key messages made in the 2008-2010 spectrum management strategy with respect to broadcasting services should be incorporated into ComReg's current spectrum management strategy, ComReg observes that the factual circumstances were notably different in that decade compared to the current strategy period (2022-2024), given among other things the changes in broadcast spectrum arising from analogue switch-off of terrestrial TV services and the commencement of DTT services at that time.

2.19 In relation to the current spectrum management strategy, ComReg observes that this is formulated with regard to the prevailing circumstances, where among other things, ComReg agrees that the process of allocating frequencies to radio services and the regulatory framework are largely determined by external factors such as legislation, international agreements or regulations and government policy. In this regard, ComReg refers to its processes and tools detailed in Section 2.2.3 of Document 21/90 and its active role (along with the DECC) in international fora to ensure that, as far as possible, decisions relating to the international radio spectrum regulatory framework meet Ireland's specific requirements.

[5] ComReg Document 21/42 – Impact of Covid-19 on consumer use and perception of telecommunications services - Survey Q1 2021

2.2.2 Spectrum management processes and the promotion of effective competition in management of spectrum for ECS and spectrum management tools

Summary of 21/90

2.20 In Section 2.2.2, ComReg discussed the international aspects to spectrum management and the allocation of radio spectrum and the assignment of radio spectrum in Ireland. Ideally spectrum should be distributed efficiently, which means giving access to the combination of uses and users that maximises economic activity, subject to taking account of social welfare, public and other legitimate policy concerns. Granting spectrum rights of use to one user rather than another can greatly impact the extent to which the radio spectrum is efficiently used to deliver overall benefits for society.

2.21 In Section 2.2.3, ComReg discussed the promotion of effective competition in its management of the radio spectrum resource, and the spectrum management tools available to ComReg in that pursuit. ComReg also outlined that:

- it takes a proactive approach to ensuring the efficient assignment and use of the radio spectrum while promoting effective competition and producing an optimal outcome for society; and
- its spectrum management plans are aligned with a number of goals as reflected in ComReg's ECS Strategy Statement.[6]

Views of respondents

2.22 In relation to Section 2.2.2, RTÉ & 2RN submits that the Beta release of the online version of the Radio Frequency Plan is very useful, and Sigma Wireless submits that it strongly believes in the pan-European and global approach to spectrum management, as supported by ComReg.

2.23 In relation to Section 2.2.3, RTÉ & 2RN welcomes the market research work undertaken by ComReg to study end-user trends and the implications these have for spectrum management. However, RTÉ & 2RN contends that TV and video consumption over broadband does not imply substitution for broadcasting services, which, it adds, recorded increased usage during the Covid crisis without any reduction in quality.

[6] See Document 21/70

2.24 RTÉ & 2RN also submits that it is grateful for ComReg's continued active participation at international level. However, in its view, some comments made at the 2020 European Management Conference were not aligned with European and national spectrum policy.

ComReg's assessment

2.25 ComReg welcomes the support from RTÉ & 2RN regarding the beta release of its Radio Frequency Plan, and the support from Sigma Wireless in relation to ComReg's approach to spectrum management.

2.26 In relation to RTÉ & 2RN's comment that TV and video consumption over broadband does not imply substitution for broadcasting services, ComReg remains cognisant of the importance of Ireland's public service broadcasting to society and of its obligations set out in the Broadcasting Act 2009 which obliges ComReg to issue DTT multiplexes licences to RTÉ, on request from RTÉ, for the provision of its free to air DTT services.

2.27 However, ComReg is also cognisant of advancements in technologies and potential changing end-user trends which appear to suggest an increase in complementary consumption of television content through services such as IPTV[7] and OTT[8] services. This is not a development limited to Ireland; indeed, this change appears to have been experienced in many countries around the globe. As previously noted, ComReg proposes to carry out a study to consider the current and future spectrum requirements of broadcasting services in Ireland in the frequency range 470-694 MHz during this spectrum strategy period.

2.28 In relation to European and national broadcasting policy matters and as noted above, ComReg will continue to work with its colleagues in the DECC and the DTCAGSM to ensure alignment with European and national legislation and spectrum policies.

[7] IPTV ("Internet Protocol Television") is the delivery of television content over Internet Protocol networks.
[8] OTT ("Over-The-Top") services are services that use the internet for their delivery. They can range from messaging apps and social networks, to online video and subscription services (e.g. Netflix, Spotify, and digital print services)

Chapter 3

3 Factors informing ComReg's proposed work plan for 2022-2024

3.1 In Chapter 4, ComReg discussed various factors which have informed its draft radio spectrum work plan for 2019 to 2021, including:

- International harmonisation of radio spectrum;
- World Radiocommunication Conference 2023;
- European Commission harmonisation decisions;
- End-user demand (and, in particular, for mobile broadband);
- Technology changes and advancements (service specific);
- The expiry of existing licences in the near future (e.g. within the next 5 years); and
- the ECS sector and climate change.

3.1 International harmonisation of radio spectrum

Summary of Consultation 21/90

3.2 In Section 4.1, ComReg discussed the key role that international harmonisation plays in determining the demand for and supply of radio spectrum, given its benefits including in terms of facilitating economies of scale in the manufacture of radio equipment, and the minimisation of interference between users. This is particularly important for countries with a small population, such as Ireland.

Views of respondent

3.3 Apple supports ComReg's policy objectives that strive to develop international harmonisation measures as far as practicable. Apple agrees that while user demand has an impact on the direction of technology evolution, technology enhancements that require access to wider bandwidths, will have a profound effect on the user experience.

ComReg's assessment

3.4 ComReg welcomes the support from Apple for its work in developing international spectrum harmonisation measures. ComReg is actively engaged in the work of the European Commission ("EC"), the European Conference of Postal and Telecommunications Administrations known as "CEPT" and the International Telecommunication Union ("ITU") where it has prioritised tasks and activities in areas where it has resources available to do so. This includes the work of the Electronic Communications Committee ("ECC"), ECC Project Team 1 ("ECC PT1") and in the Short-Range Devices Maintenance Group ("SRDMG")[9] where many of the harmonisation tasks related to technology evolution and access to wider bandwidths are being dealt with.

3.1.1 The 2019 and 2023 World Radio Communications Conferences

Summary of Consultation 21/90

3.5 In Section 4.1.1 of Consultation 21/90, ComReg discussed the contribution of the Irish delegation to World Radio Conference 2019 ("WRC-19") and the outcomes of the conference which influenced ComReg's work plan.

3.6 In Section 4.1.2, ComReg detailed the agenda items for World Radiocommunication Conference 2023 that are of the greatest interest to ComReg, and these were discussed in more detail in Annex 2 of Document 21/90.

Views of respondents

3.7 In relation to WRC-19, RTÉ & 2RN note the importance of the Irish Delegation to WRC's supporting CEPT common positions and the positions determined by the European Council on behalf of the EU.

3.8 In relation to WRC-23, RTÉ & 2RN remark that the Irish national position is of public interest and should be developed in-line with national policy, which is itself developed with input from all relevant stakeholders.

3.9 In relation to WRC-23, RTÉ & 2RN submits that Ireland should support a "no-change" position on agenda item 1.5 of WRC-23 as, in its view, broadcasting and mobile services are still not compatible and unable to share spectrum in a meaningful way, even between neighbouring countries. RTÉ & 2RN also contends that, in practice a co-primary allocation means one service or the other.

[9] The Short Range Device Maintenance Group ("SRDMG") which harmonised access to spectrum for the majority of licence-exempt devices used in Ireland.

3.10 Concerning WRC-23 agenda item 1.5 where ComReg intends to carry out a study on the use of the band 470 – 694 MHz in Ireland, RTÉ & 2RN consider that the study should be:

- extended to cover the band 470 – 960 MHz as the efficient use of spectrum across the entirety of the band is important in the context of any future decisions that could affect the availability of high-quality spectrum for broadcasting in the 470 to 694 MHz part of the band; and
- listed as "to inform itself on the opportunities and potential costs (economic as well as social/cultural and political) for Ireland".

3.11 In respect of WRC-23 Agenda Item 1.2[10], Apple considers that this will be one of the most important, and indeed controversial, agenda items for the conference to deal with. Apple points out that ComReg has focussed on the bands that fall under ITU Region 1, but for completeness Apple provides the complete text of the Agenda Item and acknowledges the importance of protecting the existing users of those bands.

3.12 Furthermore, Apple provides commentary on the 3.3 – 4.2 GHz band (to enable all or part of the band for IMT) and the 10-10.5 GHz ITU Region 2 band (no need for IMT identification). Specifically, Apple highlights the importance, in its view, of licence exempt access to the full 6 GHz band (5925 -7125 MHz) for WAS/RLAN systems and their evolution and that in their view no IMT identification is needed in any part of the band as this would mitigate against the roll out of WAS/RLAN/Wi-Fi services in the band.

ComReg's assessment

3.13 ComReg expects the preparations for WRC-23 to follow a similar process to that adopted for WRC-19. This would include ComReg's involvement in the national preparatory group, the CEPT conference preparatory group and the work of the RSPG in relation to WRC-23.

[10] ITU, WRC-23 Agenda Item 1.2 states, "*to consider identification of the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution* 245 (WRC-19)*",* available at *www.itu.int/*

ITU, Resolution 245 (WRC-19) refers to, "*Studies on frequency-related matters for the terrestrial component of International Mobile Telecommunications identification in the frequency bands 3 300 - 3 400 MHz, 3 600 - 3 800 MHz, 6 425 - 7 025 MHz, 7 025 - 7 125 MHz and 10.0 - 10.5 GHz*.", available at www.itu.int/

3.14 Many of the issues expressed by large multinationals, lobby groups, interest groups and government organisations are brought directly to the CEPT for consideration and as such are already part of the considerations of the Irish preparatory group for WRC-23.

3.15 In relation to the Irish preparations for WRC-23, ComReg notes that this is led by the DECC. ComReg will support and advise the DECC as appropriate on the objectives and goals to be established in the national preparatory process.

3.16 In respect of RTÉ & 2RN's submission that ComReg's study be expanded to cover the entire 470 – 960 MHz band, while ComReg notes that this would align with the text of Agenda item 1.5, ComReg is of the view that it remains appropriate to keep the focus on the 470 – 694 MHz band, for the reasons set out in paragraph 4.30 below.

3.17 Regarding WRC-23 Agenda Item 1.2[11] and more specifically Apple's view on the full 6 GHz band (5925 -7125 MHz) ComReg can report that at the November 2021 ECC Plenary meeting, Administrations agreed to a new work item on WAS/RLAN in 6425 - 7125 MHz. The outcome of this work item will be an ECC Report which considers:

- Studies of the technical and operational characteristics of lower power indoor (LPI) use and very low power (VLP) WAS/RLAN in the 6425-7125 MHz band; and
- Studies of the sharing and compatibility issues between LPI and VLP WAS/RLAN and incumbent services in the 6425-7125 MHz band;

In addition:

- No regulatory measures shall be taken under this work item;
- The work in preparation for WRC-23 agenda item 1.2 will run independently from the work conducted under this work item;
- The work under this work item here is neither a decision for the introduction of WAS/RLAN in the 6425-7125 MHz band, nor a prejudice to a future European common position on WRC-23 agenda item 1.2 and

[11] Resolution 245 (WRC-19) "Studies on frequency-related matters for the terrestrial component of International Mobile Telecommunications identification in the frequency bands 3 300 - 3 400 MHz, 3 600 - 3 800 MHz, 6 425 - 7 025 MHz, 7 025 - 7 125 MHz and 10.0 - 10.5 GHz."

- Dependent on the outcome of WRC-23 agenda item 1.2, further technical studies under a new work item could be initiated on the possible technical and usage conditions under which Low Power Indoor (LPI) and Very Low Power (VLP) portable Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) in the 6425-7125 MHz band could coexist with IMT.

3.18 In relation to the 3.3 – 4.2 GHz band, ComReg notes that:

- The portion 3.3 – 3.4 GHz is allocated only to radiolocation services internationally and a change in allocation would be required at WRC-23 before use of this band could be considered for IMT;
- The majority of the portion 3.4 – 3.8 GHz was assigned in a spectrum award in 2017[12] in Ireland; and
- The portion 3.8 – 4.2 GHz is under consideration by the Radio Spectrum Committee ("RSC"). On 22 November 2021, the draft Mandate[13] was adopted by the European Commission following a written procedure which sought the opinion of the Radio Spectrum Committee. The next step is for the Commission services to formally submit the Mandate to CEPT. Among other things, CEPT will be required to consider the protection of radio altimeters in the adjacent band 4200 - 4400 MHz.

3.2 European Commission Harmonisation Decisions

3.19 Section 4.2 provided an overview of existing and forthcoming European Commission ("EC") harmonisation decisions.

3.2.1 Existing EC Harmonisation Decisions

Summary of Consultation 21/90

3.20 In Section 4.2.1, ComReg detailed that it has undertaken actions to implement EC Decisions that were adopted over the period of the last strategy statement.

Views of respondents

Spectrum bands for WBB/MFCN

[12] See ComReg 17/46 – Information notice: Results of the 3.6 GHz Band Spectrum Award - Published 1 June 2017.
[13] Draft Mandate to CEPT on technical conditions regarding the shared use of the 3.8-4.2 GHz frequency band for terrestrial wireless broadband systems providing local-area network connectivity in the Union

3.21 Huawei submits that the 700 MHz band allocation should be technology neutral to accommodate the development of IMT services including 4G LTE, NB-IoT[14] and 5G NR.

3.22 RTÉ & 2RN submits that the MBSA 2021 award of spectrum in harmonised bands for liberalised use will significantly increase the quantum of spectrum available for WBB/MFCN purposes. In that regard, RTÉ & 2RN:

- note the recently increased amount of suitable spectrum already available for mobile communications[15] and the potential availability for such use of an additional 15 GHz following WRC-19 – although RTÉ & 2RN acknowledges that much of this spectrum is in significantly higher frequency ranges that may not yet be ready for practical networks;
- submit that there may be some inefficiency in the current mobile spectrum use of sub-1 GHz spectrum where more than 300 MHz is already allocated to mobile, but significantly less is shown as being available in Figure 25 of Document 21/90;
- contend that mobile networks will best achieve greater capacity and coverage through additional investment in infrastructure using existing bands and new spectrum in higher frequency bands, rather than by seeking additional sub-1 GHz spectrum where, in its view, mobile device sizes would limit spectrum efficiency; and
- submit that the substantial advancements[16] associated with 5G occur in the higher frequency bands where, in its view, under-utilised spectrum is available which should be considered when evaluating sub-1 GHz spectrum for a potential mobile allocation.

3.23 Cellnex submits that 700 MHz band spectrum should be allocated for the Broadband PPDR services. Cellnex is of the view that a quick identification and allocation of dedicated spectrum for use by vertical and local-area networks is key to paving the way for the Irish and European industry of the future.

[14] Narrowband Internet of Things
[15] As illustrated in Figure 25 of Document 21/90.
[16] E.g. higher order MIMO, active antenna systems and smart antennas.

3.24 Sigma Wireless encourages ComReg to study and consult on the suitability of the 700 MHz Guard Bands and Duplex Gap for PPDR and to continue engagement on the matter with other regulators and the public safety sector in Europe to provide clarity and stability for progress in R&D and product development. Further, Sigma Wireless recommends assignment of these sub-bands for PPDR within the timeframe of ComReg's 2022-2024 spectrum strategy, given its view that although emergency services users have guaranteed support for Tetra Ireland until at least 2030, migration from that TETRA service to LTE/5G services will need to begin well in advance of this date in order to guarantee the orderly and timely build-out of next-generation BB-PPDR networks.

3.25 RTÉ & 2RN state that it would welcome further clarity on PMSE and PPDR use in the 700 MHz Guard Bands and the 700 MHz Duplex Gap, as per Ireland's National Roadmap on the Use of the 700MHz Frequency Band.

Intelligent Transport Systems in the 5.9 GHz Band

3.26 Eutelsat notes ComReg's intention to consult on the regulation of the 5.9 GHz band for Intelligent Transport Systems ("ITS") in Ireland, following the EC implementation Decision EU 2020/1426. Eutelsat recommends defining technical conditions to protect incumbent users in the band or in adjacent bands, including satellite services, from harmful interference.

3.27 Cellnex submits that ComReg should take into consideration what it terms the European trend to consider the 5.9 GHz band as a dedicated band for ITS-G5 Short-range communications.

ComReg's assessment

3.28 In relation to Huawei's view that the 700 MHz allocation should be technology neutral, ComReg first observes that under the MBSA 2021 award, ComReg is making the 700 MHz Duplex available on a service and technology neutrality basis in line with the relevant EC decision (i.e., Decision (EU)2016/687).

3.29 Second, in relation to other parts of the band (i.e., the 700 MHz Guard Bands and the 700 MHz Duplex Gap):

- ComReg intends to continue to engage with stakeholders in the coming strategy period to obtain clarity on the use of these parts of the band[17];
- Decision (EU)2016/687 provides for various uses in these parts of the band, including:

[17] As noted in Section 3.2.4 of Document 21/90

  - Supplemental downlink ("SDL");
  - wireless audio Programme Making and Special Events ("PMSE") equipment;
  - Machine-to-Machine ("M2M") radio communications; and
  - Broadband Public Protection and Disaster Relief ("BB-PPDR"); and

- Given that BB-PPDR is a potential use of these parts of the band, in line with Decision (EU)2016/687, careful consideration of its use is an important national policy matter given Ireland's future spectrum needs for public protection and disaster relief communications.

3.30 In relation to RTÉ & 2RN's comments on spectrum bands for MFCN, ComReg observes that:

- Figure 25 of Document 21/90 shows the amount of harmonised spectrum (including sub 1 GHz spectrum) made available in Ireland for MFCN and not the amount of such spectrum that has a mobile allocation in Ireland's Radio Frequency Plan. ComReg observes that RTÉ & 2RN does not appear to consider that not all the sub-1 GHz spectrum bands that have a mobile allocation are harmonised and made available for MFCN and that many such bands have important uses for other services. For example, the frequency range 440 - 470 MHz is used in Ireland variously for land mobile (i.e. PMR) and maritime mobile and spectrum in the 876-880 MHz and 921-925 MHz bands is allocated for GSM-R[18]. As such, mobile allocations in Ireland's Radio Frequency Plan are not a guide to the amount of spectrum available for MFCN in Ireland.

- Given the favourable radio propagation characteristics of the sub-1 GHz bands compared to higher frequency bands and Ireland's demographic and geographic challenges in providing widespread services[19], it is particularly important to consider the efficient use of the sub-1 GHz bands, including as an option to improving the provision of widespread MFCN coverage in Ireland in rural areas and on national transport routes. Indeed, this topic is under consideration in agenda item 1.5 of WRC-23. During this strategy period ComReg will commence a study to understand broadcasting's need for spectrum in the 470-694 MHz band, as well as the other potential uses for this band in the future.

[18] GSM-R, in contrast to public mobile GSM, constitutes a non-public communications network for use by European railway operators.

[19] For example:
- 37% of the population is spread across 95% of the land area;
- of EU member states, Ireland has the highest proportion of population that live in NUTS 3 areas classified as rural at 72%, compared to the EU average of 22%;

3.31 Considering the comments of RTÉ & 2RN in relation to PPDR and the 700 MHz Band, ComReg would remind respondents of relevant information on the matter which it previously outlined in Section 3.7.4 of Document 21/90. This is also set out in greater detail in Document 20/98[20]. In summary:

- three proposed spectrum options for BB-PPDR[21] are under active consideration by the Office of the Government Chief Information Officer ("OGCIO") and further investigations, including the possibility of tests in a real-life environment, are envisaged before OGCIO would be in a position to indicate its BB-PPDR spectrum preferences and timing; and

- ComReg envisages that another BB-PPDR spectrum options update will be provided in due course following further engagement with OGCIO and the existing licensees, and when further information is available.

3.32 Consequently, ComReg is not in a position to pre-judge the outcome of the OGCIO's considerations by actively committing to the assignment of spectrum in the 700 MHz Duplex Gap and 700 MHz Guard Bands for PPDR at this time.

3.33 Further, ComReg would highlight its commitment to continued engagement with the relevant stakeholders with a view to obtaining greater clarity on national policy on the use in Ireland of the 700 MHz Guard Bands and the 700 MHz Duplex Gap and, in particular for BB-PPDR, as reflected in the relevant proposed work plan item set out in Section 5.2.2 of Document 21/90.

3.34 In relation to RTÉ & 2RN's comment regarding clarity on PMSE use in the 700 MHz Guard Bands and the 700 MHz Duplex Gap, ComReg wishes to clarify that currently the frequency ranges 470-703 MHz and 733-753 MHz are available for PMSE use within the UHF band. Therefore:

- the 700 MHz Lower Guard Band (694-703 MHz) and 20 MHz of the 700 MHz Duplex Gap (i.e. from 733-753 MHz) are currently available for PMSE use; while

- 5 MHz of the 700 MHz Duplex Gap (i.e. 753-758 MHz) and the 700 MHz Upper Guard Band (788-791 MHz) are not available for PMSE use.

- Ireland has an extensive road network (5,306 km of primary and secondary roads and a further 91,000 km of regional and local roads). The road density in Ireland (21 km per 1000 inhabitants) is twice the EU average.

[20] Document 20/98 *, "Broadband Public Protection and Disaster Relief (BB-PPDR) Spectrum Options - October 2020 Update"*, https://www.comreg.ie/media/2020/10/ComReg-2098.pdf

[21] i.e. the 400 MHz Band, the 700 MHz Duplex Gap and the 700 MHz Guard Bands, as detailed in Section 1.3 of Document 20/98.

3.35 Further information on the availability of spectrum for PMSE use is set out in Document 08/08R6[22] which ComReg updates from time to time to reflect any relevant changes in spectrum availability and which was most recently updated in November 2021.

Intelligent Transport Systems in the 5.9 GHz Band

3.36 Regarding the submissions received from Cellnex and Eutelsat, ComReg notes that CEPT Report 71[23] concluded that the assumptions and conclusions regarding co-existence between ITS and other applications, such as FSS, made in ECC Reports 101 and 228 are valid. Therefore, ComReg is of the preliminary view that the technical parameters as set out in (EU) 2020/1426 are appropriate to ensure protection of services in adjacent bands.

3.37 ComReg intends to consult on the manner in which the 5.9 GHz Band will be regulated for ITS in Ireland. This will include consideration of what elements of the ITS system may best be exempted from requiring a licence, what elements would require licensing as well as the licence regime type (technical conditions, fees, award mechanism, etc) that ComReg proposes to put in place.

3.2.2 Future EC harmonisation decisions

Summary of Consultation 21/90

3.38 In Section 4.2.2, ComReg discussed future EC harmonisation decisions and ComReg's intentions for such during the 2022-2024 period. This included discussion of:

- frequency bands above 24 GHz;
- the 900 MHz and 1800 MHz bands;
- the 5 GHz band;
- the 3800-4200 MHz band;
- changes to the GSM-R licensing regime; and
- the 6425-7125 MHz band

[22] Document 08/08R6, "Guidance Notes Radio Licensing for Programme Making and Special Events Use in Ireland", 11/11/2021, https://www.comreg.ie/media/2021/11/ComReg0808-R6.pdf
[23] CEPT Report 71 – Report from CEPT to the European Commission in response to the Mandate to study the extension of the Intelligent Transport Systems (ITS) safety-related band at 5.9 GHz – published 8 March 2019

Views of respondents

42 GHz Band

3.39 Eutelsat considers that special care should be given to the protection of the satellite gateways and earth stations before any decision regarding IMT use in the 42 GHz band.

The 3800-4200 MHz band

3.40 Cellnex is of the view that the 3800-4200 MHz band should be made available for private networks as soon as possible.

3.41 Eutelsat is of the view that it is necessary to ensure that the entire 3.8-4.2 GHz band continues to be available for current and future FSS operations in Europe and in Ireland, due to the use of the C-band by FSS for connectivity.

3.42 EUWENA urges ComReg to closely follow relevant EU developments on the 3800-4200 MHz band and supports actions that would harmonise spectrum in this band for local private networks.

3.43 Huawei suggests that the 3.8-4.2 GHz band should be accessible to all parties including verticals, MNOs and wireless broadband operators

3.44 The IAA supports upcoming European Commission and CEPT work to harmonise the 3800-4200 MHz band for use by private local networks and believes that ComReg's proposed actions to monitor this work are vital to include in its spectrum strategy. The IAA hopes that any harmonisation measures will also include mitigations to ensure continued safe operation of radar altimeters and radio altimeters on aircraft.

3.45 Intel is of the view that the 3.8-4.2 GHz and 4.4-4.99 GHz bands are ideal bands to consider for licensing MFCN in mid-band spectrum, given that the bands are supported by an existing ecosystem of 3GPP band n77[24] and n79[25] equipment.

3.46 Vilicom submits that ComReg should enable mobile operators to deploy high-performance private networks that can be heavily loaded without affecting their public subscribers and protecting the spectrum assigned to public cellular networks. Vilicom contends that any relevant licensing regime for private networks should align with local licensing regimes such as those used by Ofcom in the UK and BnetzA in Germany, or with the Citizens Broadband Radio Service regime in the US.

[24] 3300 – 4200 MHz
[25] 4400 – 5000 MHz

ComReg's assessment

42 GHz Band

3.47 In relation to Eutelsat submission regarding the 42 MHz band, ComReg notes that the future use of the 42 GHz band will be subject to any decisions adopted by the EC and/or ECC. ComReg further notes that the EC mandate to CEPT states that the tasks to be undertaken should take into account relevant authorisation modes and be sufficient to mitigate interference and to ensure co-existence with incumbent radio services/applications in the same band or in adjacent bands, in line with their regulatory status.

3.8 - 4.2 GHz Band

3.48 ComReg notes that Cellnex, EUWENA, Huawei, the IAA, Intel, and Vilicom all supported various aspects of the harmonisation work on this spectrum band. To support this harmonisation process, ComReg intends to actively participate in the CEPT study on the 3.8 – 4.2 GHz band.

3.49 ComReg will also monitor and input into the discussions on future EC harmonisation decisions matter at the EC and ECC. If any EC decisions are adopted during the 2022 - 2024 period, ComReg will consider the appropriate implementation of those decisions.

3.50 Regarding Eutelsat submission on the 3800-4200 MHz band, ComReg notes that the current draft of the draft EC mandate to CEPT on the 3.8-4.2 GHz band is proposing that CEPT:

- take full account of EU law applicable and support the principles of service and technological neutrality, non-discrimination and proportionality insofar as technically possible;
- collaborate actively with all concerned stakeholders and ETSI;
- study and assess the technical feasibility of the shared use of the 3.8-4.2 GHz; and
- develop a harmonised frequency arrangement as well as the least restrictive harmonised technical conditions for the shared use of the 3.8-4.2 GHz band.

3.51 The draft mandate also states that any harmonised technical conditions should in particular ensure the protection and the possibility of future evolution and development of incumbent spectrum users in this band (notably receiving satellite earth stations in the fixed satellite service and terrestrial fixed links) and the coexistence with spectrum users in adjacent bands (such as radio altimeters on board aircraft operating in the 4.2 - 4.4 GHz frequency band).

3.52 In relation to the Huawei view that spectrum in the 3.8 – 4.2 GHz band should be made available to all parties such as verticals, MNOs and wireless broadband operators, ComReg notes that the draft mandate requires CEPT to study and assess the technical feasibility of the shared use of the band by terrestrial wireless broadband systems providing local-area network connectivity which could serve both private (e.g., enterprise) and public (e.g., community-type) networks. The draft mandate is not limited to considering only private networks.

3.53 Regarding Intel's submission, ComReg notes that the 4.4 - 4.99 GHz band has not been identified by the RSPG as a candidate band for MFCN and that the European Commission is not considering tasking CEPT to conduct studies on this band currently. Therefore, ComReg does not intend to consider future use of the 4.4 - 4.99 GHz band during the 2022 - 2024 period.

3.3 Technology changes and advancements

Summary of Consultation 21/90

3.54 In Section 4.4, ComReg discussed how technology changes and advancements can affect both the demand for and supply of radio spectrum.

3.55 In relation to mobile/WBB advancements, ComReg noted that technology advancements are part and parcel of each new generation of mobile technology (e.g., 3G, 4G, 5G, etc.) and that over the last number of years 4G network rollout and subscribers has further advanced in Ireland, while the rollout of 5G networks is at an early stage.

3.56 Further, ComReg considered that as 4G and 5G networks are rolled out, these will help address the future demand for data on mobile networks, and spectrum currently used for 2G and 3G will likely be re-farmed for newer, more efficient technologies (e.g., 4G and 5G). In Ireland, this has already occurred with the 900 MHz, 1800 MHz and 2.1 GHz bands. ComReg also observed that, over time, further spectrum bands may get re-farmed and legacy mobile technologies may get decommissioned.

Views of respondents

3.57 Five respondents (Mr. Jonathan Bradshaw, Huawei, RTÉ & 2RN, Sigma Wireless and Three) provided views on aspects of technology changes and advancements.

3.58 RTÉ & 2RN suggest highlighting 5G broadcasting as a 5G mobile application, complementary to existing terrestrial broadcast networks, which could be introduced without any need to change the radio regulations.

3.59 Sigma Wireless believes that the MBSA 2021 will provide sufficient spectrum to meet rapidly increasing demand for commercial mobile broadband services, especially at a time when those services will also benefit from additional urban and suburban fibre deployments and new developments such as small cell densification and OpenRAN.

3.60 Huawei believes that the 2.3 GHz band would boost the capacity available for data services and submits that large contiguous bandwidths and nationwide coverage will be critical for MFCN in this band.

3.61 Mr. Jonathan Bradshaw, RTÉ & 2RN, and Three comment on the potential for decommissioning legacy mobile technologies, such as 2G and 3G, as outlined below.

- Mr. Jonathan Bradshaw suggests including a detailed Section on the decommissioning of legacy mobile technologies and the related radio access technologies of the MNOs. In that regard, Mr. Bradshaw notes that several remote access technologies, such as gate automation, depend on 2G and 3G networks.
- RTÉ & 2RN welcomes the re-farming of existing mobile spectrum for more efficient technologies and allocations.
- Three maintains that support of multiple technologies from 2G to 5G on mobile networks is beginning to undermine network and spectrum efficiency and indicates likely plans to decommission legacy mobile technologies during the upcoming strategy period.

ComReg's assessment

3.62 ComReg notes RTÉ & 2RN's suggestion with regard to 5G broadcasting. In setting out a spectrum strategy it is not possible to provide an exhaustive account of the many and diverse applications available in the 3GPP standards for 5G. However, ComReg acknowledges that 5G Broadcasting has the potential to deliver broadcasting services to a wider variety of devices and could therefore be a complementary service to existing terrestrial broadcast networks. ComReg notes however that applications that are likely to be deployed will ultimately be those with developed business models and it remains to be seen which 5G technologies will be those that develop the most traction.

3.63 ComReg notes Sigma Wireless' observation on the MBSA 2021 as a further example of how the release of this spectrum can help drive 5G advancements that will benefit consumers and business.

3.64 In that connection, ComReg also notes Huawei's submission on the potential of the 2.3 GHz Band to enhance data services. This band forms part of the MBSA 2021 award, where ComReg is making this band available on a nationwide basis with award rules designed to ensure that winning bidders can acquire contiguous blocks of spectrum within a spectrum band.

3.65 In relation to Mr. Jonathan Bradshaw's submission, ComReg is of the view that a detailed Section on the decommissioning of legacy mobile technologies in not an appropriate matter for ComReg, as it is the mobile operators that set the timelines for such decommissioning. Notwithstanding this, ComReg would highlight that it has included a specific condition[26] in various liberalised use licences[27] with a view to minimising any consumer disruption issues that might result from the decommissioning of a technology. This condition provides that where a licensee intends to cease the use of a terrestrial system that is used to provide services under its licence, the licensee shall:

- notify ComReg of this intention at least 6 months in advance of the proposed termination date; and
- use all reasonable endeavours to ensure that any adverse effects on users caused by the cessation of use of a terrestrial system are minimised.

[26] This condition is without prejudice to the contractual rights of parties who have entered into contracts with the licensee.
[27] i.e. Liberalised Use Licences for 800 MHz, 900 MHz and 1800 MHz bands granted on foot of the 2012 Multi-band Spectrum Award; 3.6 GHz Band Liberalised Use Licences; and MBSA2 Liberalised Use Licences for the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands granted under the upcoming MBSA 2021 award.

3.66 Finally, ComReg notes Three's indication that decommissioning plans for its legacy technologies may arise during the next two years.

3.4 The 26 GHz Band for 5G

Summary of Consultation 21/90

3.67 In Section 3.2.6, ComReg noted the importance of the 26 GHz band as a "pioneer 5G band" for providing high-capacity wireless broadband ("WBB") services over relatively small areas as well as the provision of point-to-point radio links and other services such as Radio Astronomy ("RA") and Earth Exploration Satellite Services ("EESS").

3.68 ComReg outlined the work undertaken to-date to inform its considerations of the future use of the 26 GHz band, including its 26 GHz Band 5G Study by Plum Consulting and IDATE (Document 21/07a[28]), and it invited further comment on the matters related to the 26 GHz Band 5G Study.

3.69 Further, Annex 4 of Document 21/90 contained a summary of all 10 submissions received regarding the 26 GHz Band 5G Study. The non-confidential submissions are published in Document 21/47.[29]

Views of respondents to Document 21/90

3.70 A summary of the five respondent's views (Apple, Huawei, Sigma Wireless, EUTELSAT and SpaceX) relating to the 26 GHz band[30] is set out below.

Spectrum

3.71 Apple notes the GSMA's view that *"Regulators should aim to make available ….. around 1 GHz per operator in high-bands (e.g. mmWave spectrum)"*

3.72 Huawei submits that it believes that the 26 GHz band is actually 24.250-27.550 GHz and that ComReg should keep monitoring interest in the 26 GHz band for IMT applications and proceed using steps as carried out in other EU countries, noting that:

[28] Document 21/07a, "26 GHz Band 5G Study - A study by Plum Consulting and IDATE regarding the future use of the 26 GHz Band", 26 January 2021, available at www.comreg.ie
[29] ComReg Document 21/47, "*Non-Confidential Submissions to 26 GHz Band 5G Study (Documents 21/07 and 21/07a)*", available at www.comreg.ie
[30] For convenience, these submissions are considered under the headings of Spectrum, Methods of Award, Licensing, Timescales and use cases, as set out in Document 21/07a (the 26 GHz Band 5G Study)

- a number of the large EU countries such as France, have not seen the necessity to release the 26 GHz band or portions of the 26 GHz band at this time other than for trialling;
- while others, such as Germany and the UK, have sought to use portions of the band for indoor or local/regional use; and
- that the Czech Republic has adopted a different approach and decided to make the band available for experimental licences to inform future regulatory and technical considerations due to lack of demand

3.73 In that regard, Huawei submits that if operators within Ireland build interest, the assignment of 5G licences could commence within the upper band of this spectrum (26.5-27.5 GHz) with minimum blocks of 200 MHz in order to guarantee quality performances. Assignment in a second stage of the remaining part of the 26 GHz band would allow wider virtual channels by means of intra-band carrier aggregation.

3.74 As of today, in Eutelsat's view there is little use of mmWaves for IMT, and the 3.25 GHz available in the 26 GHz band should be more than sufficient to accommodate current and future demand of terrestrial 5G in these bands.

Method of Award

3.75 In relation to 26.5 – 27.5 GHz range, Huawei proposes that a "club-use licensing" approach is considered to enhance local and/or campus/enterprises indoor connection. This method of licensing would permit each licensee to use the 1 GHz of awarded spectrum where other licensees do not use frequencies.

Licensing (conditions and compatibility)

3.76 SpaceX submits that to ensure customers relying on SpaceX ground infrastructure (using 27.5 – 29.1 GHz) are protected, ComReg should adopt appropriate technical and operational rules. Further, SpaceX urges ComReg to proceed with caution and sufficient safeguards when considering whether to permit 5G use of the upper 26 GHz band.

3.77 Eutelsat submits that the uplink and downlink Ka-bands are critical and should, remain available for satellite services. As such, Eutelsat suggests making sure that the satellite services in the 28 GHz band are protected from adjacent band interference when ComReg studies the introduction of terrestrial 5G in the 26 GHz band or other harmonized bands for IMT.

3.78 Regarding coexistence between FSS and Fixed Service providers Huawei submits that ECC Decision (05)01 provides the regulatory framework for deploying FS and FSS identifying 27.8285-28.4445 GHz and 28.9485-29.4525 GHz for the use of FS systems.

Timescales and migration of existing services

3.79 Apple submits that it is important to award 24.25-27.5 GHz band for 5G in a timely manner noting that the 26 GHz band was identified for IMT at WRC-19 and that this decision means national governments around the world now have the opportunity to consider assigning it for use in 5G networks. In doing so, Apple submits that this will help deliver long-lasting socio-economic benefits.

Use cases

3.80 Apple submits that while it appreciates that demand for access to the 26 GHz band might currently be limited, it believes that the 26 GHz (24.25-27.5 GHz) is a prime 5G mmWave band suitable for dense 5G small cell networks in urban hotspots where additional capacity is vital.

3.81 Sigma Wireless submits that with hundreds of megahertz of contiguous bandwidth available for individual operators and/or users, millimetre wave technology promises to deliver the full benefits of 5G in highly dense environments, indoors, i.e. for Fixed Wireless Access as a replacement or enhancement for the so-called last-mile delivery of services.

3.82 In addition, Sigma Wireless submits that there has even been some talk at European Commission level of offering the 26 GHz Band for use for private local networks across Europe. However, Sigma Wireless believes that such services are still many years away from becoming reality and that other frequency bands, such as 3800-4200 MHz in the mid-band offer vertical industries and enterprises a better path in the short term to full digital transformation of industrial processes and related mission-critical services.

ComReg's view on the 26 GHz Band

3.83 Noting that the above respondents' views form part of an existing consultation process on the potential use of the 26 GHz band for 5G which began with the publication of Plum/IDATE's key findings in the 26 GHz Band 5G Study[31], ComReg's assessment of responses and view on the 26 GHz band is set out in Annex 1 of this document. In summary, and having considered, among other things:

[31] Document 21/07a, …

- Plum/IDATE's key findings in the 26 GHz Band 5G Study, and recommendations with regard to spectrum, method of award, licensing and timescales;
- the ten submissions received in response to the 26 GHz Band 5G Study (see Annex 4 of Document 21/90 and Document 21/47);
- the further five submissions received as part of the consultation on the proposed radio spectrum strategy 2022-2024 (see above); and
- other relevant information such as Test & Trial Ireland activity in the 26 GHz Band in Ireland, equipment availability and international updates relating to the 26 GHz band.

ComReg is of the view that it is appropriate to identify the following work plan items for the 26 GHz band during this strategy period:

i. By 1 January 2022, ComReg will close the 26 GHz band to new Fixed Wireless Access Local Area (FWALA) licence applications. (see paragraphs A1.79 – A1.81 of Annex 1 for ComReg's assessment on this matter) ; and

ii. ComReg will continue to monitor developments in the 26 GHz band with respect of 5G, and following the completion of the MBSA 2021 and, subject to demand (e.g. reasoned submissions to responses to consultations, use of any 26 GHz test and trial licences issued, etc.), ComReg will consult on making one or more portions of the 26 GHz band available, noting that any consultation process may also consider other harmonised spectrum bands available for award. (see Annex 1 for ComReg's assessment on this matter)

3.84 In relation to the Test & Trial Ireland licensing scheme, ComReg highlights that remains open and available to all potential use cases in the 26 GHz band and would welcome any interest, of which to date there has unfortunately been none, from industry or research professionals to test or trial services in this band, noting that there is currently:

- 1047 MHz of contiguous available spectrum from 26,453 MHz to 27,500 MHz;
- 355 MHz of contiguous spectrum available from 24,250 MHz to 24,605 MHz; and
- 168 MHz of contiguous spectrum available from 25,445MHz to 25,613 MHz.

3.5 COVID-19 Temporary ECS Licensing Framework

Summary of Consultation 21/90

3.85 In Section 3.2.1, ComReg noted that it put in place three COVID-19 temporary ECS licensing frameworks for the temporary assignment to MNOs of additional spectrum rights in the 700 MHz and 2.6 GHz Bands and liberalised spectrum rights in the 2.1 GHz Band, and that it was considering in putting place a further COVID-19 temporary ECS licensing framework beyond 1 October 2021.

Views of respondents

3.86 In relation to the COVID-19 Temporary ECS Licensing Frameworks. Three commends ComReg's reaction in promptly developing a detailed and comprehensive consultation process which led to cooperation from different users of the radio spectrum (broadcasting, communications and transport). Three submits that this was the right reaction during an extraordinary time and demonstrates how a dynamic approach to spectrum management can benefit end users.

3.87 Three submits that during the last 18 months it saw the importance of radio-based services, with large peaks in voice call minutes at certain defining moments – the announcement of changes to restrictions brought about peaks in the volume of voice calls, whereas data demand rose rapidly in a more sustained way.

3.88 Noting that operators have now put the 700 MHz band into use on their networks, and customers have become used to the service that it delivers, Three submits that:

- there is a requirement for a transition from the current use under the COVID-19 Temporary ECS Licensing Framework to the long-term assignments that will be in place following the MBSA 2021; and
- this transition must avoid any unnecessary interruption of services that consumers have come to rely on.

ComReg's assessment

3.89 In putting each of the COVID-19 Temporary ECS Licensing Frameworks in place ComReg would like to acknowledge the collaborative effort and fast response from the DECC and various radio users[32], which has facilitated the availability of temporary spectrum rights to the benefit of consumers during the extraordinary period of the COVID-19 pandemic.

3.90 While ComReg notes Three's submission that there is a requirement for transition from the current temporary licensing framework, ComReg highlights that it's latest views on COVID-19 Temporary ECS licensing are set out in Documents 21/87[33] and 21/96[34], where among other things, ComReg noted that:

- a consideration of the need for the MNOs to make transition arrangements in advance of the cessation of any further temporary spectrum rights formed part of ComReg's observations in relation to the current temporary licensing framework; and:
- in relation to any further temporary licensing framework(s) beyond 1 April 2022, this was beyond the scope of the Decision set out in Document 21/96 and would be considered at the appropriate time, taking into account all relevant information.

3.6 The ECS sector and climate change

Summary of Consultation 21/90

3.91 In Section 4.6, ComReg detailed the increasing awareness and attention being placed on the relationship between the ECS sector and climate change. ComReg outlined relevant contributions and work items and noted that the Climate Action and Low Carbon Development (Amendment) Act 2015, as amended by the Climate Action and Low Carbon Development Act 2021, requires ComReg and other public bodies to perform functions in a way that is consistent with approved national climate plans, strategies, and objectives – as far as is practicable.

[32] Broadcasters, mobile and fixed wireless communications providers and the transport industry in relation to responding to ComReg's consultation processes.
[33] Document 21/87, "COVID-19: Temporary Spectrum Management Measures, Consultation and draft decision, including draft regulations on a further temporary spectrum rights (No.3) framework in the 700 MHz Duplex, 2.1 GHz and 2.6 GHz Bands", 8 September 2021, https://www.comreg.ie/media/2021/09/ComReg2187.pdf
[34] Document 21/96, "COVID-19: Temporary Spectrum Management Measures Response to consultation and decision, including draft regulations on a further temporary spectrum rights (No.3) framework in the 700 MHz Duplex, 2.1 GHz and 2.6 GHz Bands", 23 September 2021, https://www.comreg.ie/media/2021/09/ComReg_21_96_R2CD_COVID-19_3rd_Futher-TEMP-ECS_1.pdf

Views of respondents

3.92 Sigma Wireless supports ComReg's increased focus on the relationship between the ECS sector and climate change and submits that it is positive to see the award of the 400 MHz band to ESB Networks for a nationwide smart grid is considered to be a key enabler in the reduction of carbon emissions.

3.93 In relation to the study that ComReg will commission to investigate the impact of climate change on the electronic communications networks in Ireland, Sigma Wireless submits that it looks forward to supporting ComReg on this. RTÉ & 2RN submits that it is important to include broadcasting in this study, as the results may help inform the debate on the future use of the UHF band and submits that DTT is more energy efficient at delivering TV data than other platforms.

ComReg's assessment

3.94 ComReg notes the views expressed by Sigma Wireless and RTÉ & 2RN in respect of the ECS sector and climate change. ComReg welcomes support expressed by Sigma Wireless regarding ComReg's future study on the impact of climate change on ECS. Regarding comments expressed by RTÉ & 2RN, these will be considered by ComReg in framing the study.

Chapter 4

4 Radio Spectrum work plan for 2022 – 2024

4.1 In Chapter 5 of Consultation 21/90, ComReg outlined its draft spectrum management work plan for the period 2022–2024 for specific radiocommunication services, whilst observing the need for appropriate prioritisation of same

4.1 Appropriate prioritisation of spectrum management workplan activities

Summary of Consultation 21/90

4.2 In Section 5.1, ComReg described that it aims to manage its workload in a manner that seeks to address the needs of a diverse range of stakeholders appropriately and pragmatically. ComReg outlined a number of relevant considerations that affected its prioritisation.

Views of respondents

4.3 Cellnex supports ComReg's prioritisation of spectrum management workplan activities.

ComReg's assessment

4.4 ComReg welcomes Cellnex's view on its prioritisation of spectrum management workplan activities.

4.2 ComReg's draft spectrum work plan 2022 to 2024

4.5 In Section 5.2, ComReg set out its indicative spectrum work plan for the period 2022 to 2024, which covered areas such as:

- Programmatic spectrum management functions;
- MFCN;
- Broadcasting Services;
- EC harmonisation decisions (non MFCN);
- Terrestrial Fixed Services;

- Licence Exempt Short Range Devices (SRDs);
- Satellite Services;
- Private Mobile Radio Services;
- Radio Amateur Services;
- Unmanned Aircraft Systems (UAS);
- Aeronautical and Scientific Services; and
- Defence Force use of spectrum

4.2.1 Programmatic spectrum management functions

Summary of Consultation 21/90

4.6 In Section 5.2.1, ComReg set out its work plan proposals for its spectrum management functions, including licensing and compliance activities.

Views of respondents

4.7 Apple supports ComReg's programmatic work plan items for its spectrum management function for the period 2022 – 2024. Apple is of the view that these activities and objectives are vitally important.

4.8 ESBN submits that the Test and Trial scheme is a key enabler and driver of innovation in Ireland and ESBN commends ComReg's continued focus in this area.

4.9 Three welcomes ComReg's SII Forum and submits that ComReg could re-convene with on-line rather than in-person meetings as a way to restart this forum during COVID-19.

ComReg's assessment

4.10 ComReg welcomes Apple and ESBN's views on the programmatic work plan.

4.11 Regarding the SII forum, ComReg recently held the forum online on 8 December 2021, which was attended by 19 organisations, including Three. ComReg intends to continue to hold the SII Forum online for the foreseeable future.

4.2.2 MFCN

Summary of Consultation 21/90

4.12 In Section 5.2.2, ComReg described the proposed work plan items for MFCN for the period 2022 – 2024.

Views of respondents

4.13 Four respondents (Apple, the IAA, RTÉ & 2RN and Three) submitted comments in relation to the proposed work plan items for MFCN.

4.14 Apple supports the proposed work plan items relating to:

- completion of the MBSA 2021 multi-band spectrum award;
- implementing the future EC Implementing Decision to replace Commission Decision 2009/766/EC to enable M2M deployment in the 900 MHz and 1800 MHz bands;
- implementing EC harmonisation decisions in bands for MFCN in support of next generation terrestrial wireless systems;
- monitoring developments in the 1.4 GHz band for MFCN and consulting on the award of some or all of this band;
- monitoring 5G 26 GHz band developments and consulting on making part(s) of the band available;
- monitoring work in CEPT and EC on harmonised technical conditions for shared use of 3800-4200 MHz by local networks and support for harmonisation decisions; and
- contributing to the EC's and CEPT's considerations of what efficiencies might be introduced for authorisation and licensing of spectrum for MFCN services in the future.

4.15 The IAA welcomes inclusion of the proposed work item for ComReg's continued engagement with the IAA on compatibility issues between MFCN in the 2.6 GHz Band and the IAA's aeronautical primary radars in the adjacent 2.7 – 2.9 GHz band. The IAA affirms its own commitment to continued cooperation on the matter.

4.16 Commenting on the proposed work item for ComReg's online mobile coverage maps, including updating the maps to include 5G mobile coverage, Three encourages ComReg to add 5G coverage as quickly as possible.

4.17 In relation to TV White Space, RTÉ & 2RN welcomes what it terms ComReg's generally cautious approach and agrees with ComReg's summary of the TVWS issue. RTÉ & 2RN submits that "unutilised frequencies" at a local level, are often a function of highly efficient high power high tower multi frequency networks and should not be interpreted as a lack of efficiency.

4.18 RTÉ & 2RN is of the view that the TVWS concept results in increased spectrum usage in the 470 - 694 MHz band and that there is a potential for additional interference to broadcast networks and reduced opportunity for the existing sharing relationship with PMSE services.

4.19 RTÉ & 2RN is also of the view that TVWS does not provide any benefit that is not already promised by existing 4G/5G systems within existing mobile/broadband spectrum.

ComReg's assessment

4.20 ComReg welcomes Apple's support for several of the proposed work plan items for MFCN and the IAA's confirmation of its continued commitment to cooperation with ComReg to resolve compatibility issues between MFCN in the 2.6 GHz Band and the IAA's aeronautical primary radars in the adjacent 2.7 – 2.9 GHz band.

4.21 In relation to Three's comment, ComReg notes that it is actively engaging with the MNOs with a view to ensuring availability of the relevant network data and finalising the development of an appropriate methodology for generating representative 5G outdoor coverage maps for publication on the ComReg website. In that connection, on 25 November 2021 ComReg published an Information Notice (Document 21/118) and associated report from Plum Consulting (Document 21/118a) on the appropriate 5G outdoor mobile coverage thresholds to be used for plotting 5G outdoor coverage maps[35].

4.22 In relation to TV White Space, ComReg notes and agrees with RTÉ & 2RN's view that a cautious approach to TVWS is appropriate, noting among other things that:

- the future use of the 470 – 694 MHz spectrum band is now under consideration for WRC-23, and ComReg observes that the outcome of this work may impact the spectrum allocations for this band, and thus the ability for TVWS services to make use of any pockets of available spectrum; and

[35] See further Document 21/118, "Information Notice: ComReg Outdoor Mobile Coverage Map - A study by Plum Consulting on 5G Outdoor Mobile Coverage Thresholds", https://www.comreg.ie/media/2021/11/ComReg-21118.pdf, and Document 21/118a, "Coverage thresholds for 5G services - A study by Plum Consulting" https://www.comreg.ie/media/2021/11/ComReg-21118a.pdf

- TVWS has the potential to cause additional interference to broadcasting networks as well as reducing the opportunities for PMSE.

4.23 Finally, given ComReg's consideration of specific items elsewhere in this document, ComReg has amended its MFCN work plan (a draft of which was set out in Document 21/90) by:

- amending the wording of the 3800-4200 MHz work plan item (see Section 3.2.2 above) to clarify that this band is for local-area connectivity whether this is for private (e.g. enterprises) or public (e.g. community-type) networks;
- adding a work plan item in relation to the 26 GHz band (see Section 3.4 above) that close this band for new applications in FWALA by 1 January 2022; and
- adding a work plan item to identify that ComReg intends to carry out a mobile data forecast during the period of the strategy statement (see paragraph 4.67 of Document 21/90).

4.2.3 Broadcasting Services

Summary of Consultation 21/90

4.24 In Section 5.2.3, ComReg identified the following work plan items for broadcasting services for the period 2022 – 2024:

> Continue to engage in the international coordination of broadcasting transmitter stations;
>
> Issue and amend, as appropriate, Digital Terrestrial Television ("DTT"), Digital Sound Broadcasting ("DSB") and Analogue Sound Broadcasting ("ASB") licences as requested in line with the broadcasting licensing framework;
>
> Provide advice as required to DTCAGSM and DECC, in relation to spectrum for broadcasting services[36]; and
>
> Carry out a study to consider the current and future spectrum requirements of broadcasting services in Ireland in the frequency range 470-694 MHz noting its consideration at WRC-23

[36] For example, the government has signalled an intention to revise the Broadcasting Act 2009, ComReg will assist DECC staff as appropriate. See www.decc.gov.ie.

Views of respondents

4.25 Two respondents (Apple and RTÉ & 2RN) submitted views relating to ComReg's proposed work plan for Broadcasting Services.

4.26 Apple notes that ComReg will review the future requirements for broadcasting as well as TV white space technology as part of any future discussions on 470-694/698 MHz, as well as consider what position to take on WRC-23 Agenda Item 1.5. Apple submits that:

"*We would like to reiterate that we believe this frequency range has exceptional propagation characteristics particularly suited for rural mobile broadband connectivity, localised long-range communications, and infrastructure enhancement under a Mobile allocation in the Radio Regulations. This does not necessarily mean that an IMT identification is needed, and it is more appropriate to maintain a technology and service neutrality approach for regulations for this frequency band that could also allow shared use of the band".*

4.27 In relation to ComReg's proposed study to consider the current and future spectrum requirements of broadcasting services in Ireland in the frequency range 470-694 MHz, RTÉ & 2RN submits that:

"We would like to be involved in this study from the beginning and would like to assist in the development of its scope. It is important to factor in that this should not be just a technical exercise looking at spectrum assignments but should consider the level of quality of spectrum needed to ensure adequate service, noting the public service / social importance of broadcasting. The study should be extended to consider the entire 470 to 960 MHz band in line with WRC-23 Agenda item 1.5."

ComReg's assessment

4.28 ComReg notes the views of Apple and RTÉ & 2RN on agenda item 1.5 of WRC-23 and ComReg's study of the 470-694 MHz band in preparation for same. ComReg is also of the view that this spectrum band and the WRC-23 agenda item are important for Ireland, noting among other things, the very favourable propagation characteristics of sub-1 GHz spectrum that make it suitable for providing widespread coverage in indoor and rural areas.

4.29 In relation to Apple's view that it would be appropriate to apply a technology and service neutrality approach for regulations for this frequency band, that could also allow shared use of the band, this is something that ComReg will consider in its preparations for WRC-23. However, it should be noted that any such consideration would among other things require a change to the ITU Regulations for the 470 - 694 MHz band, as in ITU Region 1 this band is currently allocated on a primary basis to Broadcasting services.

4.30 In relation to RTÉ & 2RN's view that it would like to be involved in developing the scope for ComReg's study and that the study should be expanded to consider the Mobile services' use of the entire 470 – 960 MHz band ComReg:

- firstly is of the view that it is not appropriate for RTÉ & 2RN, or other direct stakeholders such as the MNOs, to be directly involved in developing the scope of this study, as this is a ComReg study being undertaken by the independent spectrum manager. However, ComReg notes that RTÉ & 2RN have already provided comments on the scope of this study in its response to this consultation and ComReg will consider same when finalising the scope for this study; and

- notes that while expanding to scope of the study to consider the Mobile services' use of the entire 470 – 960 MHz band may provide benefits in terms of a greater alignment with the WRC-23 Agenda Item, ComReg is of the view that focus in the study should remain on the 470-694 MHz band as:

  - information on the MNO's and other interested parties' demand for and use of the existing harmonised sub-1 GHz spectrum bands for MFCN in Ireland is already available to a certain degree via various ComReg consultations on sub-1 GHz spectrum[37], and the tracking and forecast of mobile data usage in Ireland (e.g. see Figures 26 and 27 of Document 21/90); and

  - a focus on the 470-694 MHz band allows a consideration of both the existing use of this spectrum band by broadcasting services and the potential for this spectrum band to be used for other services in the future. Multiple factors (including potential benefits and costs) could be included in any such consideration.

4.31 Finally, ComReg envisages that once this study is commenced it would likely include stakeholder engagement with various parties such as RTÉ & 2RN, BAI, DECC, DTACGSM and the MNOs, and that this would provide a further opportunity for the provision of views.

[37] For example, information in relation to the MNO's demand for 700 MHz spectrum is available from the recent consultations on the COVID-19 temporary spectrum measures the MBSA 2021, available at:

- https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/covid-19-temporary-spectrum-management-measures/ and
- https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/proposed-multi-band-spectrum-award/

4.2.4 EC harmonisation decisions (non MFCN)

Summary of Consultation 21/90

4.32 In Section 5.2.4, ComReg described its intended strategy for existing and future EC harmonisation decisions for the upcoming period. This included:

i. Consulting on the manner in which the 5.9 GHz band will be regulated for ITS in Ireland;

ii. Considering the appropriate implementation of the future revised Commission Implementing Decision on 5 GHz WAS/RLANs; and

iii. Considering the appropriate implementation of the expected Commission Implementing Decision on Future Railway Mobile Communication Systems.

ComReg's assessment

4.33 Cellnex and Eutelsat submitted comments regarding the 5.9 GHz band, and ComReg has assessed these comments in Section 3.2.1 above.

4.2.5 Terrestrial Fixed Services

Summary of Consultation 21/90

4.34 In Section 5.2.5, ComReg identified the following work items for terrestrial fixed services for the 2022 to 2024 period:

i. Conclude the consultation process of the Fixed Links Bands Review and, if appropriate, implement new guidelines and regulations for the fixed links licensing scheme;

ii. Continue to publish an annual report detailing the most up to date information regarding the licensing of fixed links;

iii. Continue to encourage licensees to use the latest technology in line with ensuring the efficient use of spectrum; and

iv. Publish fixed links data on Siteviewer.

Views of respondents

4.35 ESBN submits that it will continue to engage with the consultation process of the Fixed Links Bands Review to assist in developing the most efficient Fixed Links process for all users and ComReg.

4.36 Huawei suggests ComReg considers the use of block licensing in order to incentivise an efficient spectrum reuse, speed up network deployment and ease the assignment procedures.

4.37 SpaceX submits that it supports ComReg's intended strategy for Terrestrial Fixed Services. SpaceX further submits that ComReg should ensure that deployment of fixed links in the 70/80 GHz bands will not unduly hinder future deployment of satellite ground infrastructure.

4.38 SpaceX requests that ComReg adopt policies and processes for fixed links in the 70/80 GHz bands that promote transparency to facilitate efficient network planning, coordination, coexistence, and deployment, including for co-primary services such as fixed-satellite service gateways. SpaceX further requests that ComReg make available fixed links information in its public database for 70/80 GHz links to enable meaningful analysis and self-coordination.

ComReg's assessment

4.39 ComReg welcomes the views of the respondents and notes that it has published a further consultation document on the Fixed Links Bands Review in December[38]. That consultation document sets out ComReg's views on a number of matters, including block licensing and the setting of fees for fixed links, and will provide an assessment of the respondents' views to the initial consultation, Document 20/109.[39]

4.40 Regarding SpaceX's submission, in the Proposed Strategy for Managing the Radio Spectrum 2022 to 2024 (ComReg document 21/90), ComReg signalled its intention to make fixed radio links licence information publicly available on https://siteviewer.comreg.ie/. ComReg noted that providing access to fixed radio link licence information would provide greater transparency regarding what services are deployed in particular areas and would assist operators with their network planning. By extension, satellite operators, such as SpaceX, would also benefit from having access to fixed radio link license information to plan the deployment of satellite earth stations and terminals.

4.41 The publication of fixed links data on https://siteviewer.comreg.ie/ is identified in the final RSMSS as a work item for the period 2022-2024.

[38] See Document 21/134
[39] Document 20/109 – Review of the Fixed Radio Links Licensing Regime: Preliminary Consultation – published 9 November 2020

4.2.6 Licence Exempt Short Range Devices (SRDs)

Summary of Consultation 21/90

4.42 In Section 5.2.6, ComReg identified the following work items for licence exempt short range devices for the 2022 to 2024 period:

i. Continue to facilitate the use of SRDs in Ireland, in accordance with international harmonisations measures and where necessary, revise Document 02/71 on foot of EC and ECC harmonisation updates;

ii. Monitor, contribute to and promote Ireland's spectrum management position in relation to IoT;

iii. Implement the ECC Decision (04)08 on the harmonised use of the 5 GHz frequency bands for Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) as amended July 2021; and

iv. Consider a review of all "National SRD Solution Only" entries in Document 02/71.

Views of respondents

4.43 Apple supports ComReg's strategy for 2022-2024 to continue to facilitate the use of SRDs in accordance with international harmonisations measures.

4.44 Eutelsat submits that satellite based IoT solutions can offer ubiquitous coverage, enabling objects to transmit data irrespective of their location and demonstrating the fundamental complementarity between terrestrial networks and satellite technology. Eutelsat appreciates ComReg plans to continue to facilitate the use of SRDs in Ireland in accordance with international and regional harmonisations.

4.45 Eutelsat thanks ComReg for ensuring earth stations continue to be protected and encourages ComReg to consider the potential impact on satellite services' operations when studying and regulating spectrum access for other services.

ComReg's assessment

4.46 ComReg welcomes the support of Apple and Eutelsat for its proposals for SRDs for 2022 – 2024. ComReg intends to undertake the work items identified above for licence exempt short range devices.

4.2.7 Satellite Services

Summary of Consultation 21/90

4.47 In Section 5.2.7, ComReg identified the following work items for satellite services for the 2022 to 2024 period:

i. Consult on, amongst other issues, the authorisation of SES below 3 GHz as well as the Satellite Earth Station Licensing regime during the strategy period 2022 - 2024;

ii. Continue to facilitate the licensing of satellite earth stations (SES) operating in spectrum above 3 GHz; and

iii. Continue to facilitate the exemption of individual licensing for certain classes of Terminals for Satellite Services by updating ComReg Document 20/47, as required.

Views of respondents

4.48 ESOA states that it will be grateful to be able to provide detailed input from the satellite industry's perspective when ComReg publishes the consultation on its review of the Satellite Earth Station Licensing regime.

4.49 Sigma Wireless submits that ComReg should continue to study and monitor possible future uses of satellite services as newer, LEO constellations with smaller, more modular form factors are launched to provide ubiquitous coverage.

4.50 SpaceX supports ComReg's proposed work plan for satellite services for the 2022-2024 period. In addition, SpaceX also submits that ComReg should:

i. consider a spectrum-splitting backstop in the event operator-to-operator coordination is not completed by the time non-geostationary satellite system operators have commenced service in Ireland. Under this proposal, operators would strive to reach a coordination agreement before both systems have commenced service. However, in the event that such an agreement is not reached, the operators would split the spectrum evenly once operational;

ii. set reasonable, cost-recovery fees for Satellite Earth Station licences;

iii. leverage software-driven spectrum management practices wherever possible to accelerate application processing and licensing of satellite earth stations, building on the success of ComReg's eLicensing and Siteviewer tools;

iv. explicitly reference ETSI standard 303 981 in its exemption for ESIMs communicating with NGSO fixed satellite systems; and

v. ComReg should take this opportunity to include the 70/80 GHz bands in its consultation to fully capture prospective spectrum uses for fixed-satellite service gateways.

ComReg's assessment

4.51 ComReg welcomes the broad support of respondents to its proposed work plan for satellite services. Regarding the four points raised by SpaceX, ComReg notes that:

- In relation to (i), Document 20/47[40], as amended, is informed by relevant ECC Decisions which harmonise the exemption from individual licensing and free circulation and use of certain terminals for satellite services across Europe. ComReg further notes that when a satellite operator which deploys terminals under the licence-exemption regime for terminals for satellite services, the operator cannot claim all or part of a frequency band solely for its exclusive use, nor can satellite operators agree to split a frequency band evenly between them. Any satellite operator can use all or part of a frequency band specified in ComReg 20/47R3 provided they do so in compliance with the conditions set out therein.

- However, ComReg notes that new broadband satellites systems are being developed and in service, some of which use a constellation of satellites in a non-geostationary satellite orbit ("NGSO") to offer lower latency and greater capacity broadband to consumers. These NGSO systems are more complex as they use hundreds/thousands of satellites. This, in turn, introduces challenges to coordinating different NGSO services. Therefore, ComReg intends to consider this matter further as part of its review of the satellite earth station licensing regime.

- In relation to (ii), Regulation 19 of the Authorisation Regulations permits ComReg to impose fees for rights of use that reflect the need to ensure the optimal use of the radio frequency spectrum. In addition, ComReg is required to ensure that any such fees are objectively justified, transparent, non-discriminatory and proportionate in relation to their intended purpose and take into account the objectives of ComReg as set out in section 12 of the 2002 Act and Regulation 16 of the Framework Regulations.

[40] Document 20/47R3 – Permitted Licence Exemptions for Terminals for Satellite Services – published 7 December 2021

- In relation to any fees which might apply, ComReg notes that there are a variety of methodologies that can be used to calculate applicable fees. As part of the consultation process for the satellite earth station licensing regime, ComReg intends to consult on an appropriate methodology for setting fees and SpaceX would be welcome to submit any comments it may have on ComReg's proposals at that point in time.

- In relation to (iii), ComReg notes that the radio spectrum licensing system continues to evolve and further improvements continue to be developed and rolled out by ComReg. In its Fixed Radio Links Annual Report 2021[41], ComReg noted that it introduced in early 2021, a mapping graphical user interface ("GUI") on its eLicensing system. ComReg followed this in April 2021 by introducing a preview of the applicants link budget on eLicensing. As part of its review of the satellite earth station licensing regime, ComReg intends to also consider what, if any, improvements can be made to the licensing system for the processing of applications for satellite earth station licences.

- In relation to (iv), ComReg notes that in Annex 1 of ECC Decision (18)05, bullet 4 refers to ETSI standard 303 981, and that in part (c) of Section 2.9 of ComReg 20/47R2, there is a requirement that ESIMs comply with the requirements in Annex 1 and 2 of ECC Decision (18)05. However, ComReg has included a reference to the standard in Section 2.9 of the latest revision of ComReg 20/47.

- In relation to (v), ComReg notes that in Document 21/90 that it has commenced a project to review the current Fixed Satellite Earth Station licensing regime. The scope of the project is to consult on a new licensing framework for satellite earth stations and terminals and consider, among other things, frequency bands, fees, technology, and international developments in satellite services. The preliminary consultation document is scheduled for publication in Q4 2021 and will consider, amongst other things, current and future use cases for satellite earth stations. The preliminary consultation document has been informed partly by interviews conducted by ComReg and DotEcon with relevant parties, such as SpaceX. ComReg encourages SpaceX to review the preliminary consultation document when it is published and submit any it views it may have.

- Regarding the submission by SpaceX on the 80 GHz, ComReg intends to consider the matter further as part of the consultation process to review the satellite earth station licensing regime and will set out its views on the 80 GHz band at the next consultation stage once having considered all submissions to the preliminary consultation.

[41] Document 21/97 – Fixed Radio Links Report: Annual Report for 2021 – published 30 September 2021

4.2.8 Private Mobile Radio Services

Summary of Consultation 21/90

4.52 In Section 5.2.8, ComReg identified the following work items for private mobile radio services for the 2022 to 2024 period:

i. Review the current licensing regimes for PMR and consult on, amongst other things, implementing a single unified, modern and fit for purpose licensing regime;

ii. Monitor and contribute to the spectrum management considerations of PMSE and take appropriate actions to implement harmonisation decisions; and

iii. Monitor and contribute to the spectrum management considerations in respect of broadband PPDR.

Views of respondents

4.53 ESBN submits that ComReg should decide soonest on what spectrum should be made available for PPDR. In the event that 414 – 417 MHz and 424 – 427 MHz was not required for PPDR, ESBN encourages ComReg to make this spectrum available for ESBN to enable a greater Smart Grid network. ESBN further submits that it would benefit from knowing if this spectrum will be used by OGCIO for PPDR as this would allow ESBN build in potential interference mitigation measures when designing and deploying its Smart Grid network.

ComReg's assessment

4.54 ComReg welcomes ESBN's submission and notes that its position regarding the spectrum options (400 MHz band, 700 MHz Duplex Gap and 700 MHz Guard Bands) for broadband PPDR is set out in Section 3.1 above.

4.2.9 Radio Amateur Services

Summary of Consultation 21/90

4.55 In Section 5.2.9 and in Annex 3 (A3.1 – A3.34), ComReg set out its proposed work items for radio amateur services for the 2022 to 2024 period and invited views on:

i. Novice Licences; and

ii. An increase in maximum permitted power and related issues such as the measurement of power, non-ionising radiation and spurious emissions.

Views of respondents: Overview

4.56 Of the 44 responses received, 26 focused on the radio amateur services:

- 10 responses were received from individual radio amateurs; and
- 16 responses were received from clubs, organisations, groups or societies.

4.57 ComReg will, as a matter of priority, update the current guidelines to remove the errors noted in A3.20 of the consultation.

Views of respondents on novice licences

4.58 There was wide support for a form of entry-level or novice-level licensing.

4.59 The justification for ComReg implementing a licence regime that does not require the full knowledge of HAREC included:

- such an action would align with the national policy for Ireland to be a leader in nurturing, developing and deploying STEM talent and the availability of a novice licence would enable the amateur radio service to act in the national interest;
- there are groups of people for whom the HAREC examination is unobtainable (e.g. Scouts, “kids in ‘maker’ and STEM groups”, those currently studying for the HAREC examination, transition year students);
- there are persons who only want to take part in a very limited manner in radio amateur activities (e.g. hill walkers) for whom the HAREC examination is an excessive requirement;
- A comparison was made with the marine radio licence that requires a Short Range Certificate for VHF operators which can be obtained after 8 hours of instruction and a short exam - A shorter novice/foundation licence with shorter courses can be embedded into for example: summer camps and after school camps;
- a tiered approach from novice to full licence would answer ComReg’s concern as to how an adequate level of competence can be achieved;
- The CEPT Novice licence has been implemented in 25 CEPT countries and it is claimed that there is some evidence that this has led to an increase in registered amateurs;
- Not all interested parties want to use the HF bands and access to VHF and UHF would be of great interest; and

- Based on an analysis of the age of amateur licensees (GREC) a younger group of new licensees is required to sustain this hobby.

4.60 Suggestions on what a novice licence would permit included:

- Bands:
  - some responses suggested only access to the 2m (VHF 144 – 146 MHz) and 70cm (UHF 432 – 440 MHz) amateur bands;
  - one response included 28 – 29.7 MHz (the 10m band);
  - another was of the view that access to 50 – 52 MHz and 69.9 – 70.5 MHz would be beneficial for young entrants; and
  - one response considered that giving any access to HF bands would discourage further study;
- Power - Two maximum powers were proposed: 5 W and 25 W;
- Licence duration:
  - To encourage upskilling the licence should be limited to two years; and
  - While some responses also encouraged a 2-year limit they also favoured the option for a renewal.

ComReg's assessment on novice licences

4.61 Taking into account the support expressed for entry-level or novice-licensing and the strong justifications given above, ComReg will seek, in the timeline of this strategy statement and subject to resources, to put in place a framework for novice licensing in Ireland.

4.62 It is envisaged that to achieve this, ComReg will need to:

- Consult on its proposals;
- Make new Regulations, with the consent of the DECC Minister under Section 6 of the Wireless Telegraphy Act ,1926, as amended; and
- tender for an external party to run any examination that may be required. At this time ComReg would consider if that examination is best offered online and, as a consequence, can be taken at any time.

Views of respondents on increasing maximum permitted power levels

4.63 There was wide support for an increase in the maximum permitted power levels.

4.64 Suggestions included:

- A general increase in permissible transmitter power for all licensees;
- Maintaining the existing power levels but updating the list of contests (in the guidelines) where higher power will be permitted for the duration of the contests;
- Allow for individual authorisations to use higher power where compliance with NIR can be demonstrated;
- The issue of NIR should be dealt with by modelling or by the use of measurement equipment – useful details related to measurement equipment was supplied by the Marconi Group; and
- The use of modern radio equipment reduces the chances of spurious emissions.

ComReg's assessment on increasing maximum permitted power levels

4.65 ComReg wishes to point out an error in paragraph A3.25 of Document 21/90. The word "medium" is an error and the word "median" should have been used.

4.66 ComReg notes that the term "high power" seems to have become synonymous with 1 500 Watts (~32 dBW) and wishes to point to appendix 2 of the Marconi Radio Groups input, which appears in Annex 5 of ComReg 21/90. In that Appendix the Marconi Group requested a range of powers across the bands.

4.67 However, in the responses to consultation there was no engagement with ComReg's points that related to lower powers in use across the CEPT (A3.26) and the parity Irish amateurs already have with a number of CEPT countries (A3.27).

4.68 Nevertheless, as part of the update of the guidelines ComReg will update the competitions for which high power is permitted.

4.69 Furthermore, ComReg will consider further the matter of a general increase in permissible power for all licensees and/or individual authorisations for licensees wishing to operate at higher powers. Included in these considerations will be the matters related to compliance with NIR, spurious emission and measurement of power.

Other matters raised by respondents and ComReg's assessment of each.

4.70 The IRTS details the current situation in the CEPT with respect of how Administrations engage with matters related to the amateur services and request a review of the situation in the CEPT suggest some mechanism of resource sharing and multi-country input. It is not clear to ComReg how this would operate and thus further consideration is required.

4.71 The IRTS notes with respect to self-regulation, how individual frequencies and sub-bands should be utilised based on band plans developed by the IARU and adapted for unique national requirements. ComReg also notes the consultative exercise undertaken by the IRTS to develop national band plans for the 30 – 70.5 MHz bands. In order to facilitate self-regulation, and noting its intention to update the current guidelines, ComReg intends to modify the table in Annex 1 of those guidelines as follows:

- Remove the column defining “emission classification”;
- Remove the column defining “modes”; and
- Refer to the effect that licensees are, in terms of maximum bandwidth, modes and usage, to adhere to the IARU band plans and any applicable Irish national band plans.

4.72 The IRTS and the NRSI have both requested an invitation to meetings of the Spectrum Intelligence and Investigation Operators Forum (the SII Forum). This matter has already been dealt with in ComReg Document 20/62[42] (page 23, paragraph 71) where ComReg notes that “*the IRTS is a representative of amateur radio operators in Ireland and that it itself is not an Electronic Communications Service provider. Consequently, ComReg does not consider it necessary or appropriate for the IRTS to attend the SII Forum. Nevertheless, ComReg will continue to engage with the IRTS on a bi-lateral basis as it has always done*”. The same principle applies to the NRSI and ComReg welcomes the opportunity to engage bilaterally or multilaterally with the IRTS and the NRSI as representative societies.

4.73 Both the NRSI and the IRTS raise the matter of the alignment of the Radio Frequency Plan for Ireland[43] (RFPI) with the European Common Allocations[44]. In respect of the bands above 75.5 GHz ComReg intends to update the RFPI in December 2021 to fully align it with the ECA in respect of these EHF bands. The current guidelines will be updated to reflect these changes.

[42] ComReg Doc. 20/62 - Response to Consultation on the management of Radio Spectrum Interference Complaints - 16 July 2020
[43] Currently ComReg Doc. 20/58R2 – Radio Frequency Plan for Ireland – 18 June 2021.
[44] ERC Report 25 – The European table of frequency allocations and applications int eh frequency range 8.3 kHz to 3 000 GHz (ECA TABLE) - October 2021

4.74 The IRTS proposes to transfer five specific frequencies between 5 280 kHz and 5 405 kHz from A1.4 of the guidelines (use requires additional authorisation) to A1.3 of the guidelines (available for general use). The IRTS contends that this would provide more flexibility for amateurs operating on a secondary basis to avoid interfering with primary services. ComReg agrees with this proposal and will adjust the guidelines to make these five spot frequencies available to all licensees.

4.75 The IRTS proposes a change to Section 6.3 of the guidelines that deals with automatic stations to take into account recently licensed and commissioned propagation beacons around 40 MHz. ComReg agrees with this proposal and will adjust the guidelines to take this change into account.

4.76 In respect of the band 50 – 54 MHz the IRTS has made four proposals:

i. Proposal 1 – that at WRC-23 Ireland joins footnote 5.166A which will provide primary status for the Amateur Service in the band 50 – 50.5 MHz. ComReg will bring this request to the national preparatory group. However, ComReg notes that the European Common Allocation is on a secondary basis and hence does not favour any change.

ii. Proposal 2 – to provide consistency with adjacent allocations that the band 52 - 54 MHz is allocated to the amateur services. ComReg will consider this request.

iii. Proposal 3 – subject to proposal 1 that ComReg increase the power levels that can be used in the band 50 - 50.5 MHz. ComReg will not wait until WRC-23 but will consider a power increase in this band along with the general issue of increasing power levels.

iv. Proposal 4 – that studies for a new secondary allocation to the Earth exploration satellite (active) service for space-borne radar sounders, in the range around 45 MHz should address the need to protect the incumbent amateur service in the adjacent 50 – 54 MHz band. ComReg notes that ITU Resolution 656 includes the instruction for the ITU-R to conduct studies on spectrum needs and sharing studies between the Earth exploration-satellite (active) service and the radiolocation, fixed, mobile, broadcasting, **amateur** and space research services in the frequency range 40-50 MHz and **in adjacent bands**. Proposal 4 – that studies for a new secondary allocation to the Earth exploration satellite (active) service for space-borne radar sounders, in the range around 45 MHz should address the need to protect the incumbent amateur service in the adjacent 50 – 54 MHz band. ComReg notes that ITU Resolution 656 includes the instruction for the ITU-R to conduct studies on spectrum needs and sharing studies between the Earth exploration-satellite (active) service and the radiolocation, fixed, mobile, broadcasting, **amateur** and space research services in the frequency range 40-50 MHz and **in adjacent bands**.

4.77 The IRTS has raised the issue of how the possible establishment of quiet zones around specific areas of radio spectrum research, such as Birr Castle (which is a radio astronomy site), would affect the radio amateur services.

4.78 In responding to this comment ComReg notes:

- the use of quiet zones, if such zones were to be established in Ireland, is to protect such sensitive sites from direct interference coming from motorised traffic, electronic equipment, restriction of construction, power lines, etc;
- with such quiet zones ComReg may limit or even prohibit the establishment of base stations, the use of VSATS or mobile earth stations and radio amateur equipment within the quiet zone; and
- The size of quiet zones depends on the transmission characteristics of this equipment and on the frequency(s) in use and the footnote below ([45]) provides some idea of the scale of radio quiet zones used in Europe.

[45] See https://www.craf.eu/radio-quiet-zones-around-observatories/

4.79 In respect of WRC-23 the IRTS has detailed their positions on a number of agenda items and ComReg will relay these into the national preparatory group. In respect of participation in the national delegation, ComReg reiterates that this is ultimately a decision for the DECC. However, ComReg notes that the national delegation is currently only open to participation by government departments and government agencies but it is open for all other parties to bring their input to the national delegation through the government department or agency with responsibility for that service. Furthermore, ComReg notes that the amateur service has representation at the CEPT through the IARU.

4.2.10 Aeronautical and Scientific Services

Summary of Consultation 21/90

4.80 In Section 5.2.11, ComReg identified work items for the 2022 to 2024 period that considered:

i. Aeronautical Services;

ii. Scientific Services;

iii. A licence regime for Meteorological Aids (MetAids); and

iv. The protection of Radiocommunication Services of Strategic Importance.

Views of respondents

4.81 The IAA acknowledges that ComReg is continuing to liaise with relevant stakeholders, including the IAA to encourage an ensure the efficient use of spectrum and to promote Ireland's interest at international fora.

ComReg's assessment

4.82 ComReg welcomes the submission from the IAA.

Annex: 1 The 26 GHz Band – ComReg's assessment and updated views

A.1.1 Background information

A 1.1 In January 2021, ComReg published a study by Plum Consulting and IDATE on the future use of the 26 GHz band in Ireland (the "26 GHz Band 5G Study") (Document 21/07a)[46] and an associated ComReg Information Notice (Document 21/07)[47].

A 1.2 ComReg received ten submissions to the 26 GHz Band 5G Study from: Dense Air; Eir; Mr. Eoin O'Connell; Imagine; Netmore; Qualcomm; SpaceX; Three; Viasat; and Vodafone.

A 1.3 On 13 May 2021, ComReg published the non-confidential versions of these submissions in Document 21/47[48]. A summary of these responses was set out in Annex 4 of Document 21/90.

A 1.4 ComReg's consultation on its draft RSMSS (Document 21/90) provided another opportunity for interested parties to submit comments on the 26 GHz Band, and ComReg received five such submissions from: Apple; Huawei; Sigma Wireless; EUTELSAT and SpaceX.

A 1.5 The non-confidential versions of these submissions are published alongside this document (in Document 21/134s), and a summary of the responses related to the 26 GHz Band is set out in Section 3.4 of this document.

A 1.6 This purpose of this Annex is to set out:

- ComReg's assessment of the respondents' submissions to both the 26 GHz Band 5G Study and Document 21/90 related to the 26 GHz band; and
- ComReg's view on its work plan items for the 26 GHz Band in the RSMSS for the 2022-2024 period.

A 1.7 ComReg firstly sets out:

[46] ComReg Document 21/07a, "*26 GHz Band 5G Study - A study by Plum Consulting and IDATE regarding the future use of the 26 GHz Band*", 26 January 2021, available at www.comreg.ie/
[47] ComReg Document 21/07, "*26 GHz Band 5G Study - A study by Plum Consulting and IDATE regarding the future use of the 26 GHz Band – ComReg Information Notice*", 26 January 2021, available at www.comreg.ie
[48] ComReg Document 21/47, "*Non-Confidential Submissions to 26 GHz Band 5G Study (Documents 21/07 and 21/07a)*",13 May 2021, available at: www.comreg.ie/

- A summary of the key findings and recommendations in the 26 GHz band Study; and
- Relevant updated information.

A1.2: Summary of the 26 GHz Band 5G Study

A 1.8 This section provides a summary of the 26 GHz Band 5G Study under the following headings:

- background information and observations relevant to the 26 GHz band; and
- a summary of the recommendations.

A1.2.1 Relevant information and observations in the 26 GHz Band 5G Study

A 1.9 A summary of relevant information and observations in the 26 GHz Band 5G Study is set out below under the following headings:

- Allocation and use of the 26 GHz band and adjacent bands;
- Harmonisation status of the 26 GHz band;
- Technical licensing conditions;
- Availability of 5G Equipment in the 26 GHz band;
- Award or assignment of the 26 GHz band in Europe; and
- Observations on use cases for the 26 GHz band.

Allocation and use of the 26 GHz band and adjacent bands

A 1.10 In Chapter 5 of the 26 GHz Band 5G Study, information on the allocation and use of the 26 GHz band and adjacent bands in Ireland was provided, as shown in Figure A.1 below.

A 1.11 The 26 GHz Band 5G Study noted that the existing allocation and assignment of the 26 GHz band included:

- A Fixed Wireless Access Local Area (“FWALA”) allocation in 24.605 – 24.745 GHz / 25.613 – 25.753 GHz, whereas of January 2021 there were no assignments in this band;
- National block licences enabling Point-to-point (PP) fixed link operation in 24.745 – 25.277 GHz / 25.753 – 26.285 GHz;

- One hundred and seventy-eight (178) (as of November 2020) individually co-ordinated PP link licences operating in the 25.277 –25.445 GHz / 26.285 – 26.453 GHz band; and
- A licence exemption of short-range devices for automotive short-range radars (21.65 – 26.65 GHz), industrial probing radars (24.05 – 26.5 GHz); and tank-level probing radars (24.05 – 27 GHz).

A 1.12 Consequently, there are three unassigned portions in the 26 GHz band:

- 26.453 – 27.5 GHz (1 047 MHz) – Block A;
- 25.445 – 25.613 GHz (168 MHz) – Block B; and
- 24.25 – 24.605 GHz (355 MHz) – Block C.

A 1.13 In relation to the adjacent bands, the 26 GHz Band 5G Study noted that:

- for the lower adjacent band (below 24.25 GHz), spectrum was allocated to / used by the following services / systems:
  - Fixed links in 23.55 – 23.6 GHz;
  - Short-range devices (including automotive) in 21.65 – 26.65 GHz;
  - Earth Exploration Satellite Service and Radioastronomy Service in 23.6 – 24 GHz;
  - Amateur and Amateur Satellite Services in 24 – 24.05 GHz;
  - Industrial probing radars in 24.05 – 26.5 GHz; and
  - Tank-level probing radars in 24.05 – 27 GHz; and
- for the upper adjacent band (above 27.5 GHz), there were
  - Fixed links in 27.5 – 28.5 GHz.

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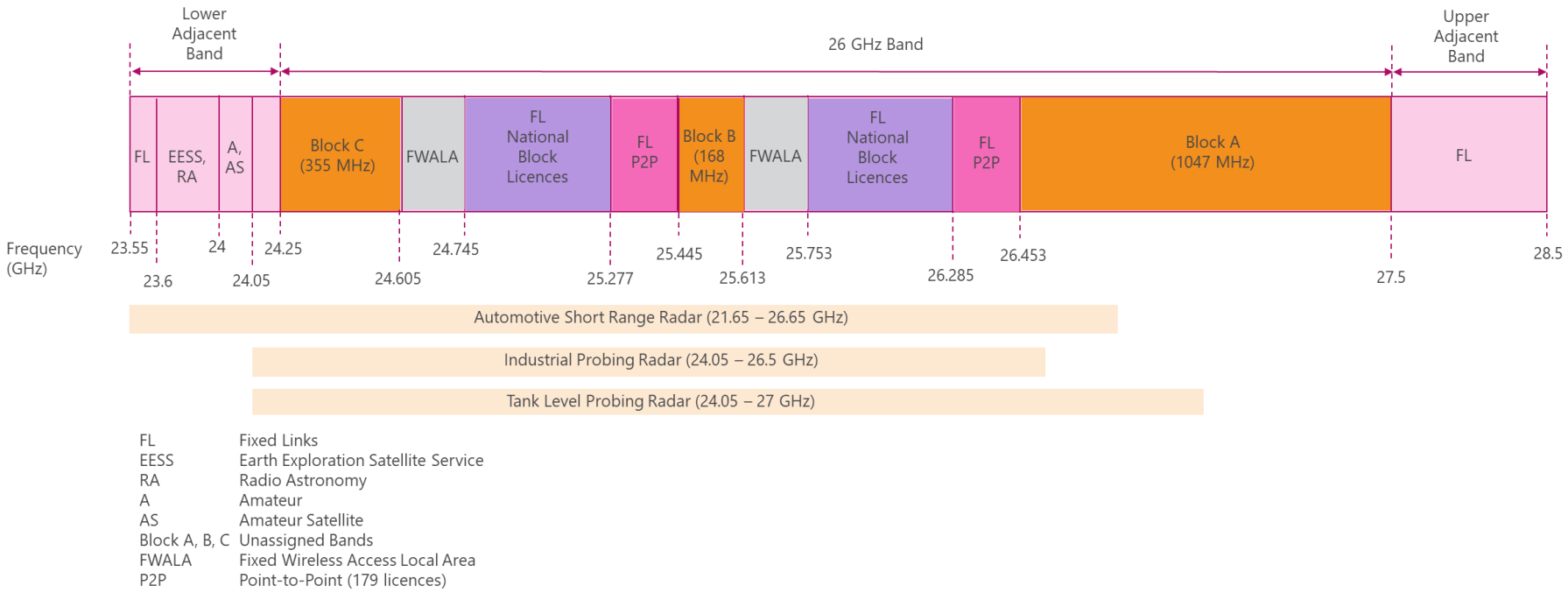


Figure A.1: Allocation and use of the 26 GHz band and adjacent bands in Ireland (Source Document 21/07a, January 2020)

Harmonisation Status

A 1.14 As noted in Section 3.2 and Appendix E of the 26 GHz Band 5G study, in Europe the 26 GHz band is a harmonised spectrum band for terrestrial systems capable of providing wireless broadband electronic communications services, where among other things:

- the 26 GHz Band Implementing Decision EU 2019/784/EC of 14 May 2019 as amended by Implementing Decision EU 2020/590/EC of April 2020) ("26 GHz EU Decision"), sets out the essential technical conditions for the 26 GHz band; and
- Article 54(1)(b) of the European Electronic Communications Code (EECC) Directive ((EU) 2018/1972) states that:

  "By 31 December 2020, for terrestrial systems capable of providing wireless broadband services, Member States shall, where necessary in order to facilitate the roll-out of 5G, take all appropriate measures to:

  – allow the use of at least 1 GHz of the 24,25-27,5 GHz band, provided that there is clear evidence of market demand and of the absence of significant constraints for migration of existing users or band clearance".

Technical Licensing Conditions

A 1.15 Section 5.2 of the 26 GHz Band 5G study notes that the essential harmonised technical conditions under which WBB ECS can be used in the 26 GHz band are defined in the 26 GHz EU Decision.

A 1.16 In summary the general parameters would be:

- A TDD duplex mode.
- Assigned block size shall be a multiple of 200 MHz (although smaller blocks of 50, 100 or 150 MHz are possible adjacent to the assigned block of another spectrum user).
- The upper frequency limit of an assigned block shall be aligned with or spaced at a multiple of 200 MHz from 27.5 GHz.
- Base station transmissions within the band are restricted by 'block edge masks'.
- to limit interference into satellite receivers, the main beam of any Active Antenna System (AAS) outdoor base station is only allowed to point below the horizon.

- For the protection of EESS in the band 23.6 – 24 GHz where all emissions are prohibited, 5G base station out-of-band emission limits (in terms of total radiated power a composite antenna radiates) are -33 dBW/200MHz for deployments before 1 January 2024 and -39 dBW/200MHz for deployments after 1 January 2024. For user terminals, the corresponding levels are -29 dBW/200MHz and -35 dBW/200MHz.

A 1.17 Furthermore, the 26 GHz Band 5G Study noted that, as required by 26 GHz EU Decision, ComReg would also need to consider how:

- *"it wants to deal with any new deployment, if allowed at all, of EESS (s-E), SRS (s-E) and FSS (E-s) earth stations in the band;*
- *to ensure the adequate protection of FSS satellite systems (E-s) in the portion 24.65 – 25.25 GHz if any such protection is warranted;*
- *to ensure the protection of an inter-satellite communications operating in the portions 24.45 – 24.75 and 25.25 – 27.5 GHz if any such protection is necessary."*

Availability of 5G equipment for the 26 GHz band

A 1.18 In Appendix A of the 26 GHz Band 5G Study (Document 21/07a), information was provided on the availability of 5G equipment for the 26 GHz Band (see Figure A.2 below) as well as for the mmWave bands combined (i.e., the 26 GHz, 28 GHz, 37 GHz, and 66-71 GHz bands) and the sub-6 GHz bands (Figure A.2 of Document 21/07a).

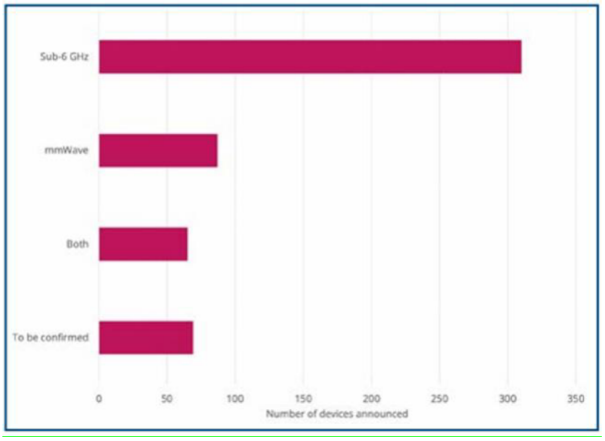
Figure A.3: Distribution of announced 5G devices by range of frequency band*

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

Figure A.2: Distribution of announced 5G devices by frequency range

Figure A.2: Announced devices with known spectrum support, by broad category – September 2020



Source: GSA

Figure A.3: Announced devices with known spectrum support, by broad category – September 2020

Award or Assignment of the 26 GHz band in Europe

A 1.19 In Chapter 4 of the 26 GHz Band 5G Study, information was provided on the European approaches to award the 26 GHz band. At that time, it was noted that across the EU 27, plus the UK, there had only been three awards of 26 GHz band (Greece, Italy and Finland), while a couple of other countries (Denmark and Slovenia) were at an advanced stage in their award preparations.

A 1.20 In addition, the 26 GHz Band 5G Study noted that different approaches (national, local area) were being taken by countries. In summary it observed that:

> *"There has been very limited release of the 26 GHz band across Europe for 5G. Momentum is slowly growing but a number of the large EU countries i.e. France have not seen the need to release the 26 GHz band or portions of the 26 GHz band at this time other than for trialling, while others, i.e. Germany and the UK, have sought to use portions of the band for indoor or local/regional use. The Czech Republic has adopted a different approach and decided to make the band available for experimental licences to inform future regulatory and technical considerations due to lack of demand."*

Observations on use cases for the 26 GHz band

A 1.21 One of the important matters emerging from the 26 GHz Band 5G Study is the requirement for clarity regarding potential use cases in Ireland. The 26 GHz Band 5G 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;
- a use case for eMBB services for city centres and “hot spots” such as airports, railway stations and malls may develop in time, but it is not clear if any of these so called “hots spots” exist on an apposite scale in Ireland;
- may be interest from verticals such as industry, ports and airports but again it is not clear as to the extent of this interest; and
- a requirement for in-band backhauling, which is an overlay on other services, may develop in time. However, given the current paucity of use cases, this may not come to fruition.

A1.2.2 Recommendations in the 26 GHz Band 5G Study

A 1.22 This section sets out a summary of the recommendations in the 26 GHz Band 5G Study under the following headings:

- Spectrum;
- Methods of award;
- Licensing (conditions and compatibility); and
- Timescales and migration of existing services.

Spectrum

A 1.23 With regard to spectrum requirements, the 26 GHz Band 5G Study **recommended** that:

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

- the frequency range 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

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

Methods of award

A 1.24 In relation to possible methods of award of the 26 GHz Band, the 26 GHz Band 5G Study **recommended** the following:

- while ComReg's approach in most harmonised ECS bands to date has tended 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. 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;

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

    - on balance, a light licensing approach could be adopted (rather than licence exemption) which would enable monitoring of the nature and extent of the use of the band.

Licensing (conditions and compatibility)

A 1.25 The 26 GHz Band 5G Study **recommended** the following in relation to licence conditions for use of the 26 GHz Band by WBB ECS including 5G services:

- technical licensing conditions should be consistent with those defined in 26 GHz EU Decision, which are sufficient to provide protection and co-existence with other services in the band;

    - if Radioastronomy is planned in the future, appropriate exclusions or coordination zones may be necessary; and

- appropriate licence conditions may be required to ensure spectrum is efficiently used.

Timescales and migration of existing services

A 1.26 In relation to timescales, the 26 GHz Band 5G Study **recommended** that:

- assignment of the upper 1 GHz of the 26 GHz Band could be considered c. 2023-2027, depending on the type of award (local, regional or national) used;
- assignment of the lower 250 MHz of the 26 GHz Band could be within 2022 – 2023 subject to demand;
- 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;
  - 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 WBBECS in Ireland, for example 2025, to assess whether there is a need for further spectrum and / or a different licensing approach.

A1.3 Updated Information

Existing allocation and use of the 26 GHz band and adjacent bands

A 1.27 Since the 26 GHz Band 5G Study was published, the existing allocation and use of the 26 GHz band and adjacent bands (see Figure A.1 above) remains unchanged, with the exception that:

- The number of individual point-to-point fixed links in the 26 GHz band has reduced from 178 (November 2020) to 127 (December 2021).

A 1.28 As noted in the Fixed Radio Links Annual Report for 2021 (Document 21/97)[49], the sustained reduction of licences in the 26 GHz band (as well as the 38 GHz and 42 GHz bands) can likely be attributed to the mobile network operators migrating links to their 26 GHz national block licences.

[49] ComReg Document 21/97, “Fixed Radio Links Report”, 30 September 2021, available at www.comreg.ie/

Harmonisation status – 26 GHz Band

A 1.29 Since the 26 GHz Band 5G study was published in January 2021, and as noted in Annex 4 of Document 21/90, two Radio Spectrum Policy Group ("RSPG") opinions related to the 26 GHz Band were published, being:

- the *"RSPG Opinion on Additional spectrum needs and guidance on the fast rollout of future wireless broadband networks"*[50], published on 16 June 2021, where the RSPG, among other things:
  - recognises that the current demand in the majority of EU Member States for additional spectrum is mainly for the mid-bands;
  - recognises that there is a specific demand for local access to licensed spectrum for vertical networks:
    - in mid-bands, which has been addressed in a dissimilar way in Member States (MS), due to different national circumstances (e.g., priorities for efficient spectrum use); and
    - in the mmWave bands;
  - recognises that there is no specific spectrum need for FWA in the mmWave bands, although operators should also have the possibility to address this application within their spectrum;
  - recognises that different types of authorisation methods facilitate innovation and different technologies; and
  - recommends that EU Member States foster consistent approaches for spectrum access for verticals in the mmWaves with options for enabling local access to spectrum in the 26 GHz Band; and
- the *"RSPG Opinion on a Radio Spectrum Policy Programme (RSPP)"*[51], published on 16 June 2021.

Technical licensing conditions

A 1.30 Since the 26 GHz Band 5G Study was published, ComReg observes that there have been no relevant updates on the technical licensing conditions for the 26 GHz band.

[50] RSPG21-024, "*RSPG Opinion on Additional spectrum needs and guidance on the fast rollout of future wireless broadband networks*", 16 June 2021, available at https://rspg-spectrum.eu/
[51] RSPG21-033, "*RSPG Opinion on a Radio Spectrum Policy Programme (RSPP)*", 16 June 2021, available at https://rspg-spectrum.eu/

Availability of 5G equipment for the 26 GHz band

A 1.31 Using information from the latest release of the Global Suppliers Association (GSAcom) "GAMBoD" database[52] (i.e., December 2021), updated information on the availability of 5G equipment is set out in Table 1 below for:

- the 26 GHz Band
- the mmWave bands combined (i.e., the 26 GHz, 28 GHz, 37 GHz and 66-71 GHz bands); and
- the sub-6 GHz bands.

Table 1: Availability of 5G equipment (December 2021) for the 26 GHz, mmWave and Sub-6 GHz bands

5G Frequency band range	Dec 2019	Dec 2020	Dec 2021	YoY %increase Dec 20-21
n258 (24.25 – 27.5 GHz) **26 GHz Band** - (Australia, China, **Europe**)	7	10	29	190%
n257 (26.5—29.5 GHz) 28 GHz Band (JP, SK and US)	11	21	39	86%
n257 and n258 combined	13	23	50	117%
Total mmWave[53]	**45**	**90**	**143**	**59%**
Total Sub-6 GHz	**125**	**408**	**946**	**132%**

A 1.32 While devices are now becoming available for band n258 (i.e. the 26 GHz band in Europe) and band n257 (the 28 GHz band), the number of devices remains low and is substantially lower than the number of 5G devices available for the Sub-6 GHz bands i.e. 946 devices.

Award or Assignment of the 26 GHz band in Europe

A 1.33 Since the 26 GHz Band 5G Study was published, updated information has become available on the award or assignment of the 26 GHz band in Europe.

[52] https://gsacom.com/gambod-lte-5g-devices/
[53] Includes the 26 GHz, 28 GHz, 37 GHz and 66-71 GHz bands

A 1.34 Based on the RSPG's most recent document on the state of play for the award of the 5G bands[54], ComReg observes that from the 27 EU Member States plus Norway and Iceland:

- six countries (Croatia[55], Denmark[56], Finland, Greece, Italy and Slovenia[57]) have now awarded the 26 GHz band; while
- one country (Germany) is awarding individual local licences on application; and
- four countries (France, Czech Republic, Latvia, and Norway) have issued, or are encouraging the issue of, test, trial or non-commercial experimental licences.

A 1.35 From the remaining countries, ComReg observes that:

- a number of countries (e.g., Ireland, Latvia, Lithuania, Luxembourg, Slovakia, Norway and Iceland) have indicated that there is no current demand for spectrum in the 26 GHz band; while
- some other countries (e.g., Austria) have recently consulted on award proposals, while others (e.g., Netherlands) have plans to consult in the future, to assess if there is clear market demand.

A 1.36 In addition, ComReg observes that:

- In June 2021, Sweden opened a scheme for local licences in the frequency range 24.25–25.1 GHz[58]. Until end of 2025, the use of the 26 GHz spectrum will be limited to indoor applications. PTS, the Swedish regulator, intends to reassess the possible use of the 26 GHz band outdoors during 2022[59].

[54] RSPG21-038, "*State of play regarding award of 5G pioneer bands*", published 24 November 2021, available at https://rspg-spectrum.eu/
[55] Croatia assigned 1 GHz of 26 GHz band in the frequency range 26.5 – 27.5 GHz for a 15 year time period https://www.hakom.hr/en/hakom-awarded-radio-frequency-spectrum-for-the-fifth-generation-mobile-communications/9081.
[56] Denmark's assigned 2850 MHz of the 26 GHz spectrum with an expiry date of 2042. Denmark's also plan to make the 24.25 – 24.65 GHz band available for industrial networks in the future.
[57] Slovenia's assigned of 1 GHz of 26 GHz spectrum is for a period of 20 years
[58] https://pts.se/sv/bransch/radio/radiotillstand/lokala-tillstand-i-37-ghz--och-26-ghz-banden/
[59] https://www.cullen-international.com/client/site/documents/RRSPEU20210002

- In Germany, BNetzA, the German regulator, has issued seven local 5G licences in the 26 GHz Band since the application procedure opened in January 2021[60] and 169 licences in the 3.7-3.8 GHz band since that procedure opened in November 2019[61].

Test & Trial Ireland – 26 GHz Band

A 1.37 It is normal to experience some interest in testing equipment and even trialling services in a spectrum band, prior to that spectrum band being licensed. This has occurred previously with other spectrum bands and services (e.g., the use the 70/80 GHz band for fixed links, or the trialling of 3G/LTE services in the 900/1800 MHz bands) and provides a useful indication of demand.

A 1.38 Since the 26 GHz Band 5G Study was published, ComReg has continued to promote and highlight the availability of 26 GHz band for test and trial purposes (e.g., through Test & Trial Ireland[62] and through online awareness campaigns[63]).

A 1.39 Even with its best efforts, regrettably ComReg has not received any applications or expressions of interest using ComReg's Test and Trial Ireland to conduct either tests or trials in the 26 GHz band (December 2021).

Other relevant ComReg projects

A 1.40 Since the 26 GHz Band 5G Study was published, progress has been made in two relevant ComReg projects:

- The Multi-Band Spectrum Award of 2021 (MBSA 2021) for the long-term assignment of spectrum rights of use in the 700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz bands has continued to progress, and in April 2021 the award formally commenced with the publication of the Information Memorandum (Document 21/40[64]), noting that certain parts of the MBSA2 Decision (Decision D11/2019) are under appeal[65]; and

[60] BNetzA, 26 GHz Band Frequencies, available at https://www.bundesnetzagentur.de/
[61] Telecoms, "*Nokia highlights Volkswagen 5G private mobile network deal", 6 December 2021, available at* https://telecoms.com/
[62] Test & Trial Ireland, "*26 GHz Band 5G Study*", available at https://www.testandtrial.ie/Consultations/26-GHz-Study
[63] Online awareness campaigns include "*Have your say*" and "*the 26 GHz Band 5G Study*" conducted via Linkedin from January 2021 through to October 2021.
[64] ComReg Document 21/40 ,"Information Memorandum and Draft Regulations", 16 April 2021, available at www.comreg.ie
[65] On 14 January 2021, Three Ireland (Hutchison) Limited and Three Ireland Services (Hutchison) Limited (collectively "Three") lodged an appeal against the MBSA2 Decision to the High Court.

- As noted in Section 4.2.5 of this document, the Fixed Links Band Review project has also advanced, and ComReg has published a further consultation in December. That consultation sets out ComReg's views on a number of matters, including block licensing and the setting of fees for fixed links, and will provide an assessment of the respondents' views to the initial consultation, Document 20/109.[66]

Other spectrum harmonisation developments – 3.8 to 4.2 GHz Band

A 1.41 As discussed in Section 3.2.2 of this document:

- the EC is the process of issuing a mandate to CEPT to study and assess the technical feasibility of the shared use of the band by terrestrial wireless broadband systems providing local-area network connectivity which could serve both private (e.g., enterprise) and public (e.g., community-type) networks;
- it is ComReg's intention to actively participate in the CEPT study on the 3.8 – 4.2 GHz band, and to monitor and input into the discussions on future EC harmonisation decisions matter at the EC and ECC; and
- if any EC decisions are adopted during the 2022 - 2024 period, ComReg will consider the appropriate implementation of any such decisions.

A 1.42 While ComReg notes that considerable work has yet to be completed on the harmonisation of this band, ComReg observes that:

- there is a considerable number of 5G devices already available in the band - as of December 2021 there were 629 5G devices available for band n77 (3300-4200 MHz)[67] - when compared to availability of 5G devices for the 26 GHz band and mmWave bands in general (see Figure A.4 below and Table 1 above);
- interest and an application on the use of spectrum the 3.8 to 4.2 GHz band in Ireland for test and trial purposes has already been expressed to ComReg;
- the UK has made already spectrum available in this band for low power and medium power licences under its shared access framework[68]; and
- Belgium and Denmark are proposing to make spectrum available for private networks/verticals[69].

[66] See Document 21/134
[67] GSA, "*GAMBoD: 4G & 5G Devices Networks, Technologies and Spectrum Database*", available at https://gsacom.com/gambod-lte-5g-devices/
[68] Ofcom, "*Shared access licences*", available at https://www.ofcom.org.uk/
[69] Cullen, "*Spectrum for industrial 5G networks*", available at https://www.cullen-international.com/

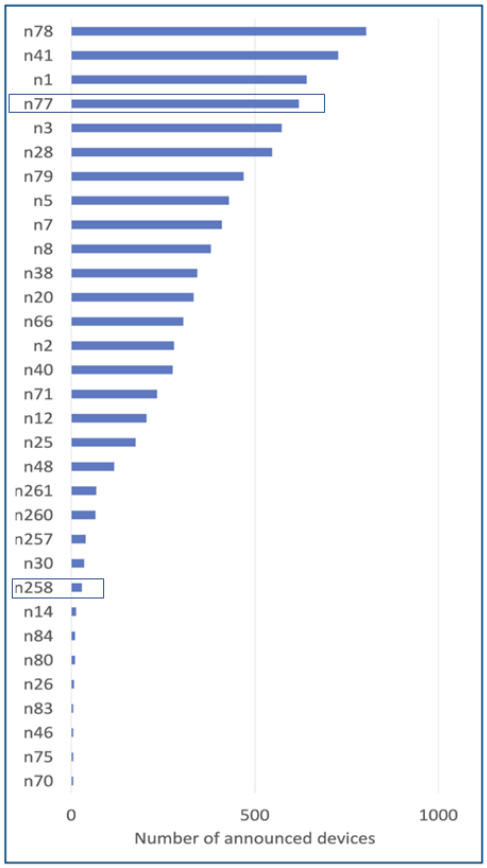


Figure A.4: Availability of 5G Devices for spectrum bands (December 2021)[70]

A1.4 Assessment of responses

A 1.43 The assessment below considers the submissions of respondents received in response to the 26 GHz Band 5G Study (Document 21/07a) and the draft RSMSS (Document 21/90) where relevant. This assessment considers the submissions in terms of the:

i. information and observations in the 26 GHz Band Study (as summarised in Section A.1.2.1 above); and

ii. recommendations in the 26 GHz Band Study (as summarised in Section A1.2.2 above).

[70] GSA, "5G Ecosystem: Executive Summary: December 2021", available at https://gsacom.com/

A1.4.1 Information and observations in the 26 GHz Band 5G Study

Existing allocations and use of the 26 GHz band

A 1.44 ComReg received two submissions (Huawei and Three) relating to the quantum of spectrum available in the 26 GHz band and its use by existing services. A summary of Three's response is set out in paragraph A4.10 to A4.11 of Annex 4 of Document 21/90 and a summary of Huawei's submission is set out in Section 3.4 of this document.

A 1.45 In relation to Huawei's submission that the 26 GHz band is actually 24,250 MHz to 27,550 MHz, ComReg notes that the 26 GHz band consists of harmonised spectrum from 24.25 GHz to 27.5 GHz, as set out in 26 GHz EU Decision[71] which clarifies, among other things, under Article 1 that:

> "*This Decision harmonises the essential technical conditions for the availability and efficient use of* ***the 24,25-27,5 GHz frequency band*** *in the Union for terrestrial systems capable of providing wireless broadband electronic communications services*." (emphasis added)

A 1.46 Regarding Three's queries on the quantum of spectrum allocated and used by the different services as indicated in the 26 GHz Band 5G Study[72], ComReg confirms that the information set out in the 26 GHz Band 5G Study is correct (see Figure A.1 above which shows Figure 5.1 on page 32 of the 26 GHz Band 5G Study).

Use cases and Demand for spectrum in the 26 GHz band

A 1.47 One of the important issues to consider for the 26 GHz band is the potential use cases in Ireland, where the 26 GHz Band 5G Study indicated that the use case demand would be very limited or may only develop over time.

[71] Commission Implementing Decision (EU) 2019/784 of 14 May 2019 on harmonisation of the 24.25 27.5 GHz frequency band for terrestrial systems capable of providing wireless broadband electronic communications services in the Union

[72] In summary, Three submit that:

- 1792 MHz of spectrum is assigned to the use of microwave links in the 26 GHz band and that 1097 MHz is available for 5G at the upper part of the band descending from 27.5GHz and not 1047 MHz as identified by Plum; and
- 299 MHz of spectrum is available from the start of the band at 24.25GHz and not 355 MHz as identified by Plum.

A 1.48 ComReg received eight submissions (Apple, Dense Air, Imagine, Netmore, Sigma Wireless, Three, Qualcomm and Vodafone) on this matter. A summary of the submissions from Dense Air, Imagine, Netmore, Three, Qualcomm, Viasat and Vodafone is set out in paragraphs A4.31 to A4.37 of Annex 4 of Document 21/90 and a summary of submission from Apple and Sigma Wireless is set out in Section 3.4 of this document.

A 1.49 From these submissions, ComReg firstly observes that the respondents generally mentioned the same potential use case applications as discussed in the 26 GHz Band 5G Study, thus suggesting that the 26 GHz Band 5G Study considered the relevant potential applications and use cases.

A 1.50 In this regard, ComReg observes that the potential uses cases mentioned by respondents included:

- eMBB services in urban and high footfall areas, as mentioned by Apple, Dense Air, Qualcomm and Vodafone;
- FWA services in suburban and rural areas, as mentioned by Imagine and Qualcomm;
- Verticals (e.g. industrial) or private networks as mentioned by Dense Air, Netmore, Qualcomm, Three and Vodafone, with Qualcomm and Vodafone indicating an potential focus on indoor-use; and
- In-band backhauling as mentioned by Vodafone.

A 1.51 While respondents provided little detail to substantiate a demand for the 26 GHz band, ComReg observes the following:

- Imagine suggested that there are examples of use cases in the US, Australia and Italy which show that there is significant potential for 26 GHz FWA to be deployed in a manner complementary to existing 4G and 5G FWA deployments in the sub 6 GHz bands;
- Qualcomm suggested that the multi-gigabit data rates possible with mmWave technology and wide bandwidths available in the 26 GHz Band will enable new use cases and mmWave technology will bring the benefits of Massive MIMO down to a small-cell scale, thus maximizing small cell capacity and hotspot coverage; and
- Dense Air noted that the limited use of the 26 GHz Band internationally is due to poor economics of standalone mmWave 5G deployments, and that in its view other 5G deployment solutions are easier and cheaper to bring to the market; and

- Sigma Wireless' view that private local access services are still many years away from becoming reality and that other frequency bands, such as 3800 - 4200 MHz in the mid-band offer vertical industries and enterprises a better path in the short term to full digital transformation of industrial processes and related mission-critical services.

A 1.52 In relation to Imagine's observation, ComReg notes that international usage examples of the 26 GHz band were considered in the 26 GHz Band Study, including for those in the US, Australia and Italy. ComReg is not aware of any significant changes to usage in these countries since it published the 26 GHz Band Study.

A 1.53 Regarding Qualcomm's submission, ComReg concurs that the wide bandwidths available and multi-gigabit data rates can enable use cases for the 26 GHz band in the future. However, ComReg also agrees with the views of Dense Air and Sigma Wireless that other spectrum bands, such as sub-6 GHz spectrum bands are likely to offer an easier and cheaper route to the market than the 26 GHz band.

A 1.54 In this regard, ComReg observes that:

- the availability of 5G devices in the 26 GHz band in Europe is low at 29 devices, particularly when compared to the much larger availability for the sub-6 GHz bands (see Figure A.4 and Table 1 above);
- both the iPhone 12 and iPhone 13 models for Europe do not have mmWave capability, as such availability is only in the United States[73]. As noted in the 26 GHz Band 5G Study[74], this suggests that Apple is continuing to focus on the sub-6 GHz bands in Europe, and ComReg observes that this may have a significant impact on the demand for the 26 GHz band for mobile services, considering that 32% of smartphones in Ireland are Apple iPhones and 36% of mobile phone owners hold onto their current models for up to 6 years[75];
- there are currently limited areas in Ireland with an adequate population density to make any 26 GHz FWA service economically viable;

[73] https://www.apple.com/uk/iphone/cellular/

[74] *"The limited 5G use of the 26 GHz band across Europe is reflected in the recently released Apple iPhone 12 Pro not including the 26 GHz band. It appears that Apple has chosen to focus on the 3.6 GHz band where there is far greater rollout across Europe. This is an important metric as 32% of smartphones in Ireland are Apple iPhones and 36% of mobile phone owners hold onto their current models for at least 3 – 6 years."* , see Page 30 of the 26 GHz 5G Band Study.

[75] ComReg Document 19/101, "Mobile Consumer Experience Survey of Customers – 2019", 18 November 2019, available at www.comreg.ie/

- the recently published RSPG Opinion on "Additional spectrum needs and guidance on the fast rollout of future wireless broadband networks", recognises that *"the current demand in the majority of EU Member States for additional spectrum is mainly for the mid-bands";*
- the rollout of 5G services in Ireland is still at a relatively early stage and spectrum in existing bands (e.g., 3.6 GHz) is not fully utilised;
- with the upcoming award of spectrum in the MBSA 2021, an additional 350 MHz of new spectrum (in the 700 MHz, 2.3 GHz and 2.6 GHz bands) is being made available to the market. Alongside the existing spectrum already assigned to operators, this spectrum is likely to provide additional capacity for new 5G services to emerge in the short to medium term; and
- harmonisation activities on further Sub-6 GHz spectrum bands are underway (e.g., in the 3.8 to 4.2 GHz band), which in time may result in the release of further harmonised spectrum.

A 1.55 In addition and noting that it is normal to experience some interest in testing equipment and even trialling services in a spectrum band, prior to licensing, ComReg has regrettably not received any applications or expression of interest to use Test and Trial Ireland to conduct either tests or trials in the 26 GHz band.

A 1.56 This is despite the fact that ComReg has gone to considerable lengths to publicise that there is spectrum available in the 26 GHz band for test and trial purposes and has promoted same via Test & Trial Ireland[76] and online awareness campaigns[77].

A 1.57 Noting the above, ComReg:

- agrees with the view on use cases as set out in the 26 GHz Band 5G Study, being that in the short to medium term, the use case demand would be very limited or may only develop over time, and
- notes that for some potential use cases (e.g., Verticals) the demand for the 26 GHz band may even be reduced compared to that considered in the 26 GHz Band Study given the considerations outlined in paragraph A1.54, including the potential harmonisation of additional mid-band spectrum in the future.

[76] Test & Trial Ireland, "*26 GHz Band 5G Study*", available at https://www.testandtrial.ie/Consultations/26-GHz-Study
[77] Online awareness campaigns include "*Have your say*" and "*the 26 GHz Band 5G Study*" conducted via Linkedin from January 2021 through to October 2021.

Other Issues raised

A 1.58 Several other issues were raised which were not directly related to the recommendations in the 26 GHz Band Study. These are considered below.

Club Use

A 1.59 The potential for "club-use" licensing as a way to allow the use of large spectrum bandwidths (e.g., 1 GHz) in geographical areas where other licensees do not use the licensed frequencies was mentioned by two respondents, Dense Air and Huawei[78].

A 1.60 ComReg notes that Section 4.1 of the 26 GHz Band 5G Study considered this "club-use" model, and among other things noted that it is still in the process of being implemented.

> *"In Italy the regulator has adopted an innovative regulatory framework based on a "Club use" model[79] and under this framework 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. Plum understands that this model is still in the process of being implemented"*

A 1.61 Noting the above, ComReg is of the view that it would be premature to assess the benefits or otherwise of this approach but notes that it might facilitate a more efficient use of the 1 GHz of spectrum between 26.5-27.6 GHz.

Spectrum Bandwidth Requirements per Operator

A 1.62 ComReg observes that three respondents (Apple, Three and Huawei) commented on the quantum of 26 GHz spectrum required per operator:

- Apple submits that it should be around 1-GHz per operator.
- Three submits that bandwidths of up to 800 MHz are required, contending that in its view, only one provider could use the 26.5 GHz to 27.5 GHz part of the band at any one location with such a bandwidth; and

[78] See paragraph A4.16 of Document 21/90 and Section 3.4 of this document
[79] This is a variant of the classic "club use" formula, as the club members and the access criteria are decided by the regulator, while the club "members" decide on their own rules of coexistence and management.

- Huawei submits that minimum blocks of 200 MHz should be assigned, noting that any assignment in a second stage of remaining parts of the 26 GHz band would allow wider virtual channels by means of intra-band carrier aggregation.

A 1.63 In relation to the above, ComReg observes that 200 MHz is the minimum block size specified in the 26 GHz EU Decision, and that in an award process the amount of spectrum that could be assigned to an operator would depend on factors including the amount of spectrum available for award and the number of applicants for this spectrum.

A 1.64 In relation to the amount of spectrum in an award, ComReg notes Plum/IDATE's analysis of 26 GHz usage scenarios in the Irish Market (Figure 6.16 of Document 21/07a), which concludes that:

> *"Clearly, the limited demand under the optimistic scenario will easily be facilitated in the contiguous 1 GHz of 26 GHz spectrum available in Ireland* ***during the coming decade****."* (emphasis added) *and*
>
> *"Stronger demand expected in the longer term and higher throughputs will probably require larger bandwidth per operator and potentially more spectrum availability in the 26 GHz band, although this needs to be balanced against the* ***availability of other mmWave bands*** *that are expected to be harmonised over the next five years in Europe."* (emphasis added)

A 1.65 Noting that ComReg has not been presented with any evidence to suggest that the use case demand for 5G services in the 26 GHz Band has developed any further since the 26 GHz Band Study was published, ComReg sees no reason to disagree with Plum/IDATE's analysis that over the coming decade, the limited demand for 26 GHz band can easily be accommodated within the upper 1 GHz of the 26 GHz band.

A 1.66 Even in such a scenario, ComReg observes that, depending on the award conditions (e.g., local area, club-use, etc.), it may be possible for one operator to obtain and use assignments larger than 200 MHz and up to 1 GHz.

Barriers to Deployment

A 1.67 Dense Air responded to Document 21/07a regarding potential barriers to deployment. A summary of its response set out in paragraphs A4.38 to A4.39 of Annex 4 of Document 21/90.

A 1.68 In relation to Dense Air's concerns about access for service providers to existing local authority and power network infrastructure for small cell deployment, ComReg notes that this is a Government policy / planning matter and is not a matter unique to the 26 GHz band, as small cells may also be provided in other bands.

A1.4.2 Recommendations in the 26 GHz band Study

A 1.69 This section sets out ComReg's assessment of respondents' views on the recommendations in the 26 GHz Band 5G Study under the following headings:

- Migration of existing services
- Spectrum;
- Methods of award;
- Licensing (conditions and compatibility);
- Timescales; and
- Review of WBB-ECS.

Migration of existing services

A 1.70 In relation to migration of existing services in the 26 GHz band, the 26 GHz Band 5G Study set out two recommendations:

i. 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.

ii. 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

A 1.71 In relation to recommendation (i), ComReg observes that:

- Three respondents, Eir, Imagine and Vodafone[80] agree that 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 now. In addition, Vodafone submits that:
  - the migration of existing services, namely fixed links would be a long and expensive process which would require an alternative band to be awarded 5 years in advance; and

[80] See paragraph A4.26 of Annex 4 to Document 21/90.

  - it would like to see ComReg produce a plan for national block licences by the end of 2023 (i.e., 5 years in advance of expiry); and

- one respondent, Three[81], disagrees with the recommendation that there is no strong basis to limit the use of any existing regimes and contends that ComReg must now produce a plan considering how it can provide large contiguous blocks of spectrum for 5G services in the 26 GHz Band, noting that this may require re-farming some spectrum currently reserved for fixed services.

A 1.72 Regarding Three's view, ComReg observes that the use case demand for 5G services in the 26 GHz band has not developed any further since the 26 GHz Band 5G study was published, and given this, ComReg is of the view that presently there is no pressing need to limit the existing point-to-point or national block licences in the 26 GHz band, noting also that the national block licences expire in 2028.

A 1.73 Notwithstanding this, ComReg notes that the future of fixed links in the 26 GHz band is being considered in a separate process, ComReg's Fixed Links Review.

A 1.74 In relation to recommendation (ii) that this might be an ideal opportunity to consider their future use FWALA in the 26 GHz band and establish a roadmap to avoid any downstream migration or co-existence issues, ComReg observes that the four respondents who responded on this matter (Eir, Imagine, Three and Vodafone)[82] all agreed with this recommendation.

A 1.75 In addition, Imagine submitted that it does not believe the lack of FWALA licenses is an indication of the lack of suitable business case but rather a combination of a previous lack of choice of suitable equipment.

A 1.76 Having regard to:

- the continued lack of FWALA licences in the 26 GHz band and any interest being expressed to ComReg on same;
- the harmonisation of the 26 GHz band for TDD which may further reduce the choice of suitable FDD equipment for FWALA;
- the recommendation of the 26 GHz Band 5G Study; and
- the respondents' views above:

[81] See paragraph A4.27 A4.9 of Annex 4 to Document 21/90.
[82] See paragraphs A4.26 and A4.27 of Annex 4 of Document 21/90

ComReg is of the view that by 1 January 2022, it will close the 26 GHz band to new FWALA licence applications in order to avoid any future migration or co-existence issues.

A 1.77 As noted in Section 5.5.3 of the 26 GHz Band 5G Study[83], the FWALA spectrum is in an FDD arrangement and accounts for a total of 280 MHz, meaning that the release of this spectrum has the potential to allow the release two aligned 200 MHz blocks in the lower duplex (B15 and B16) and one aligned 200 MHz block in the upper duplex (B10) as illustrated in Figure A.5 below.

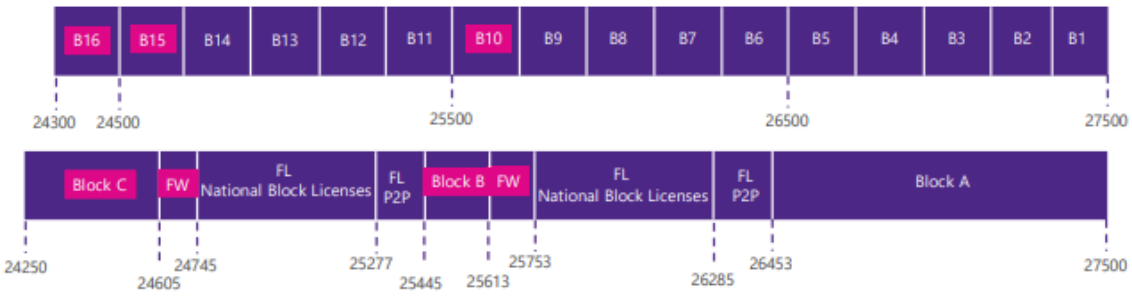


Figure A.5: Release of spectrum used by FWALA (Fig.5.19 Document 21/07a)

Spectrum

A 1.78 In relation to spectrum available WBB-ECS in the 26 GHz band, the 26 GHz Band 5G Study set out four recommendations:

i. 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; and

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

[83] Any release of the 26 GHz FWALA band would:

- *"release 140 MHz of spectrum from the upper duplex and together with unassigned spectrum Block B would facilitate one additional 200 MHz block (B10). This small amount of spectrum on its own provides only marginal gain and would not add anything unless it was vacated together with the lower duplex from the individual link licences as well as the lower duplex from the national block licences"; and*
- *"release 140 MHz of spectrum from the lower duplex and together with unassigned spectrum Block C would facilitate two additional contiguous and aligned 200 MHz blocks (B15 & B16) at the bottom edge of the 26 GHz band."*

iii. The frequency range 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;

iv. Currently there are no indications that further spectrum should be considered for award.

A 1.79 In relation to these recommendations, ComReg observes that

- Imagine[84] and Vodafone[85] agree with recommendations (i), (ii) and (iii) with Vodafone submitting that ComReg should review the usage of other parts of the 26 GHz Band and work to an overall plan for the band above;
- Huawei[86] agrees with recommendation (ii);
- Viasat[87] and Eutelsat[88] agree with recommendation (iv); and
- Three[89] disagrees with recommendation (iv) above, submitting that there is a requirement to have additional spectrum available to facilitate adequate bandwidths from when the band is first opened up in order to avoid requiring users to aggregate across multiple bands. In this regard, Three requested ComReg to review the existing use of the 26 GHz Band to determine whether additional spectrum could be made available in a reasonably short timeframe.

A 1.80 In relation to Three's view that additional spectrum should be made available in the 26 GHz band from the initial award, as noted above, ComReg has not been presented with any evidence to suggest that the use case demand for 5G services in the 26 GHz Band has developed any further since the 26 GHz Band Study was published. ComReg therefore sees no reason to disagree with Plum/IDATE's analysis[90] that over the coming decade, the limited demand for 26 GHz band under the optimistic scenario can easily be accommodated within the upper 1 GHz of the 26 GHz band.

A 1.81 In relation to Three and Vodafone's view that ComReg should review usage in other parts of the 26 GHz band and work on an overall plan for the band, as noted in the 'migration of existing services' section above, ComReg:

[84] See paragraph A4.8 of Annex 4 of Document 21/90.
[85] See paragraph A4.12 and A4.37 of Annex 4 of Document 21/90.
[86] See Section 3.4 of this document
[87] See paragraph A4.8 of Annex 4 of Document 21/90.
[88] See Section 3.4 of this document.
[89] See paragraph A4.9 of Annex 4 of Document 21/90.
[90] Page 67 of the 26 GHz Band Study.

- is of the view that presently there is no pressing need to limit the existing point-to-point or national block licences in the 26 GHz band;
- notes that the future of fixed links in the 26 GHz band is being considered in a separate process, ComReg's Fixed Links Review where ComReg has published a further consultation document in December.[91] That consultation document sets out ComReg's views on a number of matters, including block licensing and the setting of fees for fixed links, and will provide an assessment of the respondents' views to the initial consultation, Document 20/109; and
- By 1 January 2022 will close applications to new FWALA licences in the 26 GHz band, thereby readying the availability of additional spectrum for release in the 26 GHz band (see Figure A.5 above).

Methods of Award

A 1.82 In relation to the method of award for the 26 GHz band, the 26 GHz Band 5G Study set out two recommendations:

i. While ComReg's approach in most harmonised ECS bands to date has tended 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. 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;

ii. the 24.25 – 24.5 GHz portion should be made available using either a licence exempt or "light licensing" approach;

   - on balance, a light licensing approach could be adopted (rather than licence exemption) which would enable monitoring of the nature and extent of the use of the band.

A 1.83 With regard to recommendation (i) concerning the 26.5 – 27.5 GHz portion of the 26 GHz band, ComReg notes that:

- Four respondents (Dense Air, Mr. Eoin O' Connell, Huawei, Imagine)[92] supported a local area licensing approach,

[91] See Document 21/134
[92] See paragraphs A4.15 to A4.17 of Annex 4 of Document 21/90 and Section 3.4 of this document.

- One respondent (Viasat)[93] supported an individual base station framework submitting that in its view terrestrial IMT/5G in millimetre bands will be used on a very localized and geographically limited basis due to a short signal propagation radius;
- One respondent (Qualcomm)[94] supported a licensing approach that strikes a balance between providing opportunities for local use in the band and ensuring that mobile network operators can also maximise the potential of the band, noting also that flexibility in spectrum use could be aided with leasing;
- One respondent (Three)[95] submitted that some spectrum should be made available on a national basis, applying the same principles as the national block licences. In Three's view, operators should be given the same freedom to rapidly plan and deploy 5G services in the 26 GHz Band without the barrier of requiring individual per site licences; and
- One respondent (Vodafone)[96] submitted that it is too early to decide on an award process for the upper part of the band because the business and traffic cases are not yet clear. It believes that a local licensing approach would potentially be very inefficient if it prevents the nationwide provision of services.

A 1.84 From the above, ComReg observes that while the majority of respondents supported a local area / individual base station framework, Qualcomm, Three and Vodafone submitted some support for a licensing approach that could facilitate nationwide deployments.

A 1.85 While ComReg agrees with Vodafone that the 5G use cases and traffic for the 26 GHz band is still very unclear one of the factors for Plum/IDATE recommending a local area approach for the 26 GHz band in the first place was its very limited coverage range. This is a factor unlikely to change over time given the poor propagation characteristics of the 26 GHz band. In addition, while ComReg notes that some more EU member states (Croatia, Denmark and Slovenia) have recently awarded this band on a national basis, it also notes a local access framework is implemented in other countries (e.g., Germany, the UK).

A 1.86 Notwithstanding the above, ComReg will continue to monitor the 26 GHz band and will consider this matter further when it is appropriate to consult upon a method of award for this portion of the band.

[93] See paragraph A4.15 of Annex 4 of Document 21/90
[94] See paragraph A4.15 of Annex 4 of Document 21/90.
[95] See paragraph A4.16 of Annex 4 of Document 21/90.
[96] See paragraph A4.17 of Annex 4 of Document 21/90.

A 1.87 In relation to recommendation (ii) concerning the 24.25 – 24.5 GHz portion of the band, ComReg observes that:

- four respondents (Dense Air, Mr. Eoin O' Connell, Qualcomm, Viasat)[97] supported a licensing approach, with Qualcomm noting that an uncoordinated deployment of small cells or a licence exempt regime, may lead to excessive spectrum congestion and interference; and
- Two respondents (Imagine and Vodafone) agreed that this portion could be made available using either a licence-exempt or light-licensing approach.

A 1.88 While noting that all of the respondents agreed that a licensing regime would be appropriate for this portion of the band, ComReg will continue to monitor developments in the 26 GHz band and will consider this matter further when it is appropriate to consult upon a method of award for this portion of the band.

Licensing (conditions and compatibility)

A 1.89 In relation to the licensing conditions for the 26 GHz band, the 26 GHz Band 5G Study set out two recommendations:

i. Technical licensing conditions should be those defined in European Commission Implementing Decision (EU) 2019/784, amended by European Commission Implementing Decision (EU) 2020/590.
   - No additional conditions are necessary based on co-existence with other services in the 26 GHz band.
   - If Radioastronomy is planned in the future appropriate exclusions or co-ordination zones may be necessary.

ii. Appropriate licence conditions (e.g., Use-it-or-lose, fees, etc.) may be required to ensure spectrum is efficiently used.

A 1.90 In relation to recommendation (i) ComReg observes that

- two respondents (Imagine and Vodafone)[98] supported this recommendation; and
- four respondents (Eutelsat, Huawei, SpaceX and Viasat) [99] comment on the need to protect adjacent services, noting in particular satellite services in the 28 GHz band.

[97] See paragraphs A4.15 to A4.17 of Annex 4 of Document 21/90 and Section 3.4 of this document.
[98] See paragraphs A4.20 and to A4.24 of Annex 4 of Document 21/90.
[99] See paragraphs A4.21 to A4.23 of Annex 4 of Document 21/90 and Section 3.4 of this document.

A 1.91 In relation to recommendation (ii) ComReg observes that one respondent (imagine)[100] supported the adoption of appropriate licensing conditions to ensure spectrum is efficiently used.

A 1.92 ComReg welcomes the respondents' views on this topic and notes that the compatibility issue between satellite services in adjacent bands has been considered by Plum/IDATE in the 26 GHz Band 5G study, where it is noted that a key technical condition of the 26 GHz EU Decision is an:

> *"restriction of an outdoor base station antenna beam below the horizon for the protection of satellite receivers."*[101]

Timescales for assignment

A 1.93 In the 26 GHz Band 5G Study, the following two recommendations were set out in relation to the timescales for making available the lower and upper parts of the 26 GHz band:

i. 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; and

ii. assignment of the lower 250 MHz of the 26 GHz Band could be within 2022 – 2023 subject to demand;

A 1.94 With regard to these recommendations, ComReg observes that the respondents had a diverse range of views on the appropriate timescales.

- Four respondents (Dense Air, Imagine, Qualcomm, Three)[102] submitted that a closer timescale may be appropriate. In this regard:
  - Imagine submits that although demand may be low initially, allocating the spectrum will allow demand to be stimulated in the same way as the 3.6 GHz band;
  - Qualcomm submits that making at least the upper 1 GHz of the band available as soon as possible will be key for unleashing the full 5G potential in Ireland; and
  - Three submits that a delayed assignment of the upper 1 GHz will mean lost opportunities for Irish Industry 4.0[103] and that the lower part of the band should be made available immediately so long-lasting proof of concept trials can grow the ecosystem in Ireland;

[100] See paragraphs A4.20 of Annex 4 of Document 21/90.
[101] Page 75 of the 26 GHz Band 5G Study.
[102] See paragraphs A4.27 of Document 21/90.
[103] Gov.ie, "*Ireland's Industry 4.0 Strategy 202-2025*", 16 December 2021, available at https://enterprise.gov.ie/

- Apple[104] submits that the release of the 26 GHz band should be completed in a timely manner to help deliver long-lasting socio-economic benefits and noting that the 26 GHz band was identified for IMT at WRC-19,
- Vodafone[105] agrees with the timescales set out in recommendations (i) and (ii) above for the lower and upper parts of the 26 GHz band;
- Eir[106] submits that there is no immediate need to award spectrum for 5G in the 26 GHz Band; and
- Huawei[107] submits that ComReg should keep monitoring interest in the 26 GHz band for 5G applications and proceed using steps as carried out in other EU countries, noting that countries such as France and the Czech Republic have not seen the need to release the 26 GHz band or portions of the 26 GHz band at this time other than for trialling / experimental licences.

A 1.95 In relation to the views suggesting a sooner timescale than that recommended in the 26 GHz Band Study, ComReg is of the view that it has not received adequate demonstratable evidence of demand for spectrum in the 26 GHz band to justify an assignment for 5G any sooner than that indicated in the 26 GHz Band Study, where Plum/IDATE indicate that

> *"demand for the upper 1 GHz of the 26 GHz band could emerge from 2023-2027 and depending on the type of award (local, regional or national) that is most suitable, the upper 1 GHz of the 26 GHz band could be made available by 2028."*

A 1.96 Further, for the reason set out in the 'use case' assessment above, ComReg notes that for some potential use cases (e.g., Verticals) the demand for the 26 GHz band may even be reduced compared to that considered in the 26 GHz Band Study given the considerations outlined in paragraph A1.54, including the potential harmonisation of mid-band spectrum in the future.

A 1.97 Finally, ComReg observes that should interested parties need access to the 26 GHz Band spectrum to stimulate demand or carry out proof of concept trials, such access is available via Test & Trial Ireland. As noted in Section A1.3 above, to date (December 2021) ComReg has unfortunately not received any applications or expression of interest in availing of Test & Trial Ireland to conduct either tests or trials in the 26 GHz band.

[104] See Section 3.4 of this document.
[105] See paragraph A4.26 of Annex 4 to Document 21/90.
[106] See paragraph A4.26 of Annex 4 to Document 21/90.
[107] See Section 3.4 of this document.

Review of WBB ECS developments

A 1.98 In the 26 GHz Band 5G Study the following recommendation was set out in relation to a review of WBB-ECS.

i. The development of WBB-ECS in Ireland should be reviewed at an appropriate date (to be determined by ComReg) and subject to demand, to assess whether there is a need for further spectrum and / or a different long-term licensing approach beyond 2027.

A 1.99 In relation to this recommendation, ComReg observes that respondent (Eir)[108] submits that an appropriate time for such a review might be around 2025, while another respondent (Dense Air)[109] submits that the development of WBB-ECS in the band should be considered sooner than 2025.

A 1.100 While noting the views of respondents, ComReg believes that at this time it is too early to indicate a timeframe for when a review of WBB-ECS in the 26 GHz band might occur. As discussed throughout this annex there remains a lack of clarity on the use cases for the 26 GHz band in Ireland, and for the immediate term, ComReg proposes to continue to monitor developments in the 26 GHz band to inform its future spectrum management actions for this band.

A1.5 ComReg's view on its work plan items for the 26 GHz band in the RSMSS 2022-2024

A 1.101 Having considered, among other things:

- Plum/IDATE's key findings in the 26 GHz Band 5G Study, and recommendations with regard to spectrum, method of award, licensing and timescales;
- the ten submissions received in response to the 26 GHz Band 5G Study (see Annex 4 of Document 21/90 and Document 21/47);
- the further five submissions received as part of the consultation on the proposed radio spectrum strategy 2022-2024 (see above); and
- other relevant information such as Test & Trial Ireland activity in the 26 GHz Band in Ireland, equipment availability and international updates relating to the 26 GHz band.

A 1.102 ComReg is of the view that it is appropriate to identify the following work plan items regarding the 26 GHz band during this strategy period:

[108] See paragraph A4.26 of Annex 4 of Document 21/90.
[109] See paragraph A4.27 of Annex 4 of Document 21/90.

- By 1 January 2022, ComReg will close the 26 GHz band to new Fixed Wireless Access Local Area (FWALA) licence applications; and
- ComReg will continue to monitor developments in the 26 GHz band with respect of 5G, and following the completion of the MBSA 2021 and, subject to demand (for example reasoned submissions to responses to consultations and/or use of any 26 GHz test and trial licences issued), ComReg will consult on making one or more portions of the 26 GHz band available, noting that any consultation process may also consider other harmonised spectrum bands available for award.

A 1.103 In relation to Test & Trial Ireland, ComReg highlights that this remains open and available to all potential use cases in the 26 GHz band and would welcome any interest, of which to date there has regrettably been none, from industry or research professionals to test or trial services in the 26 GHz band, noting that there is currently:

- 1047 MHz of contiguous available spectrum from 26,453 MHz to 27,500 MHz;
- 355 MHz of contiguous spectrum available from 24,250 MHz to 24,605 MHz; and
- 168 MHz of contiguous spectrum available from 25,445MHz to 25,613 MHz.

Annex: 2 Submissions to Document 21/90

A 2.1 Forty-four parties made submissions to Document 21/90. These are listed below:

- Adrian Connor
- Albert White
- AMSAT Ireland
- Apple
- Benetel
- Cellnex
- Charlie Carolan
- Connacht Radio Club
- Dundalk Amateur Radio Society
- Dynamic Spectrum Alliance
- Enda Broderick
- ESB
- ESOA
- Eutelsat
- EUWENA
- Galway Radio Club
- Galway VHF Club
- George Donaldson
- Gerry Feeney
- Huawei
- IAA
- IECRO Ireland

- Intel
- Irish Radio Transmitters Society
- Jeffrey Roe
- John Holland
- Jonathan Bradshaw
- Keith Wallace
- Leinster Radio Club
- Marconi Group
- Mayo VHF Group
- Midlands Radio Club
- Munster Radio Club
- National Radio Society of Ireland
- OneWeb
- Pat Baynes
- RTÉ & 2RN
- Shannon Basin Radio Club
- Sigma Wireless
- SpaceX
- Three
- Tom Linden Memorial Club
- Ulster Radio Club
- Vilicom