An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Proposed Strategy for Managing the Radio Spectrum 2022 to 2024

Consultation

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Chapter 1

1 Introduction

1.1 Background and Purpose

1.1 The Commission for Communications Regulation ("ComReg") is the statutory body responsible for the regulation of the electronic communications (telecommunications, radiocommunication and broadcasting networks), postal and premium rate sectors in Ireland in accordance with European Union ("EU") and Irish law. ComReg also manages Ireland's radio spectrum (or "spectrum") and national numbering resource.

1.2 Radio spectrum is a medium by which information may be transmitted wirelessly over distances ranging from a few metres to thousands of kilometres. It is a valuable national resource underpinning important economic, social and communications activities. These include widely used services, such as mobile/fixed wireless communications and broadband, radio and TV broadcasting, and the safe operation of air and maritime transport. Radio spectrum is also fundamental in the day-to-day operation of the emergency services and defence forces and is a vital input to many other services including important scientific applications, such as weather forecasting and monitoring the Earth's environment. However, it is a finite natural resource with competing uses and users and so it must be managed effectively and efficiently used.

1.3 To assist in the management of the radio spectrum resource, ComReg regularly sets out and updates its radio spectrum strategy[1]. ComReg's current Radio Spectrum Management Strategy Statement 2019 to 2021 (ComReg Document 18/118[2]) ("2019-2021 Strategy Statement") published in 2018, set out, among other things, its work plan priorities at that time.

1.4 Following a review of the current strategy period (2019 – 2021), this document details, and invites comments from interested parties on, ComReg's draft radio spectrum management strategy statement and work plan proposals for the period 2022 to 2024.

1.2 Structure of this document

1.5 The remainder of this document is structured as follows:

[1] In accordance with ComReg's obligations under section 31 of the Communications Regulation Act 2002 (as amended) ("2002 Act").
[2] See ComReg-18118-design.pdf

- **Chapter 2:** provides an introduction to Ireland's radio spectrum and the importance of managing the radio spectrum in Ireland;
- **Chapter 3:** presents a review of the strategy period 2019-2021
- **Chapter 4:** considers the factors informing ComReg's strategy for the period 2022-2024
- **Chapter 5:** outlines ComReg's draft work plan for the period 2022-2024
- **Chapter 6:** sets out details of the next steps including the requirements for making submissions
- **Annex 1:** Summary of ComReg's statutory framework relevant to the management of the radio frequency spectrum in Ireland
- **Annex 2:** Radiocommunication Conferences 2019 and 2023
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Chapter 2

2 The Framework for Spectrum Management in Ireland

2.1 Spectrum Policy and Management in Ireland

2.1 This section sets out the spectrum policy in Ireland and ComReg's role in relation to spectrum management.

2.1.1 Spectrum Policy

2.2 A key role of the Department of the Environment, Climate and Communications ("DECC") is the development of policies for the regulation and optimal use of Ireland's radio spectrum. Spectrum policy is part of the national policy governing the telecommunications sector in Ireland, which also covers next generation broadband, electronic communications services ("ECS") and international connectivity. The DECC also has the responsibility for spectrum use associated with national broadcasting policy.

2.3 It should be noted that responsibility for national broadcasting policy sits with the Department of Tourism, Culture, Arts, Gaeltacht, Sports, and Media ("TCAGSM")[3].

[3] Formerly the Department of Culture, Heritage and the Gaeltacht, to which general responsibility for broadcasting policy from the then Department of Communications, Climate Action and Environment was transferred by S.I. No. 372 of 2020, the Broadcasting (Transfer of Departmental Administration and Ministerial Functions) Order 2020. The Department of Culture, Heritage and the Gaeltacht was re-named the Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media by means of S.I. No. 403 of 2020, the Culture, Heritage and the Gaeltacht (Alteration of Name of Department and Title of Minister) Order 2020. The Department of Communications, Climate Action and Environment was re-named the Department of the Environment, Climate and Communications by means of S.I. No. 373 of 2020, the Communications, Climate Action and Environment (Alteration of Name of Department and Title of Minister) Order 2020.

2.1.2 Spectrum Management: ComReg's mandate and role

2.4 The Communications Regulation Act 2002 (as amended by the Communications Regulation (Amendment) Act 2007) (the "2002 Act"), the EU Common Regulatory Framework (including the Framework and Authorisation Directives[4] as transposed into Irish law by the corresponding Framework and Authorisation Regulations[5]), and the Wireless Telegraphy Acts 1926 to 2009[6] ("1926 Act") set out, amongst other things, powers, functions, duties and objectives of ComReg that are relevant to the management of the radio frequency spectrum in Ireland.

2.5 In exercising its function of the management of Ireland's radio spectrum (and in accordance with relevant ministerial Policy Directions given under section 13 of the 2002 Act), ComReg's spectrum management objective is to ensure the efficient management and use of the radio spectrum. ComReg is obliged to effectively carry out this function, including having regard to relevant government policy statements and international developments.

2.6 In the context of radio spectrum used for Electronic Communications Networks ("ECN") and ECS, one of ComReg's objectives is to promote and create the conditions for effective competition in the provision of ECN and ECS. In that regard, section 12(2)(a) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at the promotion of competition, including:

i. ensuring that there is no distortion or restriction of competition in the electronic communications sector;

ii. encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources; and

iii. ensuring that users, including disabled users, derive maximum benefit in terms of choice, price and quality.

2.7 Readers are referred to Annex 1 for an overview of the legal framework and statutory objectives relevant to ComReg's management of the radio spectrum.

[4] Directive No. 2002/21/EC of the European Parliament and of the Council of 7 March 2002 (as amended by Regulation (EC) No. 717/2007 of 27 June 2007, Regulation (EC) No. 544/2009 of 18 June 2009 and Directive 2009/140/EC of the European Parliament and Council of 25 November 2009) (the "Framework Directive") and Directive No. 2002/20/EC of the European Parliament and of the Council of 7 March 2002 (as amended by Directive 2009/140/EC) (the "Authorisation Directive").

[5] The European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (S.I. No. 333 of 2011) and the European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2011 (S.I. No. 335 of 2011) respectively.

[6] The Wireless Telegraphy Acts 1926 to 1988 and Sections 181 (1) to (7) and (9) and Section 182 of the Broadcasting Act 2009.

2.8 ComReg, in preparing the draft strategy set out herein, has also had regard to the European Electronic Communications Code[7] ("the EECC") which replaces the common EU Regulatory Framework. The EECC is in the process of being transposed into draft Regulations by DECC.

2.9 In fulfilling its spectrum management function, ComReg carries out a range of programmatic activities, including the:

- licensing of spectrum rights of use in Ireland for many varied uses;
- monitoring of radio spectrum usage in Ireland, including the enforcement of licence conditions and equipment standards; and
- promotion of Ireland as an ideal location for spectrum development through Test and Trial Ireland[8].

2.10 Further details of these activities are set out in Chapter 3.

2.2 Spectrum management

2.11 The radio spectrum is a limited and valuable national resource that permeates all areas of communications, including radio, television, mobile voice and data, aeronautical/marine navigation, and satellite communications. Increased demand for the radio spectrum requires that it be used efficiently and that effective spectrum management processes be employed to maximise the benefits to society. The ability to take full advantage of the spectrum resource depends on the spectrum management activities that facilitates the implementation of radio systems with minimum radio interference.[9] However, as spectrum is a finite resource with many different services and users, spectrum management involves the careful consideration of a broad range of factors (e.g. administrative, regulatory, social, economic and technical) with a view to ensuring that radio spectrum is efficiently used. This may also involve balancing a range of competing factors, including:

i. appropriately meeting the reasonable requirements of all radio services, including commercial and public uses, such as public safety, national security and health care; and

[7] Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code

[8] See Home (testandtrial.ie)

[9] The radio spectrum needs be managed because two or more radio signals occurring simultaneously and in the same location can interfere with each other reducing the ability of the radio spectrum to operate effectively. It is not possible for users to share spectrum indiscriminately because one user may cause interference for another user.

ii. for spectrum used for ECS and ECN, promoting competition including ensuring that users derive maximum benefit in terms of price, choice and quality, contributing to the development of the internal market, and promoting the interests of users within the Community.

2.12 A system of spectrum management is required to ensure the efficient assignment and subsequent use of scarce frequencies among competing uses and users. This is essential to promote competition within the relevant downstream markets, particularly given that spectrum is an essential input in the provision of many ECS and an inefficient assignment of spectrum has the potential to distort competition and create inefficient outcomes for society.

2.2.1 The importance of radio spectrum

2.13 Investments in services that utilise the radio spectrum support change and innovation across the entire Irish economy. This is because these services not only provide an efficient and reliable means of communication, but they also support economic activity across the whole economy.

2.14 In 2019, ComReg commissioned Frontier Economics to estimate this economic contribution of the radio spectrum.[10] The preferred methodology was determined after several potential approaches were consulted on with industry in preparing the 2019-2021 Strategy Statement.[11] This methodology measured the economic activity by calculating Gross Value Added in sectors (See Figure 1) where spectrum is used as a core input. This methodology used data from both the Companies Registration Office ("CRO") and the Central Statistics Office ("CSO").

Gross Value Added = Gross Operating Surplus + Compensation of Employees + Mixed Income + (Taxes on Products - Subsidies on Products)

Figure 1: Gross Value Added

2.15 As part of the 2022-2024 Radio Spectrum Management Strategy Statement, ComReg proposes to provide an updated estimate using the same methodology, save for any changes proposed in response to this consultation. While full data is not currently available in order to complete this assessment at this time, based on preliminary data, and compared to the 2019 – 2021 Radio Spectrum Management Strategy Statement[12], ComReg provisionally estimates

[10] See ComReg Document 18/118a.
[11] See ComReg Documents 18/74 and 18/74a
[12] At the time of publication, a number of company financial accounts for 2019 were unavailable. In such instances, financial accounts for 2018 are used to inform the 2019 calculations. The Radio Spectrum Management Strategy Statement 2022-2024 will include estimates based on the most up-to-date data at the time of publication (likely to be complete 2019 data). Consequently, the estimates above are subject to revision.

that the economic contribution of the radio spectrum to Ireland in terms of Gross Value Added has increased from around €4 billion to €4.5 billion over the period. Similarly, the contribution to Irish Gross National Income[13] has increased from approximately €6.2 billion to €7 billion, accounting for approximately 3.2% of Modified Gross National Income, when modest multiplier effects are taken into account.[14]

2.16 Radio spectrum is also an important contributor to employment. Again, a preliminary estimate of the number of employees in Ireland whose jobs are directly dependent on the use of radio spectrum suggests c.19,000, up from 17,000 when compared to the 2019 – 2021 RSMSS.[15]

2.17 Following an assessment of responses to this consultation, ComReg will update its estimates to take account of the most recent data. Further, the economic contribution of the radio spectrum will be assessed in greater detail in advance of finalising the Radio Spectrum Management Strategy Statement 2022 – 2024.

Social and secondary benefits of spectrum usage

2.18 There are also considerable social benefits arising from the use of radio spectrum that are not reflected in the above analysis given its primary focus on ECN and ECS. For example, the efficient functioning of the Gardaí, fire and ambulance services all depend on reliable mobile communications, while radio spectrum plays a major role in enabling the Defence Forces to carry out its duties both at home and overseas.

2.19 Access to radio spectrum is also necessary for free-to-air television and radio broadcasting. Effective free-to-air delivery of national and regional broadcasting helps ensures media plurality, a greater expression of national and community cultural identity and the development of home-grown audio-visual content, including drama and documentaries.

2.20 Radio spectrum also enables the use of a wide variety of consumer applications enriching all our daily lives.

[13] Gross National Income (GNI) is a similar measure to Gross National Product and is a measurement of a country's income. The contribution to GNI for the purpose of this study includes each sectors' Direct GVA + Indirect GVA + Taxes less Subsidies.

[14] In a modern economy, supply chains are complex, meaning that many upstream industries may be involved in the provision of a final good or service. However, these sub-sectors will all, to some degree, have used, as inputs, other goods and services produced in Ireland. For example, these inputs include the equipment used to provide the services (where this is not captured in the direct estimate set out above) or the vehicles, power, advertising, financial services or legal services. The direct contribution of a sector or company does not capture the contribution of these upstream activities. These 'multipliers' use input-output tables from the CSO to account for the indirect GVA via inputs upstream in the supply chain.

[15] Subject to revision in the final Radio Spectrum Management Strategy Statement 2022-2024.

Figure 2: Examples of consumer applications that use radio spectrum

2.2.2 Spectrum management processes

International aspects to spectrum management

2.21 As radio spectrum usage propagates naturally beyond our national borders, spectrum management requires knowledge of, and involvement in, European and global spectrum management developments. Much of the radio spectrum use requires international planning and, in some cases, this may constrain how specific frequencies or frequency bands may be used nationally. This is particularly so in the aeronautical and maritime sectors where, because of the global nature of these services, ships and aircraft must use specific frequencies for navigation and communication purposes. The frequency bands used by TV and radio broadcasting services have also been harmonised for many decades to facilitate coordination between neighbouring countries and to assist the development of consumer markets. More recently, an increasing number of radio frequency bands have been internationally harmonised for commercial radio systems, such as wireless mobile communications.

2.22 While the "allocation" and/or "assignment" of spectrum is a national function, the global regulation of spectrum is primarily within the remit of the International Telecommunication Union ("ITU"), while European regulatory functions lie with the EU and the European Conference of Postal and Telecommunications Administrations ("CEPT"). These bodies define the broad framework within which all spectrum users must operate, and, in some cases, these bodies develop harmonised decisions, recommendations, and approaches for the use of spectrum. Harmonised radio frequency bands provide considerable benefits in facilitating the development of international services, promoting economies of scale with respect to the manufacture of radio equipment (thereby lowering both the cost of deploying wireless networks and the cost of wireless devices for consumers), and minimising the risk of interference between users.

2.23 As the radio spectrum manager for Ireland, ComReg is charged with the implementation of international treaties, agreements and obligations[16] relating to the use of radio spectrum in the State. The implementation of these measures often requires action in relation to the allocation and/or assignment of radio spectrum as discussed below.

2.24 Along with DECC, ComReg plays an active role in international fora to ensure that, as far as possible, decisions relating to the international radio spectrum regulatory framework meet Ireland's specific requirements. ComReg also participates in technical compatibility studies and in the development of technical standards to support more efficient and flexible use of the radio spectrum.

[16] The interference-free operation of radiocommunication systems across international borders is achieved through the implementation of the ITU Radio Regulations and Regional Agreements, and the efficient and timely update of these instruments through the processes of the World and Regional Radiocommunication Conferences. The ITU Radio Regulations, which have the status of an international intergovernmental treaty, provide a framework for the use of the radio frequency spectrum and satellite orbits. To keep pace with the fast development of technologies and the consequent convergence of services and technologies, the ITU Radio Regulations are revised every three to four years at a World Radiocommunication Conference. The last WRC was held in November 2019 in Egypt.

The radio spectrum decisions and recommendations of the CEPT (ECC Decisions and ECC Recommendations) are non-binding on national administrations. The list of ECC Decisions/Recommendations and their implementation status for all CEPT countries, including Ireland, is maintained at http://www.erodocdb.dk.

The radio spectrum decisions of the EU (the EU/EC Decisions) are binding decisions on EU Member States. These decisions are normally based on the relevant technical harmonisation measures as outlined in the CEPT reports to the EC and are generally adopted subsequent to the prior adoption of a CEPT ECC Decision. A list of EU Decisions/Recommendations is maintained at https://ec.europa.eu/digital-agenda/en/radio-spectrum-policy-document-archive

The allocation of radio spectrum in Ireland

2.25 The allocation of radio spectrum means "the designation of a given frequency band for use by one or more types of radiocommunications services, where appropriate, under specified conditions".[17] An allocation identifies the services that could potentially use a radio frequency band and is an important activity in facilitating the international coordination of radio spectrum between regional areas and neighbouring countries, thereby reducing the potential for interference while enabling economies of scale.

2.26 Under the 2002 Act, ComReg is obliged to publish, and revise, a Radio Frequency Plan ("Plan")[18]. The Plan is comprised of a set of tables which sets out Ireland's radio spectrum allocations for 8.3 kilohertz (kHz) to 3000 Gigahertz (GHz), indicating the services to which each frequency band is allocated ("frequency allocations") in the radio spectrum and is an important tool for users of radio frequencies.

2.27 The Plan is updated regularly in line with the outcomes of the ITU World Radiocommunication Conferences ("WRCs") and other relevant developments, such as the adoption of European harmonisation decisions and recommendations for a particular radio frequency band or service.

2.28 In June 2021, alongside the publication of an updated plan[19] ComReg made available a Beta release of a new online version of the Plan, which provides excellent search and reference functionality for stakeholders[20]. This is being made available for user testing purposes and provides early access to an interactive version of the RFPI for users to test and trial prior to formal release of the product, expected towards the end of 2021.

[17] European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (S.I. 333 of 2011).
[18] Section 35 of the 2002 Act.
[19] See ComReg document 20/58R2
[20] See https://rfpi.comreg.ie/

The assignment of radio spectrum in Ireland

2.29 The assignment of radio spectrum refers to the spectrum management activities that issues, and authorises the use of, rights of use of radio frequencies[21]. In Ireland, the possession and use of radio equipment requires authorisation from ComReg and this authorisation may take the form of either a licence or a licence-exemption under the 1926 Act[22].

2.30 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.

2.2.3 Promotion of effective competition in management of spectrum for ECS and spectrum management tools

2.31 As noted earlier, spectrum is an essential input in the provision of ECS and an inefficient assignment has the potential to distort competition and create inefficient outcomes for society. The following three principal methods are used to address these potential issues:

1) market access;

2) access to essential inputs; and

3) demand-side factors.

2.32 ComReg's 2021-2023 Electronic Communications Strategy Statement[23] identifies specific strategic intents and supporting goals that can be used to support those methods.

[21] A spectrum assignment refers to the rights of use for specific radio frequencies within a frequency band issued to an individual or for a station and usually under specified conditions (e.g. in the context of radio frequencies for ECS, one or more of the conditions identified in Part B of the Schedule to the Authorisation Regulations).
[22] Section 3(1) and section 3(6) of the Wireless Telegraphy Act 1926, as amended.
[23] ComReg Document 21/70 – Electronic Communications Strategy Statement 2021-2023 – Published 30 June 2021. https://www.comreg.ie/publication-download/electronic-communications-strategy-statement-2021-2023

2.33 ComReg set out in its strategy that the availability of spectrum is necessary for the entry and expansion of many operators in electronic communications markets. Therefore, the efficient management of the national radio spectrum (and numbering) resources is required to facilitate competition, enhance connectivity and promote efficient investment, taking into account the potential impact that the assignment and allocation of these inputs may have on downstream markets.

Strategic intention: Competition & Investment
Goal 1.6: The management of spectrum and numbers facilitates competition, enhances connectivity and promotes efficient investment.

Figure 3: Goal 1.6 of ComReg's 2021-2023 Electronic Communications Strategy Statement

2.34 Goal 1.6 of ComReg's Electronic Communications Strategy Statement reflects a primary goal of ComReg's spectrum management functions because effective competition between wireless service providers brings long term benefits to consumers in terms of enhanced competition, choice, quality of services and innovation. The efficient assignment and use of the radio spectrum is an important consideration in promoting efficient investment.

2.35 In that regard, ComReg takes a proactive approach in ensuring the efficient assignment and use of the radio spectrum while facilitating competition and producing an optimal outcome for society. ComReg has a number of spectrum management tools that are designed to serve the interests of all users of the radio frequency spectrum and strike the right balance between those users while ensuring that spectrum is used efficiently and that competition is not distorted. ComReg uses these tools as required, depending on the circumstances of each particular assignment, in order to derive the maximum benefit for society and contribute to the development of the internal market, while promoting the interests of users within the Community. These tools are illustrated in Figure 4 below.

Figure 4: Spectrum Management Tools

2.36 The appropriate deployment of these tools involves the careful consideration of a broad range of factors (including administrative, regulatory, social, economic and technical considerations) with a view to ensuring that radio spectrum is efficiently assigned and used. Any measures must also be objectively justified, transparent, non-discriminatory and proportionate in relation to their intended purpose. The proposed use of such spectrum management tools often requires detailed consideration with relevant stakeholders.

2.37 As part of its spectrum management function, ComReg monitors the market in order to be informed of changes to the market since previous radio spectrum management strategy statements and spectrum awards. ComReg is conscious that the circumstances previously present may have changed or the market has developed such that the spectrum management tools referred to above may need to be deployed differently to promote competition and protect consumers. This approach is in line with ComReg's strategic intention to enable consumers to choose and use communications services with confidence.

Strategic intention: Consumer Protection
Goal 2.1: ComReg identifies and understands consumer harms.

Figure 5: Goal 2.1 of ComReg's 2021-2023 Electronic Communications Strategy Statement

2.38 In that regard, ComReg continually tracks end-user usage trends (see ComReg Quarterly Reports) and has completed various market research and forecasting in order to inform future spectrum management activities. For example:

- Mobile Consumer Experience survey 2019 (see ComReg Document 19/101);
- Connectivity Survey (See ComReg Document 21/30);
- Impact of Covid-19 on consumer use and perception of telecommunications services (see ComReg Documents 20/107, 21/06, 21/42); and
- ComReg Technology Survey (see ComReg Document 21/32b).

2.39 The following points have particular spectrum management implications:

- The Mobile Consumer Experience Survey highlighted several key issues and concerns with regard to mobile connectivity including:
  - inside the home is where consumers (c. 65%) mostly use their mobile phone for voice and data services;
  - the incidence of experiencing service issues in the house for calls/text and data (33%) is higher than the same service issues that occur outside the home (17%);
  - Voice calls remain an important service for consumers, with 93% using their mobile phone to make traditional voice calls using telephone numbers;
  - the main outdoor service issues across all types of consumers (rural and urban) relate to voice calls; and
  - rural consumers experience higher rates of service issues regardless of location with higher levels of service issues arising in the home or part thereof (i.e. indoors).
- The Impact of Covid-19 Surveys highlighted consumer perception of mobile connectivity during the Covid-19 pandemic including:
  - 3 in 4 of surveyed consumers strongly value being able to access and use their mobile phone during the ongoing Covid-19 pandemic (similar to Sept '20 levels).[24]
  - 69% of surveyed consumers used their mobile phone service to work from home/work remotely (including tethering) since 1st of March 2020; [24]

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

- 87% of surveyed consumers believe that their mobile phone service for voice calls service is adequate to allow them to carry out work related activities while at home; and
- 79% of surveyed consumers believe that their mobile phone for data / internet access service is adequate to allow them to carry out work related activities while at home. [24]

- The volume of mobile data traffic is increasing, for example in 2020 mobile data increased by 44% compared to 2019[25], and mobile data increased by 103% in Q1 2021 when compared to Q1 2019.[26] In addition, mobile voice services account for 84% of total voice traffic in Ireland.[27]
- The increase in mobile data traffic is also reflected in terms of consumers' average mobile phone usage per day. For example, a consumer may spend on average of 30 minutes per day on making/receiving traditional mobile call compared to 130 minutes per day on activities requiring MBB (e.g. emailing, social media, internet-based applications for voice calls, streaming TV apps and video-on-demand, streaming music and browsing general websites).[28]

2.40 In response to the information received, ComReg completed the following work streams to (a) inform future spectrum award proposals, (b) provide additional consumer information and (c) improve the connectivity experience for consumers:

- On 18 December 2020, ComReg published its response to consultation and Decision on the Multi Band Spectrum Award for the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands (see ComReg Document 20/122 and Multi Band Spectrum Award webpage);
- Published "Improving connectivity in Ireland – Challenges, solutions and actions". (see ComReg Document 18/103);
- Commissioned and published "Meeting Consumers' Connectivity Needs" by Frontier Economics (see ComReg Documents 18/103a and 18/103b);
- Commissioned and published "Future Mobile Connectivity in Ireland" – by Oxera Consulting with Real Wireless (see ComReg Documents 18/103c and 19/124f);
- Commissioned and published "Coverage obligations and spectrum awards" by DotEcon (see ComReg Documents 18/103d and 19/124b);

[25] Mobile data traffic was 539,697,814 GB in 2019 and 778,683,589 GB in 2020.
[26] Mobile data traffic was 116,076, 000 GB in Q1 2019 and 236,390,000 GB in Q1 2021.
[27] ComReg Quarterly Key Data as of Q1 2021.
[28] Slide 51 of Document 19/101.

- in response to the extraordinary situation presented by COVID-19, ComReg consulted upon and put in place three licensing frameworks (with the consent of the Minister[29] [30]) for the temporary assignment of spectrum rights in the 700 MHz Duplex, 2.1 GHz and 2.6 GHz Bands.[31] [32] ComReg determined that the temporary assignment of spectrum rights of use was necessary as the ability to make or receive voice calls and access services over the internet (particularly indoors) was likely to be of significant importance and a key priority for consumers during the COVID-19 Situation;[33] [34] and
- Made available the Outdoor Mobile Coverage Map - a solution to provide consumers with a visual (geographic-based) means of presenting predicted mobile outdoor coverage throughout Ireland, through the use of an interactive website[35].

2.41 This approach is also consistent with ComReg's strategic intention that end-users have widespread access to high-quality and secure communications networks, services and applications, specifically Goal 3.2 of the ECS Strategy Statement.

Strategic intention: Connectivity and Network Resilience
Goal 3.2: Utilising the regulatory toolkit, ComReg's activities promote connectivity and/or incentivise infrastructure rollout.

Figure 6: Goal 3.2 of ComReg's 2021-2023 Electronic Communications Strategy Statement

2.42 Regulated entities should be fully cognisant of their obligations, comply with them and have an internal culture of compliance. It is therefore ComReg's goal that regulated entities are pro-active in ensuring their own compliance, for example, with the conditions that attach to radio spectrum licences issued by ComReg. ComReg encourages operators to have robust internal controls to prevent and detect non-compliance.

[29] The Minister for Communications, Climate Action and Environment.
[30] The Minister for the Environment, Climate and Communications.
[31] COVID-19: Temporary Spectrum Management Measures | Commission for Communications Regulation (comreg.ie)
[32] ComReg's current MFCN workplan includes a work item on COVID-19 temporary spectrum management measures to consider whether it would be appropriate to put in place a further temporary ECS licensing framework beyond 1 October 2021. See ComReg Document 21/87
[33] gov.ie - Speech of the Taoiseach, Leo Varadkar TD, Post Cabinet Statement, Tuesday 24 March 2020 (www.gov.ie)
[34] Working from home during COVID-19 (citizensinformation.ie)
[35] See https://coveragemap.comreg.ie/map

2.43 In meeting its strategic intention regarding compliance and enforcement, ComReg actively monitors the radio spectrum[36] to ensure that it is being used in compliance with relevant regulations and authorisations and will intervene where appropriate.

2.44 ComReg publishes an annual report to inform interested parties of its radio spectrum compliance and enforcement activities, the relevant legal framework, and to provide information on existing and/or new compliance requirements.

Strategic intention: Compliance and Enforcement
Goal 4.1: Regulated entities are pro-active in ensuring their own compliance. **Goal 4.2: ComReg's compliance and enforcement activities are conducted using fair and objective processes and are targeted and prioritised appropriately.** **Goal 4.3: ComReg has an effective set of powers to incentivise compliance and effectively monitor and enforce.**

Figure 7: Goals 4.1, 4.2, and 4.3 of ComReg's 2021-2023 Electronic Communications Strategy Statement

2.45 ComReg recognises the need to engage with different stakeholder groups and interested parties. This engagement takes several forms, including forums, formal consultation[37] and publication of proposals on its website. This is consistent with ComReg's strategic intention to be an effective, agile and relevant regulator as expressed in Goal 5.3 of the ECS Strategy Statement.

2.46 ComReg continuously engages with a range of regulatory bodies at an international level, including other European administrations, the Radio Spectrum Policy Group ("RSPG")[38], the ITU and the CEPT with the purpose of contributing to radio spectrum management regulatory policy discussions and inputting to regulatory decision making in an international setting. In some instances, ComReg has taken leadership roles in these bodies, in recognition of its standing as an expert-led and knowledge-driven regulator. International collaboration facilitates the development of an open and competitive environment in which innovation, creativity and competition can thrive.

[36] For example, ComReg undertakes market surveillance of products, radio frequency interference investigations, radio spectrum monitoring and compliance and enforcement activities.
[37] ComReg Document 11/34 – ComReg Consultation Procedures – published 6 May 2011
[38] The Radio Spectrum Policy Group (RSPG) is a high-level advisory group that assists the European Commission in the development of radio spectrum policy – https://rspg-spectrum.eu/

2.47 This approach is consistent with ComReg's strategic intention to contribute to and learn from the best practices of others and devote considerable resources to understanding the regulatory analyses and decisions made by its international colleagues.

Strategic intention: Organisation
Goal 5.3: ComReg is proactive on engagement with a range of stakeholders **Goal 5.4: ComReg contributes to and learns from international best practice.**

Figure 8: Goals 5.3 and 5.4 of ComReg's 2021-2023 Electronic Communications Strategy Statement

Chapter 3

3 Review of the 2019-2021 Strategy Period

3.1 In this chapter, ComReg reviews its 2019-2021 Strategy Statement and associated work plan, as set out in Chapter 5 of Document 18/118), using the following broad categories:

- ComReg's spectrum management function (i.e. programmatic work);
- Mobile and Fixed Communications Network (MFCN) services;
- Broadcasting services;
- Terrestrial Fixed services;
- Licence-Exempt Short Range Devices (SRDs) (including IoT);
- Satellite Services;
- Business Radio services (including PPDR and PMSE);
- Radio Amateur services;
- Aeronautical, Maritime, Scientific Services; and
- Defence Forces use of spectrum.

3.1 ComReg's programmatic spectrum management work

3.2 In section 5.2.1 of Document 18/118, ComReg identified the following programmatic work items for the period 2019 – 2021.

i. Continue to issue licences for wireless telegraphy in accordance with the 1926 Act and the regulations associated with each licence type;

ii. Continue to conduct market surveillance on items being imported to the State through customs;

iii. Continue to conduct surveys of transmission sites to assess compliance with licence conditions;

iv. Continue to monitor compliance and take enforcement action where appropriate;

v. Continue to investigate radio interference, giving appropriate priority to cases that have safety-of-life implications;

vi. Continue to publish an annual report detailing activities in respect of market surveillance, investigations of radio interference and enforcement action;

vii. Continue a programme of measurement of NIR and publication of surveys on Siteviewer as appropriate;

viii. Continue to promote Test and Trial Ireland and the benefits of using Ireland as a location to test or trial wireless products and services in a real world environment;

ix. Assist the DECC in the transposition of the EECC, and implement same as appropriate; and

x. Consult on potential deployment of LoRa technology in the 900MHz Band.

3.1.1 Licensing

3.3 Figure 9 presents the total number of radio spectrum licences in force (i.e. 'live' licences) in Ireland over the past 6 years, and highlights that the demand for licences generally continues to grow, in the main for fixed point-to-point radio links ("fixed radio links"). As of 30 June 2021, the number of licences totalled 20,121 representing a moderate 13.1% increase in the six years since 30 June 2015.

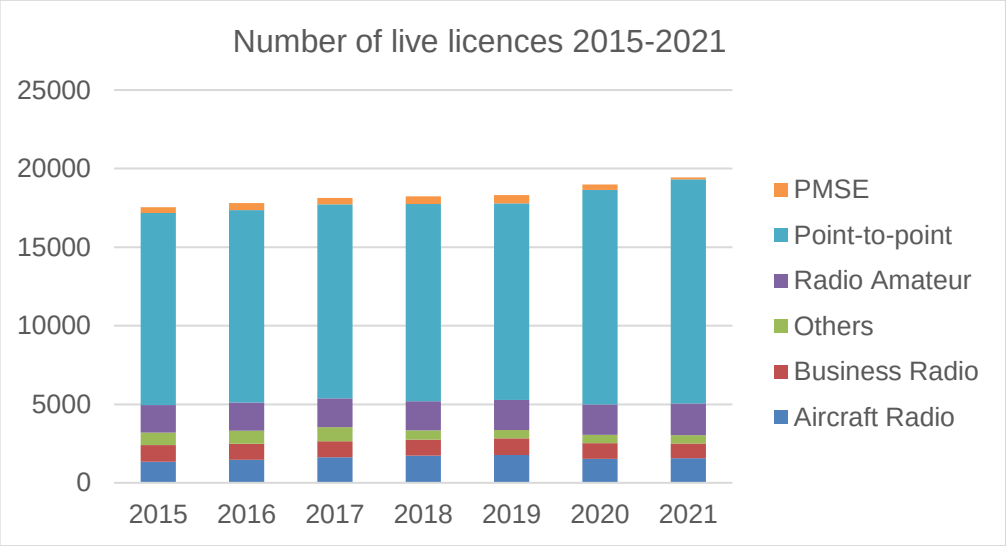


Figure 9: Number of live licences 2015-2021

3.4 While licences are issued for a wide variety of purposes some radio spectrum licences are more in demand than others. Fixed radio links licences remain the most in demand licence type and there has been a 16.6% increase in the number of fixed radio links in Ireland over the past 6 years. As of 30 June 2021, there were 14,256 fixed radio links licences, representing circa 70.9% of all live licences. Fixed radio links are used mainly by fixed and mobile operators, broadcasters, and utilities to provide transmission capacity and networks, and to provide redundancy and back-up for other networks.

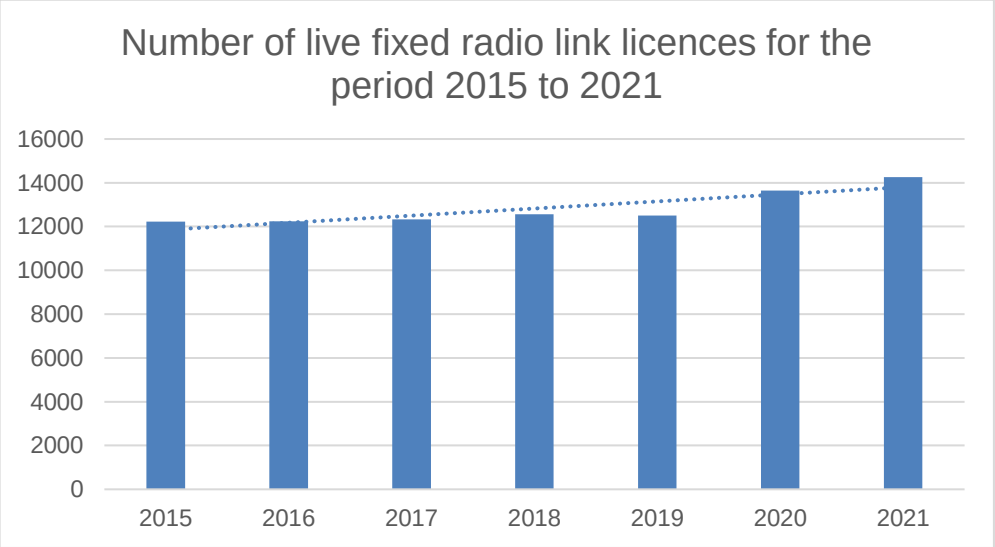


Figure 10: Number of live fixed radio link licences for the period 2015 to 2021

3.5 Licences for business radio, aircraft radio and radio amateurs are the next most voluminous licence type. As of 30 June 2021, there were 4,522 live licences for these services, representing circa 22.5% of all live licences. The number of aircraft radio licences granted has increased by 16% since June 2015. However, this has been somewhat offset by a continuing decline in the number of business radio licences which has fallen by 10.4% over the same period. The number of radio amateur licences has increased to 2,014 licences in June 2021, an increase of 13.8% on 30 June 2015.

3.6 The remaining 6.6% of radio licences cover a variety of licence types including the 3G and Liberalised Use licences (which facilitate the provision of mobile services), trunked mobile radio and air traffic services and land-based maritime services licences (which facilitate the safe operation of air and sea transport).

3.7 While licences for mobile wireless broadband represent a small proportion of the total licences issued by ComReg, they are nonetheless responsible for a large proportion of ComReg's radio spectrum management workload.

3.1.2 Monitoring, compliance and enforcement

3.8 ComReg is also responsible for monitoring, compliance and enforcement of the 1926 Act and relevant legal obligations arising from the Electromagnetic Compatibility ("EMC")[39] and Radio Equipment ("RE")[40] Directives, as transposed into national law, within the State

3.9 Such activities include:

- random surveys of transmission sites for compliance with licence conditions regarding non-ionising radiation;
- investigation of harmful radio interference to licensed operators;
- enforcement action, including the execution of search warrants and subsequent prosecutions in respect of unlicensed use of the radio spectrum; and
- market surveillance of products, including compliance checks on items being imported to the State through cooperation with Customs.

3.10 In the strategy period under review ComReg conducted a public consultation[41] [42] on the categorisation and classification of Radio Spectrum Interference Complaints.

3.11 The previous classification system placed an undue emphasis on the identity of the complainant rather than the impact the reported interference had on the complainant's ability to provide service. ComReg sought to address this, among other things, by placing emphasis on the nature and impact of the reported interference and the complainant's ability to continue to provide services.

3.12 A new classification system, based on three Case Types, has since been introduced along with revised complaint response times as shown in Table 1 below.

[39] Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.
[40] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment.
[41] See ComReg Doc. 19/108
[42] See ComReg Doc. 20/62

Case Type	Response Time
Type A	Immediate [43]
Type B	5 working Days
Type C	N/A

Table 1: Radio frequency interference case types and associated response times

3.13 ComReg established the Spectrum Intelligence and Investigations ("SII") Operators Forum ("the Forum") in 2019. The Forum aims to deepen engagement between ComReg and licensees by discussing topics of shared interest and future trends. The Forum met in September and December 2019 and was attended by a wide range of stakeholders including the mobile network operators, 2rn[44], An Garda Siochána and Tetra Ireland. Government restrictions imposed as a result of COVID-19 has restricted the Forums ability to convene but ComReg remains committed to hosting further meetings of the Forum once it is in a position to do so.

3.1.3 RLANs

3.14 In Ireland MET Eireann currently operates two meteorological radars in the 5470 - 5570 GHz frequency band, one in Dublin and one in Shannon, that are used for weather forecasting purposes. Harmful interference to meteorological radars caused by non-compliant RLANs operating in the 5 GHz Band is a Europe wide issue that is being addressed by CEPT and ADCO RED.

3.15 During the 2020 – 2021 operating year, ComReg engaged extensively with MET Eireann to identify how both parties can best co-operate to address the on-going harmful interference issues arising from non-compliant RLAN equipment adversely affecting the radars at both Shannon and Dublin airports.

3.16 In this regard a methodology for the measurement identification of non-compliant RLAN equipment interfering with the radars was agreed. These measurements are taken periodically by Met Eireann to measure and identify non-compliant RLANs interfering with their radars. This information is then forwarded to ComReg.

[43] ComReg's hours of work are 9:00 am to 5.30 pm, Monday to Friday. ComReg staff do not operate on an "on call basis".
[44] RTÉ Transmission Network, trading as 2rn

3.17 In parallel, ComReg has also engaged extensively with wireless internet service providers (WISP) and their industry representatives to raise awareness of the requirements for the use of RLAN in Ireland and the impact that non-compliant RLAN equipment has on MET radars.

3.18 ComReg has produced an infographic, as shown in Figure 11 below, which sets out the technical conditions attached to the operation of 5 GHz RLANs in Ireland. In addition, ComReg has compiled a register of WISPs providing services in the 5 GHz Band.

3.19 ComReg uses this register, among other things, to remind services providers of their obligations, provide details of RLANs found to be causing harmful interference to meteorological radars and require service providers to confirm to ComReg that they have checked with equipment to ensure that it is operating correctly.

3.20 To date approximately 20 RLANs that had been causing harmful interference to the radars at Dublin and Shannon have been identified and the interference removed with the assistance of WISPs, bringing about an immediate improvement in the operation of the MET radars.

3.21 This workstream has also served to highlight the extensive use of the 5 GHz Band by companies providing CCTV services.

3.22 ComReg plans to engage with the Private Security Authority[45] ("PSA") and other relevant parties in the 2021-2022 work period with a view to educate and make aware of the obligations on users in this Band in much the same way as has been successfully undertaken with the WISPS.

[45] The Private Security Authority is the statutory body with responsibility for licensing and regulating the private security industry in Ireland. The PSA is an independent body under the aegis of the Department of Justice.

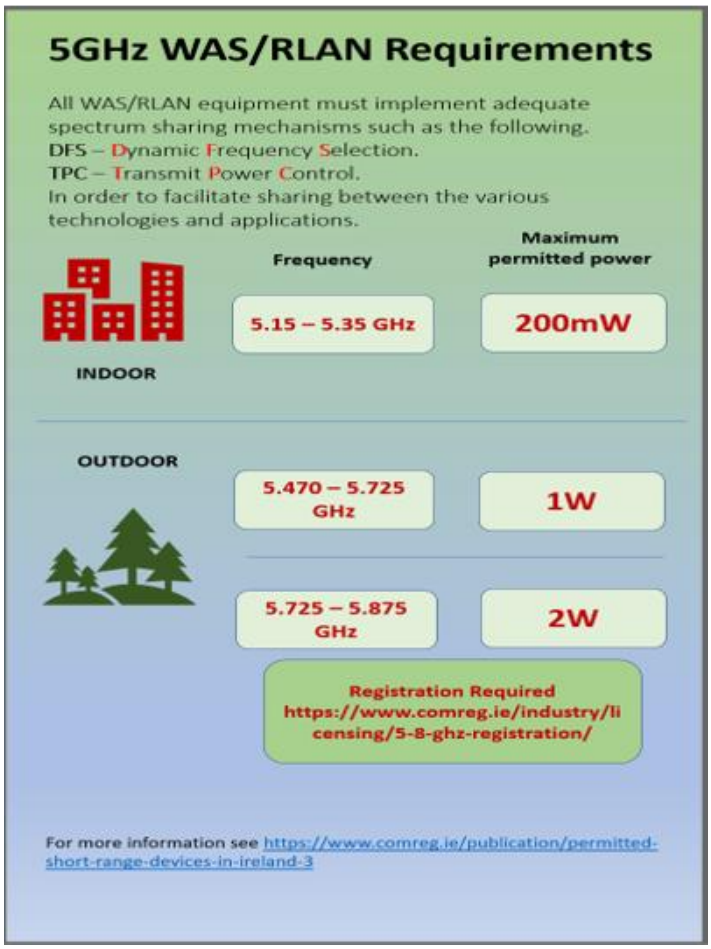


Figure 11: 5 GHz WAS/RLAN Requirements

3.23 Since the publication of the 2019-2021 Strategy Statement ComReg has published two further Spectrum Intelligence and Investigations Annual Reports (ComReg Documents 19/86[46] and 20/79[47]) detailing its activities in respect of Spectrum Monitoring, Radio Frequency Interference Investigations, Compliance and Enforcement and the Market surveillance of products. Interested parties are directed to these publications for detailed information in respect of same.

[46] https://www.comreg.ie/publication/spectrum-intelligence-investigations-annual-report-2018-2019
[47] https://www.comreg.ie/publication/spectrum-intelligence-and-investigations-annual-report-2019-2020

3.1.4 Non-Ionising Radiation Monitoring

3.24 Non-Ionising Radiation ("NIR") emissions from transmitter sites remains an important matter. ComReg requires, as a condition of a General Authorisation as well as of various Wireless Telegraphy licences, that operators of transmitting stations ensure that their installations comply with the NIR emission limits specified in the latest guidelines published by the International Commission on Non-Ionising Radiation Protection ("ICNIRP")[48]. In addition, in 2019 the functions of Environmental Protection Authority ("EPA") were expanded to cover public exposure to non-ionising radiation in the electromagnetic spectrum[49], and the Health and Safety Authority is the body responsible for occupational exposure to NIR[50].

3.25 In 2003, ComReg commenced its Programme of Measurement of Non-Ionising Radiation, which entails annual audits of compliance by operators with their General Authorisation/Wireless Telegraphy Licence conditions relating to NIR. Each annual audit involves surveying a sample number (circa 80) of sites and transmitter types (including 2G, 3G, 4G and 5G mobile telephony, radio and TV broadcast, wireless broadband etc.) countrywide. To-date, over 1,400 such individual site surveys have been conducted and emissions measured at all surveyed sites, without exception, have been found to fall well below the ICNIRP limits for general public exposure to NIR.

3.26 Results of all site surveys undertaken by ComReg are summarised and published in quarterly reports which are available at https://www.comreg.ie/publications/. Copies of individual site survey reports can be viewed on Siteviewer[51], an on-line map facility provided by ComReg, which allows the public to view details of mobile phone base stations throughout Ireland.

[48] ICNIRP is a body of independent scientific experts and is formally recognised as an official collaborating non-governmental organization by the World Health Organization. For further information see: www.icnirp.org.
[49] https://www.epa.ie/our-services/monitoring--assessment/radiation/
[50] See: http://www.hsa.ie/eng/Topics/Physical_Agents/Electromagnetic_Fields/

[51] See http://siteviewer.comreg.ie/

3.1.5 Test and Trial Ireland

3.27 Ireland has a capability and reputation for research and excellence in wireless innovation and technology. Wireless technologies, in the form of new products and services, are evolving to meet new communication trends. Developments in consumers' desire for ubiquitous connectivity, the crunch on available spectrum resources, future new efficient wireless systems and radio access technologies, and the so-called 'Internet of Things and Industries' are driving innovation in radio spectrum use.

3.28 Test and Trial Ireland[52] enables entrepreneurs, researchers and developers to test or trial wireless technologies quickly and at a low cost in a wide variety of frequency bands in Ireland. The number of test and trial licences granted since 2015 is shown in Figure 12. The reduction in the number of test and trial licences applied for and licensed during 2020 may have been a result of the Covid-19 pandemic.

3.29 Having regard to future trends, including the increased demands for advanced mobile services and potential impact of development including the internet of things ("IoT") and 5G, ComReg is committed to supporting Test and Trial Ireland for the benefit of new and returning Test and Trial Ireland clients.

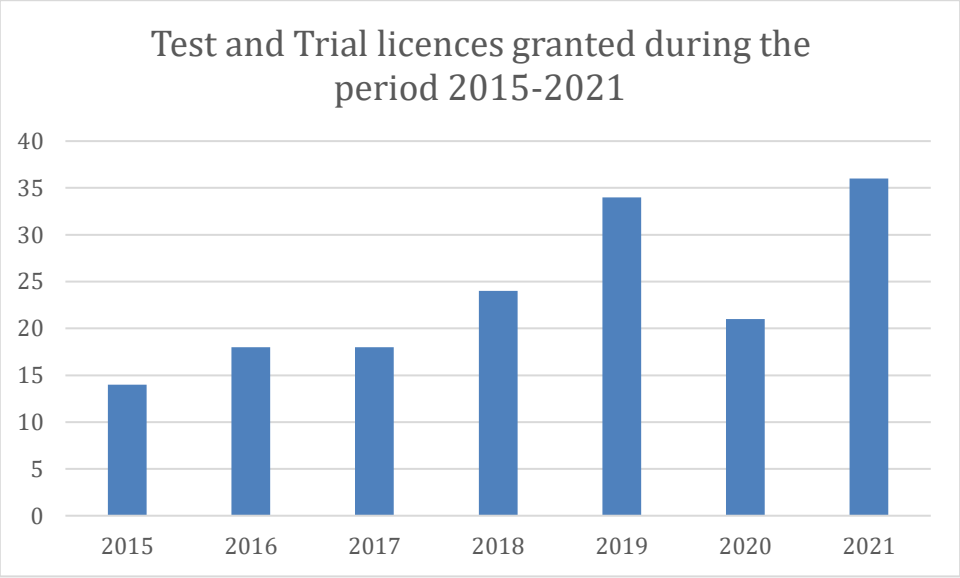


Figure 12: Test and Trial licences granted during the period 2015-2021

[52] See https://www.testandtrial.ie/

3.2 MFCN services

3.30 Mobile and Fixed Communications Network ("MFCN") services continue to play an important role in the Irish telecommunications sector. The most recent statistics published on ComReg's online Data Portal[53] show that in Ireland at the end of Q1 2021:

- there were 7,180,054 mobile subscriptions in total - up 6.6% from the previous year – which included:
  - 5,217,230 mobile voice and data subscribers - up 1.9% from the previous year;
  - 333,075 mobile broadband subscribers - up 3.9% from the previous year; and
  - 1,630,749 M2M subscribers - up 25.9% from the previous year;
- the mobile penetration rate[54] was 104.8% % - up 1.7% from the previous year;
- mobile data volumes continue to rise, increasing by 33.6% in the year to reach 236,390 Terabytes; and
- there were nearly 69,562 fixed wireless subscribers - up 30.6% from the previous year - with associated data volumes in Q1 2021 of 62,190 terabytes – up 117.3% from the previous year.

3.31 The recent increases, as noted above, in mobile subscriptions and volume of data traffic on mobile and fixed wireless networks can be seen in Figure 13 and Figure 14 below respectively which show relevant data for the period since Q1 2021.

[53] https://www.comreg.ie/industry/electronic-communications/data-portal/tabular-information/

[54] Excluding mobile broadband and M2M.

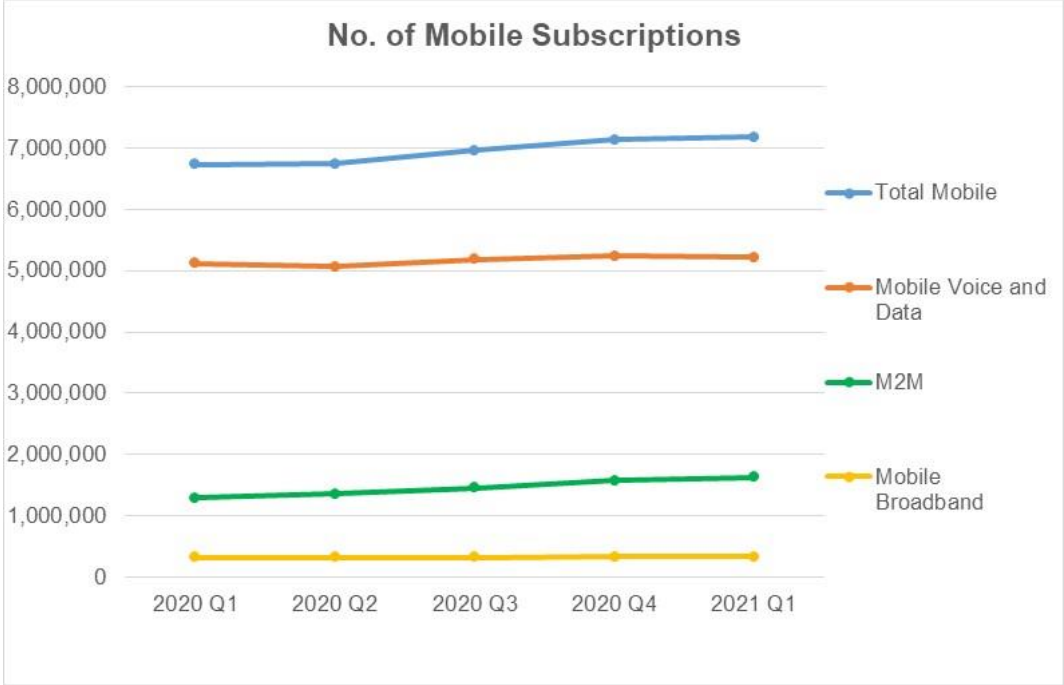


Figure 13: No. of Mobile Subscriptions

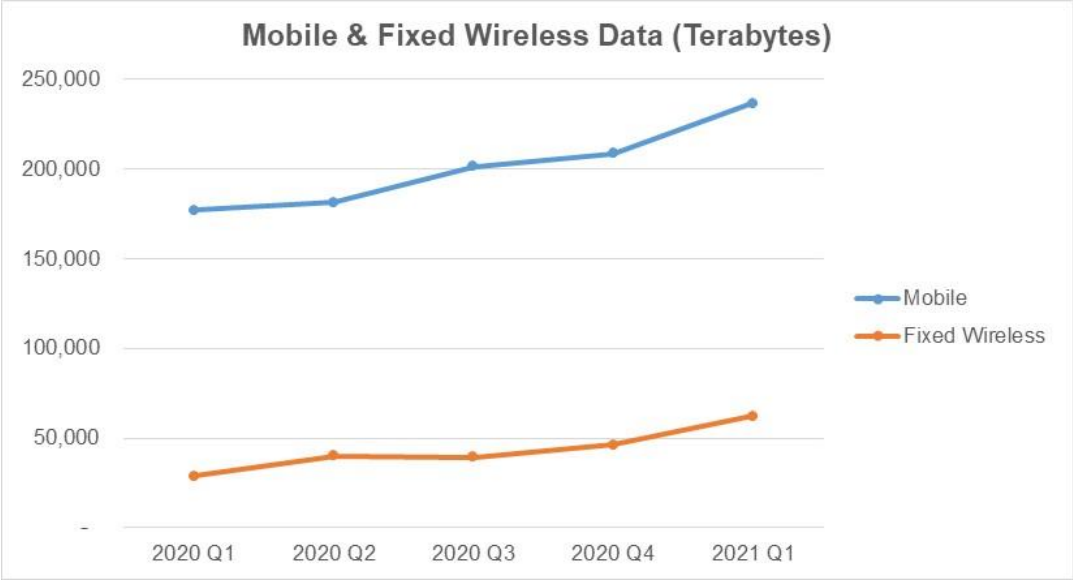


Figure 14: Mobile and Fixed Wireless Data

3.32 MFCN services are provided using a variety of licence types issued by ComReg including the "liberalised use" licences in the 800 MHz, 900 MHz and 1800 MHz Bands, 3G licences and "liberalised use" licences in the 2.1 GHz Band, "liberalised use" licences in the 3.6 GHz Band, COVID-19 temporary Electronic Communications Services (ECS) licences in the 700 MHz and 2.1 GHz Bands, and Spectrum Lease licences.

3.33 User demand for mobile data traffic has increased significantly in recent years and forecasts predict further increases in mobile traffic (see chapter 4). Such increases in end-user demand will likely result in increased demands for spectrum. In that regard, ComReg carried out a number of activities during the period 2019 – 2021 aimed at enabling this demand to be met, most particularly via:

- the finalisation of the award decisions, procedures and rules on the multi-band spectrum award for spectrum in the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands which is currently progressing[55];
- the liberalisation of the 2.1 GHz Band and the issue of "liberalised use" licences; and
- the issue of COVID-19 temporary ECS licences in the 700 MHz and 2.1 GHz Bands[56], noting that this came about due to the extraordinary circumstances that arose from March 2020 onwards and was not foreseen in ComReg's work plan before then.

3.34 ComReg's work plan for the MFCN services for the period 2019 – 2021 was to:

i. Develop and finalise its multi-band award proposals for the release of spectrum rights for the provision of wireless broadband (both mobile and fixed broadband) services, and implement same;

ii. Take appropriate administrative measures arising from the adoption of Decision (EU) 2018/637 - which amends Decision 2009/766/EC - to enable the deployment of M2M technologies in the 900 MHz and 1800 MHz frequency Bands;

iii. Implement relevant EC harmonisation decisions in the Bands for MFCN in support of next generation terrestrial wireless systems;

iv. Engage with the relevant stakeholders with a view to obtaining greater clarity on national policy on the use of the different portions of the 700 MHz Band in Ireland and, in particular, for PPDR;

v. Monitor developments in the 1.4 GHz Band for MFCN and consider the current and future use of the Band in Ireland;

vi. Publish non-confidential information regarding ComReg's drive testing programme of mobile networks in Ireland;

[55] https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/proposed-multi-band-spectrum-award/

[56] https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/covid-19-temporary-spectrum-management-measures/

vii. Continue to measure the performance of all new makes and models of mobile handsets that become available on the Irish market for both voice and data on a regular, ongoing basis;

viii. Consider how to best establish the aggregate effect of building materials on signal propagation including collaboration with other research bodies;

ix. Continue to liaise with MNOs to gather network architecture data for the generation of coverage prediction maps and make these available on the consumer section of ComReg's website;

x. Consider administrative matters concerning the EC's spectrum divestment commitments in relation to the acquisition of Telefonica by Hutchison at the appropriate time;

xi. Continue to work with relevant parties to ensure the orderly and timely transition by existing FWALA licensees in the 3.6 GHz Band to enable services to be provided by the winning bidders in the award, in accordance with the transition rules of the award;

xii. Monitor the progress of the developments in respect of 5G with a view to making a portion of the 26 GHz Band available, if and when it is required; and

xiii. Consider other means of monitoring MNO compliance with their coverage obligations noting its work plan item to generate mobile coverage maps for publication on its website.

3.35 These work plan items, and the additional work item on Covid-19 temporary ECS licences, are briefly discussed below

3.2.1 COVID-19 Temporary ECS licences

3.36 In early 2020, governments around the world introduced a suite of public health measures to tackle the spread of COVID-19. In Ireland, as people began to work and school from home, there were significant changes to the normal traffic levels and patterns on the electronic communications networks, including mobile networks, with operators taking various steps to optimise their networks.

3.37 Figure 15 below illustrates the change in data traffic volume on the mobile networks during COVID (i.e. Q1'20 – Q2'21) compared to a pre-COVID-19 (Q4'19 and before). While data volumes were increasing prior to COVID-19, the rate of increase accelerated from Q1'20 onwards due to the introduction of COVID-19 measures and the increased need to access a range of essential and non-essentail services over the internet. However, while data volumes continue to increase (which also occurred pre-COVID), the rates of growth have returned to pre-Covid levels in line with the relaxation of restrictions.

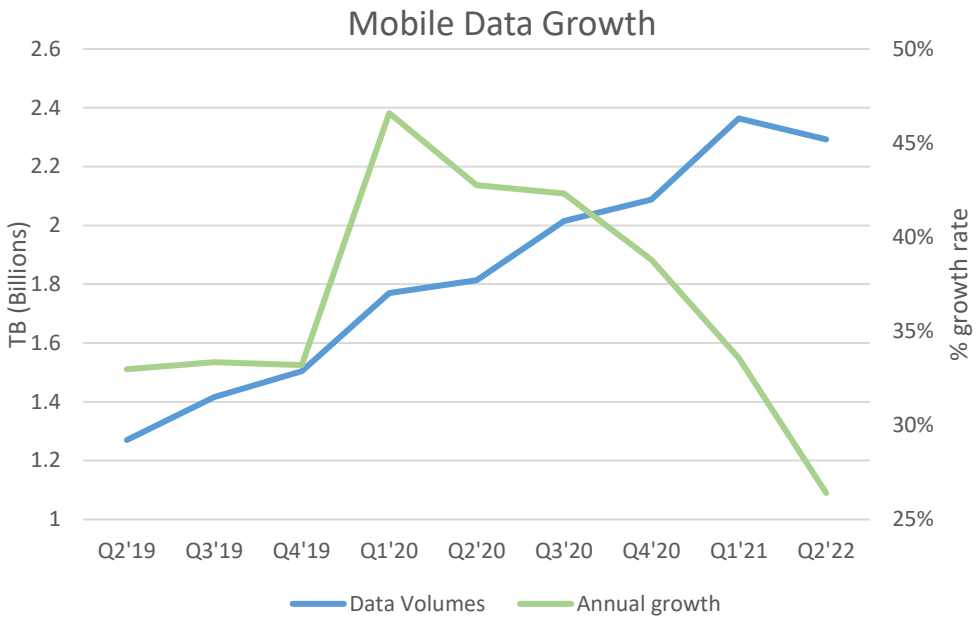


Figure 15: Mobile Data Growth[57]

3.38 ComReg worked with industry to best manage the situation and, since the onset of the COVID-19 pandemic, has taken a number of steps to ease network congestion. This has included the implementation of three consecutive six-month Temporary ECS Licence frameworks[58] 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.

3.39 Six separate temporary spectrum licences covering the overall period from April 2020 to 1 October 2021 have been issued to each of the three mobile network operators (MNOs) - Meteor Mobile Communications Limited ("Meteor"), Three Ireland (Hutchinson) Limited ("3IRL") and Vodafone Ireland Limited ("Vodafone").

3.40 These temporary spectrum rights have been used to provide additional mobile network capacity to support the increased voice and data traffic demands from consumers, arising from the Government's COVID-19 measures.

[57] Taken from ComReg Document 21/88.
[58] (1) From 8 April 2020 to 7 October 2020, (2) from 8 October 2020 to 1 April 2021 and (3) from 2 April 2021 to 1 October 2021.

3.41 On 31 August 2021, the Irish government published its strategic approach for addressing COVID-19 going forward "Reframing the challenge, Continuing our recovery and reconnecting"[59]. Based on the recent public health advice and the rates of uptake being achieved by the vaccination programme, the strategy sets out that the transition to the future state of managing COVID-19 should make a final significant shift in approach in October 2021[60].

3.42 ComReg is currently considering whether a further COVID-19 temporary licensing framework is required beyond 1 October 2021[61].

3.2.2 Multi-Band Spectrum Award 2021

3.43 During the 2019 – 2021 time-period, ComReg consulted on and finalised its decisions for the award of long-term spectrum rights of use in the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands. This is termed the Multi-Band Spectrum Award 2021 ("MBSA 2021")[62].

3.44 Specifically:

- ComReg issued four consultations on its detailed award proposals and procedures in Documents 19/59R, 19/124, 20/32 and 20/56;
- On 18 December 2020, ComReg finalised its response to consultation and decisions on the award in Document 20/122 and Decision 11/20 (see Chapter 10 of Document 20/122);
- On 14 January 2021, an appeal of the Decision 11/20 was lodged by Three Ireland (Hutchison) Limited and Three Ireland Services (Hutchison) Limited. This is noted in Document 21/04R. The lodging of this appeal does not, in itself, affect the taking effect of Decision 11/20 or steps being taken to implement it;
- On 16 April 2021, ComReg published the Information Memorandum (or the "IM") for the MBSA 2021, in ComReg Document 21/40. This commenced the award process. The IM details the processes and procedures that ComReg is employing to implement Decision 11/20.

[59] See https://assets.gov.ie/197018/ee93451c-2c67-4ea4-ad2b-ba5fb38bfce2.pdf

[60] Based on the criteria of at or close to 90% of people 16 or over being fully vaccinated in the coming weeks, and having regard to the incidence and behaviour of the disease at that time, the Government will remove further statutory restrictions in respect of events and activities from 22 October 2021.

[61] See ComReg Information Notice – Document 21/74 - https://www.comreg.ie/publication/covid-19-potential-further-temporary-ecs-licensing-july-2021-update-and-next-steps-in-considering-any-further-temporary-licensing-framework

[62] All documents relevant to the MBSA 2021 are available on ComReg's website at https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/proposed-multi-band-spectrum-award/

Table 17 of the IM sets out an indicative timeline for steps in the MBSA 2021;

- On 28 May 2021 two sets of Wireless Telegraphy ("WT") regulations associated with the MBSA 2021 were made. Among other things, these regulations provide for:
    - the granting of "liberalised use" licences in the 2.1 GHz Band for existing 3G licensees;
    - the granting of "interim licences" in the 2.1 GHz Band for 3IRL; and
    - the granting of "liberalised use" licences for spectrum rights in the 700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands in accordance with the outcome of the MBSA 2021.

3.45 ComReg is currently progressing the steps set out in the IM and awaiting the judgment of the appeal.[63]

3.46 As noted in ComReg Document 20/122, spectrum awards, and particularly those suitable for the deployment of mobile and wireless broadband services, are very important events which occur only every few years and which have economy-wide impact. ComReg's previous spectrum awards[64] have, among other things, promoted effective competition including new market entry, and facilitated the rollout of existing and new services, including 4G and 5G, to the benefit of Irish users.

3.47 The MBSA 2021 award is a very important one and its progress will enable licensees to make long-term capital expenditure decisions as well as being an important aspect of general economic and social development in Ireland given that:

- it will lead to improved network coverage and capacity, with significant economic benefits;
- it will likely result in significant cost savings for existing network operators that secure spectrum in the award; and
- it is central to meeting the European Commission's ("EC") 5G for Europe Action Plan, a strategic initiative which concerns all stakeholders, private

[63] See ComReg Spectrum Awards webpage for any updates on progress of MBSA2 and Three's appeal, available at www.comreg.ie

[64] The last major award was in 2017 for the 3.6 GHz band, a 5G candidate band, and before that in 2012 for the 800 MHz, 900 MHz and 1800 MHz bands. See:

- 3.6 GHz band award webpage - https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/3-6ghz-band-spectrum-award/; and
- 2012 MBSA webpage - https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/multi-band-spectrum-award-2012/.

and public, small and large, in all Member States, to meet the challenge of making 5G a reality[65].

3.48 In addition, pursuant to Article 1 of Decision (EU) 2017/899[66], Ireland is obliged to "allow the use" of the 700 MHz Band by 30 June 2020, and Ireland's national roadmap for the 700 MHz Band[67] envisaged an award process commencing in Q1 2021.

3.2.3 Adoption of Decision (EU) 2018/637 to enable the deployment of M2M technologies in the 900 MHz and 1800 MHz

3.49 In section 4.2 of Document 18/118, ComReg noted that M2M communication and the IoT are widely considered to be applications with significant growth potential and that some M2M/IoT technologies are designed to operate in the spectrum bands assigned to MFCN.

3.50 In that regard, ComReg highlighted the adoption on 20 April 2018 of the European Commission Implementing Decision (EU) 2018/637[68], which amended Decision 2009/766/EC[69] and set out harmonised technical conditions for IoT in the 900 MHz and 1800 MHz Bands. ComReg identified the Implementation of Decision (EU) 2018/637 as a work plan item for the 2019 to 2021 strategy period and intended to implement the Decision within the 2021 calendar year.

3.51 ComReg notes that the European Commission's Radio Spectrum Committee is currently considering a draft EC Implementing Decision[70] to repeal and replace Commission Decision 2009/766/EC[71] to update the technical framework for the 900 MHz and 1800 MHz frequency Bands. Therefore, ComReg intends to implement the new draft EC Implementing Decision once it has been adopted by the European Commission in H1 2022[72].

3.2.4 Implement EC harmonised decisions for spectrum bands

[65] European Commission, "5G Action Plan", available at https://ec.europa.eu/digital-single-market/en/5g-europe-action-plan
[66] See https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32017D0899
[67] See gov.ie - Ireland's National Roadmap on the Use of the 700MHz Frequency Band (www.gov.ie)

[68] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018D0637&from=EN
[69] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009D0766&from=EN
[70] Draft Commission Implementing Decision on harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing electronic communications services in the Union and repealing Decision 2009/766/EC – https://circabc.europa.eu/ui/group/af096568-9b95-4bb2-84db-45b307b06a22/library/91093950-7a37-4966-ad31-7f89582e22cf/details
[71] Amended by Commission Decisions 2011/251/EC and (EU) 2018/637. The last amendment addresses harmonised technical conditions for the Internet of Things.
[72] Given these circumstances, ComReg does not intend to implement Decision (EU) 2018/637

suitable for MFCN

3.52 As set out in Annex 6 of this document, a number of EC harmonised decisions were recently adopted for spectrum bands suitable for MFCN. These relate to:

- the 900 MHz and 1800 MHz Bands (Decision (EU)2018/637);
- the 1.4 GHz Band (Decision (EU)2018/661);
- the 2.1 GHz Band (Decision (EU)2020/667);
- the 2.6 GHz Band (Decision (EU)2020/636);
- the 3.6 GHz Band (Decision (EU)2019/235); and
- the 26 GHz Band (Decision (EU)2020/590 and (EU)2019/784)).

3.53 For all the above decisions ComReg updated the radio frequency plan for Ireland[73] to designate the above spectrum bands in accordance with the relevant EC Decision(s).

3.54 For the 1.4 GHz Band, 2.1 GHz Band, 2.6 GHz Band, 26 GHz Band as well as other relevant bands including the 700 MHz Band, ComReg also consulted upon the making available of these bands in various consultation process including the MBSA 2021 consultations, the 26 GHz 5G Band study, and the fixed links consultation.

3.55 For the 3.6 GHz Band, the 3.6 GHz licences were amended in 2020 to take account of the parameters in the Annex to Decision (EU)2019/235.

3.56 In relation to the 900 MHz and 1800 MHz Bands see Section 3.2.3 above.

3.57 The 700 MHz Guard Bands and the Duplex Gap In the MBSA 2021 process, ComReg obtained clarity on the 700 MHz Duplex portion of the 700 MHz Band, where after obtaining expert advice from LS Telcom on BB-PPDR[74] and consultation on same, ComReg decided to include the full 2 x 30 MHz of the 700 MHz Duplex in the MBSA 2021 award (See Documents 20/122).

3.58 In relation to the other parts of the 700 MHz Band (i.e. the 700 MHz Guard Bands and the 700 MHz Duplex Gap), ComReg will continue to engage with stakeholders in the coming strategy period to obtain clarity on this use, noting that Decision (EU)2016/687 provides for various uses, including:

[73] Document 20/58R2, "Radio Frequency Plan for Ireland"

[74] 'Public Protection and Disaster Relief (PPDR) radio communications' means radio applications used for public safety, security and defence used by national authorities or relevant operators responding to the relevant national needs in regard to public safety and security including in emergency situations;

- Supplemental downlink ("SDL")[75], wireless audio Programme Making and Special Events ("PMSE") equipment[76], Machine-to-Machine ("M2M") radio communications[77] and Broadband Public Protection and Disaster Relief ("BB-PPDR")

3.59 In relation to BB-PPDR, during the period of the previous strategy statement ComReg engaged with the Office of the Government Chief Information Officer ("OGCIO") and issued an information notice on spectrum for BB-PPDR (Document 20/98), published 14 October 2020 (see Section 3.7.4 below for further detail).

3.2.5 Monitor developments in the 1.4 GHz Band and consider current and future use of this band

3.60 As noted above, the current and future use of the 1.4 GHz Band was monitored and considered by ComReg in various consultations including the MBSA 2021 consultations and the fixed links consultation.

3.61 In those consultations, ComReg noted that:

- The future use of the 1.4 GHz Band was considered in the MBSA 2021 consultation process, where for the reasons set out in Consultation Documents 18/60, 19/59R and 19/124, ComReg's preliminary view is that the 1.4 GHz Band (both the 1.4 GHz Centre Band and the 1.4 GHz Extension Bands) should not be included in the MBSA 2021 award. This preliminary view was also adopted in ComReg's decision on the MBSA 2021 as set out in Document 20/122; and
- It would continue to monitor developments in the 1.4 GHz Band and may provide additional clarifications during this review and following any final Decision on MBSA 2021. The future award of the 1.4 GHz Band will be determined by a separate consultation process, which would commence following any final Decision and assignment of spectrum in relation to the MBSA 2021 award.

[75] Supplemental Downlink (SDL) represents downlink-only (i.e. unidirectional) base station transmission for the provision of terrestrial wireless broadband electronic communications services.

[76] 'Wireless audio PMSE equipment' means radio equipment used for transmission of analogue or digital audio signals between a limited number of transmitters and receivers, such as radio microphones, in-ear monitor systems or audio links, used mainly for the production of broadcast programmes or private or public social or cultural events.

[77] Machine-to-Machine (M2M) radio communications means radio links for the purpose of relaying information between physical or virtual entities that build a complex ecosystem including the Internet of Things; such radio links may be realised through electronic communications services (e.g. based on cellular technologies) or other services, based on licensed or unlicensed use of spectrum

3.62 In the coming strategy period, ComReg proposes to continue to monitor the 1.4 GHz Band and following the completion of the MBSA 2021 award, will consult on the award of some or all of this Band[78].

3.2.6 Monitor 5G developments in the 26 GHz Band

3.63 The 26 GHz Band is one of the three pioneer radio spectrum bands[79] identified as being suitable for the deployment of "5G" services in Europe and consists of 3250 MHz of spectrum in the 24.25 - 27.5 GHz frequency range. Its propagation characteristics along with the large contiguous bandwidth potentially available make the band suited 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").

3.64 To inform its considerations in relation to the future use of the 26 GHz Band, ComReg commissioned a study of the 26 GHz Band in the context of potential 5G use by Plum Consulting and IDATE, which considered, among other things the requirements to ensure the continued provision of existing services, as appropriate, while also seeking to facilitate WBB deployments, including "5G", through the introduction of appropriate licensing framework(s).

3.65 In January 2021, ComReg published the Plum/IDATE study as Document 21/07a[80] ("the 26 GHz Band 5G Study") along with an associated Information Notice (Document 21/07)[81] and invited comments from interested parties on the matters discussed in the study.

3.66 The key findings set out in the 26 GHz Band 5G Study include that:

- there is little usage of the band internationally or in Europe as there is limited demand to use the band due to business case uncertainty;
- an international harmonised approach to releasing the 26 GHz Band for WBB ECS is not evident – again driven by business case uncertainty;

[78] Noting that EC Implementing Decision (EU) 2018/661 allows for certain situations where partial award may be appropriate.

[79] The other two pioneer bands are the 700 MHz Band (694-790 MHz) (the duplex portion of which forms part of the MBSA 2021 award) and the 3.6 GHz Band (3.4-3.8 GHz), for which ComReg awarded rights of use in 2017.

[80] 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

[81] 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 – Information Notice"*, 26 January 2021, available at www.comreg.ie

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

3.67 In February 2021, ComReg received ten submissions to the 26 GHz Band 5G Study from interested parties and, in May 2021, published non-confidential versions of these submissions in Document 21/47[82]. These submissions, in combination with the study, will help inform ComReg's consideration of the next steps for the band.

3.68 Annex 4 provides a summary of respondents' views with respect to the key findings and recommendations of the study, and a brief overview of developments related to 26 GHz Band since the publication of the study.

3.69 ComReg is further considering the 26 GHz Band 5G Study, along with the views of interested parties expressed in the consultation responses as part of its deliberations for this proposed strategy for managing the radio spectrum for the period 2022 to 2024".

3.70 In that connection, interested parties who wish to comment further on the above matters, are invited to submit their views in response to this consultation. Please see Chapter 6 for details on how to submit comments.

3.2.7 Drive testing of mobile networks

3.71 In order to monitor mobile network licence compliance, ComReg conducts a bi-annual drive test programme which was most recently conducted during winter 2019 by Advanced Wireless Technologies Group Limited ("AWTG").

3.72 During 2019 ComReg issued a report on the results of the summer 2019 drive test [83] and during 2020 issued a report on the results of the winter 2019 drive test[84].

3.73 Due to the world-wide COVID-19 pandemic and subsequent Government Public Health restrictions, ComReg with the agreement of AWTG has suspended this work. ComReg plans to recommence this work shortly.

[82] ComReg Document 21/47, *"Non-Confidential Submissions to Documents 21/07 and 21/07a – Submissions to Consultation"*, 13 May 2021, available at www.comreg.ie

[83] ComReg Document 19/97, "*Assessment of Mobile Network Operators' Compliance with Licence Obligations (Coverage) Summer 2019*", 24 September 2019, available at www.comreg.ie

[84] ComReg Document 20/16, "*Assessment of Mobile Network Operators Compliance with Licence Obligations (Coverage) Winter 2019*", 12 March 2020, available at www.comreg.ie

3.2.8 Mobile handset testing

3.74 Several factors affect the quality of mobile connectivity that a user experiences at any given location. Most of these factors vary over time and by location. One factor that can impact connectivity from a mobile user perspective, is the mobile handset.

3.75 ComReg's aim is to allow users to understand the factors that affect the connectivity experience, including those introduced by mobile handsets.

3.76 During 2019 ComReg issued a report of the results of mobile handset performance (data)[85] and mobile handset performance (voice)[86]. This report summarises the overall average of the Total Radiated Power "TRP" in measurement scenarios.

3.77 During 2020 ComReg issued a report of the results of mobile handset performance (date)[87]. This report noted that the overall average values of the Total Isotropic Sensitivity ("TIS")[88] measurement surpass the GSMA TIS recommendation values across all the technologies and frequency bands.

3.2.9 Building Materials

3.78 The combined effect of use of more heat-efficient building materials and a great increase in overall mobile voice and data traffic has contributed to a deterioration in perceived quality of indoor mobile performance in many homes. Underscoring this, ComReg 2017 Mobile Consumer Experience survey[89] found that *"deterioration in the reception quality of the call while at home (indoors)"* was the most frequently cited service issue experienced by respondents who had had a service issue in the past month.

[85] https://www.comreg.ie/publication/mobile-handset-performance-data-2
[86] https://www.comreg.ie/publication/mobile-handset-performance-voice-2
[87] https://www.comreg.ie/publication/mobile-handset-performance-data-3
[88] Total Isotropic Sensitivity ("TIS") is a measurement of a mobile handset's ability to detect a weak signal and maintain connection with a base station.
[89] https://www.comreg.ie/?dlm_download=mobile-consumer-experience-survey

3.79 With this in mind, ComReg completed a project to quantify the effects of some representative modern building materials on indoor radio signal performance. To do this, ComReg obtained a range of brick, roof tile, window and insulating materials used in contemporary Irish building construction. A laboratory test environment was established so as to test radio signal attenuation through a sample of each of these materials to be measured over the typical mobile network frequency ranges. The resulting attenuation measurements allowed an assessment of the range of attenuations caused by different building materials to be made. In carrying out the measurements, ComReg's measurement methodology was first reviewed by Queen's University Belfast.

3.80 In 2018, ComReg published "The Effect of Building Materials on Indoor Mobile Performance"[90] which provided commentary and conclusions on the effect of building materials on radio attenuation. In summary the building materials which caused the most attenuation were those used in heat insulation (especially those with one or more foil layers) and windows (especially triple-glazed windows with aluminium or PVC frames). The roofing materials tested did not contribute significantly to radio attenuation, while of the brick materials tested only cavity blocks caused significant attenuation.

3.2.10 Outdoor Mobile Coverage Map

3.81 The outdoor mobile coverage map[91] allows consumers to assess the level of outdoor mobile coverage they might reasonably expect to experience in their own localities or other. Amongst other things, this information helps consumers make an informed choice regarding their connectivity requirements.

3.82 During 2019 and 2020, 5 updates to the outdoor mobile coverage map were published[92]. These and future updates will continue to allow consumers to assess the level of outdoor coverage they might reasonably expect to experience.

3.2.11 Administrative matters concerning the EC's spectrum divestment commitments in relation to the acquisition of Telefonica by Hutchison

3.83 During the 2019 -2021 period, ComReg observes that no action was required regarding the administrative matters concerning the EC's spectrum divestment commitments in relation to the acquisition of Telefonica by Hutchison.

[90] https://www.comreg.ie/publication/the-effect-of-building-materials-on-indoor-mobile-performance
[91] https://www.comreg.ie/outdoor-mobile-coverage-map/
[92] See https://coveragemap.comreg.ie/map

3.84 Noting that the EC's spectrum divestment commitments can be exercised at any time prior to 1 January 2026[93], ComReg proposes to maintain this work item in the coming strategy period.

3.2.12 The 3.6 GHz Band

3.85 In document 18/118, ComReg stated that it intended to continue to work with relevant parties to ensure the orderly and timely transition by existing FWALA licensees in the 3.6 GHz Band to enable services to be provided by the winning bidders in the award, in accordance with the transition rules of the award.

3.86 Since the completion of the 3.6 GHz award in 2017[94],[95] ComReg has actively engaged with Winning Bidders and Existing Licensees to develop and implement appropriate Transition Plans. ComReg has placed particular importance on areas where Winning Bidders have sufficiently developed plans to roll-out new services.

3.87 ComReg has also encouraged Winning Bidders and Existing Licensees to engage and develop mutually agreeable Transition Plan Proposals, which ComReg would then consider with a view to finalising a Transition Plan. To date, one set of Localised Transition Plans ("LTPs") has been developed and implemented, being those required for the transition by Imagine Communications Ireland Limited ("Imagine") from 3.6 GHz Band Lots awarded to Vodafone.

3.88 In April 2019, Vodafone submitted its final Transition Plan Proposal to develop LTPs for the rollout of new services across ten sites using 3.6 GHz Band spectrum previously held by Imagine under the FWALA licensing scheme. ComReg consulted on the proposal, and on 25 June 2019, ComReg implemented LTPs for Vodafone's rollout of these ten sites. Those LTPs required Imagine to complete all relevant Transition Activities by 5 November 2019.

3.89 Upon receipt of a joint request from Imagine and Vodafone, ComReg extended the relevant Commencement and Transition dates and all Transition Activities were expected to be completed by 2 February 2020. Due to the Covid-19 pandemic, those Transition Activities were suspended by the agreement of both parties. ComReg continues to engage with Imagine and Vodafone to determine when they will restart their Transition Activities in line with the LTPs.

[93] m6992_4894_3.pdf (europa.eu)
[94] https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/3-6ghz-band-spectrum-award/
[95] https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/3-6-ghz-band-transition/

Transition Activities by Existing Licensees

3.90 Progress has also been made in the orderly transition of the Existing Licensees from the 3.6 GHz Band, including:

- e-Nasc Éireann Teoranta ('Enet'), Lighthouse Networks Ltd (trading as Lightnet), PermaNET, Ripplecom Communications Ltd and Western Broadband Networks Ltd (trading as WestNet) have all completed their transition from the 3.6 GHz Band;
- Eir currently holds a 3.6 GHz Band Transition Unprotected Licence ("TUL") to use 28 MHz of 3.6 GHz Band spectrum in one Transition Service Area ("TSA"). Eir's 3.6 GHz Band TUL will expire on 31 July 2022 and cannot be renewed.
- Imagine has migrated from 54% of the TSAs originally licensed under its 3.6 GHz Band Transition Protected Licence ("TPL") and has reduced its spectrum usage by 40% in the remaining TSAs licensed under its current TPL.

3.91 The Wireless Telegraphy (3.6 GHz Band Licences) Regulations 2016[96] specify that any TULs granted by ComReg shall expire on 31 July 2022. Therefore, Eir must complete its transition activities by that date.

Winning Bidders

3.92 Significant progress has been made in the orderly transition of the 3.6 GHz Band and this progress has facilitated the commencement of spectrum rights for all new 3.6 GHz Band licensees to varying degrees:

- On 1 September 2018, ComReg commenced 100% of the Lots won by Imagine;
- On 1 September 2020, ComReg commenced 100% of the Lots won by 3IRL;
- As of 9 September 2021, ComReg has commenced 97% of the Lots won by Meteor;
- As of 9 September 2021, ComReg has commenced 79% of the Lots won by Dense Air Ireland Limited ("Dense Air"); and
- As of 9 September 2021, ComReg has commenced 77% of the Lots won by Vodafone. For 2% of Vodafone's Lots not yet commenced, ComReg offered to commence those Lots in July 2018 but this was declined by Vodafone.

[96] S.I. No. 532 of 2016

3.93 ComReg will continue to engage with Winning Bidders and Existing Licensees in order to develop and implement appropriate Localised Transition Plans in line with the principles of the Transition licensing framework. Additionally, ComReg will commence Lots for Winning Bidders as they become available following the completion of any necessary Transition Activities.

3.94 ComReg will continue to publish its annual 3.6 GHz Band Transition Progress Reports until such time as all transition activities have been completed.[97]

3.6 GHz Band Spectrum Lease Licences

3.95 To date ComReg has issued seven 3.6 GHz Band Spectrum Lease Licences to Imagine for the lease of 3.6 GHz Band Spectrum from Dense Air, Meteor, 3IRL, and Vodafone.

3.96 Further information on those 3.6 GHz Band Spectrum Lease Licences can be found at https://www.comreg.ie/industry/radio-spectrum/licensing/search-licence-type/spectrum-lease-licences/

3.2.13 Other means of monitoring MNO compliance with coverage obligations

3.97 As part of MBSA 2021, ComReg consulted on the measuring and monitoring of coverage obligations for the 700 MHz Band.

3.98 Following careful consideration of the submissions received in response to Documents 19/59R and 19/124, ComReg set out in paragraphs 8.119 to 8.120 of its Decision, Document 20/122, the principles by which it will measure and monitor coverage obligations in the 700 MHz Band following the completion of MBSA 2021.

3.2.14 Updated Memoranda of Understanding

3.99 Ireland utilises Memoranda of Understanding (MoU) between regulators to facilitate the use of the radio spectrum resource in at national borders.

[97] Previously published 3.6 GHz Band Transition Progress Reports:
- 3.6 GHz Band Transition Progress Report 2019 – ComReg 19/115
- 3.6 GHz Band Transition Progress Report 2020 – ComReg 20/117

3.100 On the 1 May 2020 ComReg agreed an updated land mobile MoU[98] with Ofcom (UK)[99]. This MoU covers the bands used for the provision of public mobile service and was updated to include new technologies such as New Radio (NR) (5G) parameters across various bands.

3.101 On the 4 August 2021 ComReg and Ofcom (UK) agreed a MoU covering the use of the scanning telemetry band in the UHF Frequency Range 456.9875 - 458.5 MHz / 462.4875 - 464.0 MHz. This MoU facilitates frequency coordination between Ireland and the United Kingdom for Scanning Telemetry Networks.

3.3 Broadcasting services

3.102 ComReg's work plan items for the Broadcasting Service for the period 2019 – 2021 was to:

i. Assist the Department of Communications, Climate Action and Environment (DCCAE)[100], RTÉ and 2rn[101] as appropriate in facilitating the migration of Digital Terrestrial Television (DTT) services from the 700 MHz Band by 4 March 2020;

ii. Continue to manage and oversee the cost recovery mechanism for the migration of DTT services below the 700 MHz Band;

iii. Continue to engage in the international coordination of broadcasting transmitter stations;

iv. Issue and amend DTT, Digital Sound Broadcasting (DSB) and Analogue Sound Broadcasting (ASB) broadcasting licences as requested in line with the broadcasting licensing framework; and

v. Provide advice as required to DCCAE and DTCAGSM[102] as required, in relation to spectrum for broadcasting services[103].

3.103 Regarding points (i) and (ii) above:

- RTÉ successfully migrated its DTT services from the 700 MHz Band on 4 March 2020;

[99] The Office of Communications - https://www.ofcom.org.uk/
[100] Now known as DECC
[101] "2rn" means RTÉ Transmission Network DAC (trading as 2rn)
[102] The Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media
[103] For example, the government has previously signalled an intention to revise the Broadcasting Act 2009, ComReg will assist DCCAE staff as appropriate.

- The final payment to RTÉ in relation to the cost recovery mechanism was made by DTCAGSM (Broadcasting formally transferred from DCCAE) in Q4 2020 (November); and

3.104 In relation to bullets (iii), (iv) and (v) above, this work continues and will be carried over in this strategy period.

3.105 Further, ComReg observes that RTÉ ceased operation of its Digital Audio Broadcasting (DAB) services on 31 March 2021. Consequently, there are currently no DAB services offered in Ireland.

3.4 Terrestrial Fixed Services

3.106 A Radio Link (or "Fixed Link") is a wireless connection for the transmission of information between two or more fixed locations using electromagnetic waves[104]. Radio Links can provide an alternative or a complement to copper cables or fibre. They are used for a variety of applications, including backhaul for mobile network base stations, distributing TV signals from studios to broadcast transmitter sites, providing direct voice or data connection to end users and connecting nodes within private or corporate communication networks.

3.107 Radio Links are currently operated in Ireland under three different licensing models:

- Individual Fixed Links Regime[105];
- 26 GHz National Point-to-Point Block Regime[106]; and
- Licence-exempt Radio Links[107].

3.4.1 The Individual Fixed Links Regime

3.108 The individual Fixed Links regime is governed by the S.I. No. 370 of 2009 – Wireless Telegraphy (Radio Link Licence) Regulations, 2009 ("the 2009 Regulations"), while the associated Guidelines document[108] provides information on the technical requirements for Fixed Links, the licence application process; and licensing information.

[104] Fixed Links in the context of this review refers to Fixed Wireless Services, such as voice or data traffic, delivered by Fixed Links between specified geographic locations. Fixed Service is defined by the International Telecommunication Union ("ITU") as a radiocommunication service between specified fixed points.
[105] http://www.irishstatutebook.ie/eli/2009/si/370/made/en/pdf
[106] http://www.irishstatutebook.ie/eli/2018/si/158/made/en/pdf
[107] https://www.comreg.ie/publication-download/permitted-short-range-devices-in-ireland-3
[108] https://www.comreg.ie/media/dlm_uploads/2017/06/ComReg-0989R2.pdf

3.109 ComReg currently grants two types of individual Fixed Link licences:

- Point-to-Point[109] ("P-P") Fixed Links are typically used within telecommunications core networks, a broadcast contribution and distribution links. Such links may also be used as small cell backhauling within local access networks to connect access points such as Radio Local Area Network ("LAN") hotspots and cells to the core network; and

- Point-to-Multipoint[110] ("P-MP") Fixed Links are normally used within access networks, enabling network operators to provide services without the need to install conventional cables. A P-MP network topology provides a communication route (on a single radio channel for each sector) from one central point to several terminals where users are located. Each user location may be served directly from the central location or via one or more radio repeaters.

3.110 During the 2016 - 2021 period, the demand for P-P links continued to grow and there were 14,256 live fixed P-P licences as of 30 June 2021 as shown in Figure 16. However, the demand for P-MP licences continues to decline with 22 live licences[111] on 30 June 2021 as shown in Figure 17. The notable decrease for P-MP licences during the 2018-2019 operating year was due to the ESB cancelling a number of their P-MP licences.

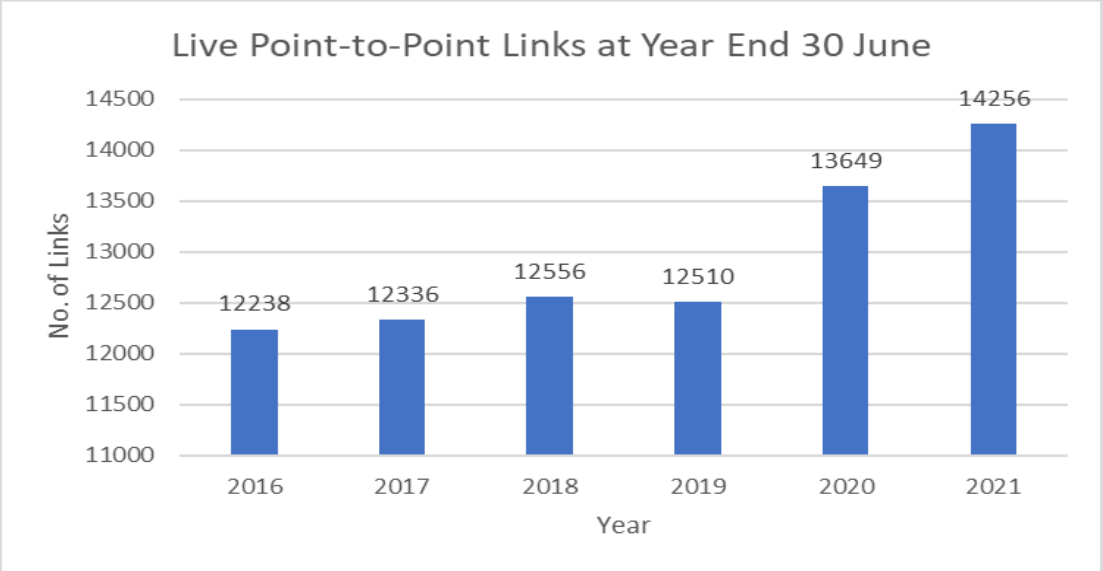


Figure 16: Live Point-to-Point Fixed Links at Year End 30 June

[109] A wireless system connecting two fixed geographic locations.
[110] A wireless system connecting more than two fixed geographic locations
[111] 20 P-MP live licences are for spectrum rights of use in the 2 GHz band and 2 P-MP live licences in the 28 GHz band.

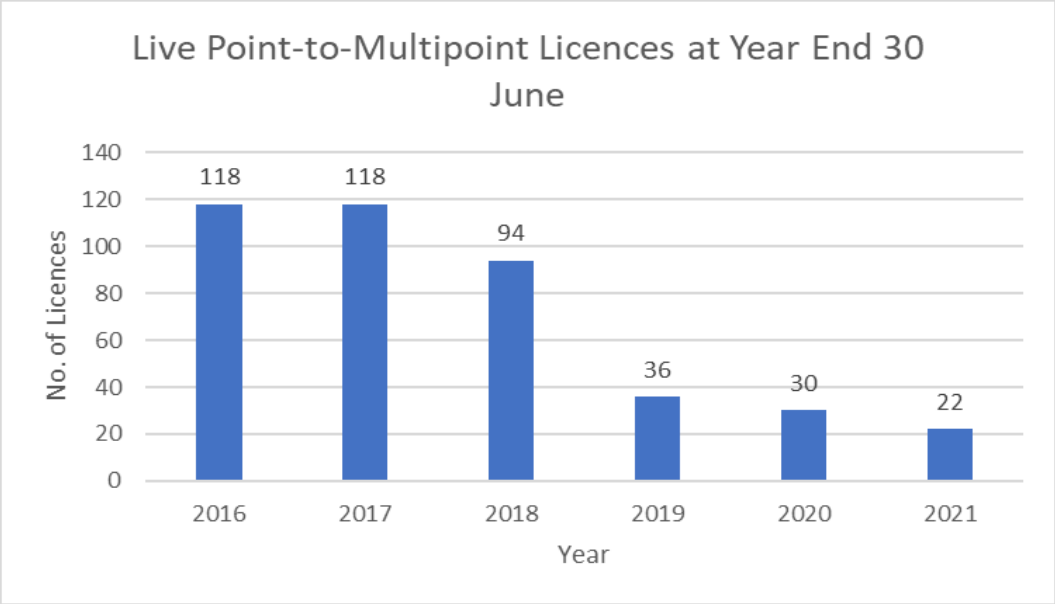


Figure 17: Live Point-to-Multipoint Licences at Year End 30 June

3.4.2 Review of Current Work Items

3.111 In its 2019-2021 Strategy Statement, ComReg identified the following spectrum work items for radio links:

- Review the technical guidelines to enable longer fixed link path lengths with lower modulation and availability requirements;
- Examine the opening of new frequency bands for fixed radio links; and
- Review the current fixed radio link licensing regime, which would include considering the future use of certain frequency bands and the current fixed radio link regulations[112].

3.4.3 Review of the Fixed Radio Links Licensing Regime

3.112 In 2020, ComReg commenced a project to review its Fixed Radio Links licensing regime and associated frequency bands incorporating the three work items identified above ("The Fixed Links Review").[113]

3.113 On 9 November 2020, ComReg published its preliminary consultation document ("ComReg Document 20/109[114]") and accompanying consultant's report ("ComReg Document 20/109A[115]). The preliminary consultation document and accompanying consultant's report considered:

[112] S.I. No. 370/2009 - Wireless Telegraphy (Radio Link Licence) Regulations, 2009
[113] https://www.comreg.ie/media/2021/05/Action-Plan-Ye-300621-Update-as-at-14-May-2021.pdf
[114] https://www.comreg.ie/publication/review-of-the-fixed-radio-links-licensing-regime
[115] https://www.comreg.ie/publication/consultants-report-fixed-links-bands-review

- the existing and potential use cases (i.e. those with the potential to evolve and/or emerge over the foreseeable future) for the current Fixed Link Bands, and potential use cases for the Candidate Bands in Ireland;
- recent trends in demand for all use cases identified nationally and internationally and forecast the likely demand for each use case over the foreseeable future in Ireland; and
- the need for any of the Fixed Link Bands and/or Candidate Bands to be made available for, or reallocated from, some or all of the use cases identified.

3.114 The Fixed Links Review is a multi-year project and the next consultation stage (including the responses to the preliminary consultation) and consultants' report is due for publication in Q3 2021 wherein ComReg intends to consider amongst other things:

- The submissions received in response to ComReg Documents 20/109 and 20/109A;
- Consideration of new frequency band for fixed radio link applications;
- A review of the technical guidelines for fixed radio links;
- The design of a future licensing framework for fixed links that best provides for efficient assignment and use in each of the frequency bands; and
- A consideration of methodologies, including the current one, to set fees for fixed links including an evaluation of their relative strengths and weaknesses in ensuring the efficient assignment and use of the radio spectrum.

3.4.4 Fixed Radio Links Annual Reports

3.115 ComReg published its first Fixed Radio Link Annual Report (ComReg document 19/89[116]) in 2019. This was followed by a subsequent report in ComReg document 20/93[117] in 2020.

3.116 The purpose of the Fixed Radio Links annual reports is to provide the most up to date information regarding the licensing of fixed radio links granted under S.I. 370 of 2009.

3.117 The Fixed Radio Links annual reports set out amongst other things the:

- background of fixed radio links deployment in Ireland;

[116] https://www.comreg.ie/publication/fixed-radio-links-annual-report-for-2019
[117] https://www.comreg.ie/publication/fixed-radio-links-annual-report-2020

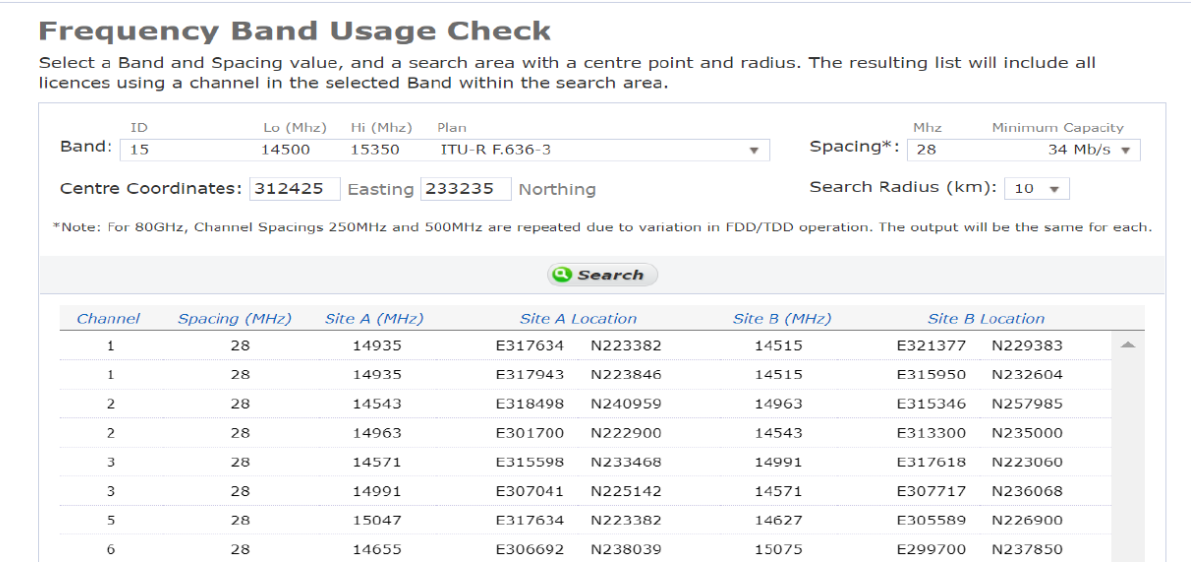
- the licensing regime for fixed radio links in Ireland;
- current demand and trends for individual fixed radio links licences across all the frequency bands;
- related ComReg work items; and
- CEPT's[118] current fixed service work programme.

3.118 ComReg has received positive feedback from stakeholders regarding the publication of these reports and is happy to continue to provide its annual fixed links report.

3.4.5 Availability of Fixed Link Data on eLicensing

3.119 In 2020, ComReg introduced a frequency band usage checker and a mapping graphical user interface ("GUI") on its eLicensing website to provide more information to applicants to assist them with their network planning.

3.120 The purpose of the checker is to enable applicants to view the number of links by band and bandwidth within a 1km, 5km or 10km radius of a proposed site before applying for a licence (Figure 18).



Frequency Band Usage Check

Select a Band and Spacing value, and a search area with a centre point and radius. The resulting list will include all licences using a channel in the selected Band within the search area.

	ID	Lo (Mhz)	Hi (Mhz)	Plan		Mhz	Minimum Capacity
Band:	15	14500	15350	ITU-R F.636-3	Spacing*:	28	34 Mb/s

Centre Coordinates: 312425 Easting 233235 Northing Search Radius (km): 10

*Note: For 80GHz, Channel Spacings 250MHz and 500MHz are repeated due to variation in FDD/TDD operation. The output will be the same for each.

Search

Channel	Spacing (MHz)	Site A (MHz)	Site A Location		Site B (MHz)	Site B Location	
1	28	14935	E317634	N223382	14515	E321377	N229383
1	28	14935	E317943	N223846	14515	E315950	N232604
2	28	14543	E318498	N240959	14963	E315346	N257985
2	28	14963	E301700	N222900	14543	E313300	N235000
3	28	14571	E315598	N233468	14991	E317618	N223060
3	28	14991	E307041	N225142	14571	E307717	N236068
5	28	15047	E317634	N223382	14627	E305589	N226900
6	28	14655	E306692	N238039	15075	E299700	N237850

Figure 18. ComReg's Frequency Band Usage Checker Grid View

[118] https://www.cept.org/

3.121 The mapping GUI allows applicants to view the location and direction of licensed links at sites prior to submitting an application for a fixed link licence (Figure 19). This information can be particularly useful in determining which frequency bands and geographic locations may be suitable for a potential fixed radio link, or where there may be potential congestion.

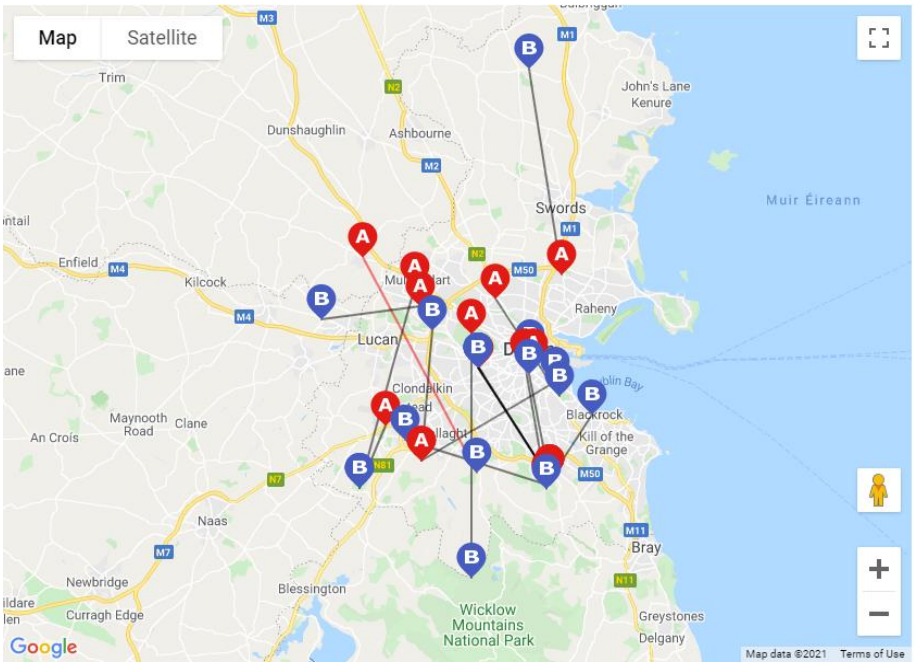


Figure 19: Example of ComReg's Frequency Band Usage Checker Map View

3.122 The availability of fixed link information on eLicensing has been well received by applicants and ComReg will continue to develop eLicensing and ComReg's website during the 2022-2024 period.

3.5 Licence-Exempt Short-Range Devices

3.123 Short Range Devices ("SRDs") occupy a range of frequency bands ranging from very low frequencies (kHz) to microwave frequencies (GHz). Due to their low power and localised usage, SRDs are generally regarded as having a low capability of causing interference. This is confirmed by extensive compatibility analysis studies which consider all the existing systems in the bands being considered. Consequently, SRDs have generally been made exempt from the need for individual licences, subject to compliance with certain technical conditions.

3.124 SRDs include devices such as inductive applications, model control, road transport and traffic telematics ("RTTT") systems, cordless telephones, alarms, field disturbance and Doppler apparatus ("FDDA") systems, wireless microphones, and wireless local area networks ("WLANs").

3.125 SRDs complying with the requirements set out in ComReg Document 02/71, as amended, may be operated without the need for an individual user licence in Ireland. Such requirements include that all SRDs operate on a non-interference and non-protected basis, and that all SRDs placed on the Irish market comply with the RE Directive.

3.126 The Internet of Things ("IoT") refers to a network comprised of physical objects (such as people and machines) capable of gathering and sharing information. Many current IoT deployments, such as Sigfox and LoRa, fall into the category of SRDs and operate in the licence-exempt frequency ranges. Other IoT technologies, include NB-IOT or LTE-M.

3.127 It is widely expected that the deployment of IoT, including Intelligent Transport Systems ("ITS") and machine to machine ("M2M"), will increase over time and that this will impact economic growth and social development.

3.128 ComReg's work plan for Licence-Exempt Short-Range Devices ("SRDs") for the period 2019 – 2021 was to:

- Continue to facilitate the use of SRDs in Ireland in line with international harmonisation measures and revise ComReg Document 02/71R in a timely manner following EC and ECC harmonisation updates to facilitate the introduction of new SRDs;
- Monitor the outcome of CEPT studies on the feasibility of extending the use Radio Local Area Networks ("RLANs") to the 5925 – 6425 MHz Band for the provision of WBB services; and
- Monitor, contribute to and promote Ireland's spectrum management position in relation to IoT.

3.129 In April 2020, ComReg published Revision 12 of Document 02/71 on the permitted short-range devices in Ireland. A summary of the amendments is listed below:

- Implementation of Decision (EU) 2019/1345 - this included among other things, updates to non-specific devices, medical implants, Transport and Traffic Telematics devices in the 76-77 GHz Band and Wideband Data Transmission devices in the 57-71 GHz Band; and
- Implementation of Decision (EU) 2019/785 - EU Decision on the Harmonisation of radio spectrum for equipment using ultra-wideband technology.

3.130 In November 2020, the CEPT adopted and published ECC/DEC (20)01 on the harmonised use of the frequency band 5945-6425 MHz (6 GHz Band) for Wireless Access Systems including Radio Local Area Networks (WAS/RLAN). In July 2021, the European Commission also published its Implementing Decision of (04)08 on the harmonised use of radio spectrum in the 5 945-6 425 MHz frequency band for the implementation of wireless access systems including radio local area networks. ComReg published Revision 13 of document 02/71[119] in July 2021 implementing that decision.

3.5.1 LoRa technology in the 900 MHz Band

3.131 In ComReg Document 18/118, ComReg outlined its intention to consult on potential deployment of LoRa[120] technology in the 900MHz Band. However, and since that time, non-specific short-range devices (including LoRa devices) can now operate on a licence-exempt basis in Ireland in the frequency ranges 862-874.4 MHz and 915-919.4 MHz. This removed the need for the intended consultation.

3.132 As set out in ComReg Document 02/71R13, the frequency ranges 862-874.4 MHz and 915-919.4 MHz are designated for use on a licence-exempt basis by non-specific short-range devices (including LoRa devices). Non-specific short-range devices must operate in compliance with technical parameters as set out in Table 1 of 02/71R13, as amended.

3.6 Satellite Services

3.133 Satellite communications provide a variety of applications such as:

- Broadcasting services such as direct-to-home multichannel television and satellite digital radio;
- Satellite news gathering;
- Satellite broadband;
- Mobile and fixed telecommunications (satellite phones and intercontinental telecommunications links);
- Meteorological services; and
- Space research, earth exploration service (EES) applications

[119] https://www.comreg.ie/publication-download/permitted-short-range-devices-in-ireland-4

[120] LoRa – Long Range, low power wireless communications.

3.134 In addition, satellite networks play a vital role in aeronautical and maritime safety by enabling the provision of services such as detection of Emergency Position indicating Radio Beacons (EPIRBs), radio navigation (global positioning systems) and global flight tracking.

3.135 In its 2019 – 2021 Strategy Statement, ComReg identified the following work plan items concerning satellite networks and services:

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

ii. Monitor compliance by MSS with CGC operators with the conditions of EC Decision 2007/98/EC; and

iii. Conduct a review of the existing exemptions orders for Satellite Services and update, amend and/or implement new exemptions as appropriate. Subject to resourcing, consider authorising the use of SES below 3GHz during the strategy period 2019 -2021.

3.136 In that regard, ComReg has continued to facilitate the licensing of satellite earth stations (SES) operating in spectrum above 3 GHz with 57 live Satellite Earth Station licence as of 30 June 2021.

3.137 ComReg granted an MSS with CGC licence to Inmarsat Ventures Ltd in 2018 and a licence to Echostar Mobile Limited in 2019. ComReg intends to continue to monitor compliance of licence conditions by MSS with CGC licensees.

3.138 In 2020, ComReg conducted a review of all existing exemption orders for Terminals for Satellite Services ("TSS"), as well as any relevant harmonised ECC Decisions that provide for individual licence exemption of TSS across various frequency bands that were not yet implemented in Ireland. As a result of that review, a new exemption order, S.I. 226 of 2020[121], was made, which supersedes and repeals existing exemption orders for TSS to ensure that certain TSS can be deployed in Ireland on a licence-exempt basis.

3.139 An accompanying technical document, ComReg 20/47[122] "Permitted Licence Exemptions for Terminals for Satellite Services" was also adopted. ComReg 20/47, as amended, defines the technical and operational characteristics of TSS equipment, as set out in the relevant ECC Decisions, eligible for exemption under S.I. 226 of 2020.

[121] https://www.comreg.ie/publication/s-i-no-226-of-2020-wireless-telegraphy-act-1926-section-3-exemption-of-terminals-for-satellite-services-order-2020

[122] https://www.comreg.ie/publication/permitted-licence-exemptions-for-terminals-for-satellite-services

3.140 In 2020, ComReg commenced a project to review the current Fixed Satellite Earth Station licensing regime.[123] 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 first stage of consultation to review the satellite licencing scheme is scheduled for publication in Q4 2021.

3.7 Private Mobile Radio Services

3.141 The management of radio frequency spectrum involves licensing electronic communication networks such as Private Mobile Radio ("PMR") which provide closed user group communications. PMR continues to be a popular communication system in circumstances where groups of mobile terminals need to communicate on a "one to all" basis or where the traffic is between a control point and one or more mobile terminals.

3.142 PMR licensees do not provide electronic communication services directly to consumers. Some of the main uses are for public safety and security, public utilities (power, water, transport etc.) and industrial and commercial users such as taxi services, security firms, factories, etc. The VHF and UHF bands are generally used for PMR and are harmonised for PMR across Europe.

Licensing information

3.143 ComReg currently issues six types of PMR licences under the current regimes and permits for paging systems[124]. For further information please see https://www.comreg.ie/industry/radio-spectrum/licensing/search-licence-type/business-radio/.

3.144 Figure 20 provides information on the number of licences issued per licence type[125] from 30 June 2018 to 30 June 2021, under the current regimes. Business Radio accounts for the largest number of licences issued, with the majority of applications being licence renewals.

[123] https://www.comreg.ie/media/2021/05/Action-Plan-Ye-300621-Update-as-at-14-May-2021.pdf

[124] https://www.comreg.ie/industry/radio-spectrum/licensing/search-licence-type/business-radio/

[125] Licensees use different licences for different types of services, therefore it should be noted that the number of licences in each type is not indicative of the importance these licence types play in the everyday business of organisations who rely on them e.g Trunked radio and Telemetry licence numbers are low but these are essential for transport operators (Trunked) and utility companies (Telemetry) to provide essential services.

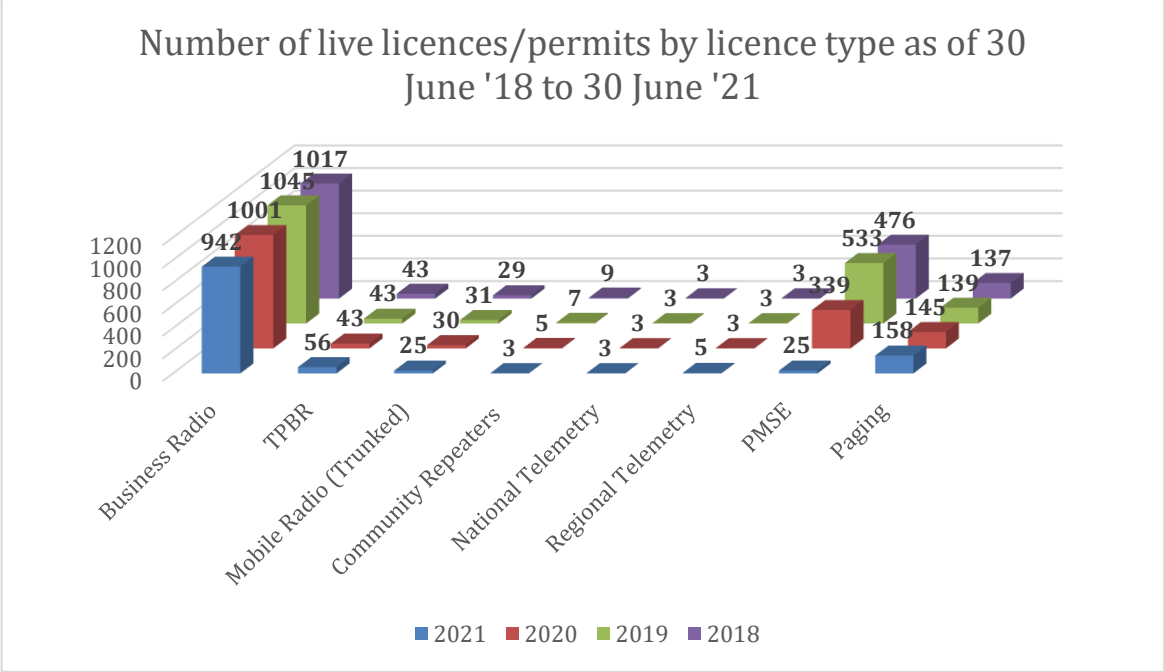


Figure 20: Number of live licences/permits by licence type as of 30 June 2018 to 30 June 2021[126]

3.145 The demand for Business Radio licences declined from 2018 to 2021 following a period of stabilisation from 2016 to 2018. The changes in demand may be a result of businesses migrating to other communication systems such as mobile phones, or to services provided by Third-Party Business Radio licensees thereby removing the need for an individual business radio licence. Nevertheless, ComReg expects that demand for licences will likely endure for some time yet. The decline in the number of PMSE licences during 2020 and 2021 can in large part be attributed to the Covid-19 pandemic.

Radio Spectrum Management Strategy Statement 2019 – 2021

3.146 In its 2019-2021 Strategy Statement ComReg identified the following work plan items for PMR:

- Conclude the consultation process on the potential award of rights of use in the 400 MHz Band and, if appropriate, implement same;
- Commence a comprehensive review of the PMR licensing regimes;
- Monitor and contribute to the spectrum management considerations of PMSE and take appropriate actions to implement harmonisation decisions;

[126] The figures for PMSE are the total figures of licences issued for the relevant 12-month period. A PMSE licence may be issued for a period of 1-day to a maximum of 6-months.

- Monitor, investigate and contribute to the spectrum management considerations in respect of broadband PPDR, noting that there are a number of generic BB-PPDR service provision options and harmonised frequency bands; and
- Relaunch the Third-Party Business Radio Licensing regime prior to the expiry of existing licences in 2021, having consulted on whether or not to keep the TPBR licensing scheme open on an ongoing basis.

3.7.1 400 MHz Band Spectrum Award

3.147 On 5 November 2019 ComReg published an Information Notice (Document 19/99[127]) setting out the results of the 400 MHz Band Spectrum Award which ComReg had commenced on 30 August 2019 with Smart Grids in mind.

3.148 Smart Grids have been identified as a key enabler in the reduction of climate emissions and to reduce the effects of climate change by international bodies such as the United Nations and the International Telecommunications Union and are referenced by the Irish Government in several documents including Project Ireland 2040, The National Mitigation Plan and the SEAI Smart Grid Roadmap.

3.149 The 400 MHz Band awarded spectrum rights of use were offered in two parts:

- Part A consisted of one 2 × 3 MHz Lot (410 – 413 MHz / 420 – 423 MHz) for the provision of wireless communications for Smart Grids; and
- Part B consisted of ten Lots of 2 × 100 kHz on a technology and service neutral basis. These Lots may be used to support Smart Grid, or for a range of other uses including Business Radio type applications.

3.150 The Award Process resulted in one Winning Bidder, ESB Networks DAC who will pay approximately €1,100,000 for its spectrum rights of use, comprising €320,000 in upfront spectrum access fees and circa €780,000 in spectrum usage fees which will be paid over the 15 year duration of the licences.[128]

3.7.2 Review of the PMR Licensing Regimes

3.151 ComReg has commenced a project to review the existing PMR licensing regimes and consult, as appropriate, on any proposed changes identified which for example could encompass licence types, use cases licence conditions, and fees. ComReg intends to publish the initial consultation document in Q2 2022.

[127] https://www.comreg.ie/publication-download/results-of-the-400-mhz-band-spectrum-award

[128] Further information on the 400 MHz Band consultation and spectrum award can be found at: https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/400mhz-band-spectrum/.

3.152 The intention of the PMR review is to futureproof the licensing regime as well as fulfilling ComReg's statutory function of managing the radio frequency spectrum[129] and ComReg's statutory objective of ensuring the efficient management and use of the radio frequency spectrum[130].

3.7.3 Programme Making and Special Events (PMSE)

3.153 PMSE allows for the use of wireless radio equipment, such as wireless cameras and wireless microphones, to aid in the production of multi-media content or the staging of live events. PMSE licences are used in the staging of live theatre, sports events and concert events as well as supporting activities such as news gathering and outside broadcasts.

A wide variety of spectrum bands are currently made available in Ireland for PMSE use under the Temporary Business Radio licensing scheme (ComReg Document 08/08R6)[131].

3.154 In its 2019-2021 Strategy Statement, ComReg stated it would monitor and contribute to the spectrum management considerations of PMSE and take appropriate actions to implement harmonisation decisions.

700 MHz Band

3.155 The 700 MHz duplex band (703-733 MHz and 758-788 MHz) is part of the Multi-Band Spectrum Award 2021.

3.156 In April 2020, ComReg published a Response to Consultation and final Decision[132] on temporary spectrum rights in the 700 MHz Band. In this, ComReg decided to temporarily grant spectrum rights of use in the 700 MHz Duplex Band for Temporary ECS licences in response to increased data traffic as a result of the Covid-19 pandemic. As set out in section 3.2 above, ComReg subsequently considered and put in place further temporary ECS licensing frameworks that included the 700 MHz Band. The current framework expires on 1 October 2021 and ComReg has recently published a consultation considering a potential further framework beyond 1 October 2021 in Document 21/87.

[129] Section 10(1)(b) of the Communications Regulation Act 2002, as amended.
[130] Section 12(1)(b) of the Communications Regulation Act 2002, as amended.
[131] ComReg Document 08/08R6 - Guidance Notes: Radio Licensing for Programme Making and Special Events use in Ireland
[132] ComReg Document 20/27

3.157 Certain PMSE systems such as wireless microphones and In-ear Monitors (IEM) have until recently shared the 700 MHz frequency Band with Digital Terrestrial Television (DTT). Therefore, ComReg subsequently updated the interleaved guidance document for PMSE applicants, along with ComReg's online system eLicensing, to reflect both the 700 MHz migration and the temporary grant rights of use in the 700 MHz Duplex Band.

3.158 To date, Ireland has not experienced a shortage in available spectrum for PMSE. However, given the demand for spectrum by other uses, the spectrum demands of PMSE may need further consideration over the coming years, including the implementation of any future PMSE-related harmonisation measures.

3.7.4 Public Protection and Disaster Relief (PPDR) services

3.159 On 14 October 2020, ComReg published Document 20/98[133] to provide consolidated information on the spectrum options for Broadband Public Protection and Disaster Relief ("BB-PPDR") in Ireland, with the aim of informing interested parties, including existing and potential licensees, of the spectrum management considerations and next steps associated with these spectrum options.

3.160 In Document 20/98, ComReg proposed to make spectrum available for BB-PPDR in the 400 MHz Band and in the 700 MHz Duplex Gap and 700 MHz Guard Bands as detailed in section 1.3 of Document 20/98. ComReg outlined its understanding that each of the proposed three BB-PPDR spectrum options was under active consideration the OGCIO and that further investigations, including the possibility of tests in a real-life environment, were envisaged before the OGCIO would be in a position to indicate its BB-PPDR spectrum preferences and timing.

3.161 Cognisant of the OGCIO's active consideration of each of the three BB-PPDR spectrum options, and ComReg's objective to ensure the effective management and efficient use of radio spectrum, ComReg outlined that next steps would include:

- endeavouring to accommodate new applications for Trunked Radio systems in the 417 – 418.9875 MHz / 427 – 428.9875 MHz part of the 400 MHz Band, or some other suitable frequency band, and not in 415.7750 – 417 MHz / 425.7750 – 427 MHz range;
- renewing existing Trunked Radio licences in the 415.7750 – 417 MHz / 425.7750 – 427 MHz range as normal in the short-term but that going

[133] ComReg Documents 20/98 – Broadband Public Protection and Disaster Relief (BB-PPDR) Spectrum Options: October 2020 Update – published 14 October 2020

forward and subject to further clarity being available on the State's BB-PPDR requirements for the 400 MHz Band, there may be a need to re-license them to the 417 – 418.9875 MHz / 427 – 428.9875 MHz part of the 400 MHz Band, or some other suitable frequency band; and

- continuing to engage with the OGCIO in relation to the State's likely BB-PPDR spectrum requirements to inform any spectrum management considerations that ComReg may have in relation to same.

3.162 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.

3.7.5 Third-Party Business Radio Licensing regime

3.163 In 2005, ComReg introduced a flexible and cost-effective licensing scheme for Third Party Business Radio ("TPBR"), using frequencies in the VHF (150-170 MHz) and UHF (450-470 MHz) bands. TPBR licences are generally held by radio equipment suppliers to provide commercial radio services to third-parties, providing the business radio community with a versatile service offering that can be tailored to meet the short term or longer term needs of individual users.

3.164 ComReg's current Strategy Statement, notes that the demand for TPBR licences has grown steadily since it first opened in 2005. Consequently, ComReg committed to consulting on the reopening of the TPBR licensing scheme during the 2019 – 2021 period, while also promising to review the wider PMR licensing schemes.

3.165 Following a public consultation[134], the TPBR licensing scheme was reopened in September 2020, where ComReg decided to:

i. retain the current number of VHF channels;

ii. provide an additional ten UHF channels, given the demand for UHF channels;

iii. accept applications for TPBR licences, for all channels that are currently licensed, one month prior to licence expiry;

iv. provide one month for interested parties to prepare licence applications;

v. place no limits on (a) the number of TPBR licences which could be granted to any one applicant; or (b) the number of channels which could be assigned in any one TPBR licence; and

[134] https://www.comreg.ie/publication/third-party-business-radio-consultation-on-re-opening-the-third-party-business-radio-scheme

vi. grant 5-year TPBR licences until all available channels have been assigned or until 30th November 2022, whichever is the earliest, and that, in any event, the TPBR licensing scheme will close at midnight on 30 November 2022. ComReg considers that this should ensure that all TPBR licences would terminate within a clearly defined period, which would facilitate reviewing all PMR licensing schemes as part of a separate work item which will begin in Q2 2021.

3.166 Since reopening the scheme, there has been increase the amount of TPBR licences issued. ComReg has granted licences for 48 channels, each of 12.5 kHz bandwidth, to 14 different licensees. There are 10 VHF channels and 54 UHF channels available in the regime, with 4 VHF and 12 UHF channels currently unassigned. The demand for TPBR licences is shown in Figure 21**Error! Reference source not found.**.

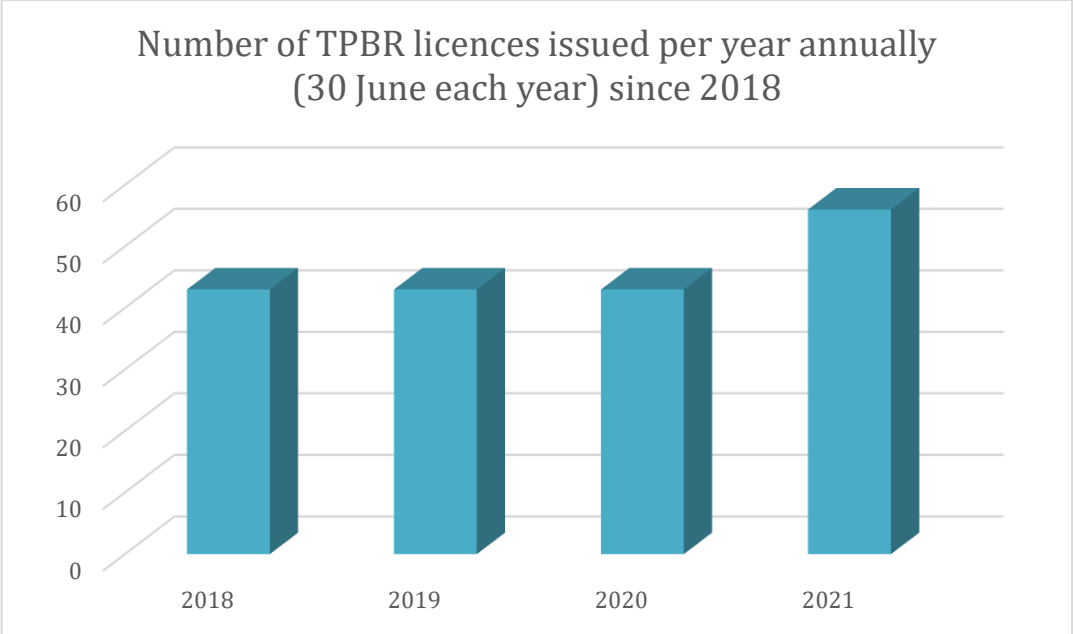


Figure 21: Number of TPBR licences issued annually (30 June each year) since 2018

3.8 The Radio Amateur Service

3.167 The amateur service and amateur-satellite service was established by the International Telecommunication Union (ITU), through the International Telecommunication Regulations, as "a radiocommunication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest"[135].

[135] See 1.56 of the ITU Radio Regulations, edition of 2020.

3.168 ComReg's Amateur Station licensing regime allows suitably qualified persons, known as radio amateurs, to use radio equipment for the purpose of conducting experiments and communicating via wireless telegraphy. A variety of radio spectrum bands have been allocated to the service within the International Table of Frequency Allocations, as set out in ComReg Document 20/58R2.

3.169 Currently, there are over 2000 radio amateurs licensed by ComReg. Figure 22 shows the demand for spectrum for Amateur use has remained popular.

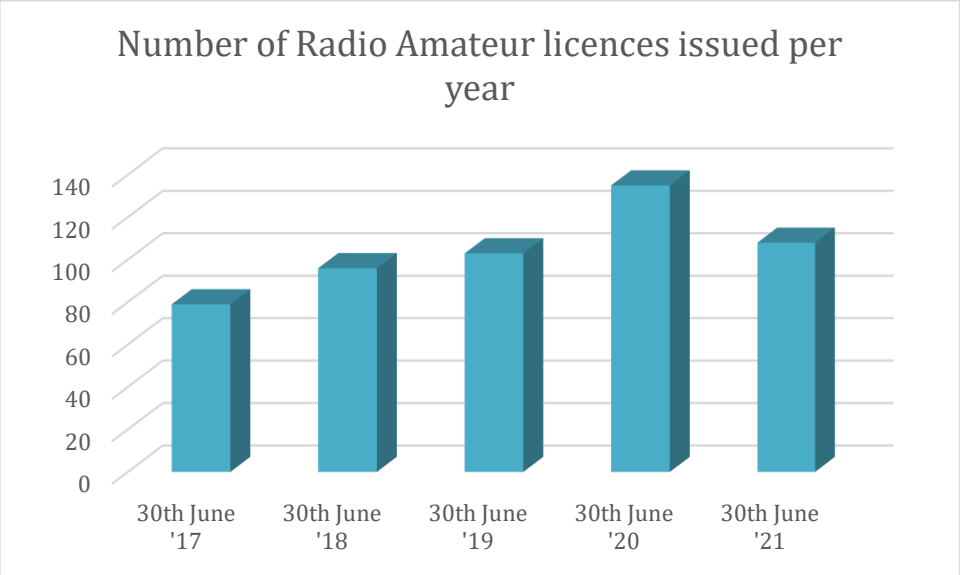


Figure 22. Number of Radio Amateur issued per year as of 30th June '17 to 30th June '21

The qualification process involves an examination based on the Harmonised Amateur Radio Examination Certificate[136] (HAREC) standard as set down by CEPT. The Irish Radio Transmitter Society[137] ("IRTS") kindly manage these examinations on behalf of ComReg. **Error! Reference source not found.** below shows the continuing demand for radio amateur certification in Ireland. The low numbers recorded so far for 2021 reflects the lack of public events permitted due to Covid-19.

Year	Total Number of Candidates
2017	43
2018	47

[136] Recommendation T/R 61-02 - Harmonised Amateur Radio Examination Certificate – Feb 2018 and available at www. ecodocdb.dk
[137] See the IRTS website for more information www.irts.ie

Year	Total Number of Candidates
2019	50
2020	60
2021	4

Table 2: No. of candidates per year that sat a radio amateur exam

3.170 In its 2019-2021 Strategy Statement, ComReg identified the following work plan item for radio amateur services:

- Consider allocating the 76-81 GHz, 134-141 GHz and 241-250 GHz bands to the Amateur Service in Ireland – which would align the Irish Table of Frequency Allocations with the European Common Allocation table and the ITU Radio Regulations[138].

3.171 ComReg intends to carry this work item forward for implementation in the 2022-2024 strategy period. This will require an update to the Radio Frequency Plan for Ireland and an update of the amateur station licence guidelines. Please see section 5.2.9 for further items under consideration regarding the Radio Amateur Service.

3.172 The current agreement with the IRTS for the setting, organising and correcting examinations for the Harmonised Amateur Radio Certificate is due to expire on the 21 December 2021. In advance of the expiry of the agreement, ComReg intends to publish an invitation to participate in a tender process for parties interested in administrating the HAREC examinations in Ireland according to CEPT ECC REC T/R 61-02.[139] The invitation to participate document will be published on ComReg's website in due course.

[138] https://www.itu.int/en/publications/ITU-R/pages/publications.aspx?parent=R-REG-RR-2020&media=electronic
[139] https://docdb.cept.org/download/e4b9c459-5726/TR61-02.pdf

3.9 Aeronautical, Maritime and Scientific Services

3.9.1 Aeronautical Services

3.173 The safety and efficiency of air transport is dependent on navigation and communication services that use radio frequencies. Since the bulk of air travel is international by nature, most of the radio spectrum that is used by the aeronautical sector must be planned internationally. In Ireland, the regulation of the aviation industry is the responsibility of the Irish Aviation Authority ("IAA")[140]. ComReg's role in this area is limited to the issuing of radio licences for equipment onboard the aircraft and for ground-based aeronautical transceivers, radars and radionavigation systems.

3.174 In its 2019 – 2021 Strategy Statement, ComReg identified the following work plan item concerning the aeronautical services:

- Continue 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.

3.175 ComReg issues licences for radio equipment on-board Irish aircrafts under the Wireless Telegraphy (Aircraft Station Licence) Regulations 2009 (S.I. 193 of 2009)[141]. In doing so, ComReg liaises closely with the Irish Aviation Authority ("IAA") which has the overall responsibility for the regulation of aeronautical services in Ireland.

3.176 Figure 23 below identifies the number of active aircraft radio licences in recent years. As of June 2021, there were 1566 [142] licensed aircraft radio licences in Ireland representing a 2.3% increase since 2020. The marked decrease from the 2019 – 2020 period is due to licensees cancelling licences for Aircraft Stations when they are notified by ComReg of their 5-year notifications[143]. The aircraft which were licensed may have be decommissioned or re-registered in another jurisdiction which would result in the cancellation of the Aircraft Station licence issued by ComReg.

[140] https://www.iaa.ie/
[141] http://www.irishstatutebook.ie/eli/2009/si/193/made/en/print
[142] https://www.comreg.ie/industry/radio-spectrum/licensing/statistics/
[143] In accordance with the conditions of the Aircraft Station licence, all licensees are required to confirm to ComReg each and every 5 years through the eLicensing website, that their licence details are up to date and correct.

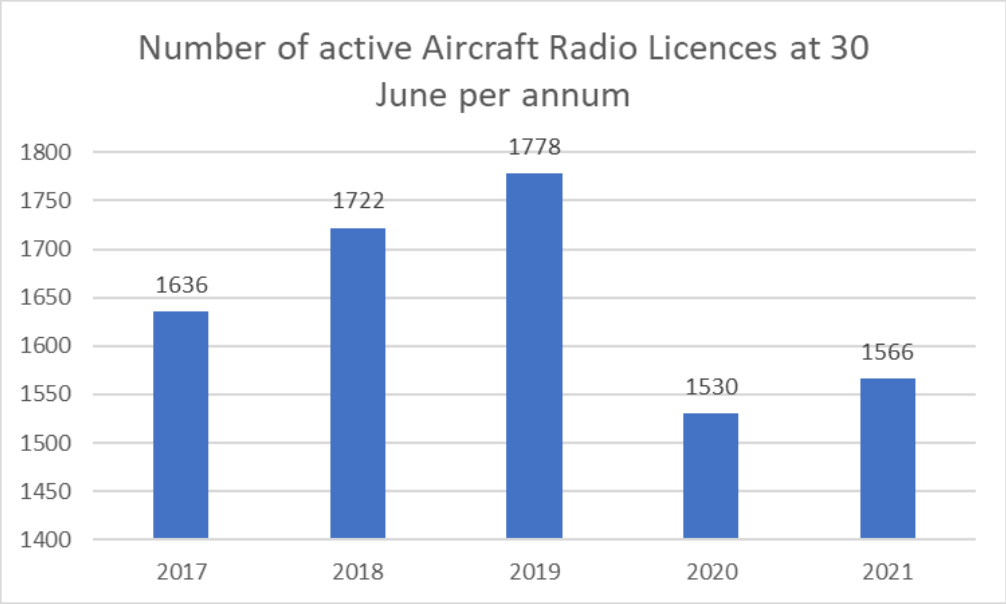


Figure 23: Number of active Aircraft Radio Licences at 30 June per annum [144]

3.177 In respect of ground-based equipment used in the support of aeronautical service, ComReg has a regime in place to license radars, beacons and air traffic operations[145]. The number of licences issued for such operations have remained consistent since 2009 when the regime was first established as seen in Figure 24.

[144] Years are assessed on a July to June basis (e.g. 2015 refers to July 2015 – June 2016).
[145] ComReg Document 11/07 – Guidelines for Radiodetermination, Air Traffic and Maritime services licences.

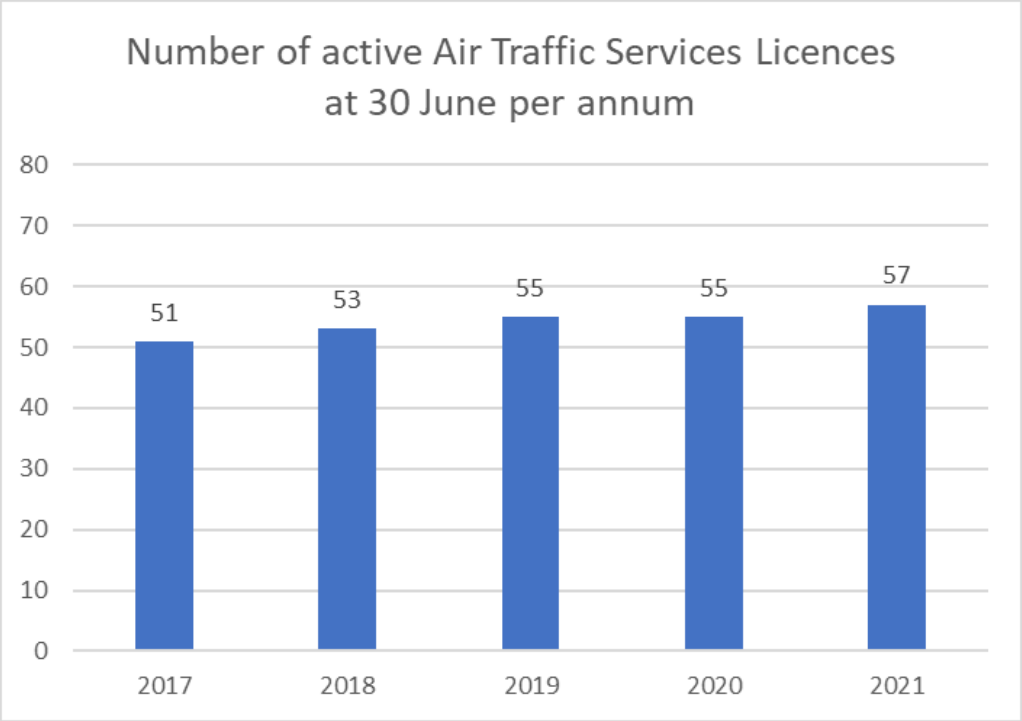


Figure 24:Number of active Aircraft Traffic Services Licences at 30 June per annum[146]

3.9.2 Maritime Services

3.178 The Maritime Radio Affairs Unit ("MRAU") of the Department of Transport is responsible for radio communication equipment used on on-board vessels.

3.179 ComReg is responsible for the licensing of equipment and systems (utilising wireless telegraphy apparatus operating in the maritime frequency bands) which are not installed on-board vessels.

3.180 There are 67 maritime services licences in force in Ireland issued to various bodies, such as yacht clubs, ports and the Commissioner of Irish Lights. Maritime services licences are issued for the lifetime of the apparatus and the number of licences granted is broadly unchanged since the introduction of this licensing scheme in 2009.

3.9.3 Scientific Services

3.181 Radio spectrum is used for a wide range of applications that operate under the description of "scientific services", including radio astronomy, earth exploration-satellite services ("EESS"), space research and meteorological aids.

[146] Years are assessed on a July to June basis (e.g. 2015 refers to July 2015 – June 2016).

3.182 In Document 18/118, ComReg identified the following work plan items for the 2019-2021 period.

3.183 Continue to liaise and assist relevant stakeholders, including universities and other third level institutions, to encourage and ensure efficient use of spectrum and to promote Ireland's interests at international fora;

- Consider developing an appropriate licensing mechanism for apparatus used for scientific services by third level institutions; and
- Consider whether it is possible to promote and potentially establish "quiet zones" for particular frequency bands around specific areas of radio spectrum research (such as Birr Castle).

3.184 ComReg has continued to liaise and assist relevant stakeholders and has promoted Ireland's interests at international fora. However, due to resource constraints, ComReg was unable to allocate time to considering the development of an appropriate licensing mechanism for apparatus used for scientific services by third level institutions, or whether it is possible to promote and potentially establish "quiet zones" for particular frequency bands around specific areas of radio spectrum research.

3.185 ComReg intends to consider these work plan items as part of its proposed radio spectrum strategy work plan for 2022-2024.

3.10 Defence Forces Use of Spectrum

3.186 Defence forces have actively utilised radiocommunications from the earliest days and their use of radio spectrum is considered critical to national security.

3.187 There are no specific service allocations for defence applications in the ITU Radio Regulations because defence communications are recognised as the prerogative of each sovereign nation. The Irish Defence Forces, comprising the army, naval service and air corps, use radio in a variety of ways, most notably in relation to maritime, aeronautical and tactical applications. In accordance with the 1926 Act, apparatus for wireless telegraphy kept by or in the possession of the Minister for Defence, for the purpose of the Defence Forces, does not require a licence.

3.188 In its 2019-2021 Strategy Statement, ComReg identified the following work plan items concerning the Defence Forces use of spectrum:

- Maintain awareness of international developments, particularly in CEPT through the Civil-Military Frequency Management Forum - which brings together civil and military spectrum managers across Europe - to address issues of mutual interest;

- Continue to liaise with the Irish Defence Forces as required to resolve issues of mutual concern; and
- Explore with the relevant authorities opportunities to further enhance spectrum efficiency.

3.189 ComReg has continued to maintain contacts with the Irish Defence Forces to ensure that matters of common interest can be discussed and issues of interference and management of spectrum can be addressed effectively.

Chapter 4

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

4.1 A wide range of factors affect the demand for and the supply of radio spectrum including: end-user demand, technology changes or advancements, the international harmonisation of radio spectrum, and relevant national or international policies.

4.2 These factors also influence each other. For example, increasing end-user demand for a service incentivises advancements in technologies used to provide these services and the development of international harmonisation measures or national/international policies, and vice versa.

4.3 In this chapter, ComReg discusses various factors which have informed its draft radio spectrum work plan for 2022 to 2024, 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.

4.1 International harmonisation of radio spectrum

4.4 The international harmonisation process plays a key role in determining the demand for and the supply of radio spectrum, given its benefits in terms of facilitating economies of scale in the manufacture of radio equipment (which lowers both the cost of deploying wireless networks and the cost of wireless devices for consumers), and the minimisation of interference between users.

4.5 International harmonisation, and the benefits provided by it are particularly important for countries with a small population, such as Ireland, and, therefore, limited ability to affect the technology roadmaps adopted by often global suppliers of radio equipment.

4.6 Harmonised radio spectrum measures are set by a number of bodies including the ITU (and/or the constituent regional groups), the CEPT and the EU bodies. These bodies generally set a forward-looking work programme, and this provides an indication of future harmonisation measures. For example, readers are directed to the agenda item of the ITU world radiocommunication conference (WRC) outlined below and the work plans of CEPT[147] and Radio Spectrum Policy Group (RSPG).[148] In some instances, harmonisation decisions are obligatory on Member States thereby directly increasing the supply of spectrum at a national level and usually with a defined timeframe.[149]

[147] For example, the ECC Strategic Plan for the period 2020-2025identifies the following major topics:

- To review, in line with Agenda Item 1.5 of WRC-23, the UHF band (470-960 MHz), taking into account the current use by PMSE in this band;
- Wireless broadband and connectivity, including mobile broadband, WAS/RLAN, backhaul, PMSE, verticals and use of higher frequency bands;
- Issues relating to general authorisations and licence exempt use of spectrum (e.g. SRDs, including for IoT/M2M, and other similar uses of spectrum);
- Next generation satellite systems (including mega Non-Geostationary-Satellite Orbit constellations and short duration satellites) and other initiatives which may require technical and/or regulatory conditions; and
- New business models and applications which may emerge based on the latest advances in network technologies, e.g. smaller cell sizes for 5G with appropriate backhaul infrastructure and neutral host network infrastructure models.

[148] The RSPG work programme for 2020 and beyond (RSPG20-005 Final Rev1) includes the following work items:

- Spectrum Sharing – pioneer initiatives and bands;
- Additional spectrum needs and guidance on the fast rollout of future wireless broadband networks;
- Role of Radio Spectrum Policy to help combat Climate Change;
- Peer review and Member States cooperation on authorisations and awards;
- World Radiocommunication Conference (WRC); and
- An opinion on the new EU Radio Spectrum Policy Programme (RSPP)

[149] In Europe, EU/EC decisions are obligatory on Member States, while CEPT decisions are non-binding and voluntarily adopted by its members.

4.7 In addition to the harmonisation of radio spectrum bands, the setting of harmonised radio equipment standards play an important facilitating role in spectrum management, particularly in terms of minimising the risk of interference between users. Within Europe, the main stakeholders responsible for setting these standards are the European Committee for Standardisation ("CEN"), the European Committee for Electrotechnical Standardisation ("CENELEC") and the European Telecommunications Standards Institute ("ETSI"). These bodies also work alongside national technical committees and various industry bodies. For example, the 3GPP[150] from which standards for mobile technologies (e.g. LTE, LTE+ and 5G NR) are developed.

4.8 ComReg is actively engaged in the work of the EC, the CEPT and the ITU where it has prioritised tasks and activities and where is has resources available to do so.

4.1.1 The 2019 World Radiocommunication Conference (WRC-19)

4.9 The ITU Radio Regulations form an international treaty governing the use of the radio-frequency spectrum and the geostationary-satellite and non-geostationary-satellite orbits. Under the terms of the ITU Constitution, only a world radiocommunication conference ("WRC") can:

- revise the ITU Radio Regulations and any associated frequency assignment and allotment plans;
- address any radiocommunication matter of worldwide character;
- instruct the ITU Radio Regulations Board and the Radiocommunication Bureau, and review their activities; and
- determine questions for study by the Radiocommunication Assembly and its study groups in preparation for future WRCs.

4.10 The ITU Radio Regulations are reviewed and revised at world radiocommunication conferences which are held every three to four years for this purpose. Revisions are made on the basis of an agenda item determined by the ITU Council, which takes into account recommendations made by previous world radiocommunication conferences. The general scope of the agenda of a WRC is established four to six years in advance, with the concurrence of a majority of Member States.

[150] 3GPP, or the 3rd Generation Partnership Project, was initially formed in December and is an engineering organization that develops technical specifications which are then then transposed into standards by the seven regional Standards Setting Organizations (SSOs) that form the 3GPP partnership. For Europe, ETSI is the SSO for Europe.

4.11 The 38th World Radiocommunication Conference was hosted in Egypt from 28 October to 22 November 2019. Over the month 3,400 participants attended, including delegates from most of the 193 ITU Member States as well as more than 260 members of the ITU Radiocommunication Sector ("ITU-R") representing international organizations, equipment manufacturers, network operators and industry forums, who attended as observers.

4.12 The Irish delegation[151] to WRC-19 underpinned matters of national importance by supporting the CEPT common positions on each issue as well as positions that had to be supported as determined by the European Council[152].

4.13 The outcome of WRC-19 has influenced the work plans of the relevant bodies of the EC and CEPT and consequently ComReg in the implementation of new harmonised measures where relevant.

4.14 The following are the main topics which were discussed at WRC-19 were:

- Broadband Communications (5G and Wi-Fi);
- Satellite Communications;
- Maritime and Aeronautical Communications; and
- Scientific Use of Spectrum.

Further detailed information on the discussions of these topics at WRC-19 can be found in Annex 2.

4.1.2 The 2023 World Radiocommunication Conference (WRC-23)

4.15 Delegates at the WRC-19 agreed the agenda of the next Conference in 2023, as well as the preliminary agenda for 2027. The agenda for WRC-23 sets the roadmap for important future technological developments, which will be addressed by both the ITU-R study groups and at regional level in the upcoming four years.

4.16 The agreed WRC-23 agenda contains nineteen specific and eleven standing agenda items, which will be studied in the years between WRC-19 and WRC-23. Thirteen of these agenda items originate at least partially from proposals made by the CEPT.

[151] In line with its priorities ComReg was able to contribute two staff members to the Irish delegation which as one of the smallest delegations comprised of five persons (not all in full time attendance).
[152] See: Council of the European Union - Interinstitutional File: 2019/0065(NLE), Council Decision on the position to be taken on behalf of the European Union in the International Telecommunication Union (ITU) World Radiocommunication Conference 2019 (WRC-19) – 13 June 2019.

4.17 Led by the DECC, Irish preparations for WRC-23 are underway. ComReg is involved in this work and will assist the DECC to meet the objectives and goals that will be established in the national preparatory process.

4.18 The following are the major agenda items of interest to Ireland at WRC-23 and are discussed in detail in Annex 2:

- Mobile Broadband and Broadcasting;
- Mobile Broadband Communications;
- Aeronautical Communications;
- Satellite Communications;
- Scientific Use of Spectrum; and
- Other Matters.

4.19 ComReg is actively engaged, within its resource constraints, in the work group preparing CEPT's input to WRC-23 as well as in the Radio Spectrum Policy Group which advises the European Commission on aspects of importance to the Union that will be dealt with at WRC-23.

4.2 European Commission harmonisation decisions

4.20 The adoption of EC harmonisation decisions on radio spectrum impacts ComReg's proposed work plan as these decisions generally place obligations on EU Member States to carry out specific actions as set out in the decision within specific timeframes.

4.21 This section discusses a number of:

- existing harmonisation decisions, including those relevant to:
  - Wireless Broadband ("WBB") or Mobile and Fixed Communications Networks ("MFCN"); and
  - Intelligent transport systems ("ITS") in the 5.9 GHz Band.
- future harmonisation decisions that are currently being drafted and which may influence ComReg's work plan once adopted.

4.2.1 Existing EC harmonisation decisions

Spectrum bands for WBB/MFCN

4.22 Over the period of the last strategy statement several EC harmonisation decisions for WBB were adopted as outlined at Section 3.2.4 above. ComReg has undertaken actions to implement these EC Decisions, noting among other things that:

- the MBSA 2021 award process will assign spectrum in accordance with the relevant EC decisions for the 700 MHz, 2.1 GHz, and 2.6 GHz Bands;
- 3.6 GHz licences were amended to reflect the new harmonised technical parameters for Active Antenna Systems ("AAS") at 3.6 GHz Band base stations set out in Decision (EU) 2019/235, thus enabling the licensees to take advantage of the capabilities of AAS technology for increasing capacity and coverage on their 5G networks in the 3.6 GHz Band; and
- while actions have been taken to implement the EC decisions related to the 700 MHz Guard Bands and Duplex Gap, the 1.4 GHz Band and the 26 GHz Band, ComReg has yet to finalise its consultation process for these bands, and spectrum has not yet been assigned for WBB or other purposes, (e.g. PMSE, PPDR, etc.) in accordance with these Decisions. Subject to demand and following the completion of the MBSA 2021, ComReg will continue its consultation on these spectrum bands, noting that it may also be appropriate to include other soon to be harmonised spectrum bands in that consultation.

4.23 Regarding assigning spectrum in harmonised bands for liberalised use including for WBB/MFCN purposes, ComReg is currently focused on completing the MBSA 2021 award. The successful completion of that award, will increase the total amount of harmonised spectrum available for WBB and other services by 47% from 750 MHz currently to 1100 MHz post the award, as illustrated in Figure 25 below.

4.24 This will provide operators with a significant quantum of spectrum with which to develop their networks to meet the increasing demand for faster and more advanced mobile/WBB services. The spectrum to be assigned includes sub-1GHz spectrum suitable for the provision of widespread coverage of 4G and new 5G services, as well as spectrum in bands above 1 GHz which is ideally suited to providing significant network capacity for mobile broadband and WBB services.

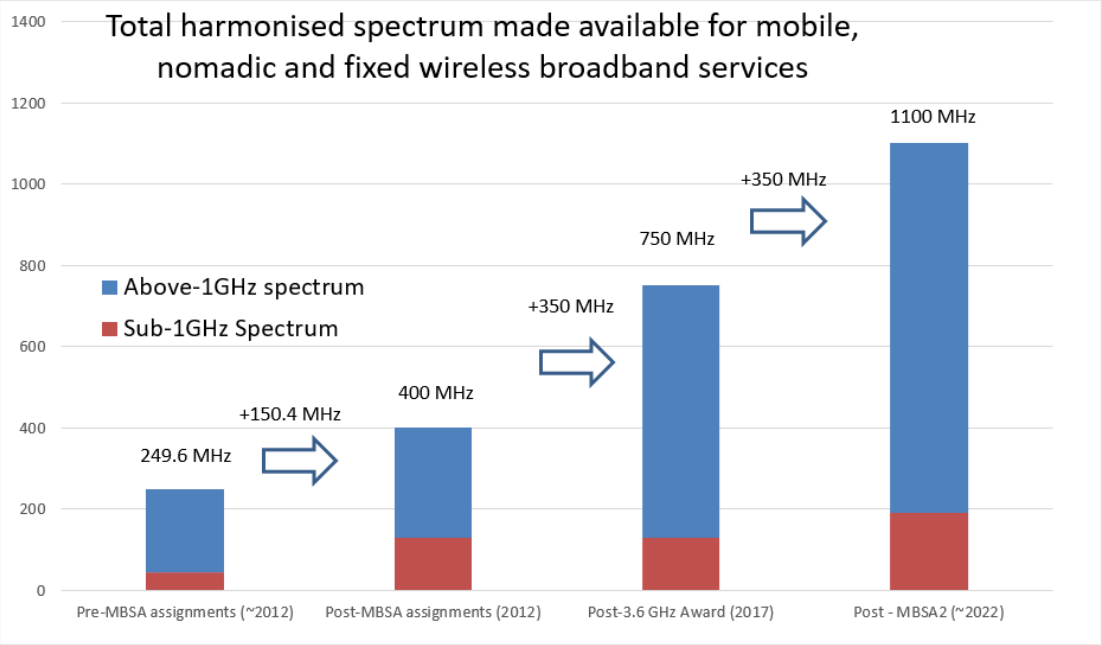


Figure 25: Total harmonised spectrum made available for mobile, nomadic and fixed wireless broadband services

Intelligent Transport Systems in the 5.9 GHz Band

4.25 Intelligent transport systems ("ITS")[153] cover both road ITS[154] and urban rail ITS[155] and has the potential to offer major improvements in transport system efficiency, in traffic safety and in comfort while travelling.

4.26 In 2008 the European Commission harmonised the use of radio spectrum in the 5.9 GHz frequency band for safety-related applications of ITS[156]. In doing so it recognised the role of ITS as being central to an integrated approach in road safety by adding information and communication technologies to transport infrastructure and vehicles to avoid potentially dangerous traffic situations and reduce the number of accidents.

[153] ITS means a range of systems and services, based on information and communications technologies, including processing, control, positioning, communication and electronics, that are applied to a road transportation system or an urban rail transportation system, or both.

[154] Road ITS include cooperative systems based on real-time communications between the vehicle (including cars, trucks, bicycles, pedestrian, etc.) and its environment (other vehicles, infrastructure, incl. industrial, agricultural, construction sites)

[155] Urban rail ITS consist of public transport systems permanently guided by at least one control and management system, intended to operate local, urban and suburban passenger services separated from general road and pedestrian traffic.

[156] See Commission Decision 2008/671/EC of 5 August 2008 on the harmonised use of radio spectrum in the 5 875-5 905 MHz frequency band for safety-related applications of Intelligent Transport Systems (ITS)

4.27 Following an EC mandate, the CEPT published[157] a report on 11 March 2019 reviewing the technical conditions, the extension of the 5.9 GHz Band for the use of ITS and making a number of proposals to the EC.

4.28 In October 2020 the European Commission repealed the 2008 Decision and published an updated ITS implementation decision ("(EU) 2020/1426")[158].

Requirements of the 2020 EC Implementing Decision

4.29 Ireland is required, no later than 30 June 2021, to designate the frequency band 5 875-5 935 MHz for intelligent transport systems and limit it to urban rail ITS in 5 925-5 935 MHz.

4.30 Hence, ComReg has designated the frequency band 5 875-5 935 MHz for intelligent transport systems by allocating this frequency band, on a non-exclusive basis to ITS, in the December 2020 revision of the radio frequency plan for Ireland[159].

4.31 Following that designation, Ireland will make this frequency band available on a non-exclusive basis with the technical parameters as detailed in the EC Decision.

4.32 In accordance with the EC Decision ComReg must ensure that:

- road ITS applications shall have priority below 5 915 MHz and urban rail ITS applications shall have priority above 5 915 MHz, so that protection is afforded to the application having priority;
- access by road ITS to the frequency range 5 915-5 925 MHz shall be limited to applications involving infrastructure- to-vehicle (I2V) connectivity only, coordinated, where appropriate, with urban rail ITS; and
- access by urban rail ITS to the frequency range 5 925-5 935 MHz shall be on a shared basis and subject to national circumstances and demand for urban rail ITS including coordination with fixed service.

[157] See CEPT Report 071 - 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 – 08 March 2019.

[158] Commission implementing decision (EU) 2020/1426 of 7 October 2020 on the harmonised use of radio spectrum in the 5 875-5 935 MHz frequency band for safety-related applications of intelligent transport systems (ITS) and repealing Decision 2008/671/EC.

[159] See ComReg 20/58R1 – Radio Frequency Plan for Ireland – published 18 December 2020.

Considerations

4.33 Noting that this is a safety related application ComReg does not consider that licence exemption is suitable for all elements of the ITS system, but rather exemption from licensing may be appropriate for users terminals mounted on cars, trucks, bicycles, motor bicycles, pedestrians, constructions equipment, agricultural equipment, etc.

4.34 For the fixed infrastructure element of the ITS system a form of licence regime may be appropriate in order to manage the:

- protection of applications (road and rail) that are identified in (EU) 2020/1426 as having priority;
- coordination between applications (road and rail); and
- appropriate sharing criteria between ITS services (road and urban rail) and other band users (fixed satellite and amateur).

Next Steps

4.35 In the next strategy statement period ComReg intends to consult on the manner in which the 5.9 GHz Band will be regulated for ITS in Ireland.

4.36 This will include consideration of what elements of the ITS system may best be exempted from requiring a licence, what elements would require licencing as well as the licence regime (technical conditions, fees, award mechanism, etc) that ComReg proposes to put in place.

4.2.2 Future EC Harmonisation Decisions

4.37 This section discusses future EC harmonisation decisions and ComReg's intentions for such during the 2022-2024 period.

Frequency Bands Above 24 GHz

4.38 On 30 March 2020, the European Commission submitted to CEPT a mandate to develop least restrictive harmonised technical conditions suitable for next-generation (5G) terrestrial wireless systems for priority frequency bands above 24 GHz.[160]

[160] https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=66338

4.39 In response to Task 3 of the EC mandate, dealing with the 66-71 GHz frequency band, CEPT published Report 78 which considers that the existing technical conditions contained in both EC Decision for SRD (EU) 2019/1345 and CEPT ERC Recommendation 70-03 are sufficient to allow for the introduction of MFCN 5G systems in that band and no changes are required at this time.

4.40 In response to Tasks (1, 2 and 4) of the EC mandate on 40.5-43.5 GHz frequency band, CEPT is drafting a Report which will consider, amongst other things, whether specific out-of-block limits are needed below 40.5 GHz for coexistence with services in the adjacent 39.5-40.5 GHz frequency band. This issue was not envisaged when the mandate was first developed.

4.41 In Ireland, fixed radio links are currently licensed in the 40.5 – 43.5 GHz (42 GHz) band, with 63 licences currently issued. The future use of the 42 GHz band will be subject to any decisions adopted by the EC and/or ECC. Therefore, ComReg intends to continue to monitor and input into the discussions on this matter at the EC and ECC. If any EC and/or ECC decisions are adopted during the 2022-2024 period, ComReg will consider the appropriate implementation of those decisions as required.

EC Mandate on 5G: 900/1800 MHz

4.42 On 12 July 2018, the European Commission submitted to CEPT a mandate to review the harmonised technical conditions for certain EU-harmonised frequency bands, including the 900 and 1800 MHz bands, and to develop least restrictive harmonised technical conditions suitable for next-generation (5G) terrestrial wireless systems.[161]

[161] https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=57746

4.43 In response to the mandate, the CEPT has delivered its Report 72[162] and Report 80[163]. The CEPT Report 72 clarifies that within the 900 MHz band, narrowband systems including GSM and cellular IoT systems will continue to be in commercial operation for the foreseeable future. Furthermore, it sets out a frequency separation of 200 kHz for certain coexistence scenarios of terrestrial systems providing electronic communications services, including 5G NR. The CEPT Report 80 delivers a harmonised frequency arrangement and '5G-ready' harmonised least restrictive technical conditions for both bands. Active antenna systems (AAS) are considered only for base stations in the 1800 MHz band. The outcome of the CEPT work ensures continued coexistence of terrestrial systems providing electronic communications services with GSM in the 900 MHz band, in line with the requirements of the GSM Directive.

4.44 On the basis of both CEPT Reports, the Commission presented to the Radio Spectrum Committee at its RSC#75 meeting, for discussion, an initial draft of a Commission Implementing Decision (RSCOM21-20). That draft Decision should formally replace Commission Decision 2009/766/EC[164] while preserving compatibility with and amending the existing technical framework for the 900 MHz and 1800 MHz frequency bands as regards technical conditions suitable for next-generation (5G) terrestrial wireless systems. A first discussion on this draft at the RSC's 75th meeting towards a stable text of the draft Commission Decision and Member States were required to provide written comments on a revised draft Commission Decision (RSCOM21-20rev1[165]) by 15 August 2021.

4.45 Three Liberalised Use licences have been granted for the 900 MHz and 1800 MHz bands[166], Therefore, ComReg intends to consider the appropriate implementation of the future EC Implementing Decision during the 2022-2024 period.

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[162] CEPT Report 72 - Review of technical conditions in the paired terrestrial 2 GHz and the 2.6 GHz frequency bands, and the usage feasibility of the 900 MHz and 1800 MHz frequency bands - https://docdb.cept.org/download/129

[163] CEPT Report 80 - Channelling arrangements and least restrictive technical conditions suitable for ECS including 5G terrestrial wireless systems in the 900 MHz and 1800 MHz frequency bands, in compliance with the principles of technology and service neutrality - https://docdb.cept.org/download/3454

[164] Commission Decision of 16 October 2009 on the harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community (notified under document C(2009) 7801)Text with EEA relevance (europa.eu)

[165] https://circabc.europa.eu/ui/group/af096568-9b95-4bb2-84db-45b307b06a22/library/91093950-7a37-4966-ad31-7f89582e22cf/details

[166] Mobile Licences | Commission for Communications Regulation (comreg.ie)

Harmonised use of radio spectrum in the 5 GHz frequency band for the implementation of wireless access systems including radio local area networks

4.46 On 14 April 2020 the Commission gave a mandate to CEPT to amend Commission Decision 2005/513/EC[167] on the harmonised use of radio spectrum in the 5 GHz frequency band for the implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLANs) following WRC-19.

4.47 The goal of the mandate is to implement the results of WRC-19 that revised Resolution 229 on the use of the bands 5150-5250 MHz, 5250-5350 MHz and 5470-5725 MHz by the mobile service for the implementation of wireless access systems including radio local area networks. In particular, the mandate tasked the CEPT to explore new options for WAS/RLANs within the 5150-5250 MHz band and allowing the use of WAS/RLAN equipment on board vehicles (aircraft, road vehicles (cars, buses) and trains) and assess the feasibility of the usage of WAS/ RLANs for UAS ('Unmanned Aircraft Systems') radio links.

4.48 In response to the mandate, CEPT published Report 79[168] and the EC has drafted elements of a revised Commission Implementing Decision on 5 GHz WAS/RLANs for Member States to consider.

4.49 Member States were required to submit written comments on the clean version of RSCOM21-18rev1[169] by 11 July 2021. Following receipt of any written comments, the Commission launched internal preparations with the aim to present a new version of the document in the next RSC meeting in October 2021 with the objective to request the Committee's regulatory opinion immediately thereafter.

4.50 ComReg intends to consider the appropriate implementation of the future EC Implementing Decision during the 2022-2024 period.

[167] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32005D0513&from=EN

[168] CEPT Report 79 - Report from CEPT to the European Commission in response to the Mandate to amend Decision 2005/513/EC on the harmonised use of radio spectrum in the 5 GHz band for the implementation of WAS/RLAN following WRC-19 - https://docdb.cept.org/download/3453

[169] https://circabc.europa.eu/ui/group/af096568-9b95-4bb2-84db-45b307b06a22/library/973678d6-c305-4190-a103-a28ced22c5f8/details

The 3800-4200 MHz frequency band for terrestrial wireless broadband systems providing private local-area network connectivity

4.51 At its 75th meeting in July 2021, the EC introduced a discussion document[170] on the consideration of issuing a mandate to the CEPT to assess spectrum needs for the use of the 3800-4200 MHz frequency band[171] by terrestrial wireless broadband systems providing private local-area network connectivity ('private local networks') and to develop harmonised technical conditions for the shared use of the 3800-4200 MHz band.

4.52 Member States were asked to submit comments by the end of August 2021, with a view that the European Commission would present a draft CEPT mandate for agreement at the RSC meeting in October 2021.

4.53 Relevantly, ComReg has received a number of enquiries related to private networks use of spectrum in the 3800-4200 MHz band, Therefore, ComReg intends to monitor and input to the development of any draft EC and ECC harmonising decisions on the use of the 3800-4200 MHz frequency band by terrestrial wireless broadband systems providing private local-area network connectivity.

4.54 Annex 3 provides background information on the consideration of spectrum needs for private local networks by the European Commission.

Changes to the GSM-R licence regime

4.55 GSM-R is a digital communications system, based on the use of GSM technology, which has been developed to replace the existing analogue VHF/UHF rail network communications system. GSM-R, in contrast to public mobile GSM, constitutes a non-public communications network for use by European railway operators.

4.56 In Ireland a licence regime was put into place in 2013 and one licence was granted, in respect of a portion of the available spectrum, to Irish Rail in November 2015.[172]

[170] https://circabc.europa.eu/ui/group/af096568-9b95-4bb2-84db-45b307b06a22/library/dc872d5b-b071-4f76-bb6f-42efe180142e/details

[171] The band 3800 – 4200 MHz is allocated in Europe to three services on a co-primary basis (fixed, mobile and fixed-satellite (space-to-earth).

[172] https://www.comreg.ie/industry/radio-spectrum/licensing/search-licence-type/gsm-r-2/

Changes to the EU Framework

4.57 After twenty years and due to technological obsolescence, industrial support for GSM-R is unlikely to be assured much after 2030. Therefore, it is intended that Future Railway Mobile Communication System (FRMCS) [173] will succeed GSM-R and will be one of the essential elements of the European Railway Traffic Management System (ERTMS). In support of railway digitalisation and service innovation, GSM-R and its successor(s), including FRMCS, are now designated by the overarching term of Railway Mobile Radio (RMR).

4.58 To support this transition to FRMCS, the EC is moving to harmonise two frequency bands to facilitate the introduction of RMR and a Commission Implementing Decision is expected in Q3 2021. It is anticipated that the implementing decision will require Member States to:

- designate and make available on a non-exclusive basis the paired frequency bands 874.4-880.0 MHz and 919.4-925.0 MHz by January 2022; and
- based on national demand, designate and make available on a non-exclusive basis the unpaired frequency band 1900-1910 MHz for Railway Mobile Radio at the latest between 1 January 2022 and 1 January 2025.

Considerations

4.59 The current licence regime for GSM-R would need to be updated to meet Ireland's obligation in relation to the expected Implementing Decision as follows:

- The current licence regime considers only a subset (876 – 880 MHz and 921 – 925 MHz) of the band (874.4-880 MHz and 919.4-925 MHz) that would need to be released and the update would need to take this expansion into account; and
- Based on national demand, the band 1900 – 1920 MHz may need to be added into the licence regime between 1 January 2022 and 1 January 2025. However, a portion of the band 1910 -1915 MHz is licenced to Three Ireland (Hutchison) Limited until 1 October 2022 as part of its 3G licence issued in October 2002.

[173] FRMCS will enable the use of applications such as Automatic Train Operation (ATO) or the Connected Driver Advisory System (C-DAS). FRMCS should also be capable of integrating new applications and technological developments over an extended period of time as railway communication systems have a much longer life cycle compared to public electronic communications networks and services.

4.60 During the 2022-2024 period ComReg intends to implement the changes required by the expected implementing decision. This may require new regulations to be put into place and provisions would need to be made to take into account the current GSM-R licence held by Irish Rail is due to expire on 26 November 2026 and the current use, until October 2022, of a portion of the 1900 MHz band.

The 6425 - 7125 MHz frequency band

4.61 The mobile industry has expressed an interest in the band 6425 - 7125 MHz as additional mid-band spectrum for MFCN since it has similar propagation conditions to the 5G pioneer band 3400 – 3800 MHz. This matter is being considered under agenda item 1.2 of WRC-23. Of relevance here for ITU Region 1 is the consideration of the frequency band 6425 - 7025 MHz for IMT (the band is already allocated to the mobile service on a co-primary basis). The ITU-R will:

- Study the technical, operational and regulatory issues pertaining to possible use of the terrestrial component of IMT in the band taking into account evolving needs, technical and operational characteristics of terrestrial IMT systems, evolution of IMT, deployment scenarios, needs of developing countries and time-frame in which spectrum would be needed; and
- Conduct sharing and compatibility studies (including with services in adjacent bands where appropriate) in order to protect services with an existing primary allocation, without imposing additional regulatory or technical constraints, and also, as appropriate, on services in adjacent bands.

4.62 At the time of publication of this consultation no decision has yet been made within the CEPT in respect of a harmonisation measure to introduce MFCN into the in the band 6425 – 7125 MHz band. ComReg intends to monitor and input to the discussions on this matter within European and at the ITU's WRC-23.

4.3 End-user demand for mobile data (i.e. 3G, 4G, 5G services)

4.63 Mobile data traffic in Ireland continues to grow and has increased by over 600% in the last five years (from 35 million GB per quarter to 236 million GB per quarter) as illustrated in Figure 26.

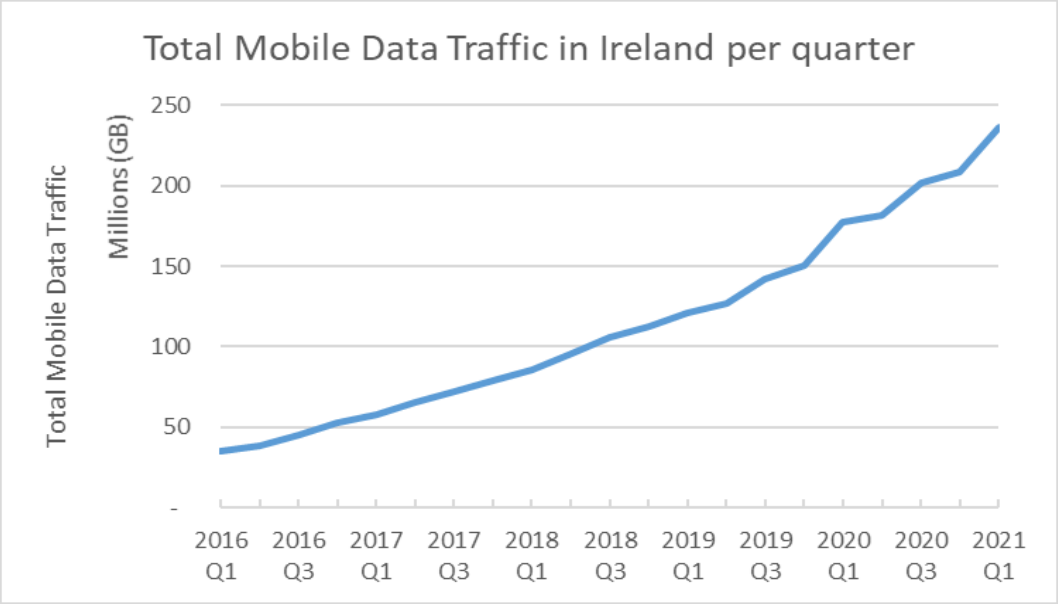

Figure 26: Total Mobile Data Traffic in Ireland per quarter

4.64 This period of rapid growth coincides with increased user demand, the changes in usage due to Government measures to tackle COVID-19, and the early stages of 5G rollout in Ireland.

4.65 Since the publication of the Mobile Data Forecast Report in 2018, annual mobile data traffic in Ireland closely followed the baseline scenario before rising above the baseline in 2020, largely due to increased requirements for data during COVID-19.

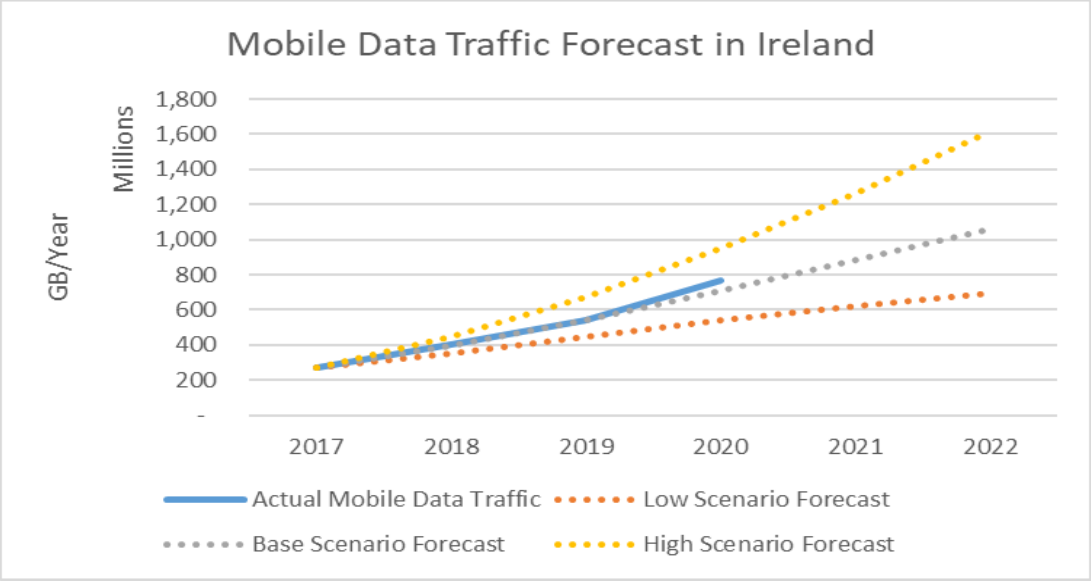

Figure 27: Mobile Data Traffic Forecast in Ireland[174]

[174] See ComReg Document 18/35

4.66 It is expected that mobile data traffic will continue to increase in 2022 (though at a lower rate following spikes in 2020 and 2021 – see Section 3.2.1 above) and beyond, noting for example that in Western Europe, average monthly mobile data traffic is forecasted to rise by 28% annually to 2026.[175]

4.67 ComReg intends to provide updated data forecasts in due course prior to the expiry of existing forecasts in 2022.

4.4 Technology changes and advancements

4.68 Technology changes[176] and advancements can affect both the demand for and supply of radio spectrum. Under normal circumstances such changes lead to a more efficient use of the radio spectrum and, in some instances, can result in faster or higher quality services being provided which may be sufficient to address increasing end-user demand for services. In other instances, this can result in spectrum being released from one service to another. [177]

4.69 Technology advancements can take many forms including the use of improved modulation or sharing techniques, and the ability for one service to use multiple spectrum bands at the same time using carrier aggregation.

4.4.1 Mobile/WBB advancements in 4G and 5G networks

4.70 Technology advancements are part and parcel of each new generation of mobile technology (e.g. 3G, 4G, 5G, etc.) and are also rolled out during the lifetime of each generation of mobile technology. For example, current 4G networks now use technical advancements such MIMO[178] and carrier aggregation[179] to provide improved (e.g. faster speeds[180]) services to end users, and the release of additional spectrum in the MBSA of 2021 offers further opportunities for the advancement of existing and new services.

[175] See Ericson Mobility Report June 2021.
[176] Technology changes happen on a less frequent basis than technology advancements. For example, the free-to-air analogue terrestrial television technology operated for over 50 years in Ireland before this technology was replaced by the free-to-air digital terrestrial television technology.

[177] For example, the switch-off of analogue TV broadcasting in 2012 allowed both more TV programme services to be delivered to Irish viewers and released the 800 MHz band for terrestrial networks capable of providing ECS and, in particular, mobile WBB services.
[178] MIMO (multiple-input and multiple-output) is a wireless technology that uses multiple transmitters and receivers to transfer more data at the same time.
[179] Aggregation of multiple carriers within frequency bands and across multiple frequency bands
[180] Current LTE-Advanced technology has the potential to offer increased peak data rates of 3 Gbps download and 1Gbps upload in line with ITU requirements for IMT Advanced - also referred to as 4G.

4.71 Over the last number of years, the rollout of 4G networks has further advanced in Ireland, and as of Q1 2021, the 4G technology is now the most widely subscribed to and used:

- 63% of mobile subscribers avail of a 4G subscription, compared to 26% availing of a 3G subscription and 11% availing a 2G subscription; and
- 85% of mobile data traffic was carried on the 4G technology, compared to 14% being carried on the 3G technology[181].

4.72 Further, 4G voice calling (VoLTE)[182] on mobile networks has been deployed on two mobile networks in Ireland, Eir and Vodafone, and the 4G technology has also been deployed on FWA to support faster internet speeds and increased data usage.

4.73 In relation to 5G, the rollout of these networks are still at the early stage, with mobile operators only relatively recently having launched 5G services. With the release of a significant amount of additional spectrum in the MBSA 2021 and an increasing availability and take-up of 5G enabled devices, the rollout and capabilities of 5G networks is likely to advance further over the duration of this strategy statement.

4.74 5G technology has the potential to enhance delivery of current WBB applications, such as mobile broadband and FWA, and to open up possibilities for new applications and use cases, such as private networks (as discussed in Annex 3 below) and aeronautical drone control over mobile networks[183] (as discussed in Annex 3 below).

4.75 As illustrated in Figure 28 below, the ITU envisages that in the future a diverse number of applications will be supported by the 5G technology and has identified three main usage scenarios:

1. Enhanced Mobile Broadband ("eMBB")[184];
2. Ultra-Reliable Low-Latency Communications ("URLLC")[185]; and

[181] https://www.comreg.ie/industry/electronic-communications/data-portal/tabular-information/

[182] VoLTE offers significantly higher voice quality than legacy circuit switched voice.

[183] This would allow drones to be operated beyond the line of sight. In that connection, CEPT is currently working on drafting a Decision to provide harmonised technical conditions for the usage of aerial UE for communications in several harmonised MFCN bands.

[184] This will cater to ever-growing demand for faster and higher volume data access, in particular for mobile data in high traffic areas - hotspots - such as busy city centres, stadiums and concert venues and will enhance delivery of broadband over FWA networks to domestic consumers.

[185] This will support applications that require uninterrupted and reliable data exchange such as autonomous driving and connected industries and automation (Industry 4.0), as well as gaming and virtual/augmented reality applications which will rely on low latency (i.e. very fast response times for communications between connected devices) to generate a seamless user experience.

3. Massive Machine-Type Communications ("mMTC")[186].

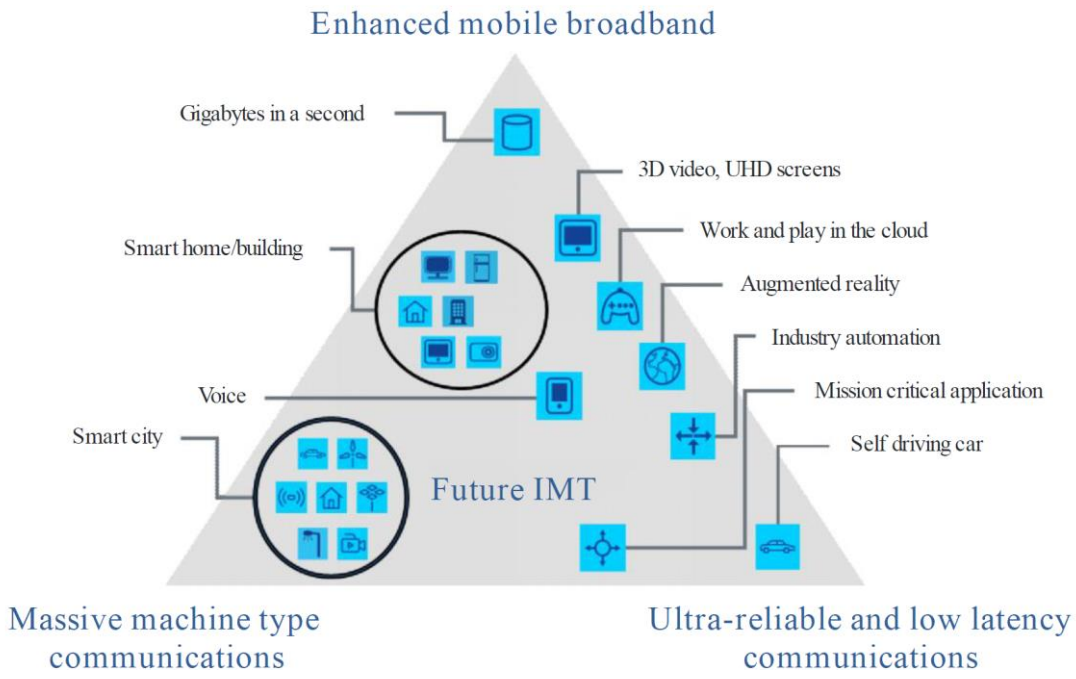

Figure 28: 5G Usage Scenarios

4.76 As 4G networks advance, and 5G networks are rolled out, this will help address the expected strong future growth in demand for ever more data traffic on mobile networks, as noted in section 4.3 above. In addition, spectrum currently used for older technologies (e.g. 2G and 3G) will likely be re-farmed for newer more efficient technologies (e.g. 3G/4G/5G). In Ireland, this has already occurred with regard to the 900 MHz, 1800 MHz and 2100 MHz spectrum bands, where this spectrum is now being used for 3G/4G and the support of 5G services, and over time further spectrum bands may get re-farmed and legacy mobile technologies may get decommissioned.

4.77 This decommissioning process has already begun in Europe where, as of June 2021[187]:

- one MNO has switched off its 2G network in Switzerland;
- MNOs in five countries[188] have plans to switch off their 2G networks;

[186] This will support a very large number of connected devices typically transmitting a relatively low volume of non-delay sensitive data. mMTC has the potential to extend the current IoT to include almost every machine communicating with other machines, for example for industrial production and for smart cities and smart grids.
[187] Source: Cullen International.
[188] The Netherlands, Norway, Poland, Sweden and Switzerland.

- MNOs have switched off legacy 3G networks in five countries[189]; and
- MNOs in 12 countries plan to switch off their 3G networks.

4.78 In Ireland, should an MNO wish to cease providing services on a technology, under the conditions of its licence[190] it is obliged to notify ComReg not less than 6 months prior to the cessation and use all reasonable endeavours, to ensure that any adverse effects on users from the cessation of use of a technology are minimised.

4.5 Licences expiring in the near future

4.79 Where existing spectrum rights of use are due to expire within the near future (e.g. the next five years) ComReg endeavours to set out its proposals on the future use of such bands well in advance of expiry including, where appropriate, defining and carrying-out an assignment process for same.

4.80 There are a number of licences that will expire in the period 2022– 2027 (i.e. three years following the 2022 – 2024 timeframe of this consultation). ComReg sets out the current status of these bands and envisaged next steps in respect of same below.

4.5.1 2.1 GHz band

4.81 The frequency range 1900-1920 MHz, 1920-1980 MHz and 2110- 2170 MHz ("the 2.1 GHz band) consists of 140 MHz of spectrum and is currently licensed in Ireland for the provision of Universal Mobile Telecommunications System ("UMTS" or "3G") services. These licences were issued following competitions in 2002 and 2007 and included two parts:

- paired FDD spectrum rights in the frequency range 1920 -1980 MHz and 2110 -2170 MHz ("Paired 2.1 GHz Band"); and
- unpaired TDD spectrum rights in the frequency range 1900-1920 MHz ("Unpaired 2.1 GHz Band").

4.82 Spectrum rights in the Paired 2.1 GHz Band are currently licensed to Three, Vodafone and Meteor. The licences held by Three and Vodafone will expire in 2022 as follows:

[189] All MNOs in Norway and one MNO in each of Germany, the Czech Republic, Italy and the Netherlands.

[190] See Condition 6(12) of a Liberalised Use Licence, Condition 6(12) of a 3.6 GHz Band Liberalised Use Licence and Condition 6(1)(k) of a MBSA2 Liberalised Use Licence

- Three holds two licences in the 2.1 GHz Band, referred to as the "A Licence" (which expires on 24 June 2022) and the "B Licence" (which expires on 1 October 2022)[191]; and
- Vodafone holds one licence which expires on 15 October 2022.

4.83 The licence held by Meteor expires on 11 March 2027.

4.84 In Document 20/122, ComReg decided that the Paired 2.1 GHz Band will be included in its proposed award of spectrum rights of use suitable for the provision of WBB.

4.5.2 All Island Licence in the 1785 – 1805 MHz band

4.85 In 2007, a joint ComReg/Ofcom spectrum award was concluded which resulted in the granting of a licence for the 1785 – 1805 MHz frequency band for mobile wireless services on an all-island basis. On foot of same, a separate licence was issued in both jurisdictions to a single entity, Personal Broadband, for a period of 15 years. In Ireland, the licence was granted on 25 April 2007 under the Wireless Telegraphy (1785–1805 MHz Wireless Access Services) Regulations (S.I. 172 of 2007). This licence is due to expire on 24 April 2022.

4.86 In considering potential future uses of this band, ComReg notes:

- Regulation 6(1) of S.I. 172 of 2007 states that all licences shall expire after 15 years;
- there is no provision in S.I. 172 of 2007 for the renewal of licences granted under same;
- that commercial services have not been deployed in either jurisdiction using the spectrum rights held under the licence;
- in 2014, the EC adopted Implementing Decision 2014/641/EU which requires Member States to designate and make available the 1785 – 1805 MHz band for audio PMSE on a non-interference, non-protected basis;
- ComReg has implemented this decision for PMSE use in Ireland;
- the 1785-1805 MHz band is not subject to any harmonisation decision within CEPT or the EU for MFCN; and
- there are no plans at either an EU or ITU level to allocate the band for MFCN; and

[191] Three also holds spectrum rights for an additional 5 MHz block in the Unpaired 2.1 GHz Band as part of its B Licence. Vodafone and Meteor previously held an equivalent 5 MHz block in the Unpaired 2.1 GHz Band, which were returned to ComReg on 11 March 2011 and 28 February 2013, Respectively.

- ComReg has set out its general position on the issue of licence expiry/ renewal in a number of publications.

4.87 ComReg has not identified at this point in time any future potential use of the 1785 – 1805 MHz band following the expiry of the existing licence. Therefore, ComReg does not currently intend to undertake any work regarding the band during the 2022-2024 period.

4.5.3 GSM – R

4.88 On 27 November 2015, ComReg issued a 10-year licence to Irish Rail for spectrum rights of use of the 876.2 - 879.6 MHz/921.2 - 924.6 MHz. As that licence is due to expire on 26 November 2025, ComReg intends to consider the future licensing of Railway Mobile Radio in light of the Draft Commission Implementing Decision on the harmonised use of the paired frequency bands 874.4-880.0 MHz and 919.4-925.0 MHz and of the unpaired frequency band 1900-1910 MHz for Railway Mobile Radio. Please see section 4.2.2 above regarding ComReg's intentions for GSM-R for the 2022-2024 period.

4.6 The ECS sector and climate change

4.89 In its Electronic Communications Strategy Statement for 2021 to 2023, ComReg notes that increasing awareness and attention is being placed on the relationship between the ECS sector and climate change. While the sector is enabling decarbonisation across the economy, from remote working to smart meters, greater use of ECN/ECS services and devices could potentially increase waste and emissions. The European Commission has emphasised the importance of a sustainable digital sector and will consider measures to improve the circular economy performance of the digital sector as well as its energy efficiency.[192] In 2019, ComReg issued a Call for Inputs[193] to better understand the relationship between connectivity and decarbonisation, the learnings from which help to shape a number of key projects and commitments in this strategy. ComReg is also actively contributing to an expert networking group on Sustainability at BEREC and will continue to monitor initiatives to address the carbon footprint of the ECS sector.

[192] Communication from The Commission to The European Parliament, The European Council, The Council, The European Economic and Social Committee and The Committee of The Regions. The European Green Deal COM/2019/640 Final - EUR-Lex - 52019DC0640 - EN - EUR-Lex (europa.eu).

[193] ComReg Document 19/126 – Call for Inputs - Connectivity and Decarbonisation – 20 December 2019

4.90 Over the coming year, ComReg will commission a study to investigate the impact of climate change on the electronic communications networks – fixed and mobile, in Ireland.The study, which is included as as a listed item in the Government's Climate Action Plan, will look to assess the vulnerability of electronic communications networks to climate change, to develop an understanding of how climate change has been impacting, and how it can impact in the future, the resilience of the electronic communications sector.[194]

4.91 ComReg also notes that the Climate Action and Low Carbon Development (Amendment) Act[195] has been enacted, but not yet commenced. It is envisaged that this legislation will establish a legally binding framework with clear targets and commitments set in law, and ensure the necessary structures and processes are embedded on a statutory basis to ensure Ireland achieves national, EU and international climate goals and obligations in the near and long term. This framework, when established, will require ComReg and other public bodies to perform our functions in a way that is consistent with approved national climate plans, strategies, and objectives – as far as is practicable.

4.92 Of relevance, ComReg notes that:

a) in 2019 it completed the 400 MHz band spectrum award[196] which placed ComReg at the vanguard in Europe for the release of radio spectrum for Smart Grid use. The 400 MHz band spectrum award is a key enabler in the reduction of climate emissions, the assignment of which is complementary with Government policy:

- Project Ireland 2040[197] – National Strategic Outcome 8 of the National Planning Framework promotes a transition to a low carbon energy future and which requires decisions around developing and deploying new technologies such as smart grids;
- The National Mitigation Plan[198] – in which the DECC observes that the smart operation of the power system at both transmission and distribution level and energy efficiency will enable maximisation of the existing grid;
- SEAI Smart Grid Roadmap[199] – which states that by 2050, Smart Grids will see an accumulated reduction in energy related emissions by 250 million tonnes.

[194] See Action 227 of *"Interim Climate Actions 2021".* Available at gov.ie - Climate Action Plan 2019 (www.gov.ie)
[195] Climate Action and Low Carbon Development (Amendment) Act 2021 (irishstatutebook.ie)
[196] https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/400mhz-band-spectrum/

[197] gov.ie - Project Ireland 2040 (www.gov.ie)
[198] gov.ie - National Mitigation Plan (www.gov.ie)
[199] Smartgrid-Roadmap.pdf (seai.ie)

b) The forthcoming consultation on the Satellite Earth Station Licencing regime (see section 5.2.6) intends to identify and consider, amongst other things, the current and future use cases relevant to the frequency bands allocated for various satellite services. For example, regarding Earth exploration-satellite services (EESS)[200], the band 6425 - 7250 MHz is planned to be used globally by the Copernicus Imaging Microwave Radiometer (CIMR). This one of the six high-priority candidate missions of the Copernicus programme that would increase its ability to serve as a tool for achieving the EU Green Deal (Climate change) objectives. The use of the spectrum band 6425 - 7250 MHz, critically relevant to EU Space Policy, is recognised under ITU RR footnote 5.458.[201]

[200] The earth exploration-satellite service (EESS) enables the prediction of precise weather forecast because the large quantity of information required is gathered by EESS sensors. Long term effects on the climate can only be predicted by using active or passive EESS sensors to measure wave height, water temperature, ocean salinity, ozone concentration, and other relevant data on the behaviour of our environment.

[201] In the band 6 425-7 075 MHz, passive microwave sensor measurements are carried out over the oceans. In the band 7 075-7 250 MHz, passive microwave sensor measurements are carried out. Administrations should bear in mind the needs of the Earth exploration-satellite (passive) and space research (passive) services in their future planning of the bands 6 425-7 075 MHz and 7 075-7 250 MHz.

Chapter 5

5 Proposed Radio Spectrum work plan for the period 2022-2024

5.1 Appropriate prioritisation of spectrum management workplan activities

5.1 ComReg aims to manage its workload in a manner that seeks to appropriately and pragmatically address the needs of a diverse range of stakeholders. Relevant considerations in this regard include:

- The capacity within the existing radio spectrum bands to meet spectrum needs. Where capacity exists, it may be possible to meet this demand via the existing spectrum assignments or to award new assignments using existing authorisation processes;
- The timing of the expiry of existing rights of use and the requirement for an appropriate re-assignment process in light of factors such as end user demand, harmonisation status, equipment availability and availability of related spectrum bands;
- The international harmonisation status of a spectrum band including any future harmonisation plans;
- The harmonisation status and appropriate timing for release of spectrum bands that are currently unassigned;
- The potential to liberalise the current restrictions placed on licensees which could increase the efficient use of spectrum, facilitate innovation and potentially free up capacity which could be made available for other uses;
- The potential for including multiple spectrum bands in a single award process where appropriate to meet ComReg's statutory objectives;
- The adoption in of legislation (national or European) which requires ComReg to take defined actions within a set timeframe; and
- The potential for market mechanisms to address spectrum management

issues.

5.2 ComReg's draft spectrum work plan 2022 to 2024

5.2 The following outlines the indicative spectrum work plan that ComReg intends to carry out within the time period 2022 to 2024

5.2.1 Programmatic spectrum management functions

5.3 ComReg's programmatic work plan items for its spectrum management function for the period 2022 – 2024 are to:

i. Continue to issue licences for wireless telegraphy in accordance with the 1926 Act and the regulations associated with each licence type;

ii. Continue to conduct market surveillance on products being imported into the State;

iii. Continue to conduct surveys of transmission sites to assess compliance with licence conditions;

iv. Continue to monitor licence compliance and take enforcement action where appropriate;

v. Continue to investigate reports of harmful interference to the radio spectrum, giving appropriate priority to cases that have the greatest impact on a service providers ability to provide services;

vi. Continue to publish an annual report detailing activities in respect of market surveillance, investigations of radio interference and enforcement action;

vii. Continue a programme of measurement of NIR and publication of surveys on Siteviewer as appropriate;

viii. Continue to promote Test and Trial Ireland and the benefits of using Ireland as a location to test or trial wireless products and services in a real world environment;

ix. Advise and assist the DECC in its preparations for WRC-23 agenda items of relevance to Ireland, including participation in relevant CEPT and regional groups; and

x. Assist the DECC in the transposition of the EECC, and implement same as appropriate.

5.2.2 MFCN

5.4 ComReg's work plan items for MFCN[202] for the period 2022 – 2024 are to:

i. Complete the Multi-Band Spectrum Award 2021 for the award of long-term spectrum rights of use in the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz bands[203];

ii. Continue engagement with Eir and the IAA to resolve compatibility issues[204] between:

a) MFCN use in the 2.3 GHz band and Eir's RurTel network which operates in the 2.3 GHz band; and

b) MFCN use in the 2.6 GHz Band and the IAA's aeronautical primary radars which operate in the adjacent 2.7 – 2.9 GHz band;

iii. Facilitate, via the development of transition plans and grant of transition licences as appropriate, any transition activities[205] that might be required on the part of the Existing 2.1 GHz Band Licensees, the Existing 2.3 GHz Band Licensee (Eir) and Winning Bidders in order to comply with the outcome of the Multi-Band Spectrum Award 2021;

iv. consider the appropriate implementation of the future EC Implementing Decision which would replace Commission Decision 2009/766/EC - to enable the deployment of M2M technologies in the 900 MHz and 1800 MHz frequency bands;

v. Continue to implement relevant EC harmonisation decisions in the bands for MFCN in support of next generation terrestrial wireless systems;

vi. Continue to engage 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;

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[202] ComReg's current MFCN workplan includes a work item on COVID-19 temporary spectrum management measures to consider whether it would be appropriate to put in place a further temporary ECS licensing framework beyond 1 October 2021. See ComReg Document 21/87

[203] Certain aspects of ComReg's decision (Document 20/122) for the MBSA 2021 are under appeal, and the indicative timing for the award is subject to change.

[204] See further section 5.2 of ComReg Document 20/122, *"Multi Band Spectrum Award - Response to Consultation and Decision - The 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands"*, https://www.comreg.ie/publication/multi-band-spectrum-award-response-to-consultation-and-decision-the-700-mhz-duplex-2-1-ghz-2-3-ghz-and-2-6-ghz-bands.

[205] i.e. adjustments to their networks.

vii. Continue to monitor developments in the 1.4 GHz band for MFCN and following the completion on MBSA 2021 consult on the award of some or all of this band, noting that any consultation process may also consider other harmonised spectrum bands available for award;

viii. Continue to monitor developments in the 26 GHz band with respect of 5G and subject to demand (e.g. reasoned submissions to responses to consultations, use of any test and trial licences issued, etc.), 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;

ix. Monitor work in the CEPT and the EC on the potential development of harmonised technical conditions for the shared use of the 3800-4200 MHz band by private local networks and take actions as appropriate to support any harmonisation decisions adopted;

x. Continue assessment of mobile network operators' compliance with licence coverage obligations through the drive test programme while investigating other methodologies to improve efficiency of the measurement of compliance with such obligations, including utilising the outdoor mobile coverage mapping data;

xi. Complete a strategic review of the best communication methodology to allow users to understand the impact of handset performance, taking into account current and future technologies. ComReg considers that such a review is appropriate given that, as current and future technologies, such as 5G, progress, the methodology of informing and allowing users to understand the factors which affect connectivity experience will evolve;

xii. Monitor and contribute to the EC's and CEPT's considerations[206] of what, if any, efficiencies might be introduced by a strategic review of the authorisation and licensing of spectrum for MFCN services in the future;

xiii. Continue to liaise with MNOs to gather network architecture data for the generation of outdoor coverage maps, make these available on the consumer section of ComReg's website and update the maps to include 5G mobile coverage;

xiv. Consider administrative matters concerning the EC's spectrum divestment commitments in relation to the acquisition of Telefonica by Hutchison at the appropriate time if required;

[206] As outlined at paragraph 2.22 above

xv. Continue to work with relevant parties to progress the remaining transition activities required from existing FWALA licensees in the 3.6 GHz Band to allow the winning bidders in the 3.6 GHz Band award to make full use of the band to provide services, in accordance with the transition rules of the award[207];

xvi. Update ComReg's Spectrum Leasing and Transfer Framework and guidelines, subject to completion of the Multi-Band Spectrum Award 2021 and the transposition of the EECC;

xvii. In relation to TV White Space ("TVWS") technology[208], and subject to resourcing capacity:

a) Continue to monitor regulatory and technology developments regarding the use of TVWS;

b) Continue to facilitate and monitor TVWS technology trials by issuing Test and/or Trial licences, as appropriate; and

c) Consider the use TV white space technology as part of any future discussions on the 470 – 698 MHz spectrum band.

Annex 3 provides for further information on TVWS technology and relevant Trials licences issued by ComReg to date.

xviii. monitor and input to the discussions on the 6425 – 7125 MHz band within European and at the ITU's WRC-23.

5.2.3 Broadcasting Services

5.5 ComReg's work plan items for Broadcasting Services for the period 2022 – 2024 are to:

i. Continue to engage in the international coordination of broadcasting transmitter stations;

ii. Issue and amend, as appropriate, DTT, DSB and ASB broadcasting licences as requested in line with the broadcasting licensing framework;

[207] To date, a substantial amount of the 3.6 GHz Band spectrum has already been made available for use by Winning Bidders, which has enabled Winning Bidders to launch higher speed FWA and new5G services in the band. See further ComReg Document 20/117, "*3.6 GHz Band Transition Progress Report 2020*", https://www.comreg.ie/publication/3-6-ghz-band-transition-progress-report-2020.

[208] Readers are referred to Annex 3 for further information on TVWS

iii. Provide advice as required to DTCAGSM and DECC, in relation to spectrum for broadcasting services[209]'; and

iv. 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[210].

5.2.4 EC harmonisation decisions (non MFCN)

5.1 ComReg's intended strategy for existing and future EC harmonising decisions for the upcoming period includes:

i. consulting on the manner in which the 5.9 GHz band will be regulated for ITS in Ireland, see section 4.2.1 above;

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

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

5.2.5 Terrestrial Fixed Services

5.2 ComReg's intended strategy for Terrestrial Fixed Services for the upcoming period includes:

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

iv. The publication of fixed links data on Siteviewer.

5.2.6 Licence Exempt Short Range Devices (SRDs)

5.3 ComReg has identified the following work plan items for SRDs for the period 2022 – 2024:

[209] 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.
[210] As discussed in Annex 2, this is agenda item 1.5 of the 2023 World Radiocommunication Conference.

i. Continue to facilitate the use of SRDs to Ireland in accordance with international harmonisations measures and where necessary, revise ComReg 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.

5.2.7 Satellite Services

5.4 ComReg has identified the following work plan items for Satellite Services for the period 2022 – 2024

i. Consult on, amongst other issues, the authorisation of SES below 3 GHz as well as the Satellite Earth Station Licencing 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 licencing for certain classes of Terminals for Satellite Services by updating ComReg Document 20/47, as required.

5.2.8 Private Mobile Radio Services

5.5 ComReg has identified the following work plan items for Private Mobile Radio Radio Services for the period 2022 - 2024:

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.

5.2.9 Radio Amateur Services

5.6 For the forthcoming strategy period, in addition to the work being carried forward (see section 3.8) ComReg is considering two additional matters which were been raised with ComReg in early 2021. The matters for consideration and on which ComReg is seeking views through this consolation are as follows:

- Novice Licences; and
- Increase in maximum permitted power and related issues.

Novice and Entry-class licensing

5.7 ComReg has received a query on the issue of novice and entry classes of amateur station licencing.

5.8 It is ComReg's view that:

1. the CEPT's Harmonised Amateur Radio Examination Certificate ("HAREC") syllabus as examined in Ireland is adequate to achieve ComReg's primary objective of ensuring the efficient management and use of the radio frequency spectrum in Ireland; and
2. a standard below that guaranteed by the HAREC syllabus does not assure a reasonable level of proficiency in a) the technical and operational aspects of amateur radio; b) the regulations governing the amateur radio service in Ireland or c) ensure the conditions of an Amateur Station Licence can be met.

5.9 For these reasons ComReg has to date not implemented any form of novice or other lower level of licencing. However, ComReg is seeking views on the matter through this consultation process. In responding to this matter please consider that:

- any change to a licensing regime would require ComReg to undertake a consultation and may require new regulations. Any new regulations would require a new statutory instrument which is at the discretion of the Minister.
- ComReg has limited resources and must balance those resources between competing work items of varying priorities during the strategic period; and
- the issue of competence to operate an amateur station without having passed a HAREC standard exam needs to be addressed.

5.10 Readers are referred to Annex 3 for a detailed discussion of Novice and Entry-class licensing, questions posed by ComReg and Annex 5 for the published submission.

Increase in permissible transmitter power and related issues

5.11 ComReg has received a request from the Marconi Radio Group (Submission in Annex 5) for ComReg to review and amend current power levels upward in order to:

- afford Irish Radio Amateurs parity with other member states;
- improve contesting outside the contests for which ComReg currently permits increased transmitter powers; and
- to facilitate DXers[211].

5.12 The consequence of any proposed changes to current power levels is that amateurs operating in any of the relevant frequency bands must be able to accurately measure their transmitter output, be able to determine the gain of their antenna system and then be able to calculate the e.i.r.p. levels in use.

5.13 To aid the decision making on this matter ComReg is calling for comments on the above as well as inputs on the following questions:

i. In order to ensure that radio amateurs are able to meet the licence conditions relating to output power, how can ComReg ensure that all amateurs are able to accurately measure the actual Peak Envelope Power (PEP) power being used at any point in time?

ii. What type of equipment should each amateur station have at hand to make these measurements?

iii. How should ComReg ensure that radio amateurs are able to meet the terms of their licence conditions relating to non-ionising radiation? ComReg notes the approach recently adopted in the UK by Ofcom[212] but is of the preliminary view that measurement of sites is necessary to guarantee compliance with limits and to-date has not accepted modelling as an alternative.

[211] *DXer* refers to a Amateur station licensee who strives to receive and identify distant radio or television signals, or seeks to makes two-way radio contact with other radio amateurs.

[212] See https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjt9e-s4ojyAhUHRBUIHRMpBnEQFjAFegQIDhAD&url=https%3A%2F%2Fwww.ofcom.org.uk%2F__data%2Fassets%2Fpdf_file%2F0026%2F218960%2Fgeneral-notice-final-decision-emf-licence-variation.pdf&usg=AOvVaw1bD4yv0b_sGNHX78oZ9OfR

iv. In order to ensure that radio amateurs are able to meet the terms of their licence conditions relating to spurious emissions:

- what type of measurement equipment is required?
- what level of equipment calibration is required for that equipment? and
- how often are measurements required (e.g. only at commissioning, regular intervals or only if any part of the transmission system is modified or adjusted)?

5.14 Readers are referred to Annex 3 for a detailed discussion of Increase in permissible transmitter power, related issues, ComReg's questions and Annex 5 for the published submission.

5.2.10 Unmanned Aircraft Systems ("UAS")

5.15 ComReg has identified the following work items for UAS during the 2022-2024 period are:

i. Monitor developments in ECC working groups and project teams and consider the appropriate implementation of any future harmonised ECC Decisions;[213]

ii. Consider any cross-border coordination requirements in the case of UAS operating at the border;

iii. Engagement with the IAA regarding restrictions on spectrum usage at or near "No Fly zones";

iv. Ensuring protection of adjacent spectrum assignments within existing mobile networks; and

v. Setting emission limits specific to aerial UE's will be necessary to avoid interference to other services in some adjacent bands.

Readers are referred to Annex 3 for further information on UAS technology and relevant discussions on the topic within Europe.

[213] The ECC Decision on the operation of UAS using existing mobile telecommunications infrastructure, is due from ECC PT1, in March 2022. The ECC report on spectrum solutions for UAS (other than MFCN) is expected from ECC FM59 by June 2022.

5.2.11 Aeronautical and Scientific Services

Aeronautical Services

5.16 ComReg's strategy for Aeronautical Services for the upcoming periods includes:

i. Continuing to promote Ireland's interest in relevant international fora to ensure adequate spectrum is available for aeronautical services; and

ii. Continuing to work with the IAA to promote the use of spectrum efficient technologies in the aeronautical bands, thereby maximising the spectrum available for growth and new applications.

Scientific Services

5.17 Radio spectrum is used for a wide range of applications that operate under the description of "scientific services", including radio astronomy, earth exploration-satellite services ("EESS"), space research and meteorological aids.

Licence regime for Meteorological Aids (MetAids)

5.18 ComReg has previously considered exempting Spectrum for Meteorological Aids ("MetAids") apparatus from the requirement to hold a licence but is concerned that this would not afford the service the appropriate protection necessary to carry out this important task.

5.19 Subject to resourcing, ComReg may consider the implementation of a licence regime during the 2022-2024 period. A licensing regime would facilitate the legal operation of radiosondes, dropsondes and rocketsondes in Ireland and provide protection against harmful interference.

5.20 Readers are referred to Annex 3 for further information on the Meteorological Aids service.

Protecting Radiocommunication Services of Strategic Importance

5.21 ComReg is considering a number of radiocommunication[214] services that currently do not enjoy the same protection as licenced services but may require recognition and protection from harmful interference. The following services are examples of what can considered of strategic importance to Ireland and the European Union:

- Global Navigation Satellite System;
- Bands used for monitoring climate change;
- Bands used for earth exploration; and
- Radio Astronomy.

5.22 These are services for which ComReg does not issue a license, the transmitters are not within the jurisdiction of Ireland but the reception of these transmissions is of:

- paramount importance to Irish consumers and/or;
- of strategic importance to Ireland, Europe or;
- of great importance to scientific study and endeavour.

5.23 As part of the 2022-2024 period, ComReg intends to consider the matter of how to protect services of strategic importance to Ireland, and to monitor and input into discussions on these types of services within Europe. An example of service of strategic importance are Global Navigation Satellite Systems (GNSS). ComReg notes that the CEPT are currently preparing a new ECC Decision[215] which has as its goal to:

- designate the frequency bands 1164-1215 MHz, 1237-1300 MHz and 1559-1620 MHz for the reception of GALILEO and GLONASS GNSS signals; and
- consider the coexistence between amateur service / amateur-satellite service and the radionavigation satellite receivers in the band 1240-1300 MHz.

5.24 The target date for delivery on this work item by the CEPT is May 2023.

[214] Radiocommunication is defined as "telecommunication by means of radio waves" and telecommunication is defined as "Any transmission, emission or reception of signs, signals, writings, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems (see Article 1.6 and Article 1.3 of the ITU Radio Regulations edition of 2020).

[215] http://eccwp.cept.org/WI_Detail.aspx?wiid=716

5.25 Readers are referred to Annex 3 for further information on Global Navigation Satellite Systems and Radio Astronomy, and relevant discussions on these topics within Europe and internationally.

5.2.12 Defence Force Use of Spectrum

5.26 ComReg intends to maintain awareness of international developments, particularly in CEPT through the Civil-Military Frequency Management Forum which brings together civil and military spectrum managers across Europe to address issues of mutual interest.

5.27 ComReg intends to continue to liaise with the Irish Defence Forces, as required, to resolve issues of mutual concern.

5.28 ComReg intends to explore with the relevant authorities opportunities to further enhance spectrum efficiency.

Chapter 6

6 Next Steps and Submitting Comments

6.1 Submitting Comments

6.1 All input and comments are welcome. Please reference comments to the relevant section / paragraph number in each chapter and annex in this document, as this will assist the task of analysing responses and ensuring that all relevant views are taken into account. Please also provide reasoning and supporting information for any views expressed.

6.2 ComReg invites views from interested parties on all aspects of the Proposed Radio Spectrum Management Strategy Statement over the next six (6) weeks. Recognising that interested parties may still be working from home as a result of the Covid-19 pandemic and that the mobilisation of resources may be challenging during this time, ComReg has given an additional two weeks over the normal four weeks identified in ComReg's Consultation Procedures.[216]

6.3 The six-week period for comment will run until 16:00 on 22 October 2021, during which time ComReg welcomes submissions in written form (e-mail) to marketframeworkconsult@comreg.ie, clearly marked – Submissions to ComReg Document 21/90.

6.4 Electronic submissions should be submitted in an unprotected format so that they may be readily included in the ComReg submissions document for electronic publication.

6.5 ComReg appreciates that respondents may wish to provide confidential information if their comments are to be meaningful. In order to promote openness and transparency, ComReg will publish all respondents' submissions to this notice, as well as all substantive correspondence on matters relating to this document, subject to the provisions of ComReg's guidelines on the treatment of confidential information (Document 05/24).

6.6 In this regard, respondents should submit views in accordance with the instructions set out below. When submitting a response to this notification that contains confidential information, respondents must choose one of the following options:

[216] See https://www.comreg.ie/media/dlm_uploads/2015/12/ComReg_1134.pdf

A. Submit both a non-confidential version and a confidential version of the response. The confidential version must have all confidential information clearly marked and highlighted in accordance with the instruction set out below. The separate non-confidential version must have actually redacted all items that were marked and highlighted in the confidential version.

6.7 OR

B. Submit only a confidential version and ComReg will perform the required redaction to create a non-confidential version for publication. With this option, respondents must ensure that confidential information has been marked and highlighted in accordance with the instructions set out below. Where confidential information has not been marked as per our instructions below, then ComReg will not create the non-confidential redacted version and the respondent will have to provide the redacted non-confidential version in Information Notice ComReg 21/07 Page 11 of 17 accordance with option A above. For ComReg to perform the redactions under Option B above, respondents must mark and highlight all confidential information in their submission as follows:

   a. Confidential information contained within a paragraph must be highlighted with a chosen colour,

   b. Square brackets must be included around the confidential text (one at the start and one at the end of the relevant highlighted confidential information),

   c. A Scissors symbol (Symbol code: Wingdings 2:38) must be included after the first square bracket.

6.8 For example, "Redtelecom has a market share of [✂25%]."

6.2 Next Steps

6.9 Following receipt and consideration of submissions in response to this, and other relevant material, ComReg intends to finalise its strategy for managing the use of radio spectrum in Ireland for the period 2022 – 2024 and publish same alongside a response to this consultation document.

Annex: 1 Summary of legal framework and statutory objectives relevant to the management of the radio spectrum

A 1.1 The Communications Regulation Acts 2002 as amended[217] (the "2002 Act"), the Common Regulatory Framework (including the Framework and Authorisation Directives[218] as transposed into Irish law by the corresponding Framework and Authorisation Regulations[219]), and the Wireless Telegraphy Acts1926 to 2009[220] set out, amongst other things, powers, functions, duties and objectives of ComReg that are relevant to the management of the radio frequency spectrum in Ireland and to this preliminary consultation.

A 1.2 Apart from licensing and making regulations in relation to licences, ComReg's functions include the management of Ireland's radio frequency spectrum in accordance with ministerial Policy Directions under Section 13 of the 2002 Act, having regard to its objectives under Section 12 of the 2002 Act, Regulation 16 of the Framework Regulations and the provisions of Article 8a of the Framework Directive. ComReg is to carry out its functions effectively, and in a manner serving to ensure that the allocation and assignment of radio frequencies is based on objective, transparent, non-discriminatory and proportionate criteria.

A 1.3 ComReg recognises that the current European Common Regulatory Framework for ECN and ECS will be superseded by the European Electronic

[217] The Communications Regulation Act 2002 (as amended), the Communications Regulation (Amendment) Act 2007, the Communications Regulation (Premium Rate Services and Electronic Communications Infrastructure) Act 2010 and the Communications Regulation (Postal Services) Act 2011.

[218] Directive No. 2002/21/EC of the European Parliament and of the Council of 7 March 2002 (as amended by Regulation (EC) No. 717/2007 of 27 June 2007, Regulation (EC) No. 544/2009 of 18 June 2009 and Directive 2009/140/EC of the European Parliament and Council of 25 November 2009) (the "Framework Directive") and Directive No. 2002/20/EC of the European Parliament and of the Council of 7 March 2002 (as amended by Directive 2009/140/EC) (the "Authorisation Directive")

[219] The European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (S.I. No. 333 of 2011) and the European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2011 (S.I. No. 335 of 2011) respectively.

[220] The Wireless Telegraphy Acts 1926 to 1988 and Sections 181 (1) to (7) and (9) and Section 182 of the Broadcasting Act 2009.

Communications Code[221] ("EECC") during the course of this forthcoming strategy period. On 20 December 2018, the EECC entered into force. The EECC replaces the EU Common Regulatory Framework adopted in 2002 (and amended in 2009) under which ComReg has regulated electronic communications since 2003.

A 1.4 With some limited exceptions (see Article 124 of the EECC), Member States had until 21 December 2020 to transpose the EECC into national law[1]. The DECC is responsible for the transposition of the EECC[2] and ComReg has assisted the DECC in that regard as appropriate.

A 1.5 ComReg understands that the EECC is unlikely to be transposed into national law until at least Q4 2021. However, for the avoidance of doubt, electronic communications providers must continue to comply with their obligations, ComReg will continue to regulate the electronic communications sector under its existing powers, and redress mechanisms for customers will continue unchanged until new legislation is introduced.

A 1.6 Notwithstanding, and for the avoidance of doubt, ComReg is satisfied that, to the best of its knowledge, the proposals contained in this document will not conflict with the objectives of the EECC or the obligations likely to be imposed on ComReg under national legislation implementing same.

A 1.7 This Annex is intended as a general guide as to ComReg's role in this area, and not as a definitive or exhaustive legal exposition of that role. Further, this annex restricts itself to consideration of those powers, functions, duties and objectives of ComReg that appear most relevant to the matters at hand and generally excludes those not considered relevant (for example, in relation to postal services, premium rate services or market analysis). For the avoidance of doubt, however, the inclusion of particular material in this Annex does not necessarily mean that ComReg considers same to be of specific relevance to the matters at hand.

A 1.8 All references in this annex to enactments are to the enactment as amended at the date hereof, unless the context otherwise requires.

Primary Objectives and Regulatory Principles under the 2002 Act and Common Regulatory Framework

A 1.9 ComReg's primary objectives in carrying out its statutory functions in the context of electronic communications are to:

[221] Directive (EU) 2018/1972 of the European Parliament and of the Council of 11th December 2018 establishing the European Electronic Communications Code.

[1] With the exception of Articles 53(2), (3) and (4), and Article 54 (See Article 124).

[2] See, for example, https://assets.gov.ie/162712/1d774c6b-55d4-4b04-9253-8be6f24fb3ba.pdf

- promote competition[222];
- contribute to the development of the internal market[223];
- promote the interests of users within the Community[224];
- ensure the efficient management and use of the radio frequency spectrum in Ireland in accordance with a direction under Section 13 of the 2002 Act[225]; and
- unless otherwise provided for in Regulation 17 of the Framework Regulations, take the utmost account of the desirability of technological neutrality in complying with the requirements of the Specific Regulations [226] in particular those designed to ensure effective competition [227].

Promotion of Competition

A 1.10 Section 12(2)(a) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at the promotion of competition, including:

- ensuring that users, including disabled users, derive maximum benefit in terms of choice, price and quality;
- ensuring that there is no distortion or restriction of competition in the electronic communications sector; and
- encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources.

A 1.11 In so far as the promotion of competition is concerned, Regulation 16(1)(b) of the Framework Regulations also requires ComReg to:

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[222] Section 12 (1)(a)(i) of the 2002 Act.

[223] Section 12 (1)(a)(ii) of the 2002 Act.

[224] Section 12(1)(a)(iii) of the 2002 Act.

[225] Section 12(1)(b) of the 2002 Act. Whilst this objective would appear to be a separate and distinct objective in the 2002 Act, it is noted that, for the purposes of ComReg's activities in relation to electronic communications networks and services ("ECN" and "ECS"), Article 8 of the Framework Directive identifies "*encouraging efficient use and ensuring the effective management of radio frequencies (and numbering resources*)" as a sub-objective of the broader objective of the promotion of competition.

[226] The 'Specific Regulations' comprise collectively the Framework Regulations, the Authorisation Regulations, the European Communities (Electronic Communications Networks and Services) (Access) Regulations 2011 (S.I. No. 334 of 2011), the European Communities (Electronic Communications Networks and Services) (Universal Service and Users' Rights) Regulations 2011 (S.I. 337 of 2011) and the European Communities (Electronic Communications Networks and Services) (Privacy and Electronic Communications) Regulations 2011 (S.I. No. 336 of 2011).

[227] Regulation 16(1)(a) of the Framework Regulations.

- ensure that elderly users and users with special social needs derive maximum benefit in terms of choice, price and quality, and
- ensure that, in the transmission of content, there is no distortion or restriction of competition in the electronic communications sector.

A 1.12 Regulation 9(11) of the Authorisation Regulations also provides that ComReg must ensure that radio frequencies are efficiently and effectively used having regard to Section 12(2)(a) of the 2002 Act and Regulations 16(1) and 17(1) of the Framework Regulations. Regulation 9(11) further provides that ComReg must ensure that competition is not distorted by any transfer or accumulation of rights of use for radio frequencies, and, for this purpose, ComReg may take appropriate measures such as mandating the sale or the lease of rights of use for radio frequencies.

Contributing to the Development of the Internal Market

A 1.13 Section 12(2)(b) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at contributing to the development of the internal market, including:

- removing remaining obstacles to the provision of electronic communications networks, electronic communications services and associated facilities at Community level;
- encouraging the establishment and development of trans-European networks and the interoperability of transnational services and end-to-end connectivity; and
- co-operating with electronic communications national regulatory authorities in other Member States of the Community and with the Commission of the Community in a transparent manner to ensure the development of consistent regulatory practice and the consistent application of Community law in this field.

A 1.14 In so far as contributing to the development of the internal market is concerned, Regulation 16(1)(c) of the Framework Regulations also requires ComReg to co-operate with the Body of European Regulators for Electronic Communications (BEREC) in a transparent manner to ensure the development of consistent regulatory practice and the consistent application of EU law in the field of electronic communications.

Promotion of Interests of Users

A 1.15 Section 12(2)(c) of the 2002 Act requires ComReg, when exercising its functions in relation to the provision of electronic communications networks and services, to take all reasonable measures which are aimed at the promotion of the interests of users within the Community, including:

- ensuring that all users have access to a universal service;
- ensuring a high level of protection for consumers in their dealings with suppliers, in particular by ensuring the availability of simple and inexpensive dispute resolution procedures carried out by a body that is independent of the parties involved;
- contributing to ensuring a high level of protection of personal data and privacy;
- promoting the provision of clear information, in particular requiring transparency of tariffs and conditions for using publicly available electronic communications services;
- encouraging access to the internet at reasonable cost to users;
- addressing the needs of specific social groups, in particular disabled users; and
- ensuring that the integrity and security of public communications networks are maintained.

A 1.16 In so far as promotion of the interests of users within the EU is concerned, Regulation 16(1)(d) of the Framework Regulations also requires ComReg to:

- address the needs of specific social groups, in particular, elderly users and users with special social needs, and
- promote the ability of end-users to access and distribute information or use applications and services of their choice.

Regulatory Principles

A 1.17 In pursuit of its objectives under Regulation 16(1) of the Framework Regulations and Section 12 of the 2002 Act, ComReg must apply objective, transparent, non-discriminatory and proportionate regulatory principles by, amongst other things:

- promoting regulatory predictability by ensuring a consistent regulatory approach over appropriate review periods;
- ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing electronic communications networks and services;
- safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure-based competition;
- promoting efficient investment and innovation in new and enhanced infrastructures, including by ensuring that any access obligation takes appropriate account of the risk incurred by the investing undertakings and by permitting various cooperative arrangements between investors and

parties seeking access to diversify the risk of investment, while ensuring that competition in the market and the principle of non-discrimination are preserved;

- taking due account of the variety of conditions relating to competition and consumers that exist in the various geographic areas within the State; and
- imposing ex-ante regulatory obligations only where there is no effective and sustainable competition and relaxing or lifting such obligations as soon as that condition is fulfilled.

BEREC

A 1.1 Under Regulation 16(1)(3) of the Framework Regulations, ComReg must:

- having regard to its objectives under Section 12 of the 2002 Act and its functions under the Specific Regulations, actively support the goals of BEREC of promoting greater regulatory co-ordination and coherence; and
- take the utmost account of opinions and common positions adopted by BEREC when adopting decisions for the national market.

Other Obligations under the 2002 Act

A 1.18 In carrying out its functions, ComReg is required amongst other things, to:

- seek to ensure that any measures taken by it are proportionate having regard to the objectives set out in Section 12 of the 2002 Act;[228]
- have regard to international developments with regard to electronic communications networks and electronic communications services, associated facilities, postal services, the radio frequency spectrum and numbering[229]; and
- take the utmost account of the desirability that the exercise of its functions aimed at achieving its radio frequency management objectives does not result in discrimination in favour of or against particular types of technology for the provision of ECS.[230]

Policy Directions[231]

A 1.19 Section 12(4) of the 2002 Act provides that, in carrying out its functions, ComReg must have appropriate regard to policy statements, published by or

[228] Section 12(3) of the 2002 Act.

[229] Section 12(5) of the 2002 Act.

[230] Section 12(6) of the 2002 Act.

[231] ComReg also notes, and takes due account of, the Spectrum Policy Statement issued by the Department of Communications Energy and Natural Resources in September 2010.

on behalf of the Government or a Minister of the Government and notified to the Commission, in relation to the economic and social development of the State. Section 13(1) of the 2002 Act requires ComReg to comply with any policy direction given to ComReg by the Minister for Communications, Energy and Natural Resources ("the Minister") as he or she considers appropriate, in the interests of the proper and effective regulation of the electronic communications market, the management of the radio frequency spectrum in the State and the formulation of policy applicable to such proper and effective regulation and management, to be followed by ComReg in the exercise of its functions. Section 10(1)(b) of the 2002 Act also requires ComReg, in managing the radio frequency spectrum, to do so in accordance with a direction of the Minister under Section 13 of the 2002 Act, while Section 12(1)(b) requires ComReg to ensure the efficient management and use of the radio frequency spectrum in accordance with a direction under Section 13.

A 1.20 The Policy Directions which are most relevant in this regard include the following:

Policy Direction No.3 on Broadband Electronic Communication Networks

A 1.21 ComReg shall in the exercise of its functions, take into account the national objective regarding broadband rollout, viz, the Government wishes to ensure the widespread availability of open-access, affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis within three years, on the basis of utilisation of a range of existing and emerging technologies and broadband speeds appropriate to specific categories of service and customers.

A 1.22 ComReg is conscious that the three year objective described in this policy direction has now expired making this direction less relevant currently.

Policy Direction No.4 on Industry Sustainability

A 1.23 ComReg shall ensure that in making regulatory decisions in relation to the electronic communications market, it takes account of the state of the industry and in particular the industry's position in the business cycle and the impact of such decisions on the sustainability of the business of undertakings affected.

Policy Direction No.5 on Regulation only where Necessary

A 1.24 Where ComReg has discretion as to whether to impose regulatory obligations, it shall, before deciding to impose such regulatory obligations on undertakings, examine whether the objectives of such regulatory obligations would be better achieved by forbearance from imposition of such obligations and reliance instead on market forces.

Policy Direction No.6 on Regulatory Impact Assessment

A 1.25 ComReg, before deciding to impose regulatory obligations on undertakings in the market for electronic communications or for the purposes of the management and use of the radio frequency spectrum or for the purposes of the regulation of the postal sector, shall conduct a Regulatory Impact Assessment in accordance with European and International best practice and otherwise in accordance with measures that may be adopted under the Government's Better Regulation programme.

Policy Direction No.7 on Consistency with other Member States

A 1.26 ComReg shall ensure that, where market circumstances are equivalent, the regulatory obligations imposed on undertakings in the electronic communications market in Ireland should be equivalent to those imposed on undertakings in equivalent positions in other Member States of the European Community.

Policy Direction No.11 on the Management of the Radio Frequency Spectrum

A 1.27 ComReg shall ensure that, in its management of the radio frequency spectrum, it takes account of the interests of all users of the radio frequency spectrum.

General Policy Direction No.1 on Competition (2004)

A 1.28 ComReg shall focus on the promotion of competition as a key objective. Where necessary, ComReg shall implement remedies which counteract or remove barriers to market entry and shall support entry by new players to the market and entry into new sectors by existing players. ComReg shall have a particular focus on:

- market share of new entrants;
- ensuring that the applicable margin attributable to a product at the wholesale level is sufficient to promote and sustain competition;
- price level to the end user;
- competition in the fixed and mobile markets;
- the potential of alternative technology delivery platforms to support competition.

Other Relevant Obligations under the Framework and

Authorisation Regulations

A2.2.1 Framework Regulations

A 1.29 Regulation 17 of the Framework Regulations governs the management of radio frequencies for electronic communications services. Regulation 17(1) requires that ComReg, subject to any directions issued by the Minister pursuant to Section 13 of the 2002 Act and having regard to its objectives under Section 12 of the 2002 Act and Regulation 16 of the Framework Regulations and the provisions of Article 8a of the Framework Directive, ensure:

- the effective management of radio frequencies for electronic communications services;
- that spectrum allocation used for electronic communications services and issuing of general authorisations or individual rights of use for such radio frequencies are based on objective, transparent, non-discriminatory and proportionate criteria; and
- ensure that harmonisation of the use of radio frequency spectrum across the EU is promoted, consistent with the need to ensure its effective and efficient use and in pursuit of benefits for the consumer such as economies of scale and interoperability of services, having regard to all decisions and measures adopted by the European Commission in accordance with Decision No. 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the EU.

A 1.30 Regulation 17(2) provides that, unless otherwise provided in Regulation 17(3), ComReg must ensure that all types of technology used for electronic communications services may be used in the radio frequency bands that are declared available for electronic communications services in the Radio Frequency Plan published under Section 35 of the 2002 Act in accordance with EU law.

A 1.31 Regulation 17(3) provides that, notwithstanding Regulation 17(2), ComReg may, through licence conditions or otherwise, provide for proportionate and non-discriminatory restrictions to the types of radio network or wireless access technology used for electronic communications services where this is necessary to—

- avoid harmful interference,
- protect public health against electromagnetic fields,
- ensure technical quality of service,
- ensure maximisation of radio frequency sharing,

- safeguard the efficient use of spectrum, or
- ensure the fulfilment of a general interest objective as defined by or on behalf of the Government or a Minister of the Government in accordance with Regulation 17(6).

A 1.32 Regulation 17(4) requires that, unless otherwise provided in Regulation 17(5), ComReg must ensure that all types of electronic communications services may be provided in the radio frequency bands, declared available for electronic communications services in the Radio Frequency Plan published under Section 35 of the Act of 2002 in accordance with EU law.

A 1.33 Regulation 17(5) provides that, notwithstanding Regulation 17(4), ComReg may provide for proportionate and non-discriminatory restrictions to the types of electronic communications services to be provided, including where necessary, to fulfil a requirement under the ITU Telecommunication Union Radio Regulations.

A 1.34 Regulation 17(6) requires that measures that require an electronic communications service to be provided in a specific band available for electronic communications services must be justified in order to ensure the fulfilment of a general interest objective as defined by or on behalf of the Government or a Minister of the Government in conformity with EU law such as, but not limited to—

- safety of life,
- the promotion of social, regional or territorial cohesion,
- the avoidance of inefficient use of radio frequencies, or
- the promotion of cultural and linguistic diversity and media pluralism, for example, by the provision of radio and television broadcasting services.

A 1.35 Regulation 17(7) provides that ComReg may only prohibit the provision of any other electronic communications service in a specific radio spectrum frequency band where such a prohibition is justified by the need to protect safety of life services. ComReg may, on an exceptional basis, extend such a measure in order to fulfil other general interest objectives as defined by or on behalf of the Government or a Minister of the Government.

A 1.36 Regulation 17(8) provides that ComReg must, in accordance with Regulation 18, regularly review the necessity of the restrictions referred to in Regulations 17(3) and 17(5) and must make the results of such reviews publicly available.

A 1.37 Regulation 17(9) provides that Regulations 17(2) to (7) only apply to spectrum allocated to be used for electronic communications services, general authorisations issued and individual rights of use for radio frequencies granted after the 1 July 2011. Spectrum allocations, general authorisations and

individual rights of use which already existed on the 1 July 2011 Framework Regulations are subject to Regulation 18.

A 1.38 Regulation 17(10) provides that ComReg may, having regard to its objectives under Section 12 of the 2002 Act and Regulation 16 and its functions under the Specific Regulations, lay down rules in order to prevent spectrum hoarding, in particular by setting out strict deadlines for the effective exploitation of the rights of use by the holder of rights and by withdrawing the rights of use in cases of non-compliance with the deadlines. Any rules laid down under this Regulation must be applied in a proportionate, non-discriminatory and transparent manner.

A 1.39 Regulation 17(11) requires ComReg to, in the fulfilment of its obligations under that Regulation, respect relevant international agreements, including the ITU Radio Regulations and any public policy considerations brought to its attention by the Minister.

Authorisation Regulations

Decision to limit rights of use for radio frequencies

A 1.40 Regulation 9(2) of the Authorisation Regulations provides that ComReg may grant individual rights of use for radio frequencies by way of a licence where it considers that one or more of the following criteria are applicable:

- it is necessary to avoid harmful interference,
- it is necessary to ensure technical quality of service,
- it is necessary to safeguard the efficient use of spectrum, or
- it is necessary to fulfil other objectives of general interest as defined by or on behalf of the Government or a Minister of the Government in conformity with EU law.

A 1.41 Regulation 9(10) of the Authorisation Regulations provides that ComReg must not limit the number of rights of use for radio frequencies to be granted except where this is necessary to ensure the efficient use of radio frequencies in accordance with Regulation 11.

A 1.42 Regulation 9(7) also provides that:

- where individual rights of use for radio frequencies are granted for a period of 10 years or more and such rights may not be transferred or leased between undertakings in accordance with Regulation 19 of the Framework Regulations, ComReg must ensure that criteria set out in Regulation 9(2) apply for the duration of the rights of use, in particular upon a justified request from the holder of the right.
- where ComReg determines that the criteria referred to in Regulation 9(2) are no longer applicable to a right of use for radio frequencies, ComReg

must, after a reasonable period and having notified the holder of the individual rights of use, change the individual rights of use into a general authorisation or must ensure that the individual rights of use are made transferable or leasable between undertakings in accordance with Regulation 19 of the Framework Regulations.

Publication of procedures

A 1.43 Regulation 9(4)(a) of the Authorisation Regulations requires that ComReg, having regard to the provisions of Regulation 17 of the Framework Regulations, establish open, objective, transparent, non-discriminatory and proportionate procedures for the granting of rights of use for radio frequencies and cause any such procedures to be made publicly available.

Duration of rights of use for radio frequencies

A 1.44 Regulation 9(6) of the Authorisation Regulations provides that rights of use for radio frequencies must be in force for such period as ComReg considers appropriate having regard to the network or service concerned in view of the objective pursued taking due account of the need to allow for an appropriate period for investment amortisation.

Conditions attached to rights of use for radio frequencies

A 1.45 Regulation 9(5) of the Authorisation Regulations provides that, when granting rights of use for radio frequencies, ComReg must, having regard to the provisions of Regulations 17 and 19 of the Framework Regulations, specify whether such rights may be transferred by the holder of the rights and under what conditions such a transfer may take place.

A 1.46 Regulation 10(1) of the Authorisation Regulations provides that, notwithstanding Section 5 of the Wireless Telegraphy Act,1926, but subject to any regulations under Section 6 of that Act, ComReg may only attach those conditions listed in Part B of the Schedule to the Authorisation Regulations. Part B lists the following conditions which may be attached to rights of use:

- Obligation to provide a service or to use a type of technology for which the rights of use for the frequency has been granted including, where appropriate, coverage and quality requirements.
- Effective and efficient use of frequencies in conformity with the Framework Directive and Framework Regulations.
- Technical and operational conditions necessary for the avoidance of harmful interference and for the limitation of exposure of the general public to electromagnetic fields, where such conditions are different from those included in the general authorisation.

- Maximum duration in conformity with Regulation 9, subject to any changes in the national frequency plan.
- Transfer of rights at the initiative of the rights holder and conditions of such transfer in conformity with the Framework Directive.
- Usage fees in accordance with Regulation 19.
- Any commitments which the undertaking obtaining the usage right has made in the course of a competitive or comparative selection procedure.
- Obligations under relevant international agreements relating to the use of frequencies.
- Obligations specific to an experimental use of radio frequencies.

A 1.47 Regulation 10(2) also requires that any attachment of conditions under Regulation 10(1) to rights of use for radio frequencies must be non-discriminatory, proportionate and transparent and in accordance with Regulation 17 of the Framework Regulations.

Procedures for limiting the number of rights of use to be granted for radio frequencies

A 1.48 Regulation 11(1) of the Authorisation Regulations provides that, where ComReg considers that the number of rights of use to be granted for radio frequencies should be limited it must, without prejudice to Sections 13 and 37 of the 2002 Act:

- give due weight to the need to maximise benefits for users and to facilitate the development of competition, and
- give all interested parties, including users and consumers, the opportunity to express their views in accordance with Regulation 12 of the Framework Regulations.

A 1.49 Regulation 11(2) of the Authorisation Regulations requires that, when granting the limited number of rights of use for radio frequencies it has decided upon, ComReg does so *"…on the basis of selection criteria which are objective, transparent, non-discriminatory and proportionate and which give due weight to the achievement of the objectives set out in Section 12 of the 2002 Act and Regulations 16 and 17 of the Framework Regulations."*

A 1.50 Regulation 11(4) provides that where it decides to use competitive or comparative selection procedures, ComReg must, inter alia, ensure that such procedures are fair, reasonable, open and transparent to all interested parties.

Fees for spectrum rights of use

A 1.51 Regulation 19 of the Authorisation Regulations permits ComReg to impose fees for rights of use which reflect the need to ensure the optimal use of the radio frequency spectrum.

A 1.52 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.

Amendment of rights and obligations

A 1.53 Regulation 15 of the Authorisation Regulations permits ComReg to amend rights and conditions concerning rights of use, provided that any such amendments may only be made in objectively justified cases and in a proportionate manner, following the process set down in Regulation 15(4).

Other Relevant Provisions

Wireless Telegraphy Act, 1926 as amended

A 1.54 Under Section 5(1) of the 1926 Act, ComReg may, subject to that Act, and on payment of the prescribed fees (if any), grant to any person a licence to keep and have possession of apparatus for wireless telegraphy in any specified place in the State.

A 1.55 Section 5(2) provides that, such a licence shall be in such form, continue in force for such period and be subject to such conditions and restrictions (including conditions as to suspension and revocation) as may be prescribed in regard to it by regulations made by ComReg under Section 6.

A 1.56 Section 5(3) also provides that, where it appears appropriate to ComReg, it may, in the interests of the efficient and orderly use of wireless telegraphy, limit the number of licences for any particular class or classes of apparatus for wireless telegraphy granted under Section 5.

A 1.57 Section 6 provides that ComReg may make regulations prescribing in relation to all licences granted by it under Section 5, or any particular class or classes of such licences, all or any of the following matters:

- the form of such licences,
- the period during which such licences continue in force,
- the manner in which, the terms on which, and the period or periods for which such licences may be renewed,
- the circumstances in which or the terms under which such licences are granted,

- the circumstances and manner in which such licences may be suspended or revoked by ComReg,
- the terms and conditions to be observed by the holders of such licences and subject to which such licences are deemed to be granted,
- the fees to be paid on the application, grant or renewal of such licences or classes of such licences, subject to such exceptions as ComReg may prescribe, and the time and manner at and in which such fees are to be paid, and
- matters which such licences do not entitle or authorise the holder to do.

A 1.58 Section 6(2) provides that Regulations made by ComReg under Regulation 6 may authorise and provide for the granting of a licence under Section 5 subject to special terms, conditions, and restrictions to persons who satisfy it that they require the licences solely for the purpose of conducting experiments in wireless telegraphy.

Broadcasting Act 2009 (the "2009 Act")

A 1.59 Section 132 of the 2009 Act relates to the duties of ComReg in respect of the licensing of spectrum for use in establishing digital terrestrial television multiplexes and places an obligation on ComReg to issue:

- two DTT multiplex licences to RTÉ by request (see Sections 132 (1) and (2) of the 2009 Act); and
- a minimum of four DTT multiplex licences to the BAI by request (see Sections 132 (3) and (4) of the 2009 Act) for the provision of commercial TV content.

Article 4 of Directive 2002/77/EC (Competition Directive)

A 1.60 Article 4 of the Competition Directive provides that:

> *"Without prejudice to specific criteria and procedures adopted by Member States to grant rights of use of radio frequencies to providers of radio or television broadcast content services with a view to pursuing general interest objectives in conformity with Community law:*
>
> - Member States shall not grant exclusive or special rights of use of radio frequencies for the provision of electronic communications services.
> - The assignment of radio frequencies for electronic communication services shall be based on objective, transparent, non-discriminatory and proportionate criteria."

Annex: 2 World Radiocommunication Conferences 2019 and 2023

Main topics from the 2019 World Radiocommunication Conference

Broadband Communications (5G and Wi-Fi)

A 2.1 The global harmonisation of suitable spectrum for IMT-2020[232] was a high-profile topic with discussion focussed on the bands 24.25-27.5 GHz, 37-43.5 and 66-71 GHz. After intensive negotiations, conditions for the use of these bands were agreed, including emission limits for the protection of passive services in adjacent bands.

A 2.2 A particularly contentious issue was the emission limits in the band 23.6-24 GHz used for weather forecasting and earth-exploration applications. Different regional groups presented widely varying views on the necessary limits to provide adequate protection for the scientific services without putting undue constraints on 5G equipment.

A 2.3 A compromise solution was ultimately agreed based on a two-step approach, where limits of -33 dBW/200 MHz will apply until September 2027. At that point a more stringent limit of -39 dBW/200 MHz will be applicable. The concept behind this approach was that a more relaxed limit during the initial stages of 5G network deployment should not cause significant interference due to the expected low number of deployed base stations. Then as deployment density increases a more stringent limit would be required to reduce the impact of interference.

A 2.4 The Conference also discussed the conditions for use of frequency bands in 5 GHz for Radio Local Area Networks ("RLAN") including Wi-Fi. It was agreed that the existing global usage conditions in the 5150 - 5250 MHz band would be relaxed to allow indoor usage in trains and cars, as well as outdoor usage with certain limitations.

Satellite Communications

A 2.5 The regulatory procedures for non-geostationary satellite ("NGSO") constellations were revised, introducing a milestone approach to deploy NGSO constellations, which may count thousands of satellites, in several frequency bands.

[232] IMT-2020 is the ITU terminology for mobile technologies and covers 3G, 4G and 5G.

A 2.6 According to the new rules, 'mega-constellations' will need to deploy 10% of their constellation within two years of the end of the current regulatory period, 50% within five years, and complete the deployment within seven years. Transitional measures with an exemption to meet the first milestone were agreed for satellite systems for which the end of the seven-year regulatory period is before 28 November 2022. This compromise strikes a balance between the prevention of spectrum warehousing, the proper functioning of coordination mechanisms, and the operational requirements related to the deployment of large NGSO constellations.

A 2.7 NGSO systems will also benefit from new rules on the use of bands in the 37.5-51.4 GHz range, while avoiding interference towards geostationary ("GSO") networks and earth exploration-satellite service ("EESS"). It was agreed to allow acceptable degradation due to aggregate interference to GSO systems – in terms of allowance for carrier-to-noise values and average reduction of throughput. Transitional measures will also protect filings notified before WRC-19 and brought into use before November 2023. In addition, the ITU will continue studies on several issues that could not be fully solved at WRC-19, including how to deal with supplemental links and protect EESS at 36-37 GHz.

A 2.8 WRC-19 also addressed the use of the 17.7-19.7 GHz and 27.5-29.5 GHz bands for satellite earth stations in motion ("ESIM") – for example, to provide connectivity on board aircraft or on ships, operating with GSO space stations in the fixed-satellite service. This continued the work of WRC-15, which opened the 19.7-20.2 GHz and 29.5-30.0 GHz bands to ESIMs intended to provide reliable high-bandwidth connections to moving platforms.

Maritime and Aeronautical Communications

A 2.9 The WRC-19 agenda also addressed the possible need of regulatory solutions for the Global Aeronautical Distress and Safety System ("GADSS") and the Global Maritime Distress and Safety System ("GMDSS").

A 2.10 While no change to the ITU Radio Regulations was needed for GADSS, several measures were adopted to modernise GMDSS and to include a new satellite system provider. In particular, a primary allocation to the maritime mobile-satellite service ("MMSS") was agreed in the frequency band 1 621.35 – 1 626.5 MHz. This will be used for the GMDSS, and for provisions to protect radioastronomy and the existing MMSS operations in the adjacent band.

A 2.11 To enhance maritime safety, WRC-19 also adopted measures that enable the satellite component of VHF data exchange systems ("VDE-SAT"). A new secondary allocation to the VDE-SAT uplink and downlink was agreed within the frequency bands of Appendix 18 of the ITU Radio Regulations, with an additional provision on the use of the downlink, subject to coordination with terrestrial stations in Azerbaijan, Belarus, the Russian Federation and in several countries outside of Europe.

A 2.12 Finally, conditions were agreed for autonomous maritime radio devices that either enhance the safety of navigation (Group A) or do not concern the operation of vessels (Group B), using the automatic identifications system technology.

Scientific Use of Spectrum

A 2.13 WRC-19 agreed on power restrictions to protect the use of Telemetry, Tracking and Command ("TT&C")[233] in the 401-403 MHz and 399.9-400.05 MHz bands under the earth exploration-satellite service, meteorological-satellite service ("MetSat") or mobile-satellite services.

A 2.14 This will provide protection from interference to the large number of existing lower power data collection system stations communicating to sensitive receivers on GSO and NGSO satellites. Measures were also adopted to take into account existing systems.

[233] Telemetry, Tracking and Command (TT&C) refers to the downlinked platform data giving details of the satellite's status, determination of its location through tracking ranging signals, and the uplinked commands given to the platform. This includes both crewed spacecraft as well as autonomous satellites.

Major agenda items scheduled for the 2023 World Radiocommunication Conference

Mobile Broadband and Broadcasting

A 2.15 The use of the 470 - 960 MHz band across ITU region 1 (Europe, the Middle East and Africa) will be reviewed to identify possible regulatory actions for the 470-694 MHz band based on the use and future needs of broadcasting and mobile services. This will be a high-profile agenda item at WRC-23 due to the importance of spectrum in this range to both mobile and broadcasting services. On behalf of Ireland and reflecting this agenda items importance, ComReg has committed to provide the CEPT co-ordinator for this agenda item.

A 2.16 To inform itself on the opportunities for Ireland, ComReg intends to carry out a study on the use of the 470-694 MHz band in Ireland during the period of this strategy statement.

Mobile Broadband Communications

A 2.17 Additional frequency bands will be considered for mobile usage and the relevant bands for the CEPT (ITU region 1) are:

- 3 300 - 3 400 MHz;
- 3 600 - 3 800 GHz[234];
- 6 425 - 7 025 MHz; and
- a possible global harmonisation in 7025-7125 MHz.

Aeronautical Communications

A 2.18 Agenda items addressing aeronautical issues include:

- Reviewing the existing conditions for control of drones using satellite networks;
- potential new allocations for the aeronautical mobile service in various ranges between 15.4 GHz and 22.5 GHz – to accommodate new non-safety applications;

[234] The 3 600 – 3 800 GHz band is already harmonised for mobile broadband ECS in CEPT through ECC Decision (11)06, in the EU though Commission Implementing Decision (EU) 2019/235 (January 2019) and was assigned in Ireland following an award in June 2017.

- new allocation for the aeronautical mobile-satellite (route) service will be considered in the range 117.975-137 MHz; and
- the existing regulatory provisions for aeronautical mobile (route) service in the range 2.85-22 MHz will be reviewed to accommodate digital technologies for commercial aviation safety-of-life systems.

Satellite Communications

A 2.19 There are two agenda items addressing satellite earth stations in motion to complement the work done in these bands for GSO networks at both WRC-15 and WRC-19:

- the frequency range 12.75-13.25 GHz will be studied specifically for aero and maritime usage with geostationary networks; and
- bands between 17.7 GHz and 30 GHz will be studied for all categories of usage with non-geostationary systems.

A 2.20 WRC-23 will also consider possible new allocations for the mobile-satellite service for future satellite-based IoT applications and will consider several frequency bands, between 1685 MHz and 3400 MHz on a regional basis, including in 2010-2025 MHz within Region 1.

Scientific Use of Spectrum

A 2.21 Agenda items related to the scientific sector will consider:

- a possible new secondary earth exploration-satellite service ("EESS") allocation – for active EESS – within a range of frequencies around 45 MHz for space-borne radar sounders;
- a possible upgrade of the space research allocation in 14.8-15.35 GHz; and
- possible adjustments to passive EESS allocations in 231.5-252 GHz.

Other Matters

A 2.22 In the maritime sector, the work that took place on the Global Maritime Distress and Safety System at WRC-19 will be continued under an agenda item focused on the modernisation of the GMDSS and the implementation of e-navigation.

A 2.23 WRC-23 will address the possible revision of various regulatory procedures which include:

- consideration of spectrum requirements for space weather sensors;

- studies on the protection of radio navigation systems in 1240-1300 MHz – including the European Galileo system – from possible interference from amateur usage; and
- the possible use of fixed service bands to provide fixed wireless broadband and measures to provide protection of EESS in 36-37 GHz from NGSO satellites.

Annex: 3 Further detailed information on specific matters

Radio Amateur Services

A 3.1 The regulations governing the issue of Radio Amateur Licences are the Wireless Telegraphy (Amateur Station Licence) Regulations, 2002 (S.I. 192 of 2009) and ComReg has published a set of guidelines (ComReg. Doc 09/45 R4).

A 3.2 The Radio Amateur Licence conditions require that each licensee operates their station "*having utmost regard to any guidelines that may be issued and amended by the Commission from time to time in relation to the keeping, installing, maintaining, working and use of apparatus for wireless telegraphy forming part of an Amateur Station*"[235].

A 3.3 ComReg has, since 2009, adopted an approach that favours self-regulation of this service and limited itself, generally, to establishing regulations and guidelines that only reflect ComReg's spectrum management functions and objectives.

A 3.4 At that time ComReg introduced life-time licences for radio amateurs, which require licensees to confirm every 5 years through the ComReg eLicensing website, that their licence details are up to date and correct.

A 3.5 The matters for consideration and on which ComReg is seeking views through this consolation are as follows:

- Novice Licences; and
- Increase in maximum permitted power and related issues.

Novice and Entry-class licensing

A 3.6 ComReg has received a query on the issue of additional classes of amateur station licencing. See Annex 5 for the published submission.

A 3.7 Under the ITU Radio Regulations[236] ComReg is obligated to "*verify the operational and technical qualifications of any person wishing to operate an amateur station*"[237].

[235] See section 7 (1) (b) of S.I. 192 of 2009.
[236] https://www.itu.int/en/publications/ITU-R/pages/publications.aspx?parent=R-REG-RR-2020&media=electronic

[237] See Article 25.6 of the ITU Radio Regulations, Volume 1, edition of 2020.

A 3.8 There are three different amateur radio licence levels described in the CEPT:

- CEPT Recommendation T/R 61-02 makes it possible for CEPT administrations to issue a Harmonised Amateur Radio Examination Certificate (HAREC). This Certificate shows proof of successfully passing an amateur radio examination that complies with the Examination Syllabus for HAREC;
- Due to the standard of the technical theory aspects of the HAREC examination syllabus, ERC Report 32[238] describes a medium-level examination with a lower standard than required under the Harmonised Amateur Radio Examination Certificate (HAREC), suitable for an amateur radio novice class licence; and
- ECC Report 89 describes a third level, the ENTRY-CLASS, a still lower level of examination syllabus and its administration.

A 3.9 ComReg notes that a number of administrations have implemented additional levels of licence and that often the driver of such an action includes:

- Making the hobby more attractive to new entrants; and;
- Allow visitors with a lower class of license to operate in country.

A 3.10 In order to issue a HAREC ComReg requires applicants to have passed an examination based on a syllabus harmonised across Europe. This approach ensures that European Amateurs have achieved a common and recognised standard.

A 3.11 The setting and running of this examination in Ireland is contracted to the IRTS[239] with ComReg responsible for ensuring the standard of examination. The examination is now a multiple-choice paper with 60 questions, The pass mark is 60%, a pass is required in each of the two main sections.[240]

A 3.12 Acknowledging the trend away from home construction to commercially supplied equipment, ComReg has focused the examination on matters that are necessary to ensure successful candidates can at a minimum:

- meet the conditions contained in their Amateur Station Licence;
- understand national and international operating rules and procedures;

[238] https://docdb.cept.org/download/f269d824-61a3/ERCRep32.pdf

[239] IRTS – Irish Radio Transmitters Society - www.irts.ie/

[240] Prior to this, the licence exam in Ireland was at a markedly higher standard in that essay answers, detailed block diagrams and the use of mathematics was required to pass the exam.

- understand national and international regulations relevant to the amateur service and amateur satellite service;
- manage interference;
- conduct their hobby safety;
- exhibit an understanding of antennas and transmission lines; and
- have a basic knowledge of radio propagation.

A 3.13 It is ComReg's view that:

- the HAREC syllabus as examined in Ireland is adequate to achieve ComReg's primary objective of ensuring the efficient management and use of the radio frequency spectrum in Ireland; and
- a standard below that guaranteed by the HAREC syllabus does not assure a reasonable level of proficiency in a) the technical and operational aspects of amateur radio; b) the regulations governing the amateur radio service in Ireland or c) ensure the conditions of an Amateur Station Licence can be met.

A 3.14 For these reasons ComReg has to date not implemented any form of novice or other lower level of licencing. However, ComReg is seeking views on the matter through this consultation process. In responding to this matter please consider that:

- any change to a licensing regime would require ComReg to undertake a consultation and may require new regulations to be put in place. Any new regulations would require a new statutory instrument which is at the discretion of the Minister;
- ComReg has limited resources and must balance those resources between competing work items of varying priorities during the strategy period; and
- the issue of competence to operate an amateur station without having passed a HAREC standard exam needs to be addressed.

Increase in permissible transmitter power and related issues

A 3.15 The spectrum bands, maximum permitted transmitted powers and permitted modes of operation under which radio amateurs can operate in Ireland are detailed in the Amateur Station Licence Guidelines[241].

[241] See ComReg document 09/45R4 - Amateur Station Licence Guidelines – published 16 April 2018.

A 3.16 On a temporary basis ComReg has extended the maximum permitted power for certain Radio Amateur contests for the duration of each contest, without the need for separate authorisation.

A 3.17 Under the ITU Radio Regulations[242] there are two relevant provisions that must be considered:

- The maximum power of amateur stations shall be "*fixed by the administrations concerned*"[243]; and
- Member States recognise that among frequencies which have long-distance propagation characteristics, those in the bands between 5 MHz and 30 MHz are particularly useful for long-distance communications; they agree to make every possible effort to reserve these bands for such communications. Whenever frequencies in these bands are used for short or medium distance communications, the minimum power necessary shall be employed[244].

A 3.18 ComReg has received a request from the Marconi Radio Group (Submission in Annex 5) for ComReg to review and amend the currently power levels to have the maximum power limits increased in order to:

- afford Irish Radio Amateurs parity with other member states;
- improve contesting outside the contests for which ComReg currently permits increased transmitter powers; and
- to facilitate DXers[245].

A 3.19 In support of their request the Marconi Radio Group submitted a spreadsheet that details transmitter powers permitted across a sample of countries that are recognised under the CEPT licencing framework. This includes some non-CEPT countries that have agreed to use the CEPT framework.

Errors in current guidelines

A 3.20 In considering this matter ComReg has noted the following errors in its Amateur Station Licence Guidelines:

- The band 135.7 – 137.8 kHz.

[242] https://www.itu.int/en/publications/ITU-R/pages/publications.aspx?parent=R-REG-RR-2020&media=electronic
[243] See Article 25.7 of the ITU Radio Regulations, Volume 1, edition of 2020.
[244] See Article 4.11 of the ITU Radio Regulations, Volume 1, edition of 2020.
[245] *DXer* refers to a Amateur station licensee who strives to receive and identify distant radio or television signals, or seeks to makes two-way radio contact with other radio amateurs.

ComReg notes that there is an error in the current guidelines which currently permits a maximum of 0 dBW peak-envelope-power (PEP) in this band.

Footnote 5.67A of the ITU Radio Regulations requires that stations in the amateur service must not exceed a maximum radiated power of 1W equivalent isotropic radiated power (e.i.r.p).

ComReg will update the guidelines to correct this error by changing the maximum permitted power to 0 dBW e.i.r.p.

- The band 472.0 – 470.0 kHz.

  ComReg notes that there is an error in the current guidelines which currently permits a maximum of 5 W (7 dBW) peak-envelope-power (PEP) in this band.

  Footnote 5.80A of the ITU Radio Regulations requires that stations in the amateur service, in Irelands circumstances, must not exceed a maximum radiated power of 5 W e.i.r.p.

  ComReg will update the guidelines to correct this error by changing the maximum permitted power to 7 dBW e.i.r.p.

- The band 5351.5 – 5366.5 kHz.

  ComReg notes that there is an error in the current guidelines which currently permits a maximum of 15 W (12 dBW) peak-envelope-power (PEP) in this band.

  Footnote 5.133B of the ITU Radio Regulations requires that stations in the amateur service in region 1, must not exceed a maximum radiated power of 15 W e.i.r.p.

  ComReg will update the guidelines to correct this error by changing the maximum permitted power to 12 dBW e.i.r.p.

A 3.21 The consequence of this change is that amateurs operating in any of these bands must be able to accurately measure their transmitter output, be able to determine the gain of their antenna system and then be able to calculate the e.i.r.p. levels in use.

Comparing power levels permitted in other countries

A 3.22 ComReg has developed its own spreadsheet based on the information provided by the Deutscher Amateur Radio Club e.V[246] and has made this spreadsheet available for download from ComReg's Radio Amateur webpage. ComReg's spreadsheet covers all CEPT member countries to give a better overview of the level of harmonisation across Europe.

A 3.23 As ComReg's focus is on EU and CEPT harmonisation, the spreadsheet does not consider the USA, Canada, New Zealand or Greenland (not in the same ITU region) or South Africa (not in the same geographic region).

A 3.24 To limit the size of the spreadsheet:

- the three bands noted above are not included; and
- where only a few administrations vary powers across a range of sub-bands these have not been included.

A 3.25 To provide some form of evaluating the wide range of differences across the table we have included in the spreadsheet the minimum power, maximum power, average power value and medium power values across each row.

A 3.26 Across the CEPT there is a wide range of maximum permitted powers with some administrations permitting higher powers than that allowed in Ireland bit also some administration permitting lower powers that that allowed in Ireland.

A 3.27 Amateurs in Ireland have, in general, parity with a number of CEPT countries including Bulgaria, Cyprus, Malta, the Netherlands, Turkey and the UK.

P.E.P vs. e.i.r.p values

A 3.28 The current guidelines refer to transmitter power outputs in terms of Peak Envelope Power (PEP), see Annex 2 of the guidelines (in particular paragraphs A2.14 – A2.15) for the definition of this power level and how it is to be measured.

[246] See *Countries with CEPT Licence, Compiled by Hans Schwarz, DK5JI, (Current as of 2021-06-26)* available at https://www.iaru-r1.org/wp-content/uploads/2020/01/Cept-Laenderliste.pdF

A 3.29 The use of PEP is somewhat unusual in that it is normal modern practise to specify the power output of a transmitting station in terms of Equivalent Isotropic Radiated Power (e.i.r.p) as this takes into account the whole transmission system including the directivity of the antenna, cable losses, etc. In theory, where only PEP is used to define the power limit, there is no upper bound to the amount of power that can be radiated in any of the bands. Practically, ComReg accepts that in the HF bands, the size and complexity of antennas does place a limit on what is achievable.

A 3.30 Bearing in mind that amateurs have access to spectrum bands from LF to EHF, ComReg is uncomfortable with a situation where the effective radiated power of an amateur station does not have a ceiling limit, which is at odds with the licence conditions of the majority of transmitting stations in Ireland.

A 3.31 However, ComReg recognises that:

- this has been the situation in Ireland for decades;
- this is currently the practise across all countries surveyed by ComReg while examining this issue; and
- ComReg already allows the use of higher PEP powers on a temporary basis for a number of contests.

A 3.32 Furthermore, there have been no reports of Irish radio amateurs causing interference to other services in the bands where operation is on a secondary basis or into adjacent bands.

Compliance with related licence conditions

A 3.33 ComReg needs to consider two other matters that are related to transmitter powers, spurious emissions and non-ionising radiation.

A 3.34 The limits of permitted spurious emissions and non-ionising radiation (NIR) are given in annex 2 of the guidelines. In order to ensure that amateurs are able to meet these licence conditions.

The Meteorological Aids Service.

A 3.35 The meteorological aids (MetAids) service is defined in the ITU Radio Regulations as a radiocommunications service used for meteorological, including hydrological, observations and exploration.

A 3.36 In practice the MetAids service usually provides the link between an *in situ* sensing system for meteorological variables (such as wind speed, wind direction, atmospheric pressure, etc.) and a remote base station. The *in situ* sensing system may be carried (e.g. attached to a balloon) or falling through the atmosphere on a parachute after release from an aircraft or rocket. The base station may be in a fixed location or mounted on a mobile platform such as a ship or research aircraft.

A 3.37 The two bands mostly used for this purpose are 400.15 – 406 MHz and 1 668.4 – 1 700 MHz with the transmitter attached to the balloon and sophisticated receivers and antenna systems used in the observatory to record the telemetry stream. In these bands the MetAids have a primary allocation and share on a co-primary basis with a variety of other services.

A 3.38 Numerous times a day Met Éireann send a radiosonde[247] (a transmitter), carried by a balloon through the atmosphere, from the station at Valentia to make upper air measurements. These measurements become part of the World Meteorological Organisation (WMO)[248] Global Observing System (GSO)[249].

Private local Networks

Background

A 3.39 The European Commission's Communication on Connectivity[250] for a competitive digital single market, towards a European gigabit society, set out ambitious connectivity objectives for the Union to be achieved through the widespread deployment and take-up of very high-capacity networks.

[247] According to the ITU as many as 800 000 radiosondes are flown worldwide on balloons each year.
[248] See https://public.wmo.int/en

[249] See https://public.wmo.int/en/resources/bulletin/global-observing-system

[250] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Connectivity for a Competitive Digital Single Market - Towards a European Gigabit Society' COM(2016) 587 final.

A 3.40 To that end, in its communication entitled '5G for Europe: an Action Plan'[251] the Commission drew on an important input from industry ('5G Manifesto for the timely deployment of 5G in Europe'[252]) that highlighted 5G as a key enabler of the digitalisation of "vertical industries" (such as transport, logistics, automotive, health, energy, smart factories, media and entertainment) and identified a need for action at Union level that included the identification and harmonization of spectrum for 5G on the basis of the opinion of the RSPG, to serve innovative business models and solutions for 'verticals'.

A 3.41 Furthermore, the Commission Communication on 'A New Industrial Strategy for Europe'[253], which lays out the vision for the industrial transformation in the Union for the next 10 years, stresses the importance of strengthening the digital single market to underpin Union's digital transition, and calls on the Union to speed up investments in 5G, as a major enabler for future digital services and be at the heart of the industrial data wave.

A 3.42 In a recent RSPG Opinion[254] 'on additional spectrum needs and guidance on the fast rollout of future wireless broadband networks', the RSPG:

- recognised that there is spectrum demand for local use (verticals) in the mid-bands with different approaches followed by Member States so far to providing access to licensed spectrum for that purpose; and
- recommended to study the possible use of the 3 800-4 200 MHz frequency band for local vertical applications (i.e. low/medium power), while protecting receiving satellite earth stations and other existing applications and services.

A 3.43 The EC has noted that while some Member States seem to be considering diverging options for radio spectrum reservations for local/vertical applications, the potential common use of the 3 800 - 4 200 MHz frequency band for such cases would ensure additional harmonised availability and efficient use of radio spectrum, while avoiding artificial scarcity in the 3 400-3 800 MHz frequency band and other mid bands, caused by spectrum reservation for private local networks.

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[252] Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions '5G for Europe: An Action Plan', COM(2016) 588 final.
[252] 5G Manifesto for timely deployment of 5G in Europe, 7 July 2016.

[253] Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions 'A New Industrial Strategy for Europe', COM(2020) 102 final.
[254] Document RSPG21-024 final of 16 June 2021, *RSPG opinion on additional spectrum needs and guidance on the fast rollout of future wireless broadband networks.*

A 3.44 Therefore, the EC is seeking to assess the spectrum needs for the use of the 3 800-4 200 MHz frequency band by private local networks while ensuring continued protected use of that band for satellite services ('safe harbour') notably by developing innovative sharing solutions.

A 3.45 The proposed manner to achieve this[255] is by issuing a mandate to the CEPT to:

- assess spectrum needs for the use of the 3 800-4 200 MHz frequency band by terrestrial wireless broadband systems providing private local-area network connectivity ('private local networks'); and
- develop harmonised technical conditions for the shared use of the 3 800-4 200 MHz band by private local networks while ensuring protection of incumbent users operating in this band (in particular receiving satellite earth stations), and co-existence with services in adjacent bands (such as the radio altimeters on board aircraft operating in the 4 200-4 400 MHz frequency band).

A 3.46 Based on the outcome of the CEPT mandate, the Commission may consider adopting a technical implementing measure under the Radio Spectrum Decision for the shared use of the 3 800-4 200 MHz frequency band for private local networks in the Union, in order to further foster the efficient use of radio spectrum and facilitate the rollout of 5G in support of vertical applications as an important component of the 5G ecosystem.

TV White Space

A 3.47 TV White Space is a technology which enables dynamic access of white space devices ("WSD") to use unutilised frequencies at specific geographical locations within the broadcast spectrum band (470MHz – 694MHz) to provide broadband services, without causing harmful interference to licensed broadcast services within the location.

A 3.48 The channel assignments in the 470MHz – 694MHz band to TV broadcasters (primary users) can vary by location, therefore the channels not assigned for broadcast services at a particular location are potentially available for use by WSDs. This concept is designed to improve spectrum usage while taking advantage of the frequency band's propagation characteristics which can provide extended coverage for services such as broadband internet connectivity to rural and underserved areas.

[255] Inline with Article4(2) of the Radio Spectrum Decision

A 3.49 A white space device is an electronic communication device which has the capability to detect unused frequencies and utilise those frequencies to provide services. A WSD may be fixed, for example a radio unit mounted on a mast, or it could be a portable device like a mobile phone.

WSD Access Techniques

A 3.50 The three major access techniques used by WSDs to ensure primary user protection and enable WSD detect unused frequencies at a geographic location are[256]:

- **Spectrum sensing:** This technique involves scanning a candidate channel to determine whether the channel is free, if the scanned channel is free, then a check will also be done on adjacent channels to determine a safe transmit power level for the WSD on the available channel. Spectrum sensing does not depend on any existing infrastructure such as a connection to a database of used frequencies at a geographic location and one of its key parameters is the sensing threshold.

- **Geo-location database:** This technique requires the WSD to measure its location and then communicate this information to a database to determine which frequencies are available at its location. The WSD is not allowed to transmit on the white space frequency until an available frequency is provided by the database.

- **Beacons:** Beacons are signals which can be used to indicate to WSD if a particular channel is occupied by a primary user or not.

6.10 The geo-location database access method has been observed to be the most practical as field trials carried out by the Federal Communications Commission ("FCC") indicate that WSDs which employs this technique had the best performance with respect to correctly ascertaining channel availability within the broadcast spectrum,[257] however, in some cases a combination of the geolocation database and spectrum sensing is been employed.

[256] See ECC Report 159
[257] Evaluation of the Performance of Prototype TV-Band White Space Devices Phase II https://docs.fcc.gov/public/attachments/DA-08-2243A3.pdf, OET Report, 2008

WSD Example

A 3.51 An example of the TVWS concept as a broadband application is where a fixed controller WSD (master) serves as an access point, just like a wifi router, for peripheral WSDs (slave) (e.g. mobile phones, laptops, etc.) and a database system containing information about the primary users spectrum at a geographic location.

A 3.52 The peripheral WSDs are not allowed to transmit on the channels until the controller WSD is able to retrieve from a white space database (WSDB) the available unused channels to transmit on. A WSDB contains information on the usage of the TV spectrum frequency within a particular geographical area. The controller WSD will serve as an intermediary between the peripheral WSDs and the WSDB, in this scenario it will be able to access the database through a local network or through the internet over a cable modem connection.

A 3.53 One principle of operation as illustrated in the ECC Report 159 will have the controller WSD designed with a capability to obtain the peripheral WSDs location either by querying the peripheral WSDs or through some network positioning method[258]. The obtained location will then be reported to the WSDB, on receiving this information from the controller WSD, the database will then communicate back the list of safe channels within the TV band and their respective maximum WSD transmit power for that particular location based on the DTT information (Digital Terrestrial Television) provided by the national regulatory authority.

A 3.54 On receiving the feedback from the geolocation database, the controller WSD will select what channel(s) from the list provided to transmit on, through this means the peripheral WSDs will be able to access broadband services using unused channels within the broadcast spectrum. On the occasion that they are no available channels, the controller WSD will have to keep checking with the geo database at certain intervals and would not transmit on the TV band until an available channel is provided. Figure 29 provides a simplified graphic of a sample use case of TVWS for broadband connectivity.

[258] See ECC Report 159

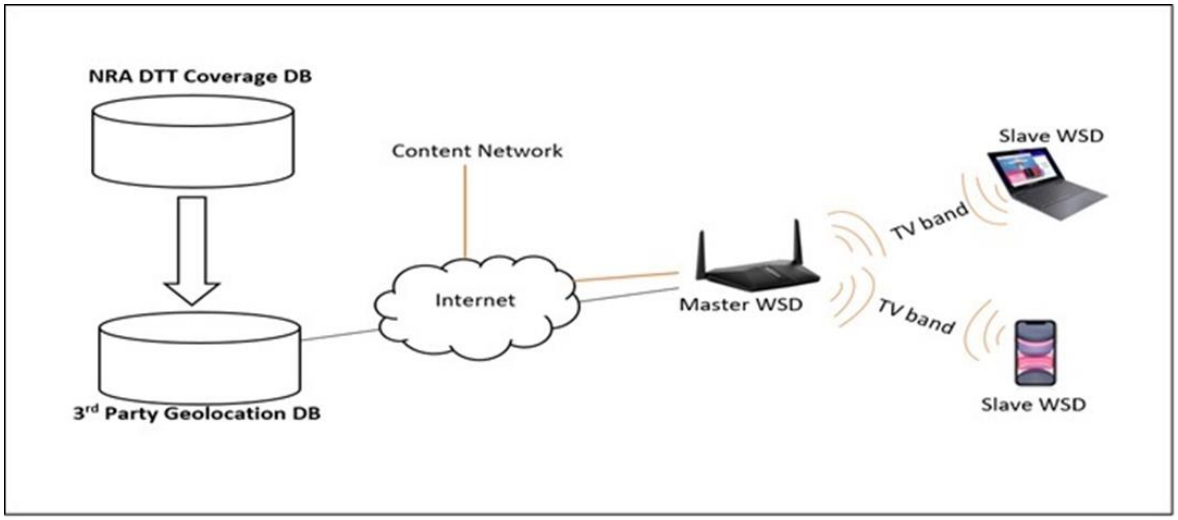


Figure 29: Sample use case of TVWS for broadband connectivity

TVWS deployments and authorisations in various countries

A 3.55 In some CEPT member states, different scales of research and trials on TVWS have been carried out, however to date, only the UK regulatory body (Ofcom) has authorised the shared access of the TV broadcast frequency band with WSDs on a license exempt basis.[259] See Table 3 for the countries Microsoft has carried out TVWS trials.[260]

Europe	Outside Europe
Belgium, Finland, France[261], Germany, Ireland, Switzerland, UK	Brazil, Japan, Kenya, Philippines, Singapore, South Korea, Uruguay, US[262]

Table 3: Microsoft TVWS trials in various countries

A 3.56 Fifteen countries around the world have adopted regulations that allow the license-exempt use of TVWS.[263]

[259] Implementing TV White Spaces, https://www.ofcom.org.uk/__data/assets/pdf_file/0034/68668/tvws-statement.pdf, Ofcom Report, 2015
[260] Super Wi-Fi Technologies, https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/spectrum-microsoft-super-wifi-overview.pdf
[261] https://en.arcep.fr/news/arcep-speaks/view/n/regulating-for-the-commons-lessons-from-the-5g-situation-in-france-the-need-for-greater-democracy-in-spectrum.html, 2020

[262] As of 30 June 2021, only 334 TVWS devices are registered in the FCC's White Space Database (which is administrated by RED Technologies):
[263] https://www.policytracker.com/from-us-to-kenya-tv-white-spaces-are-making-a-comeback/

A 3.57 Ofcom authorised TVWS use in the 470 to 790 MHz[264] TV band in 2015 on a licence-exempt basis. To ensure low probability of harmful interference to Digital Terrestrial Television ("DTT") users and to protect services along the border with the Republic of Ireland and around the coast of UK, Ofcom implemented strict operational power limits for WSDs.[265]

A 3.58 Manually configurable WSDs which are devices that cannot automatically determine its geographic coordinates but require a manual entry are not authorised by Ofcom on a licence exempt basis because the WSDB may provide operational parameters which would harm the spectrum primary users if the WSD end user should input inaccurate parameters on the device.[266]

A 3.59 Currently, the TVWS regime in the UK has authorised seven 3rd party geo-database operators which operate independently to facilitate operations of WSDs in the UK.[267]

TVWS trials in Ireland

A 3.60 As part of its Airband global initiative, which is aimed at providing remote internet connectivity, ComReg has facilitated two separate TVWS trials which were run in partnership with Microsoft Ireland and are detailed below[268]. The purpose of the trials was to prove that TVWS technology can provide remote internet connectivity within agricultural and rural settings.

A 3.61 Test frequencies were assigned manually by ComReg and a WSDB was not required to identify available frequencies:

- **Net1:** ComReg issued an initial Trial Licence to the ISP provider Net1 on the 25th April 2019 to authorise a TVWS pilot project at county Cavan with two transmit sites (Slieve Glah and Ballyhaise) providing broadband access to students and researchers working remotely in the field across

[264] WSDs will cease to use frequencies between 694MHz and 790MHz on completion of the 700MHz reallocation programme in the UK.: https://www.ofcom.org.uk/__data/assets/pdf_file/0032/198770/ofcom-annual-report-and-accounts-2019-20.pdf, 2020.

[265] Implementing TV White Spaces, https://www.ofcom.org.uk/__data/assets/pdf_file/0034/68668/tvws-statement.pdf, Ofcom Report, 2015.

[266] Ofcom did note that controller devices with geolocation capabilities were unable to geolocate successfully during E2E testing and hence the coordinates had to be manually inputted into the devices to allow them work and as such will need a licence to operate. Suggested likely cause for the device inability to geo locate includes indoor testing locations and environmental factors: https://www.ofcom.org.uk/__data/assets/pdf_file/0034/68668/tvws-statement.pdf, Ofcom Report, 2015.

[267] https://www.ofcom.org.uk/__data/assets/pdf_file/0029/73964/statement.pdf, Ofcom Report, 2016.

[268] Microsoft Ireland partnered with Net1 & Teagasc and on a separate project with the Department of Rural Community Development (DRCD) & the Local Government Management Agency (LGMA) to run trials on TVWS.

the campus. A further licence with a duration of eight months was issued on the 25th April 2020 as a need for further study on the project arose, this project ran until 24th December 2020.

- **Department of Rural and Community Development:** A Trial Licence covering a 12-month period was also issued to the Department of Rural and Community Development on the 31st October 2020. The trial scenario aims to leverage on existing broadband connections from five public locations[269] with each location having a single base station reaching heights up to 30m and targeting households in hard to reach areas.

Future use of TVWS technology in Ireland

A 3.62 ComReg notes that in its Response to Consultation (ComReg Document 18/117) on the previous 2019-2021 Strategy Statement, it stated that there did not appear at that point in time a sufficient merit for the introduction of an authorisation regime to licence-exempt TVWS operations in the VHF/UHF TV band. Nevertheless, ComReg stated that it would continue to monitor regulatory and technology developments in this area and may revisit this matter as part of the 2022-2024 strategy period.

A 3.63 At this point in time, ComReg notes that a number of matters would need to be assessed as part of any future considerations on the use of TVWS technology in Ireland. These matters are, but not limited to, the following:

- **UHF Spectrum Availability:** With the allocation of the 700MHz band for MFCN, 29 UHF channels would be available to share with existing primary (DTT) and secondary (PMSE) users and any future TVWS users. In addition, the ITU's World Radio Conference in 2023 intends, as agenda 1.5, to review the spectrum use and spectrum needs of existing services in the frequency band 470-960 MHz in Region 1 and consider possible regulatory actions in the frequency band 470-694 MHz in Region 1 on the basis of the review in accordance with Resolution 235 (WRC-15)[270].
- **Mitigating harmful interference:** Depending on the volume of WSDs and their proximity to DTT users, power limits of WSDs would need to be considered to ensure protection of primary services, while also providing TVWS end-users with an appropriate level of service**.**
- **Cross-border issues:** Spectrum usage by broadcasters in the UK and Northern Ireland could impact TVWS deployment and use in Ireland, specifically in the Border regions and on the East coast.

The use of spectrum bands harmonised for ECS for

[269] Each of these locations were provisioned with six 8MHz UHF channels aside the Carlow area which was provisioned with ten 8MHz UHF channels.
[270] ITU Resolution 235 (WRC-15)

communications with Unmanned Aircraft Systems (Drones).

A 3.64 Within Europe (i.e. the CEPT) a demand has been identified to operate professional Unmanned Aircraft Systems (UAS) in particular under beyond-visual-line-of-sight (BVLOS) conditions. The term UAS is synonymous with the term Drones.

A 3.65 According to a study for the European Union[271]:

- in aggregate, some 7 million consumer leisure drones are expected to be operating across Europe and a fleet of 400 000 is expected to be used for commercial and government missions in 2050.
- Commercial and professional users are expected to demand drones in both rural and urban settings and will be reliant on beyond visual line of sight capabilities to be permitted.
- Examples of some of the most influential missions, in terms of the potential number of drones and economic impact, include the following:
    - agriculture sector where over 100 000 drones are forecasted to enable precision agriculture to help drive increased levels of productivity that are required;
    - energy sector where close to 10 000 drones limit risk of personnel and infrastructure by performing preventative maintenance inspections;
    - delivery purposes where there is potential for a fleet of nearly 100 000 drones to provide society with some kind of urgent service capabilities, such as transporting emergency medical supplies, and "premium" deliveries;
    - public safety and security where a forecasted fleet of approximately 50 000 drones would provide authorities like police and fire forces the means to more efficiently and effectively locate endangered citizens and assess hazards as they carry out civil protection and humanitarian missions

271 SESAR European drones outlook study: unlocking value for Europe – November 2016.

A 3.66 Flying and operating UAS in Ireland is subject to European Union Regulation 2019/947[272]. For the avoidance of doubt ComReg has no remit to consider how UAS is used in Ireland as the Irish Aviation Authority (IAA) supervises and implements the Regulation in Ireland. The IAA also provides guidance for operating and flying drones in order to ensure public safety[273].

A 3.67 The assumptions agreed by the CEPT/ECC[274] were:

- to limit studies to a technology which is already deployed and available in different frequency bands;
- That the communications links of UAS may be used for any type of communication, possibly including command and control and payload;
- The usage of UAS will be limited to a maximum altitude of 10000 m; and
- The user terminals on UAS are radio equipment subject to RED[275].

A 3.68 These assumptions lead to the conclusion that the most appropriate and currently widely deployed technology which needs to be evaluated is LTE.

A 3.69 Noting that many CEPT countries have extensive national coverage from mobile networks using LTE across a number of ECS bands, the ECC studies focused on LTE technology for the communication link in harmonised ECS bands.

Previous work within the Electronic Communications Committee (ECC)

A 3.70 With the intention to allow the use of existing mobile base stations (BS), which are typically deployed to provide effective coverage at ground level, the ECC analysed the conditions for the usage of UAS UE (User Equipment) for communications in the following harmonised ECS bands:

- 700 MHz;
- 800 MHz;
- 900 MHz;
- 1800 MHz;

[272] Commission implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft systems.
[273] See - https://www.iaa.ie/general-aviation/drones The Regulation allows registered operators and pilots to fly their drones across the EU. You must register as a drone operator if your drone weighs over 250 grams or if it has a camera or sensor.
[274] See - ECC Report 309 Analysis of the usage of aerial UE for communication in current MFCN harmonised bands – published 3 July 2020.
[275] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment.

- 2.1 GHz;
- 2.6 GHz; and
- 3.4 - 3.8 GHz (with adaptive antenna systems on the base station).

A 3.71 The study, which forms the basis of developing an additional framework to clarify spectrum regulatory conditions for the usage of UAS in the relevant suitable mobile bands, came to a number of conclusions:

- The use of ECS bands for the communication links of UAS UE within a country may be restricted to only a certain frequency band(s) and/or in some geographical areas due to national laws (e.g. no fly zones over sensitive areas such as jails, military bases, etc);
- Additional emission limits specific to UAS UEs would be necessary to avoid interference to other services in some adjacent bands;
- Noting that at the time (July 2020), that mobile operators do not intend to develop specific network planning to respond to these new aerial uses, coexistence studies are mostly required for the uplink (UL), due to the elevated position of UAS.
- No specific studies are required in the down link (DL) for non-AAS BSs, since the emissions characteristics are not modified. Studies in the DL would only be required for the case of AAS base stations, where beam steering may lead to beam pointing above the horizon and may modify the emission characteristics.
- Relevant CEPT cross-border coordination recommendations shall be developed in addition to the analysis already done in the Report.
- The band 1427-1518 MHz is harmonised for supplemental down link (SDL) at European level. Taking into account that aerial applications are mostly either bi-directional or dominated by uplink communications from the UAS to the network (e.g. earth observation data transmission) it is reasonable to assume that the 1427-1518 MHz band will not be of high interest for UAS users, so no further studies are considered.
- The band 2300-2400 MHz is harmonised for MFCN on a Licensed Shared Access (LSA) approach within CEPT. However its sparse use precluded it from study – noting that it might be appropriate to conduct future studies on this band.

Ongoing work within the Electronic Communications Committee (ECC)

A 3.72 The ECC agreed, that to ensure confidence of all spectrum users, including those is adjacent bands, there is a need for an ECC decision providing harmonized technical conditions of the usage of UAS for communications, based on LTE in a number of mobile bands.

A 3.73 Project Team 1[276] of the ECC started working on this matter in March 2020 and are aiming to delivery of an ECC Decision in Q4 2022. There are a number of open items that require further discussion, including the question on the possible need for further technical studies due to foreseen Active Antenna Systems usages in bands other than the 3.6 GHz band already covered in ECC Report 309.

A 3.74 ComReg prioritises its participation in is ECC Project Team 1, therefore this enables ComReg to monitor developments, to understand the complex issues, discuss matters with relevant stakeholders and ensure that appropriate licence regimes are put in place to facilitate UAS operations in Ireland if there is demand for such operations.

A 3.75 There is a need for cross-border coordination studies and the development of recommendations which will form the basis for any negotiations between ComReg and neighbouring administrations to avoid interference from aerial UEs. This work is scheduled to commence in the ECC work groups.

Ongoing work within ETSI

A 3.76 There are a number of issues that need to be considered by the ETSI in order to finalise equipment standards so that equipment can enter the European market. These include ensuring that the equipment standards:

- includes limits on out-of-band emission limits from aerial UEs operating in specific bands to avoid interference to other services in some adjacent bands;
- ensure that MNO's can differentiate between aerial UE and UE operating on the ground in order to monitor and maintain the number of aerial UE density under the acceptable level avoiding self-interference - Such differentiated registration mechanisms for aerial UEs are already being developed by 3GPP[277]; and
- made available a mechanism to ensure that aerial UEs respects national '"no-fly zone(s)".

[276] ECC Project Team 1 (ECC PT1) is responsible for mobile (IMT) issues, including compatibility studies, development of band plans, development and review of ECC deliverables and for the preparation of CEPT positions on WRC-23 agenda items 1.2, 1.3, 1.4 & 9 - studies on Art. 21

[277] The 3rd Generation Partnership Project (3GPP) unites seven telecommunications standard development organizations), known as "Organizational Partners" and provides their members with a stable environment to produce the Reports and Specifications that define 3GPP technologies. The project covers cellular telecommunications technologies, including radio access, core network and service capabilities, which provide a complete system description for mobile telecommunications.

Other issues related to UAS

A 3.77 Two other issues related to UAS are no-fly zones and additional out-of-band limits.

No-fly zones

A 3.78 ComReg's mandate in relation to no-fly zones is limited what is necessary to avoid interference to other services in adjacent bands. For the avoidance of doubt, ComReg has no mandate to implement no-fly zones for any other reason.

A 3.79 National studies may be needed to define no fly zones for UAS operating[278]:

- in the 703 - 713.5 MHz frequency band in order to protect sites on which Radio Astronomy Services (RAS) are operating in the band 1 400-1 427 MHz;
- in the 832 - 835 MHz in order to protect sites on which RAS are operating in the 1 660 – 1 670 MHz band;
- in the 2 500-2 570 MHz in order to protect air-traffic control (ATC) radars operating above 2 700 MHz;
- in 2 570-2 620 MHz in order to protect ATC radars operating above 2 700 MHz and to protect sites on which RAS are operating in the band 2 690 - 2 700 MHz; and
- In the 3 400 – 3 800 GHz to protect fixed-satellite service (FSS) Earth stations receiving in the 3 400 – 3 800 MHz band and sites were RAS stations receiving in the band 3 345.8 – 3 352.5 MHz.

Out-of-band limits

A 3.80 There may be a need to place some out-of-band limits for UASs operating:

- In the band 1 710 – 1 785 MHz in order to protect the receivers of Meteorological Satellite (MetSat) systems receiving in the band 1 675 – 1 710 MHz band;
- In the band 3 400 – 3 800 MHz in order to protect airborne and land-based radars operating below 3 400 MHz; and
- Below 3 800 MHz to avoid the need for specific protection distances with FSS earth station operating above 3 800 MHz.

[278] For information - ComReg has not at this time examined what studies may or may not be required – this will form part of any consultation on this matter.

Global Navigation Satellite Systems (GNSS)

A 3.81 On 17 July 1995 the USA government declared that its Global Positioning System (GPS) had achieved full operational capability and in the last 26 years this uninterrupted and globally available system has led to the development of a number of civilian applications.

A 3.82 A similar system developed by Russia, the GLObal NAvigation Satellite System (GLONASS) which fell into some disrepair following the economic and political disarray after the collapse of the USSR is now completing a rebuild and modernisation program that makes it an alternative and complementary system to GPS.

A 3.83 China has also developed a global system, the BeiDou Navigation Satellite System (BDS) which is interoperable with the three other global systems that also makes it an alternative and complementary system to GPS and Glonass[279].

A 3.84 GPS (US), GLONASS (Russia) and BeiDou (China) are military systems under military control and while they provide a civil service that civil service could be either switched off or made less precise when desired (e.g. in case of conflict). As far back as July 1999[280] the European Union recognised that a satellite navigation system for civil use is a strategic resource as:

- the world has become so dependent on services provided by satellite navigation in our daily lives that should a service be reduced or switched off, the potential disruption to business, banking, transport, aviation, communication, etc., to name but a few, would be very costly (e.g. in terms of revenues for business, road safety, etc.);
- it affords European industry the chance to enhance its competence and to participate in opportunities opened up by this future technology on a large scale;
- satellite-based positioning and navigation are increasingly gaining importance in nearly all fields of technology, being a key element for the setting-up of a multimodal infrastructure for all forms of aviation, water and land transport. Satellite navigation has the potential to make a major contribution to an effective use of transport infrastructure, to an increase in safety, to a reduction of environmental pollution and to the setting-up of an integrated transport system with crucial importance for the Single Market;

[279] In addition to these four global systems there are two regional satellite navigation systems (Japan with the QZSS system and India with the IRNSS system) and ten satellite augmentation systems which are limited to providing regional coverage.
[280] See Council resolution of 19 July 1990 on the involvement of Europe in a new generation of satellite navigation services - Galileo: Definition phase (1999/C 221/01).

- A European satellite navigation system will have a positive impact on information and telecommunication industries developing a European market; and
- A lack of European influence on satellite navigation systems could make it difficult in future to resist possible unilaterally decided and excessive charges and there is only a limited possibility of quickly developing alternatives.

A 3.85 The European Commission and European Space Agency joined forces to build Galileo, an independent European system under civilian control and after the declaration of early services on 15 December 2016, Galileo continues its deployment and has started launching its so-called 'Batch 3' satellites in 2021 to complete and replenish its nominal Galileo 1st generation constellation. In parallel, evolution studies are ongoing to prepare the first batch of the Galileo second generation satellites.

A 3.86 Galileo is currently offering three Initial Services after an extensive testing period:

- Open Service: a free mass-market service for positioning, navigation and timing;
- Public Regulated Service: for government-authorised users, such as civil protection services, customs officers and the police. This system is particularly robust and fully encrypted to provide service continuity for government users during emergencies or crisis situations; and
- Search and Rescue Service: Europe's contribution to the international distress beacon locating organisation COSPAS-SARSAT. Galileo's data helps to locate beacons and rescue people in distress in every kind of environment.

A 3.87 These services are free of charge and are available for citizens, business and authorities.

A 3.88 On the 14 April 2021 the European GNSS Agency[281] announced that sales of Galileo enabled smartphones had reached the 2 billion mark[282] and that there are currently over 600 smartphone/tablet models available to users that make use of the Galileo navigation service.

[281] See https://www.gsa.europa.eu/
[282] See https://www.youtube.com/watch?v=k9xYN5jIynM

The use of GNSS

A 3.89 Many sectors of the European economy rely on precise localisation and more than 10% of the EU economy is dependent on the availability of global navigation satellite signals[283]. This includes transport, energy, logistics and telecommunications.

A 3.90 The global GNSS downstream market continues to grow rapidly and in 2019 the global installed base of GNSS devices in use is forecast[284] to reach almost 6.5 billion, while global GNSS downstream market revenues from both devices and services are set to reach an astonishing €150 billion.

A 3.91 It is worth highlighting that in 2019 alone 1.7 billion GNSS units were shipped with more than 40% of these enabled to receive Galileo enabled.

A 3.92 Studies show that Galileo will deliver around €90 billion to the EU economy over the first 20 years of operations.[285] This includes direct revenues for the space, receivers, and applications industries, and indirect revenues for society such as more effective transport systems, more effective rescue operations, etc.

A 3.93 The European Global Navigation Satellite Systems Agency[286] predicts that the global GNSS downstream market revenues from both devices and services will grow from €150 Billion in 2019 to €325 billion in 2029 with a CAGR of 8%.

A 3.94 The global installed base of GNSS devices in use is forecast[287] to increase from 6.4 billion in 2019 to 9.6 billion in 2029. Despite the increasing saturation of the mature EU28, North American and Chinese markets, shipments of smartphones still outnumber those of all other devices. Following smartphones, wearables has become the second most sold GNSS device, reaching 70 million shipments in 2019. The silver economy is a key driver, mostly for health-related solutions but also following the trend of democratisation of sports & fitness equipment for all ages.

A 3.95 The vast array of use cases that rely on GNSS includes:

- Aviation - this is one of the key market segments for European GNSS and has revolutionised this market[288]. GNSS is used to increase the safety and efficiency of flight. With its accurate, continuous, and global capabilities, space-based position and navigation enables three-dimensional position

[283] See https://ec.europa.eu/growth/sectors/space/egnos_en
[284] See the GSA GNSS Market Reports at https://www.gsa.europa.eu/communication/publications
[285] https://ec.europa.eu/defence-industry-space/eu-space-policy/galileo_ro

[286] See the GSA GNSS Market Reports at https://www.gsa.europa.eu/communication/publications
[287] See the GSA GNSS Market Reports at https://www.gsa.europa.eu/communication/publications
[288] https://www.gsc-europa.eu/system/files/galileo_documents/Aviation-Report-on-User-Needs-and-Requirements-v1.0.pdf

determination for all phases of flight from departure, en route, and arrival, to airport surface navigation. It has created more access to small airports, increased safety and facilitated the commercial, regional, general and business aviation sectors across Europe.

- Precision Agriculture adopts a whole-farm management approach using information technology, satellite positioning (GNSS) data, remote sensing and proximal data gathering. These technologies have the goal of optimising returns on inputs whilst potentially reducing environmental impacts[289]. The European precision agriculture market was worth €1.92 billion in 2020 and is estimated to be growing at a rate of 13.7% to reach €3.73 billion by 2025[290].
- Marine - All passenger ships and cargo ships larger than 500 gross tonnage rely heavily on GNSS for navigation and at least three GNSS devices are typically fitted on vessels for redundancy, which indicate the level of reliance placed on the GNSS system. GNSS systems for maritime navigation are widespread across commercial and recreational vessels, both overseas and in high traffic areas. GNSS is also used to ensure safe navigation in inland waterways (rivers, canals, lakes and estuaries).
- Public safety and disaster relief - GNSS is increasingly at the core of Search and Rescue solutions providing the location information being transmitted by beacons indicating that a search and rescue is required. It is estimated that these beacons provide assistance in saving six lives every day. The role of GNSS in providing precise positioning information will be even more central as the penetration of GNSS in Emergency Position Indicating Radio Beacon (EPIRBs)[291] is foreseen to grow from 70% to 100% in 2020[292], whereas in Personal Locator Beacons (PLBs) it is already close to 100%.
- Road, Rail and Recreation - Mobility is an important part of everyone's daily lives. European *GNSS*, including *EGNOS*, is making everyone's life on the road easier by significantly reducing congestion and, consequently, CO2 pollution, improving the efficiency of road and rail transportation through navigation, fleet management opportunities and satellite road traffic monitoring. The use of apps such as Google Maps, Waze, Apple Maps and Mapquest rely on GNSS to provide the users location data, direction of travel and speed of travel.

[289] http://www.europarl.europa.eu/RegData/etudes/note/join/2014/529049/IPOL-AGRI_NT%282014%29529049_ EN.pdf
[290] https://www.marketdataforecast.com/market-reports/europe-precision-agriculture-market
[291] See https://www.comreg.ie/industry/licensing/personal-locator-beacons/ for more details on EPIRBs and PLBs.
[292] http://www.gsa.europa.eu/sites/default/files/Maritime_0.pdf

- Timing - In addition to longitude, latitude, and altitude, the GNSS provides a critical fourth dimension – time. Each GNSS satellite contains multiple atomic clocks that contribute very precise time data to the GNSS signals. GNSS receivers decode these signals, effectively synchronizing each receiver to the atomic clocks. This enables users to determine the time to within 100 billionths of a second, without the cost of owning and operating atomic clocks. Precise time is crucial to a variety of economic activities around the world. Communication systems, electrical power grids, and financial networks all rely on precision timing for synchronization and operational efficiency. For example:
    - wireless telephone and data networks use timing from GNSS to keep all of their base stations in perfect synchronization. This allows mobile handsets to share limited radio spectrum more efficiently;
    - The finance sector uses GNSS-derived timing systems to timestamp ATM, credit card, and high-speed market transactions; and
    - Computer network synchronization, digital television and radio, Doppler radar weather reporting, seismic monitoring, even multi-camera sequencing for film production relies on timing signals derived from the GNSS system.

Allocations - the spectrum band(s) used by GNSS

A 3.96 The GNSS falls under the ITU allocation of Radionavigation Satellite Service.

A 3.97 Each GNSS system transmits a variety of signals which individually or used together cover a number of services – a comprehensive list of these signals for each GNSS system is detailed below in **Error! Reference source not found.**.

A 3.98 The majority of transmitted signals fall within two spectrum bands allocated to the aeronautical radionavigation service and radionavigation-satellite (E-s) service on a primary basis worldwide. These correspond to:

- the band 1 164 - 1 215 MHz (shown in Figure 30) where GPS L5 and Galileo E5, E5a and E5b signals are transmitted; and
- the band 1 559 - 1 610 MHz (shown in Figure 31) in which the GPS L1, Galileo E1 and GLONASS G1 signals are transmitted.

A 3.99 However, there are a number of signals, including the GPS L2, GLONASS G2 and Galileo E6 signals transmitted in the band 1 215 - 1 300 MHz (covered by Figure 30). This band has primary allocations to the Earth Exploration-Satellite Service (EESS (active)), Radiolocation service, and the Radionavigation Satellite Service (RNSS). In addition portions of the band are allocated to:

- The space research service (active) on a primary basis: 1215 – 1300 MHz; and
- the amateur service (1240 – 1304 MHz) and the amateur-satellite service (1240 – 1300) both on a secondary basis.

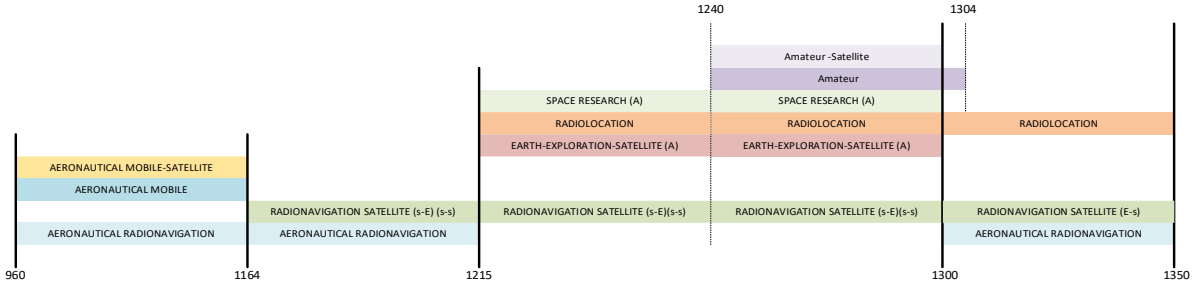


Figure 30. Allocations from 960 - 1350 MHz[293]

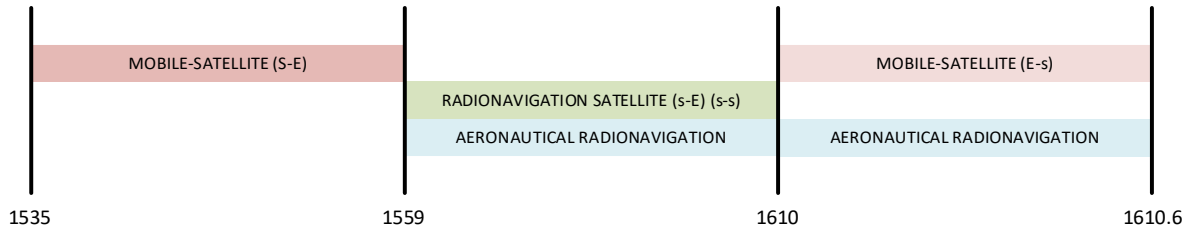


Figure 31. Allocations from 1535 – 1610.6 MHz[294]

[293] See column three in ComReg's Radio Frequency Plan for Ireland in document 20/58R2
[294] See column three in ComReg's Radio Frequency Plan for Ireland in document 20/58R2

Table 4: List of current GNSS systems, signal designations and frequencies

Constellation	Bands	Frequency in MHz				Signals/Comments
		Centre	Bandwidth	Lower	Upper	
GPS	L1	1575.42	+/- 2	1573.42	1577.42	L1C GPS III
			+/- 1.023	1574.397	1576.443	L1C/A
			+/- 10.23	1565.19	1585.65	L1P (Y)
			+/- 15	1560	1590	M Code
	L2	1227.6	+/- 10.23	1217.37	1237.83	L2P (Y)
			+/- 1.023	1226.577	1228.623	L2C
			+/- 15	1212	1242	M Code
	L5	1176.45	+/- 10.23	1166.22	1186.68	L5I/Q
QZSS	L1	1575.42	+/- 2	1573.42	1577.42	L1C D/P
			+/- 1.023	1574.397	1576.443	L1C/A
	L6	1278.75	+/- 21.0	1257.75	1299.75	Block II
	L2	1227.6	+/- 1.023	1226.577	1228.623	L2C
	L5	1176.45	+/- 10.23	1166.22	1186.68	I/Q
Galileo	E1	1575.42	+/- 12.276	1563.144	1587.696	D/P
	E5a	1176.45	+/- 10.23	1166.22	1186.68	D/P
	E5(altBOC)	1191.795	+/- 25.575	1166.22	1217.37	AltBOC
	E5b	1207.14	+/- 10.23	1196.91	1217.37	D/P
	E6	1278.75	+/- 20.46	1258.29	1299.21	D/P
GLONASS	G1			1598.0625	1605.37	FDMA

		N/A				
			+/- 0.5			CA
			+/- 5.0			P
	G1a CDMA	1600.995	+/- 5.0 +/- 1 +/- 2	1595.955. 1599.995 1598.995	1605.995 1601.995 1602.955	L1SC L1OC-D L1OC-P
	G2	N/A		1242.9375	1248.625	FDMA
			+/- 0.5			CA
			+/- 5.0			P
	G2a CDMA	1248.06	+/- 7.0 +/- 1 +/- 2	1241.06 1247.06 1246.06	1255.06 1249.06 1250.06	L2SC L2OC-D L2OC-P
	G3 CDMA	1202.025	+/- 10.23	1191.795	1212.255	L3OC-D L3OC-P
BeiDou	B1I	1561.098	+/- 2.046	1559.052	1563.144	BeiDou (II) OS
	B1	1575.42	+/- 16.368	1559.052	1591.788	BeiDou (III) B1A-D B1A-P
	B2a	1176.45	+/- 10.23	1166.22	1186.68	BeiDou (III) I/Q
	B2/B2b	1207.14	+/- 10.0	1197	1217	BeiDou(III) Not Published
	B3I	1268.52	+/- 10.23	1258.29	1278.75	B3C-D B3C-P
NAVIC (IRNSS)	L5	1176.45	+/- 12.0	1164.245	1188.45	SPS
	S	2492.028	+/- 8.25	2483.5	2500	SPS
WAAS/EGNOS	L1	1575.42	+/- 1.023	1574.397	1576.443	C/A
	L5	1176.45	+/- 10.23	1166.22	1186.68	L5 I/Q

Radio Astronomy

A 3.100 "*Astronomy is the study of our place in the universe, and the radio astronomy service is responsible for many exciting discoveries in this grand endeavour. Whether imaging massive black holes in the centres of distant galaxies or watching new planetary systems form around nearby stars, radio astronomy's success depends on the careful management of radio spectrum*" – Harvey S. Liszt[295].

A 3.101 Radio astronomy is a uni-directional service that is based on the reception of radio waves of cosmic origin and therefore, radio astronomy has the status in the ITU as a radio service rather than the usual status of radiocommunication service.

A 3.102 To take this into account the ITU Radio Regulations (Article 4.6) note that "For the purpose of resolving cases of harmful interference, the radio astronomy service shall be treated as a radiocommunication service. However, with regard to emissions from services operating in other bands, it shall be afforded the same degree of protection as such services are afforded vis-à-vis each other."

A 3.103 It has been previously been possible to avoid interference by locating radio astronomy sites in remote or less inhabited rural areas. However, the areas in which many older sites are located are becoming less rural and even suburban in nature making it increasingly difficult to protect radio astronomy operations from radio interference as use of the spectrum increases for terrestrial communications. Furthermore, no matter how remote no site can be shielded from high-altitude platforms, aircraft and satellites.

Irelands obligations as an ITU Member State

A 3.104 Within the ITU Radio Regulations there are a wide range of spectrum bands within which an allocation to the Radio Astronomy Service has been internationally agreed, either on a primary or secondary basis.

A 3.105 These bands are captured in ITU RR footnote 5.149 as shown in Figure 32 which was last updated in 2007.

[295] Spectrum manager of the National Radio Astronomy Observatory (NRAO - https://public.nrao.edu/) and the chairman of the Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science (IUCAF - http://www.iucaf.org/).

5.149 In making assignments to stations of other services to which the bands:

13 360-13 410 kHz,	4 950-4 990 MHz,	102-109.5 GHz,
25 550-25 670 kHz,	4 990-5 000 MHz,	111.8-114.25 GHz,
37.5-38.25 MHz,	6 650-6 675.2 MHz,	128.33-128.59 GHz,
73-74.6 MHz in Regions 1 and 3,	10.6-10.68 GHz,	129.23-129.49 GHz,
150.05-153 MHz in Region 1,	14.47-14.5 GHz,	130-134 GHz,
322-328.6 MHz,	22.01-22.21 GHz,	136-148.5 GHz,
406.1-410 MHz,	22.21-22.5 GHz,	151.5-158.5 GHz,
608-614 MHz in Regions 1 and 3,	22.81-22.86 GHz,	168.59-168.93 GHz,
1 330-1 400 MHz,	23.07-23.12 GHz,	171.11-171.45 GHz,
1 610.6-1 613.8 MHz,	31.2-31.3 GHz,	172.31-172.65 GHz,
1 660-1 670 MHz,	31.5-31.8 GHz in Regions 1 and 3,	173.52-173.85 GHz,
1 718.8-1 722.2 MHz,	36.43-36.5 GHz,	195.75-196.15 GHz,
2 655-2 690 MHz,	42.5-43.5 GHz,	209-226 GHz,
3 260-3 267 MHz,	48.94-49.04 GHz,	241-250 GHz,
3 332-3 339 MHz,	76-86 GHz,	252-275 GHz
3 345.8-3 352.5 MHz,	92-94 GHz,	
4 825-4 835 MHz,	94.1-100 GHz,	

are allocated, administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (see Nos. **4.5** and **4.6** and Article **29**). (WRC-07)

Figure 32: The text of ITU RR Footnote 5.149

Obligations on ComReg

A 3.106 Within the ITU Radio Regulations[296] ComReg is required to cooperate in protecting the radio astronomy service from interference, bearing in mind:

- the exceptionally high sensitivity of radio astronomy stations;
- the frequent need for long periods of observation without harmful interference; and
- that the small number of radio astronomy stations in each country and their known locations often make it practicable to give special consideration to the avoidance of interference.

[296] See Article 29 of the ITU Radio Regulations.

A 3.107 In addition, ComReg is able to notify the Bureau[297] of the locations of the radio astronomy stations to be protected and their frequencies of observation to have these entered into the Master Register[298] for communication to Member States.

Obligations on the Radio Astronomy Service

A 3.108 Within the ITU Radio Regulations[299] those wishing to operate radio astronomy services need to take the following measures:

- The locations of radio astronomy stations shall be selected with due regard to the possibility of harmful interference to these stations;
- All practicable technical means shall be adopted at radio astronomy stations to reduce their susceptibility to interference; and
- The development of improved techniques for reducing susceptibility to interference shall be pursued, including participation in cooperative studies through the ITU Radiocommunication Sector.

Radio Astronomy in Ireland

A 3.109 ComReg has been notified of one site in Ireland that is used for radio astronomy. The location of this Irish station is in the centre of the country at the Rosse Solar Terrestrial Observatory[300] on the grounds of Birr Castle, Co. Offaly[301].

A 3.110 The frequency bands in use for the interferometer LOFAR[302] network include 10 – 90 MHz and 110 – 250 MHz.

[297] The Radiocommunications Bureau is the executive arm of the Radiocommunication Sector, and is headed by an elected Director who is responsible for the coordination of the work of the Sector. The Director of the BR is assisted by a team of high-calibre engineers, computer specialists and managers who, together with administrative staff, make up the Radiocommunication Bureau or the Bureau.
[298] The Master International Frequency Register (MIFR) or the Master Register contains frequency assignments together with their particulars as notified to the ITU in accordance with Article 11 of the ITU Radio Regulations (RR). This is the manner in which Administrations make their assignments known to other Administrations so that international co-ordination can be effected.
[299] See Article 29 of the ITU Radio Regulations.
[300] See www.lofar.ie

[301] Geographic longitude: 07° 55′ 19″, Geographic latitude: 53° 05′ 42″, Altitude above sea level: 75 m
[302] I-LOFAR is the Irish addition to the Low Frequency Array (LOFAR) network and the 12th international station to be built in Europe. The network uses state-of-the-art data processing and storage systems as well as sophisticated computing techniques to combine the entire network into a telescope with the effective size of the European continent. It has allow Irish astrophysical research to be integrated into one of the most sophisticated telescopes on the planet.

A 3.111 Funding for this site comes from the Science Foundation Ireland, Enterprise Ireland, Dept. of Jobs, Enterprise, and Innovation, Offaly County Council
and Dept. of Arts, Heritage, Regional, Rural, and the Gaeltacht.

A 3.112 Research programs include:

- Cosmology – the epoch of reionisation[303];
- extra-galactic and galactic research - deep extragalactic surveys, transient sources, ultra high energy cosmic rays and pulsars); and
- geophysics.

[303] The Epoch of Reionization is related to many fundamental questions in cosmology, such as properties of the first galaxies, physics of (mini-)quasars, formation of very metal-poor stars and a slew of other important research topics in astrophysics. – See https://arxiv.org/abs/1206.0267

Annex: 4 The 26 GHz Band 5G Study

Introduction

A 4.1 In February ComReg received ten submissions to the 26 GHz Band 5G Study from the following interested parties:

- Dense Air;
- Eir;
- Eoin O'Connell;
- Imagine;
- Netmore;
- Qualcomm;
- SpaceX;
- Three;
- Viasat; and
- Vodafone.

A 4.2 Subsequently, on 13 May 2021, ComReg published non-confidential versions of these submissions in Document 21/47, titled "*non-confidential submissions received to the 26 GHz Band 5G Study*"[304].

A 4.3 The respondents have provided comments in relation to:

- specific recommendations identified in the 26 GHz Band 5G Study with regard to **spectrum**, **methods of award**, **licensing** and **timescales**;
- the discussion in the 26 GHz Band 5G Study with regard to potential **use cases** for the 26 GHz Band in Ireland; and
- potential **barriers to deployment** in the 26 GHz Band.

A 4.4 In that regard, this annex sets out below:

[304] https://www.comreg.ie/publication/non-confidential-submissions-to-documents-21-07-and-21-07a

- a summary of the respondents' views in their submissions as they relate to each of these topics (as identified in bold above);
- a brief overview of developments related to the 26 GHz Band following the publication of the 26 GHz Band 5G Study; and
- next steps in relation to ComReg's consideration of the future use of the 26 GHz Band.

A 4.5 For reference, in relation to the various parts and sub-bands of the 26 GHz Band mentioned in the summaries of the respondents' views below, Figure 33 illustrates the current use of the 26 GHz Band and allocations in the adjacent bands in Ireland.

Figure 5.1: Current use of the 26 GHz band and allocations in adjacent bands in Ireland (Source: ComReg)

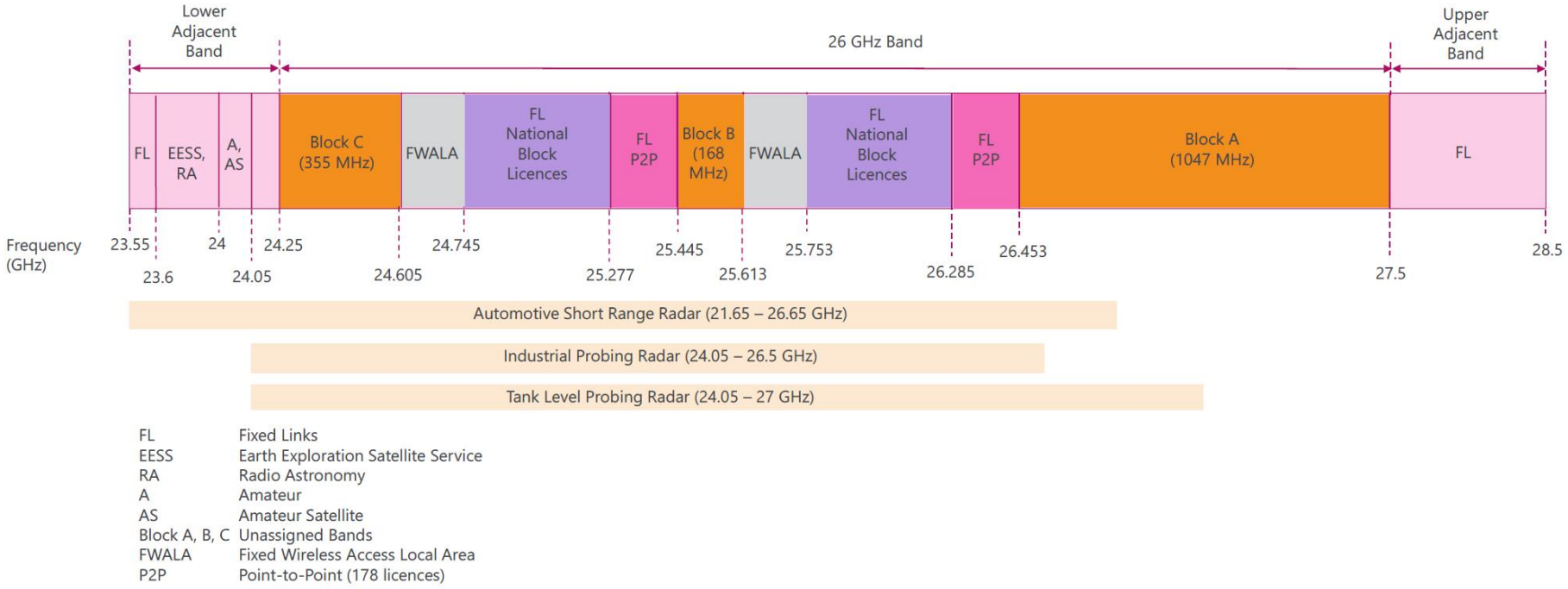


Figure 33: Current use of the 26 GHz Band and allocations in adjacent bands in Ireland

Summary of respondents' views on the 26 GHz Band 5G Study

Spectrum

A 4.6 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.

Views of Respondents

A 4.7 Four respondents (Imagine, Three, Viasat, Vodafone) submitted views in relation to spectrum requirements for WBB deployments, including "5G", in the 26 GHz Band.

A 4.8 Two respondents (Imagine and Viasat) generally support the recommendations in the 26 GHz Band 5G Study. In that connection:

- Imagine agrees that only the two larger tranches of spectrum in the band (24.25 GHz - 24.605 GHz and 26.5 GHz – 27.5 GHz) should be currently considered for WBB ECS. Imagine also agrees that the key band for award will be the upper 1 GHz and that the lower 355 MHz could be made available for indoor use.
- Viasat submits that:

- the 26 GHz Band is more than adequate to accommodate the deployment of existing services and new terrestrial IMT/5G without the migration of other services such as radio links to other bands; and
- in its view ComReg could adjust the existing block licensing scheme used in the 26 GHz Band to accommodate terrestrial IMT/5G use should future demand materialise. Further, in Viasat's view, terrestrial fixed services should not be relocated to the 28 GHz band.

A 4.9 Three submits that, in its view:

- while it is important to make rapid progress towards the availability of 26 GHz for 5G services, Three believes that it is also important to focus on making sure there is adequate bandwidth available when the band is first "opened up" for 5G services and that it is preferable to provide adequate bandwidth in this band from the start rather than requiring users to aggregate across multiple bands;
- the unassigned channels within the upper part of the national block licences (26.257 GHz to 26.285 GHz) and the upper part of the individual fixed links block (26.285 GHz to 26.453 GHz) should be considered as candidates to provide a guard band and additional spectrum to aggregate to Block A (26.5 GHz to 27.5 GHz);
- the 26.5 GHz to 27.5 GHz portion of the 26 GHz Band can only provide spectrum for one service at any location which, in its view, would limit competition. In Three's view, operators will need bandwidth of at least 800 MHz to maximise the potential of 5G services in the 26 GHz Band;
- the FWALA sub-bands should be reserved for ECS or localised industrial 5G use. Three adds that the lower FWALA sub-band (24.605 GHz to 24.745 GHz) could be aggregated with Block C (24.25 GHz to 24.605 MHz) to provide a larger aggregate bandwidth;
- ComReg should review current and future use of the band carefully and set out a plan that will provide some certainty to all. It considers that consultation will be required as part of such a review and is of the view that this can be best progressed by ComReg hosting an open workshop following this consultation; and
- ComReg should review the existing use of the 26 GHz Band to determine whether additional spectrum could be made available in a reasonably short timeframe.

A 4.10 Three questions the quanta of spectrum indicated in the 26 GHz Band 5G Study in relation to certain sub-bands and associated uses and potential uses within the 26 GHz Band. In that regard, Three believes that:

- 1792 MHz of spectrum is used for microwave links;
- 1097 MHz of spectrum is free for 5G at the upper part of the band descending from 27.5GHz; and
- 299 MHz of spectrum is free from the start of the band at 24.25GHz.

A 4.11 Three states that this is at odds with the indication in the 26 GHz Band 5G Study that there is 1047 MHz at the top and 355 MHz at the start. Three indicates that it would welcome clarification on this point from ComReg.

A 4.12 Vodafone submits that:

- while only the two larger tranches of spectrum currently unassigned should be currently considered for WBB-ECS, ComReg should however also review the usage of other parts of the 26 GHz Band and work to an overall plan for the band; and
- it agrees that the 26.5 - 27.5 GHz portion of the band is the key part for short term consideration.

Methods of award

A 4.13 In relation to 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; and
- 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.

Views of Respondents

A 4.14 Seven respondents (Dense Air, Eoin O Connell, Imagine, Three, Qualcomm, Viasat, Vodafone) submitted views in relation to recommended methods of award for the 26 GHz Band.

A 4.15 Six respondents (Dense Air, Eoin O Connell, Imagine, Qualcomm, Viasat, Vodafone) generally support the recommendations of the 26 GHz Band 5G Study:

- Dense Air submits that it would favour a light licensing approach over a licence exempt approach for the 26 GHz Band. Dense Air considers the UK's framework for issuing local licences for indoor use in the 24.25 – 26.5GHz band to be an innovative approach worth considering in the Irish context, especially if combined with an emphasis on the use of Neutral Host. Further, in Dense Air's view, aspects of the Italian "Club Use" approach to licensing the 26 GHz Band, which includes provisions for spectrum and infrastructure sharing, could be adopted for the Irish market.
- Eoin O'Connell submits that a light licensing approach, in his view, should be used and that channels of preferably 100 MHz be allocated, adding that, in his view, the benefits to the manufacturing, education and health sectors will be enormous, as Ireland will, in his view, be able to realise its digital transformation.
- Imagine submits that:
    - it agrees with the recommendation in the 26 GHz Band 5G Study that ComReg should consider releasing the 26.5 GHz to 27.5 GHz band for local area licensing;
    - in its view, this should proceed earlier to support FWA services for which, it submits, the necessary 5G base station equipment and suitable CPE are already available; and
    - it agrees with the recommendation in the 26 GHz Band 5G Study that the lower portion (24.25 – 24.5 GHz) of the 26 GHz Band could be made available using a licence exempt or light licensing approach.
- Qualcomm submits that, in its view:
    - the 26 GHz Band should be awarded on a licensed basis, as this would, in its view, enable a stable network investment environment aimed at providing predictable network performance for mobile broadband and other ultra-reliable, low latency use cases;

- an uncoordinated deployment of small cells or a licence exempt regime, may lead to excessive spectrum congestion and interference;
- ComReg should try to strike 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; and
- that flexibility in spectrum use could be aided if 5G licences allow for leasing.

- Vodafone submits that the 24.25 GHz to 24.5 GHz portion of the band may be useful for the support of local and industrial licensees and agrees with the 26 GHz Band 5G Study that this segment should be made available using either a light licensing or license exempt approach; and
- Viasat submits that, in its view, an individual base station framework for IMT/5G should be the preferred approach to manage national coordination with existing fixed links in the shared portions of the spectrum.

A 4.16 Three states its view 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.

A 4.17 Vodafone submits in relation to the 26.5 GHz to the 27.5 GHz segment of the band, that:

- it is too early to decide on a licensing or an award process because it considers that the business and traffic cases are not yet clear;
- a local licensing approach would potentially be very inefficient if it prevents the nationwide provision of services and that further consideration is needed on this; and
- ComReg should keep a flexible approach to cater for demand for 5G services.

Licensing (conditions and compatibility)

A 4.18 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 European Commission Implementing Decision (EU) 2019/784, as amended by European Commission Implementing Decision (EU) 2020/590, 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 that may be required to ensure spectrum is efficiently used.

Views of Respondents

A 4.19 Four respondents (Imagine, SpaceX, Viasat and Vodafone) provided views on the recommended licensing considerations of the 26 GHz Band 5G Study.

A 4.20 Imagine submits that it agrees that the technical licensing conditions should be consistent with those defined in European Commission Implementing Decision and that appropriate licence conditions should be applied to ensure spectrum is efficiently used.

A 4.21 SpaceX submits that it appreciates ComReg's efforts to encourage the deployment of terrestrial 5G services and adds that, in its view, ComReg must also ensure that any policies it adopts in the 26 GHz Band do not interfere with the next generation satellite services using the adjacent bands.

A 4.22 Viasat submits that:

- it supports ComReg adopting a flexible approach that would accommodate any future demand for terrestrial IMT/5G services in the 26 GHz Band while also appropriately protecting existing services like the 28 GHz band; and

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

A 4.23 In particular, Viasat urges ComReg to consider application in Ireland of the power and separation angle limitations for high power 26 GHz Band terrestrial IMT/5G base stations set out in Resolution 242 (WRC-19)[305] in order to protect 28 GHz satellite receivers in space. Viasat states that these limitations were not mentioned in the ComReg consultation and that it considers the limitations to provide more specific conditions to protect satellite services than the harmonised technical conditions in EC Decision 2019/784. In that context, Viasat notes its concerns about out-of-band emissions from terrestrial IMT/5G deployments for ground based services as well from terrestrial IMT/5G base station antennas pointed upwards to communicate with unmanned aircraft systems.

A 4.24 Vodafone submits that it strongly supports alignment with harmonised European standards for the 26 GHz Band.

Timescales and migration of existing services

A 4.25 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 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.

[305] Specifically, Resolution 242 (WRC-19) provides *that "as far as practicable, sites for IMT base stations within the frequency band 24.45-27.5 GHz employing values of e.i.r.p. per beam exceeding 30 dB(W/200 MHz) should be selected so that the direction of maximum radiation of any antenna will be separated from the geostationary-satellite orbit, within line-of-sight of the IMT base station, by ±7.5 degrees"*.

Views of Respondents

A 4.26 Four respondents (Dense Air, Eir, Imagine, Vodafone) agree generally with the timescales recommended in the 26 GHz Band 5G Study:

- Dense Air submits that it agrees that:
    - there is adequate spectrum for the take up of FWA in the 3.6 GHz and bands being considered as part of the MBSA 2021 process; and
    - any approach adopted requires sufficient flexibility for ComReg and that it is important to cater for future demand, but believes that the timely delivery of mid-band spectrum should be a priority, particularly in light of Covid-19, general delays in delivering FTTH, and the limitations of the 26 GHz Band in rural areas.
- Eir submits that:
    - there is no immediate need to award spectrum for 5G in the 26 GHz Band;
    - it is therefore appropriate to allow existing use of the spectrum to continue in the short to medium term, but agrees with the recommendation in the 26 GHz Band 5G Study that "*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
    - it agrees with the observation that ComReg should set a date for a review of the development of WBB-ECS in Ireland and that an appropriate time for such a review might be around 2025.
- Imagine agrees that:
    - demand for the upper 1 GHz of the 26 GHz Band could emerge from 2023-2027 and that that part of the band could be made available by 2028;
    - there is no strong basis currently to limit the use of existing licensing regimes for point-to-point or national block allocations or to announce migration plans; and
    - as there is no current use of the FWALA bands it might be useful to consider their future use and establish a roadmap to avoid any downstream migration or co-existence issues.

- Vodafone submits that:
    - it agrees with the timescale for assignment of the upper 1 GHz of the 26 GHz Band suggested in the study and believes that a clearer picture will emerge in the next two years;
    - it agrees with the timescale suggested for the lower 250 MHz of the band;
    - it agrees with the conclusion in the 26 GHz Band 5G Study regarding limiting of use of existing licensing regimes and adds that it would like to see ComReg aim to produce a plan for the national block licences by the end of 2023; and
    - it agrees with the recommendation in the 26 GHz Band 5G Study that, 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 4.27 Five respondents (Dense Air, Imagine, Qualcomm, Three) submitted that a sooner timescale may be appropriate for some parts of the 26 GHz Band:

- Dense Air submits that:
    - 2023 to 2024 would be a more appropriate target date for the assignment of the upper 1 GHz and the lower 250 MHz of the 26 GHz Band; and
    - ComReg should review the development of WBB ECS earlier than 2025 such as 2022 or 2023.
- Imagine submits that:
    - while the volume of demand may be low in the initial stages, it believes there will be a firm requirement for small cells for FWA in the 26 GHz Band much sooner than "after 2023" and that, in its view:
        - ComReg should, progress with the process for the allocation of the currently unassigned 26 GHz spectrum sooner than the 2023 to 2025 timeframe as suggested in the study; and
        - to achieve such figures, this would require the allocation of 26 GHz spectrum to occur in 2022 and no later than the start of 2023;

- if the allocation of the 26 GHz Band is delayed it will place Ireland and its knowledge economy at a disadvantage compared to other countries with superior broadband and wireless services;
- 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;
- although it agrees that in the short to medium term, demand for the 26 GHz Band will mainly come from FWA services, Imagine believes that by 2027, usage of the 26 GHz Band for 5G FWA could lie somewhere between the baseline and optimistic levels indicated in the study;
- for individual fixed links, a suitable mechanism for migrating these that does not disadvantage smaller operators who do not have block licences would need to be agreed. In relation to the block licences, Imagine agrees that an assessment of the situation would be appropriate closer to the time of their expiry;
- it agrees that the FWALA blocks would logically be next to be considered beyond the initial unassigned blocks. Imagine submits 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; and

- Qualcomm submits that making at least the upper 1 GHz of the band available as soon as possible and not later than the second half of 2021 will be key for unleashing the full 5G potential in Ireland.
- Three submits that:
  - it disagrees with Plum's recommendation that the upper 1 GHz of the 26 GHz Band could be assigned in 2023 to 2027. It is Three's view that the recommended timescale is too slow and will mean opportunities will be lost and that ComReg needs to facilitate Irish industry 4.0 applications that will depend on ultra-fast 5G;
  - in its view, the lower part of the band should be made available immediately so long-lasting proof of concept trials can grow the ecosystem in Ireland and then move quickly to assigned spectrum; and

- it disagrees that there is no strong basis to limit the use of any existing regimes and contends that ComReg must now consider how it can provide large contiguous blocks of spectrum for 5G services in the 26 GHz Band. Three adds that this may require re-farming some spectrum currently reserved for fixed services.

A 4.28 Vodafone submits that, in relation to migration of existing services, namely radio links for backhaul capacity in the 26 GHz Band, the replacement of backhaul capacity in its network (i.e. point-to-point links) in the 26 GHz Band with alternative links could be a long and expensive process and proposes that ComReg should identify and award alternative spectrum at least 5 years in advance of ceasing block allocations. Vodafone adds that ComReg should also identify new block allocations in the D (110-170 GHz) or W (75-110 GHz) bands as supplementary capacity in the same time frame.

Use cases

A 4.29 One of the important issues that arises 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;
- may develop in time a use case for eMBB services for city centres and "hot spots" such as airports, railway stations and malls but it is not clear if any of these "hots spots" exist on a suitable scale in Ireland;
- 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
- may develop in time a requirement for in-band backhauling which is an overlay on other services. However, given the current paucity of use cases, this may not come to fruition.

Views of Respondents

A 4.30 Seven respondents (Dense Air, Imagine, Netmore, Three, Qualcomm, Viasat and Vodafone) provided views in relation to 5G use cases in the 26 GHz Band.

A 4.31 Dense Air submits that:

- the limited usage of the 26 GHz Band internationally is due to poor economics of standalone mmWave 5G deployments. According to Dense Air, other 5G deployment solutions are easier and cheaper to bring to the market.

- it is positive about future applications of the 26 GHz Band and believes 26 GHz mmWave spectrum is ideally suited for dense urban deployment in high footfall areas where it is provided via shared networks or neutral host.

- small cells will play a vital part in the roll-out of 5G using both high and mid bands and considers that, in its view, private networks will become an increasingly important segment of the Irish and international markets;

- there will be a high demand for wireless fibre extension if it takes considerable time and cost to deploy FTTH, particularly in rural areas. However, it questions how soon demand for mmWave Ultra Reliable Low Latency Communications ("URLLC"), Vertical and Critical Services will emerge in Ireland.

- Ireland is lacking a coordinated approach to small cell infrastructure and is potentially missing an opportunity for network and infrastructure efficiency.

A 4.32 Imagine submits that:

- despite the conclusion in the 26 GHz Band 5G Study that the 26 GHz Band has limited application in the short term and economic challenges, examples of use cases in the US, Australia and Italy 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; and

- the demand for 26 GHz will grow with fibre rollout due to the potential for complementary use cases such as extending the reach of fibre networks where it is not economically viable to do so.

A 4.33 Netmore submits that 5G is widely considered to be of vital importance to the manufacturing industry and that access to 5G spectrum is a critical issue.

A 4.34 Three submits that it is aware of considerable interest in the use of 5G connectivity in the development of industry 4.0 solutions and, in its view, this indicates that there is an immediate requirement for access to 26 GHz spectrum for this type of application. Three encourages ComReg to examine how this can be brought forward so that opportunities are not lost.

A 4.35 Qualcomm submits that:

- it expects initial focus on enhanced Mobile Broadband ("eMBB") and URLLC usage for indoor hotspots in enterprises and factories and outdoor mobile broadband in dense urban areas in addition to FWA in suburban and rural scenarios;
- applications such as Mobile Virtual/Augmented Reality and Ultra High Definition Video, 5G fixed wireless access services and smart home, smart manufacturing, autonomous vehicles and health care will all benefit from 5G deployments; and
- 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.

A 4.36 Viasat submits that industry consensus is that terrestrial IMT/5G in millimetre bands will be used on a very localized and geographically limited basis due to a short signal propagation radius.

A 4.37 Vodafone submits that:

- although ComReg plans to award a number of bands in the MBSA 2021 award, this additional capacity could be filled more quickly than previously expected if current growth patterns continue;
- in a high traffic growth scenario the 26 GHz Band could be an important overlay network in city centre areas and could also support high capacity locations such as concert halls, football stadiums etc;
- interest for applications in the 24.25 – 24.5 GHz portion of the band appears focused on indoor industrial production and stock management, based on Vodafone's discussions with some potential industry users; and
- a solution to provide in-band backhauling may develop in time as a method of supporting low cost small cell solutions.

Barriers to Deployment

A 4.38 Dense Air submits that paragraph 2 of Article 57 of the EU 2018/1972 is causing difficulty for city and town authorities in Ireland seeking to implement a coherent roll out of 5G small Cells on their infrastructure. Dense Air suggests that this particularly impacts the build-out of distributed neutral host networks which, in its view, minimise road opening disturbances through utilisation of existing municipal assets instead of relying on new pole builds.

A 4.39 Further, Dense Air submits that it considers the release of mid-band spectrum through public auction and a coordinated approach with the Energy Regulator on quick and efficient access to power and poles to be of paramount importance.

Updated Information

A 4.40 This section provides a brief overview of developments related to the 26 GHz Band following the publication of the 26 GHz Band 5G Study.

Developments in Europe

A 4.41 In Slovenia, 1 GHz of the 26 GHz Band was assigned between three mobile operators as part of a multi-band award in April. Telecom Slovenia, A1 Slovenia and Telemach all acquired 26 GHz Band licences for a duration of 20 years.[306]

A 4.42 Denmark assigned 2850 MHz of the 26 GHz Band (24.65 GHz to 27.5 GHz) as part of its multi-band award in April 2021. Operators TDC, Hi3G and TT Network (a joint venture of Telenor and Telia) all acquired licences that will expire in 2042. Denmark plans to make the 24.25 – 24.65 GHz band available for industrial networks in the future.[307]

A 4.43 In June 2021, Austria published a consultation on the potential release of spectrum over the next five years. The consultation considers the future for the 26 GHz Band and seeks input from interested parties on issues related to the band.[308]

[306] Cullen International, "*Slovenian operators spend €164m in the 5G multiband auction*", available at www.cullen-international.com

[307] Cullen International, "*Danish 5G multi-band spectrum auction awards 3,490 MHz for €280m with extensive coverage obligations*", available at www.cullen-international.com/

[308] RTR, "*Consultation on the 2021–2026 Spectrum Release Plan (15.06.2021)*" available at www.rtr.at

A 4.44 In July 2021, Croatia began the bidding process the 26 GHz Band (26.5 GHz to 27.5 GHz) as part of its multiband award. Four interested parties were approved to participate in the bidding for the 26 GHz Band.[309]

A 4.45 In Germany, BNetzA received five applications for local 5G licences in the 26 GHz Band since the application procedure opened in January 2021 and issued licences to all five applicants[310].

Test and Trial

A 4.46 The 26 GHz Band 5G Study noted that, in the case of previous bands under demand, it is normal to experience some interest in testing equipment and even trialling services. In that regard, the study observed that currently there had been no take up of ComReg's Test and Trial licensing regime to conduct either tests or trials in the 26 GHz Band, even though ComReg had highlighted its availability.

A 4.47 Since the publication of the study, ComReg has still not received any applications for Test and Trial licences for the 26 GHz Band, as of 29 July 2021. This lack of uptake has continued, even though ComReg has, since the publication of the study, continued to highlight the availability of 26 GHz Band spectrum for test and trial purposes on its Test and Trial Ireland Website[311] and has conducted an awareness campaign on Linkedin.

26 GHz Band/5G Harmonisation in Europe

A 4.48 The 26 GHz Band study provided an overview of spectrum harmonisation initiatives in Europe of relevance to 5G and the 26 GHz Band, from the CEPT, BEREC, the RSPG and the European Commission. Since publication of the study, of these bodies, the RSPG has published two further opinions relevant to 5G and the 26 GHz Band.

A 4.49 First, in the *"RSPG Opinion On Additional spectrum needs and guidance on the fast rollout of future wireless broadband networks"*[312], published on 16 June 2021, the RSPG, among other things:

[309] Hakom, "*Nine Applications Were Received For Participation In The Public Auction Procedure For The Allocation Of The Right To Use The Rf Spectrum*", available at www.hakom.hr/

[310] Cullen International, "*WE Telecoms Update*", available at www.cullen-international.com

[311] www.testandtrial.ie

[312] RSPG21-024, https://rspg-spectrum.eu/wp-content/uploads/2021/06/RSPG21-024final_RSPG_Opinion_Additional_Spectrum_Needs.pdf

- 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 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.

A 4.50 Second, in the *"RSPG Opinion on a Radio Spectrum Policy Programme (RSPP)"*[313], published on 16 June 2021, the RSPG, among other things:

- considers that the European Commission and EU Member States should "actively promote innovative spectrum sharing solutions to ensure greater spectrum efficiency and to enhance flexibility in spectrum access by following the "use-it-or-share it" principle, and supporting the development of spectrum pooling and multi-tiered spectrum access approaches, including those assisted by geolocation databases or other ICT-based solutions, while highlighting the need to consider the competition aspects in assessing any specific case at hand";
- recommends that spectrum related options should be developed for addressing vertical needs in the mm-Wave-bands; and
- identifies that demand for local spectrum - including for local networks which support various vertical requirements - can be met by means of the following licensing regimes in addition to nationwide licences: spectrum leasing (voluntary/mandatory), dedicated spectrum allocations for local networks and/or third party operated local networks, noting that:
    - there is a need to remain flexible and to enable different network solutions and topologies; and
    - local networks could be provided by mobile operators, third-parties or directly by the local users themselves.

[313] RSPG21-033, https://rspg-spectrum.eu/wp-content/uploads/2021/06/RSPG21-033final-RSPG_Opinion_on_RSPP.pdf

Next steps for ComReg's 26 GHz Band considerations

A 4.51 In considering next steps in relation to the future use of the 26 GHz Band ComReg will take account of the following:

- Plum/IDATE's key findings in the 26 GHz Band 5G Study;
- recommendations with regard to spectrum, method of award, licensing and timescales;
- the ten submissions received; and
- relevant international updates since the publication of the study.

A 4.52 In the next strategy statement period, ComReg will consider further the future use of the 26 GHz Band for WBB ECS and other services.

Annex: 5 Correspondence received by ComReg deemed to be inputs to this consultation

Letter and attached files from Marconi Group about power increases

From: [REDACTED]
Sent: Wednesday 12 May 2021 20:21
To: Brendan O'Brien <brendan.obrien@comreg.ie>
Subject: RE: [Confidential] The Marconi Group request for amendment to the existing Radio Amateur power allocation in Ireland 16-2-2021

CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and believe the content is safe.

Dear Brendan

We welcome your response received 19th February 2021 and are happy to have our proposal included as part of the forthcoming RSMSS. Our apologise for not acknowledging sooner as our research grew legs and brought us on an informative path on the subject of EMF guidelines while awaited a presentation by the RSGB prior to any response. As you are aware the development of 5G technology has brought compliance with ICNIRP to the fore and the worldwide Amateur volunteer community have been doing some thronged work on the subject in the past year to show how our hobby can meet compliance and how membership can be educated.

In anticipation of your pending Q3 consultation I would like to point you to some work that is been done in the amateur radio community, the most noteworthy is the collaboration between the RSGB (Radio Society of Great Britain) and the ARRL (American Radio Relay League) which has developed a response in conjunction with OFCOM in the UK. As part of this process, they have developed a simple spreadsheet to allow operators to calculate an exclusion zone if required around their antenna. A lot of the work done is available on the RSGB website at the following URL https://rsgb.org/main/technical/emc/emf-exposure/

A link to the spreadsheet for exclusion zone calculations can be found at

https://rsgb.services/public/publications/emc/emf-calculator-v0.1.2-rsgb9e.x
lsx

Other than those of us working in the telecoms industry, access to quality test equipment for EMF testing is out of the price reach of almost all hobbyist, even then there is a high skill level required to use it properly.
This was recognised in the consultation process ran in the UK and as a result it was decided to adopt a mathematical approach with a safety margin built in that could be easily carried out by anyone with access to a basic computer.

1

No different to any process whether it be driving a car or operating a RF transmitter, safety measures can be put in place and when applied correctly mitigate any danger. From the material we have studied and the work of our worldwide community we believe that we will be able to define the measures required to meet our earlier submission. Unlike commercial radio stations where they have for example a 100% FM duty cycle 24 hours a day; a Radio Amateur may, only transmit as much as 20% in any 6 minute sample window, more often than not with a duty cycle of less than 40% and even then the periods of operation are sporadic. Nonetheless an education & awareness process is always advisable and this would appear to be gathering traction already throughout the community.

We welcome the opportunity to elaborate further in due course and we hope you find this information helpful as you prepare the next consultation.

Kind regards

Enda Broderick

-----Original Message-----
From: Brendan O'Brien <brendan.obrien@comreg.ie>
Sent: Friday 19 February 2021 17:44
To: [REDACTED]
Subject: RE: [Confidential] The Marconi Group request for amendment to the existing Radio Amateur power allocation in Ireland 16-2-2021

Dear Enda,

Thank you for your email and letter, I hope you are well.

Regarding the request that ComReg make changes to the current power levels for certain frequency bands allocated to the Amateur service, it should be noted that if ComReg was minded to make any such changes it would be required to conduct a public consultation and seek views from interested parties. Relevantly, in Q3 2021 ComReg will publish a consultation on its draft Radio Spectrum Management Strategy Statement ("RSMSS") for 2022-2024, and ComReg will address Amateur Service matters (including the matter you have raised) within that consultation and seek views from interested parties.

At this point in time and without prejudice to any future consultation, one of the closely related issues to a significant increase in power levels, is how licensees would ensure compliance[1] with their obligations related to non-ionising radiation emissions.

I would encourage you and your colleagues to review the consultation when it is published and to submit any evidence-based views you may have.

Thank you for taking the time to provide your views on this matter and I look forward to your engagement with the forthcoming RSMSS consultation.

Footnote:

[1] The requirement is detailed in section 7 of S.I. No. 192 of 2009, WIRELESS TELEGRAPHY (AMATEUR STATION LICENCE) REGULATIONS 2009 - "the Licensee shall ensure that the Apparatus operated by the Licensee is not installed or operated at a location in a manner which causes the aggregate non-ionising radiation emissions at that location to exceed the limits specified by any guidelines published by ICNIRP and that it complies with any radiation emission standards adopted and published by ICNIRP, or its successors, any radiation emission standards of the European Committee for Electrotechnical Standards and any radiation emission standards specified by national and European Community law"

2

Kind regards,

Brendan O'Brien

Projects & Licensing Manager

Spectrum Operations, Market Framework

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

Suíomh | Website www.comreg.ie <http://www.comreg.ie/>

<http://www.comreg.ie/> <http://www.testandtrial.ie/>

From: [REDACTED]
Date: Tuesday 16 February 2021 at 12:43:18
To: "Suzanne O'Toole" <Suzanne.OToole@comreg.ie <mailto:Suzanne.OToole@comreg.ie> >
Subject: The Marconi Group request for amendment to the existing Radio Amateur power allocation in Ireland 16-2-2021

Dear Suzanne

I hope this email finds you well. I am writing to you on behalf of The Marconi Group (a group of Irish licenced Radio Amateurs) with a submission attached in efforts to have an amendment made to the current Radio Amateur licencing conditions.

I understand this process may involve several departments within ComReg and we believe spectrum management would be the first in this process. Our apologies if we are incorrect and if so, I may beg you might see fit to place this submission in the correct hands.

Attached files:

* The Marconi Group request for amendment to the existing Radio Amateur power allocation in Ireland.pdf
* Power allocation sample of CEPT countries.xlsx

3

I would also ask that Appendix 2 on our attachment be treated as sensitive as we have received permission to apply the names to this submission but at the time had not requested that they be available for publication.

For correspondence I am acting secretary for the group and I am available by email [REDACTED] or by phone [REDACTED].

Thank you for your time.

Kind regards

Enda Broderick

Request for amendment to the existing Radio Amateur power allocation in Ireland

FOR THE ATTENION OF

SPECTRUM MANAGEMENT

COMMISSION FOR COMMUNICATIONS REGULATION

ONE DOCKLAND CENTRAL, GUILD STREET, DUBLIN 1, IRELAND, D01 E4X0.

The Marconi Radio Group
EI0MRG
16 February 2021

Table of Contents

Executive Summary

The power levels allocated to Radio Amateur operators in Ireland is not liken with many of its peers in the EU or other major worldwide regions as highlighted at Appendix 1 Table 2. To afford Irish Radio Amateurs parity with other member states we are seeking an increase in the permitted transmission output power as outlined in Appendix 1 Table 1. This increase is already available on a temporary basis as per a calendar schedule shown on the ComReg website [1] and notwithstanding the fact that there has been no discord since the introducing of this enhancement in 2011 we would solicit to have the full power allocation reviewed and amended for use by Irish Radio Amateurs on a full-time basis as per Appendix 1 Table 1 Column 5.

[1] https://www.comreg.ie/industry/radio-spectrum/licensing/search-licence-type/radio-amateurs-2/

Introduction

The Marconi Radio Group are an independent collective of licenced Irish Radio Amateurs [2] with a common goal, similar interests in aspects of the radio experimenter hobby and a motivation to develop the advancement of science, electronics, and radio throughout Ireland.

There is a lot of pride in one's station and Irish Radio Amateurs put in a considerable effort to ensuring good modulation and a clean signal. Modern test equipment has given even the most modest of Radio Amateurs stations the capacity to ensure a clean and high-quality signal at an affordable price. Indeed, with the advancements in today's communication equipment design, much of the modern-day Radio Amateur focus is based in refinement and not as much in construction; as a result, there has been an adoption of CE approved commercially manufactured transmitters, high-quality band-pass filters, and implementation of studio quality audio processing.

Yet, the fundamentals remain the same, the operator's knowledge of atmospheric propagation and antenna construction are still the corner stone of any Radio Amateur's station's ability to experiment and develop. Testing our enhancements can take several forms and radio sport "Contesting" [3] is but one, and one we are grateful for the increased power allocation we are afforded. However, there are a large cohort of our community who are unable to apply the same benefit to their chosen section of the hobby.

There is a whole community of DXers [4], who operate outside the contest schedule and who's ambition is to contact stations in distant countries; many of the inimitable locations may only be active for one week every 20 to 30 years, are in very high demand and only a sufficiently powered station would be able to make this successful contact. This tradition has been ongoing for almost 100 years now and over this time a league table [5] of successful Radio Amateurs is compiled and a place

[2] See list of supporting licensees in Appendix 2
[3] https://en.wikipedia.org/wiki/Contesting
[4] https://en.wikipedia.org/wiki/DXing
[5] http://www.arrl.org/system/dxcc/view/DXCC-HR-20210201-A4.pdf

on this list fiercely sought, however not many Irish amateurs have been able to compete to this level.

Having the best in antenna alone is often not enough, as if the drive behind it is lacking, our signals are too weak to be properly received in comparison to our neighbours. Modern internet based SDR (Software Defined Receivers) have allowed us to monitor our transmissions across the globe and highlight the shortcomings of the Irish Radio Amateurs stations in contrast to our neighbouring countries in Europe whom we can now monitor and compare instantly.

Irish Radio Amateurs & Experimenters

Ireland has a long tradition of experimentation with radio transmission spanning from the early 1800s with the confirmation of James Clerk Maxwells mathematical theory of the electromagnetic field by Prof George Fitzgerald [6], TCD; Marconi's first transatlantic wireless connection between Clifden and Nova Scotia in 1907 [7] and subsequent experimentation in radio communications by Col. M.J.C. Dennis [8]. Until recently, Ireland was unique in that it supported a Radio Experimenter's License where it was changed and renamed an "Amateur Station License" in keeping with the European neighbours.

Irish Radio Amateurs avail of every opportunity to promote our heritage [9] and lobby communities to preserve what is left [10]. As a sample, in the recent past there have been anniversary celebrations in Connemara [11], Co. Galway and Ballybunion, Co Kerry led by Radio Amateurs. Both these events were supported by the local communities, also attended by Princess Elettra Marconi daughter of Guglielmo Marconi, and received publicity on both national & international media.

It was a great honour in 2007 to send a greeting from Clifden on behalf of President Mary McAleese, to the Governor General Michaëlle Jean of Canada to mark the

[6] http://undersci.ucc.ie/wp-content/uploads/sites/12/2014/11/George_Francis_Fitzgerald.pdf
[7] http://www.census.nationalarchives.ie/exhibition/galway/main/Iroy_5350_Marconi.html
[8] https://www.irts.ie/cgi/st.cgi?ei2b
[9] https://hurdygurdyradiomuseum.wordpress.com/
[10] https://quidetoconnemara.com/item/marconi-wireless-station/
[11] https://www.superannrte.ie/index.php?option=com_content&view=article&id=2584:Photos-of-Marconi-Centenary-Celebrations-Clifden-2584&catid=39&Itemid=104

100th anniversary. There are many more examples,[12] but in summary we believe we contribute to and promote Ireland and it's rich history of radio development very well, in continuing to do so we would like to be able to, going forward on a par with our counterparts.

Our request

We are requesting a review and amendment to the current power levels allocated on a fulltime basis to the Irish Radio Amateur. As we have highlighted in our introduction there are other areas of the hobby that operate on an ongoing basis outside the contest window and are disadvantaged by the lower limits allocated in comparison to our counterparts worldwide.

In Appendix 1 Table 1, we wish to show the current allocation together with the contest weekend allowance and our requested full-time amendment to 30/32 dBW in Column 5. We would like to highlight that the requested increases are in line with the current power levels in many other regions and would draw your attention to Appendix 1 Table 2, showing a sample of CEPT countries from Europe and around the world where we have by way of illustration, a coloured heat map to emphasise where Ireland is positioned in comparison to their power allocations shown in dBW. The heatmap colouring is on an individual line by line (frequency) comparison scale, red being the lowest to dark green as the highest.

In developing this proposal, we note that since the weekend contest higher power allocation has been introduced in 2011, it is our understanding that there has not been a single complaint made against a licenced Irish Radio Amateur station of emitting interference and we feel this is a good reference for the manner and professionalism we uphold. We would hope that this period of exemplary behaviour since 2011 would stand to us in having this request approved for the right to operate to a similar standard throughout the entire calendar year.

[12] https://amsat-uk.org/2020/12/02/athlone-students-to-contact-iss/

In Closing

We trust that you would see fit to give our submission a seal of approval and pass it on to the appropriate department for implementation. We do appreciate how busy the department must be, the additional difficulties and pressures that remote working and current lockdown situation may be adding to the normal workload, we are thankful for your time taken to read this application.

By way of support, we are including in Appendix 2, some of the callsigns and names of those who endorse this application and seek to have the amendment approved for the benefit of all Irish Radio Amateurs.

We hope that sufficient data has been provided to aid your decision in amending the current allocation. Please revert with any matters you wish us to elaborate on to aid the process.

Kind Regards

_ Enda Broderick – EI2II

Acting Secretary

The Marconi Radio Group

[REDACTED]

Committee members

EI2II	Enda Broderick
EI5DD	Steve Wright
EI6JB	Rory O'Brien
EI9HX	Patrick O'Connor
EI0CL	Michael Higgins

Appendix 1

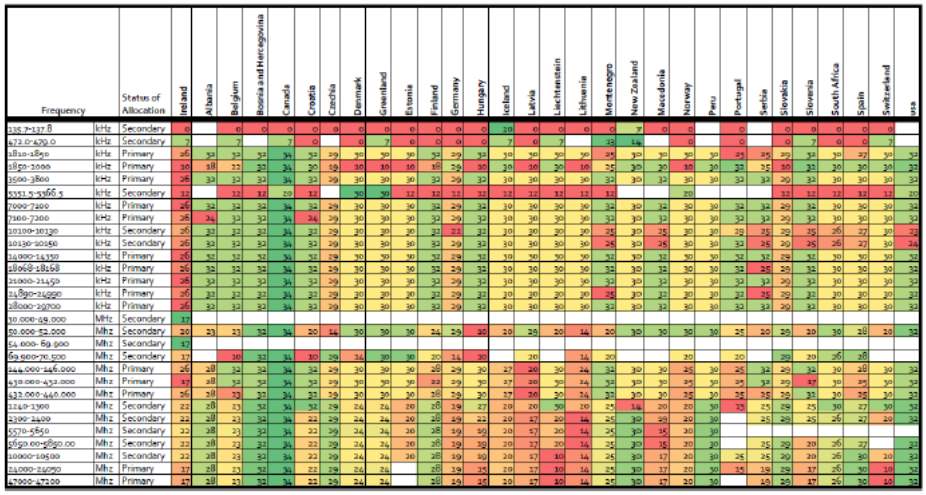
Table 1 shows an extract from ComReg Amateur Station Licence Guidelines [13] of the frequencies available to Irish Radio Amateurs, the current allocated power levels, the contest weekend allowance, and our requested full-time levels.

Frequency list as per ComReg 09/45 R4 Annex: 1		Current Peak Envelope Power Watts (dBW)	Current Contest weekend Allocation (dBW)	Requested standardised allocation on a full-time basis (dBW)
135.7-137.8	kHz	0		0
472.0-479.0	kHz	7		7
1810-1850	kHz	26	32	32
1850-2000	kHz	10	32	32
3500-3800	kHz	26	32	32
5351.5-5366.5	kHz	12		12
7000-7100	kHz	26	32	32
7100-7200	kHz	26	32	32
10100-10130	kHz	26		32
10130-10150	kHz	26		32
14000-14350	kHz	26	32	32
18068-18168	kHz	26		32
21000-21450	kHz	26	32	32
24890-24990	kHz	26		32
28000-29700	kHz	26	32	32
30.000-49.000	MHz	17		17
50.000-52.000	MHz	20	30	30
54.000- 69.900	MHz	17		17
69.900-70.500	MHz	17	30	30
144.000-146.000	MHz	26	30	30
430.000-432.000	MHz	17	30	30
432.000-440.000	MHz	26	30	30
1240-1300	MHz	22	30	30
2300-2400	MHz	22		22
5570-5650	MHz	22		22
5650.00-5850.00	MHz	22		22
10000-10500	MHz	22		22
24000-24050	MHz	17		17
47000-47200	MHz	17		17

[13] https://www.comreg.ie/publication-download/amateur-station-licence-guidelines

Table 1

Table 2; due to its size we have included this as a separate spreadsheet titled "*Power allocation sample of CEPT countries.xlxs*" a picture of which we include below.



Frequency	Status of Allocation	Ireland	Albania	Belgium	Bosnia and Hercegovina	Canada	Croatia	Czechia	Denmark	Greenland	Estonia	Finland	Germany	Hungary	Iceland	Latvia	Liechtenstein	Lithuania	Montenegro	New Zealand	Macedonia	Norway	Peru	Portugal	Serbia	Slovakia	Slovenia	South Africa	Spain	Switzerland	usa
135.7-137.8	kHz Secondary	0		0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	7	0	0		0		0	0	0	0	0	
472.0-479.0	kHz Secondary	7		7		7	0		0	7	0	0	0	0	7	0	7		15	14		0		0		0	7	0	0	7	
1810-1850	kHz Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	25	30	30	30	30	25	25	29	32	30	27	30	32
1850-2000	kHz Primary	26	28	32	32	34	30	29	30	30	30	28	29	30	30	30	30	30	25	30	30	30	30	32	25	30	32	30	30	30	30
3500-3800	kHz Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	32	29	32	30	30	30	32
5351.5-5366.5	kHz Secondary	32		32	32	29	32		30	30	32	32	32	32	32	32	32	32	32			29				32	32	32	32	32	29
7000-7200	kHz Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	32	29	32	30	30	30	32
7100-7200	kHz Primary	26	24	32	32	34	24	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	32	29	32	30	30	30	32
10100-10130	kHz Secondary	26	32	32	32	34	32	29	30	30	30	32	32	32	30	30	30	30	25	30	25	30	30	25	25	29	25	26	27	30	32
10130-10140	kHz Secondary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	25	30	25	30	30	32	25	29	25	26	27	30	28
14000-14350	kHz Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	32	29	32	30	30	30	32
18068-18168	kHz Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	25	29	32	30	30	30	32
21000-21450	kHz Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	32	29	32	30	30	30	32
24890-24990	kHz Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	25	30	32	30	30	32	25	29	32	30	30	30	32
28000-29700	kHz Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	32	29	32	30	30	30	32
50.000-52.000	MHz Secondary	32																													
50.000-52.000	Mhz Secondary	20	23	23	32	34	20	14	30	30	30	24	29	20	20	28	20	14	20	30	30	30	30	25	20	20	29	30	28	20	32
54.000- 69.900	Mhz Secondary	47																													
69.900-70.500	Mhz Secondary	32		30	32	34	30	29	24	30	30	20	24	30		20		14	20			20		20		29	29	26	26		
144.000-146.000	Mhz Primary	26	28	32	32	34	32	29	30	30	30	28	29	30	27	28	30	24	32	30	30	25	30	25	32	29	32	30	28	30	32
430.000-432.000	Mhz Primary	32	28	32	32	34	32	29	30	30	30	30	22	29	30	27	28	30	24	32	30	30	25	30	25	32	29	32	30	30	32
432.000-440.000	Mhz Primary	26	28	32	32	34	32	29	30	30	30	30	28	29	30	27	28	30	24	32	30	30	25	30	25	25	29	32	30	25	30	32
1240-1300	Mhz Secondary	22	28	23	32	34	32	29	24	24	20	28	29	27	20	20	30	20	25	14	20	20	30	25	25	29	25	30	27	30	32
2390-2400	Mhz Secondary	22	28	23	32	34	22	29	24	24	20	28	29	22	20	17	20	14	25	30	28	20	30		25	29	25	26	27	20	32
5570-5650	Mhz Secondary	22	28	23	32	34	22	29	24	24	20	28	29	30	20	17	20	14	25	30	25	20	30								
5650.00-5850.00	Mhz Secondary	22	28	23	32	34	22	29	24	24	20	28	29	30	20	17	20	14	25	30	25	20	30		25	29	20	26	27		22
10000-10500	Mhz Secondary	22	28	23	32	34	22	29	24	24	20	28	29	30	20	17	10	14	25	30	17	20	30	25	25	29	20	26	30	20	32
24000-25050	Mhz Primary	17	28	23	32	34	22	29	26	24		28	29	25	20	17	10	14	25	30	17	20	30	15	19	29	17	26	30	10	32
47000-47200	Mhz Primary	27	28	23	32	34	22	29	24	24		28	29	25	20	17	10	14	25	30	17	20	30		19	29	17	26	30	10	32

Table 2

The purpose of this table is to highlight where power allocations to Irish Radio Amateurs are positioned against a sample of prominent CEPT countries in the amateur radio world. This spreadsheet is coloured as a heat map to emphasise our point in easily showing where we rank.

The colour scale is applied on a line-by-line basis (per frequency allocation) and is dark red at its lowest relative value blending to a dark green at its highest value.

Appendix 2

In Table 3, we are including a list of licenced Irish Radio Amateur stations who wish to be a party to this submission. While this list is only a partial list of the current licences in the state, it does represent a broad range of the active amateur community throughout the country. As you would appreciate COVID-19 has stifled our usual ability to network and convey so we have put forward our petition as is.

[TABLE 3 IS REDACTED]

Frequency		Status of Allocation	Ireland	Albania	Belgium	Bosnia and Hercegovina	Canada	Croatia	Czechia	Denmark	Greenland	Estonia	Finland	Germany	Hungary	Iceland	Latvia	Liechtenstein	Lithuania	Montenegro	New Zealand	Macedonia	Norway	Peru	Portugal	Serbia	Slovakia	Slovenia	South Africa	Spain	Switzerland	usa
135.7-137.8	kHz	Secondary	0		0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	7	0	0		0		0	0	0	0	0	
472.0-479.0	kHz	Secondary	7		7		7	0		0	7	0	0	0	0	7	0	7		13	14		0		0		0	7	0	0	7	
1810-1850	kHz	Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	25	30	30	30	30	23	25	29	32	30	27	30	32
1850-2000	kHz	Primary	10	18	22	32	34	30	19	10	10	10	18	29	10	30	10	30	10	25	30	30	10	30	32	25	10	32	30	30	30	32
3500-3800	kHz	Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	32	29	32	30	30	30	32
5351.5-5366.5	kHz	Secondary	12		12	12	20	12		30	30	12	12	12	12	12	12	12	12	12			20				12	12	12	12	12	20
7000-7100	kHz	Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	32	29	32	30	30	30	32
7100-7200	kHz	Primary	26	24	32	32	34	24	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	32	29	32	30	30	30	32
10100-10130	kHz	Secondary	26	32	32	32	34	32	29	30	30	30	32	22	32	30	30	30	30	25	30	25	30	30	29	25	29	25	26	27	30	23
10130-10150	kHz	Secondary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	25	30	25	30	30	32	25	29	25	26	27	30	24
14000-14350	kHz	Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	32	29	32	30	30	30	32
18068-18168	kHz	Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	25	29	32	30	30	30	32
21000-21450	kHz	Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	32	29	32	30	30	30	32
24890-24990	kHz	Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	25	30	32	30	30	32	25	29	32	30	30	30	32
28000-29700	kHz	Primary	26	32	32	32	34	32	29	30	30	30	32	29	32	30	30	30	30	32	30	32	30	30	32	32	29	32	30	30	30	32
30.000-49.000	MHz	Secondary	17																													
50.000-52.000	Mhz	Secondary	20	23	23	32	34	20	14	30	30	30	24	29	10	20	29	20	14	20	30	30	30	30	25	20	29	20	30	28	20	32
54.000- 69.900	Mhz	Secondary	17																													
69.900-70.500	Mhz	Secondary	17		10	32	34	10	29	14	30	30	20	14	10		20		14	20			20		20		29	20	26	28		
144.000-146.000	Mhz	Primary	26	28	32	32	34	32	29	30	30	30	28	29	30	27	20	30	24	32	30	30	25	30	25	32	29	32	30	28	30	32
430.000-432.000	Mhz	Primary	17	28	32	32	34	32	29	30	30	30	22	29	30	27	20	30	24	32	30	30	25	30	25	32	29	17	30	25	30	32
432.000-440.000	Mhz	Primary	26	28	23	32	34	32	29	30	30	30	28	29	30	27	20	30	24	32	30	30	25	30	25	25	29	32	30	25	30	32
1240-1300	Mhz	Secondary	22	28	23	32	34	32	29	24	24	20	28	19	27	20	20	30	20	25	14	20	20	30	13	25	29	25	30	27	30	32
2300-2400	Mhz	Secondary	22	28	23	32	34	22	29	24	24	20	28	19	22	20	17	20	14	25	30	19	20	30		25	29	25	26	27	20	32
5570-5650	Mhz	Secondary	22	28	23	32	34	22	29	24	24	20	28	19	19	20	17	20	14	25	30	15	20	30								
5650.00-5850.00	Mhz	Secondary	22	28	23	32	34	22	29	24	24	20	28	19	19	20	17	20	14	25	30	15	20	30		25	29	20	26	27		32
10000-10500	Mhz	Secondary	22	28	23	32	34	22	29	24	24	20	28	19	19	20	17	10	14	25	30	17	20	30	25	25	29	20	26	30	20	32
24000-24050	Mhz	Primary	17	28	23	32	34	22	29	24	24		28	19	15	20	17	10	14	25	30	17	20	30	15	19	29	17	26	30	10	32
47000-47200	Mhz	Primary	17	28	23	32	34	22	29	24	24		28	19	15	20	17	10	14	25	30	17	20	30		19	29	17	26	30	10	32

Table 2

All power values above are indecated in dBW

Colour Scale Lowest value dBW — Highest value dBW

The purpose of this table is to highlight where power allocations to Irish radio amateurs are positioned against a sample of prominent CEPT countries in the amateur radio world. This spreadsheet is coloured as a heat map to emphasise our point in easily showing where we rank.
The colour scale is applied on a line-by-line basis (per frequency allocation) and is dark red at its lowest relative value blending to a dark green at its highest value. Please note this is a guide and whilst best efforts have been made to ensure the authenticity of the data, we cannot accept any responsibility for it in its entirety.

Letter about novice and intermediate radio amateur licenses

From: Brendan O'Brien
Sent: Tuesday 18 May 2021 10:59
To: [REDACTED]
Subject: RE: [Confidential] Novice or Intermediate licences in Ireland

Hi Enda,

This is a matter which has been discussed in the past, and it can be discussed again as part of the forthcoming consultation on the Radio Spectrum Management Strategy Statement for 2022-2024.

ComReg will set out its views on the matter in that consultation and consider any responses to such before deciding a policy position.

Regards,

Brendan

From: [REDACTED]
Sent: Thursday 13 May 2021 11:20
To: Brendan O'Brien <brendan.obrien@comreg.ie>
Subject: Novice or Intermediate licences in Ireland

CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and believe the content is safe.

Dear Brendan

In ComReg Document 09/45 R4, section 3.4 point 18, it states.

Under CEPT Recommendation T/R 61-01, ComReg also recognises licences granted by other National Regulatory Authorities, on condition that such licences meet the specified standard of T/R 61-02. ComReg does not recognise Novice or Intermediate licences as suitable qualifications.

What would ComReg see as the necessary steps required to amend this rule to expanding the Radio Amateur licencing schema to include the other grades as defined within the CEPT program either for new entrances into the hobby in Ireland or visiting licences from other countries (accepting that external work would have to be undertaken in the process of course material and exam preparation as was the case with the current HAREC syllabus).

I have included links for your convenience to further background information on the Novice & entry level licences produced by the ECC & ERC.

https://docdb.cept.org/download/0c9ce02d-96b4/Rec0506.pdf

https://docdb.cept.org/download/f269d824-61a3/ERCRep32.pdf

Thank you for your time in reviewing my email, I look forward to your response when your schedule allows.

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Kind regards

Enda Broderick

[REDACTED]

Annex: 6 List of recent EC Decisions

- Source:https://digital-strategy.ec.europa.eu/en/library/radio-spectrum-decisions
- **07 October 2020**
  Commission Implementing Decision (EU) 2020/1426 of 7 October 2020 on the harmonised use of radio spectrum in the 5 875-5 935 MHz frequency band for safety-related applications of intelligent transport systems (ITS) and repealing Decision 2008/671/EC

- **08 May 2020**
  Commission Implementing Decision (EU) 2020/636 of 8 May 2020 amending Decision 2008/477/EC as regards an update of relevant technical conditions applicable to the 2 500–2 690 MHz frequency band

- **06 May 2020**
  Commission Implementing Decision (EU) 2020/667 of 6 May 2020 amending Decision 2012/688/EU as regards an update of relevant technical conditions applicable to the frequency bands 1 920-1 980 MHz and 2 110-2 170 MHz

- **24 April 2020**
  Commission Implementing Decision (EU) 2020/590 of 24 April 2020 amending Decision (EU) 2019/784 as regards an update of relevant technical conditions applicable to the 24,25-27,5 GHz frequency band

- **02 August 2019**
  Commission Implementing Decision (EU) 2019/1345 of 2 August 2019 amending Decision 2006/771/EC updating harmonised technical conditions in the area of radio spectrum use for short-range devices

- **14 May 2019**
  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

  Commission Implementing Decision (EU) 2019/785 of 14 May 2019 on the harmonisation of radio spectrum for equipment using ultra-wideband

technology in the Union and repealing Decision 2007/131/EC

- **24 January 2019**
  Commission Implementing Decision (EU) 2019/235 on amending Decision 2008/411/EC as regards an update of relevant technical conditions applicable to the 3400-3800 MHz frequency band

- **11 October 2018**
  Commission Implementing Decision (EU) 2018/1538 on the harmonisation of radio spectrum for use by short-range devices within the 874-876 and 915-921 MHz frequency bands. Implementation table (15/01/2020).

- **26 April 2018**
  Commission Implementing Decision (EU) 2018/661 amending Implementing Decision (EU) 2015/750 on the harmonisation of the 1452-1492 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Union as regards its extension in the harmonised 1427-1452 MHz and 1492-1517 MHz frequency bands. Implementation table (15/01/2020).

- **20 April 2018**
  Commission Implementing Decision (EU) 2018/637 amending Decision 2009/766/EC on the harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community as regards relevant technical conditions for the Internet of Things. Implementation table (15/01/2020).