An Coimisiún um
Rialáil Cumarsáide
Commission for
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Fixed Radio Links Report

Annual Report for 2019

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Content

Chapter 1

1 Introduction

1.1 Radio spectrum is the 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 as it underpins nearly all communications services in the State. These services include mobile and fixed telephony, radio and television broadcasting, and radio communications used by commercial business and by air and maritime transport.

1.2 A key service for telecommunication infrastructure development is the fixed service ("FS") which is a radio communication service between specified fixed geographic points. Some examples of FS applications (see figure 1) are transport networks (trunking, multi-hop, etc.), mobile backhaul networks, fixed wireless access ("FWA")[1] and temporary networks (electronic news gathering and disaster relief).

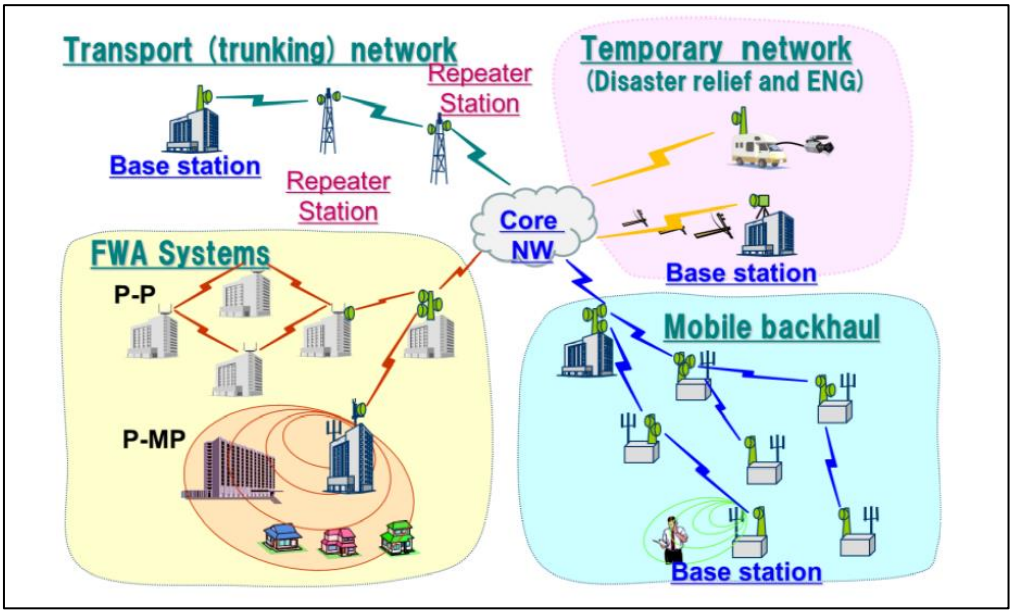

Figure 1: Various applications of fixed service systems

1.3 Over the last two decades, the most significant FS demand for spectrum has been for fixed radio links[2] to support public mobile backhaul networks and fixed wireless access networks. The number of fixed radio links licences has increased year-on-year, and currently represent circa 70% of all radio licences granted by ComReg.

[1] Fixed Wireless Access means a radiocommunication services between a base station and fixed subscriber terminals locations.
[2] A fixed radio link is a radio-relay link between two or more stations located at specified fixed geographic points.

1.4 Fixed radio links are commonly used for providing high bandwidth connections between two or more fixed geographic locations, and can provide an economic alternative to optical fibre and leased lines. The most common users of fixed radio links are:

- Mobile network operators ("MNOs") - for mobile backhaul network;
- FWA operators - for the provision of fixed wireless broadband; and
- Broadcasters - to distribute signals to transmission sites.

1.5 ComReg has two separate frameworks in place for the licensing of fixed radio links in Ireland:

1. National block licences[3] for point-to-point ("P-P")[4] services in the 26 GHz band - issued under S.I 158 of 2018 - which enables operators to plan and deploy Radio Links in this band without needing to apply to ComReg for individual Fixed Radio Link licences; and
2. Individual licences for P-P and point-to-multipoint ("P-MP")[5] services - issued under S.I. 370 of 2009 - which enable operators to apply for Fixed Radio Link licences as required to meet their needs.

1.6 The purpose of this report is to provide information to interested parties in respect of item (2) above, the licensing of fixed radio links granted under S.I. 370 of 2009. This report sets out the background of fixed radio links deployment in Ireland, the licensing regime for fixed radio links in Ireland, current demand and trends for individual fixed radio links licences across all the frequency bands, and ComReg's work plan to review the current individual fixed radio links licensing regime and the current and future use of the frequency bands allocated for fixed radio links. This fixed radio links report is the first, of what will become, an annual ComReg publication.

1.7 The remainder of this report is structured as follows:

- **Chapter 2** provides background information on the licensing of fixed radio links in Ireland.
- **Chapter 3** provides an overview of the licensing regime for fixed radio links in Ireland.
- **Chapter 4** provides information on the frequency bands allocated for fixed radio links and usage trends for the period 2015 – 2019.

[3] National Block licences/radio links will not be discussed within this report.
[4] A point-to-point – provides a radio communication service by a link between two stations located at specified fixed points.
[5] A point-to-multipoint provides a radio communication service by links between a single station located at a specified fixed point and a number of stations located at specified fixed points.

- **Chapter 5** outlines ComReg's plans going forward, including its intention to review the fixed links bands and to consider opening new frequency bands. .

Chapter 2

2 Background

2.1 Fixed radio links are wireless systems that connect two or more fixed geographic locations. Fixed radio links form a major part of the infrastructure of electronic communications networks and account for circa 70% of all licensed apparatus for wireless telegraphy in the State.

2.2 There is a large variety of fixed radio link users in Ireland including fixed and mobile operators, broadcasters, public utilities and emergency services. Some operators use fixed radio links as an economic alternative to leased lines[6] and optical fibre.

2.3 Fixed radio links are often the preferred solution over cable and fibre where constraints such as cost, local topography (e.g. mountainous terrain or paths across water) and the need for access to remote rural regions are fundamental considerations. In many such cases fixed radio links are the only practical solution. Nevertheless, many electronic network providers continue to invest in deploying fibre for backhaul and to provide electronic communication services, and long term effect of that deployment on the demand for fixed radio links is as yet unknown.

2.4 During the 2015-2019 period, the demand for fixed radio link licences in the frequency bands ranging from 1.3 GHz to 80 GHz continued to increase. As of the 30th June 2019, 12,510 fixed radio link P-P licences (see Figure 2) and 36 Fixed Radio Link P-MP licences were live in Ireland. The slight reduction in the number of live P-P licences during the 2018-2019 operating year arose from Three Ireland consolidating[7] its networks, and also a move by certain operators to licence-exempt spectrum.

[6] A leased line is a private bidirectional or symmetric telecommunications (copper or fibre) circuit between two or more locations.

[7] In 2014, the European Commission approved the acquisition of Telefónica Ireland Ltd (O2) by Three Ireland (Hutchison) Ltd. Following the approval of that merger, Three Ireland has been working towards consolidating the two networks, which involves amongst other things, consolidating duplicate fixed radio links on the same path and/or sites.

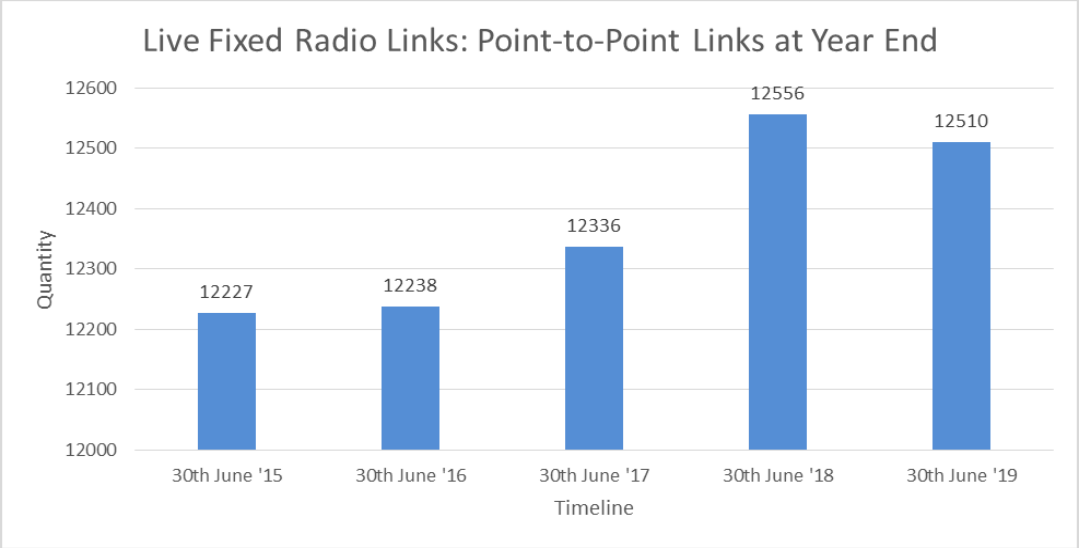

Figure 2: Live Point-to-Point Fixed Links at Year End

2.5 The current demand for fixed radio link licences is predominantly for fixed links with a higher capacity throughput as networks are expected to achieve data throughputs in the region of gigabit-per-second ("GBit/s") to provide services to end-users in the near future.[8] In addition, a future increase in small cell deployments and increased macro-cell capacity requirements seems likely to have a significant bearing on backhaul capacity requirements in both existing and new fixed link frequency bands with the upper frequency bands (i.e. 50 GHz and above) in particular being potential key facilitators for such high traffic volumes.

2.6 ECC Report 173 (Fixed Service in Europe: Current use and future trends post 2016) shows that across Europe there is a continued increase (in the order of 85% in 2016, about 75% between in 2010, and 33% in 2001) in number of Fixed radio links deployed.[9] CEPT is of the view that the increase in the number of fixed radio links is likely to continue for the foreseeable future. In order to facilitate that continued growth, CEPT regularly develops and updates ECC Decisions and Recommendations with relevant channel arrangements and additional frequency bands for high density applications.

2.7 The use of fixed radio links continues to evolve both in terms of technology and applications including the use of high capacity fixed wireless systems, with the use of higher frequency bands, e.g. the use of higher millimetre wave bands greater than 38 GHz being an important factor in supporting FS networks. Technology developments include higher modulation schemes (up to 4096 levels), adaptive modulation schemes to dynamically

[8] ComReg Document 18/118 - Radio Spectrum Management Strategy Statement for 2019 to 2021- https://www.comreg.ie/publication-download/radio-spectrum-management-strategy-statement-2019-to-2021

[9] https://www.ecodocdb.dk/download/6fd0de6b-f796/ECCRep173.PDF

increase radio throughput by scaling modulation schemes, and Bands and Carrier Aggregation[10]. This continuing evolution may require further spectrum management and regulatory considerations, such as the opening of new frequency bands and allowing higher modulation schemes, in order meet the needs of industry and consumers.

[10] Bands and Carrier Aggregation uses two or more carriers, which can be different frequency bands and may have different channel sizes, to obtain what looks like a single carrier connection. This results in delivering a payload with different steps in term of capacity/availability but with more capacity. This allows an operator to use its assigned spectrum more efficiently.

Chapter 3

3 Licensing of Fixed Radio Links

3.1 A licence to keep and operate apparatus for wireless telegraphy is required under Section 3 of the Wireless Telegraphy Act 1926[11]. Fixed Radio Link licences are governed by the Wireless Telegraphy (Radio Link Licence) Regulations, 2009 (S.I. 370 of 2009). A holder of a wireless telegraphy licence must also comply with the General Authorisation scheme (governed by the European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2011 (S.I. 335/20011) and with the European Communities (Radio Equipment and Telecommunications Terminal Equipment) Regulations 2001 (S.I. 240 of 2001).

3.2 ComReg Document 09/89R2[12] sets out the technical licensing requirements and guidelines for submitting applications for Radio Links Licences. ComReg aims to process applications and grant fixed radio links licences within ten working days, contingent on demand and available resources.

3.3 In order to ensure that spectrum is assigned in the most efficient manner possible, ComReg aims to licence fixed radio links in the most appropriate frequency band with an assigned bandwidth and transmitter EIRP (Equivalent Isotropic Radiated Power) that are consistent with the minimum capacity and availability requirements for that link.

3.4 Operators are encouraged to use the latest technology and higher order modulation schemes in line with ensuring the efficient use of spectrum. ComReg only grants licences for radio equipment that meets the minimum mandatory technical requirements and the minimum equipment requirements such as:

- minimum transmission capacity requirement;
- minimum antenna requirement - Class 3 antenna; and
- mandatory equipment class - Class 1, 2 or 3 were applicable.[13]

[11] http://www.irishstatutebook.ie/eli/1926/act/45/enacted/en/index.html
[12] https://www.comreg.ie/media/2016/04/ComReg0989R2.pdf
[13] https://www.comreg.ie/media/dlm_uploads/2017/06/ComReg-0989R2.pdf

Chapter 4

4 Fixed Radio Link Frequency Bands

4.1 Sixteen frequency bands are currently available for P-P and P-MP fixed radio link licensing and the channel arrangements for those bands are based upon internationally agreed allocations made by the ITU and CEPT.[14] While the number of fixed radio links deployed in Ireland continues to grow, certain frequency bands are more in demand than others due to the specific radio propagation of those bands (see figure 3 below).

4.2 As outlined in Chapter 2, there are currently over 12,500 live fixed radio link licences in Ireland. The continued demand for fixed radio link licences is driven in part by operators' increasing the capacity of their networks to address consumers' current and future demand for data as a result of the roll-out of new technology standards such as LTE and 5G-NR.

4.3 The continued demand for fixed radio link licence applications has seen certain trends emerge:

- High demand for deploying fixed links in the 11 GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz and 80 GHz frequency bands;
- Operators increasingly utilising channels with higher bandwidths such as 56 MHz and 112 MHz;
- Certain geographic sites (for example Three Rock, Woodcock Hill, Slieve Glah and Mount Leinster) contain high usage paths[15] in frequency bands such as 13 GHz, 15 GHz, etc.; and
- An increase in some locations in the number of applications which cannot be facilitated due to the high demand outstripping available spectrum.

4.1 Key Trends within Fixed Radio Link Frequency Bands

4.4 The following information and series of graphs outlines the trends in fixed radio link licensing over the past number of years. Figure 2 above shows that from 2015 the number of P-P links licensed grew each year, increasing by 220 links from year end 2017 to 2018, though this had stabilised by year end 30 June 2019.

[14] https://www.ecodocdb.dk/download/2ca5fcbd-4090/ERCREP025.pdf
[15] A high usage path is where there are 10 or more licensed radio links operating between two specific geographic sites.

4.5 Intensive use of the 18 GHz and 23 GHz Bands in the greater Dublin area has led to the introduction of a “congestion area”. A congestion area is a geographical area were, if either end of an 18 GHz or 23 GHz fixed radio link is located within the congestion area, a congestion charge will apply. More information on congestion areas can be found in section 2.10 of ComReg Document 09/89R2 at www.comreg.ie.

4.6 Due to the exhaustion of all available channels across the greater Dublin area in the 13 GHz and 15 GHz frequency bands, ComReg has suspended the acceptance for such new fixed radio link applications[16].

4.7 Figure 3 shows the total number of fixed radio link licences per frequency band (from 1.3/1.5 GHz to 80 GHz) for the end periods 30 June 2017, 2018 and 2019. The frequency bands from 11 GHz to 23 GHz, 38 GHz and 80 GHz are the most prevalent frequency bands for fixed radio link deployment.

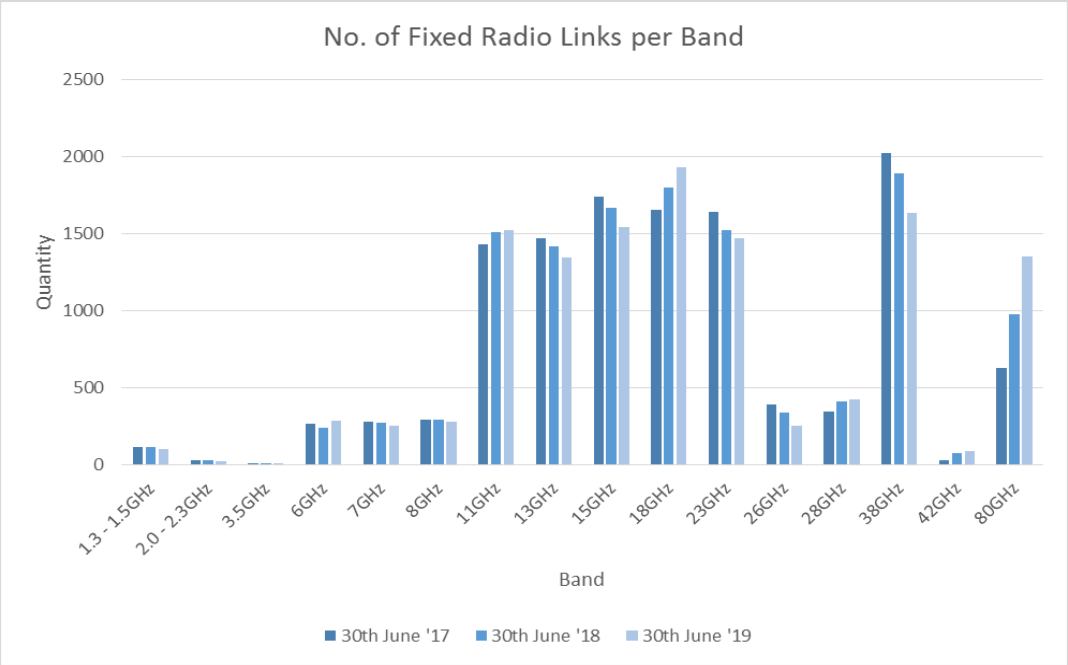

Figure 3: Number of fixed radio links per band (2017 - 2019)

4.8 It is perhaps worth noting that the number of fixed radio links licenced in the 80 GHz band has approximately doubled each year from 2017 to 2019 due to the higher bandwidths available there. At 30 June 2019, over 1,350 fixed radio links (circa. 76%) in this band were located in the greater Dublin area.

4.9 Figure 4 below presents the top ten operators that currently hold fixed radio link licences, with mobile network operators and FWA operators having deployed circa 80% of all licensed P-P fixed radio links in Ireland.

[16] It should be noted that amendments to existing 13 GHz and 15 GHz links are not affected.

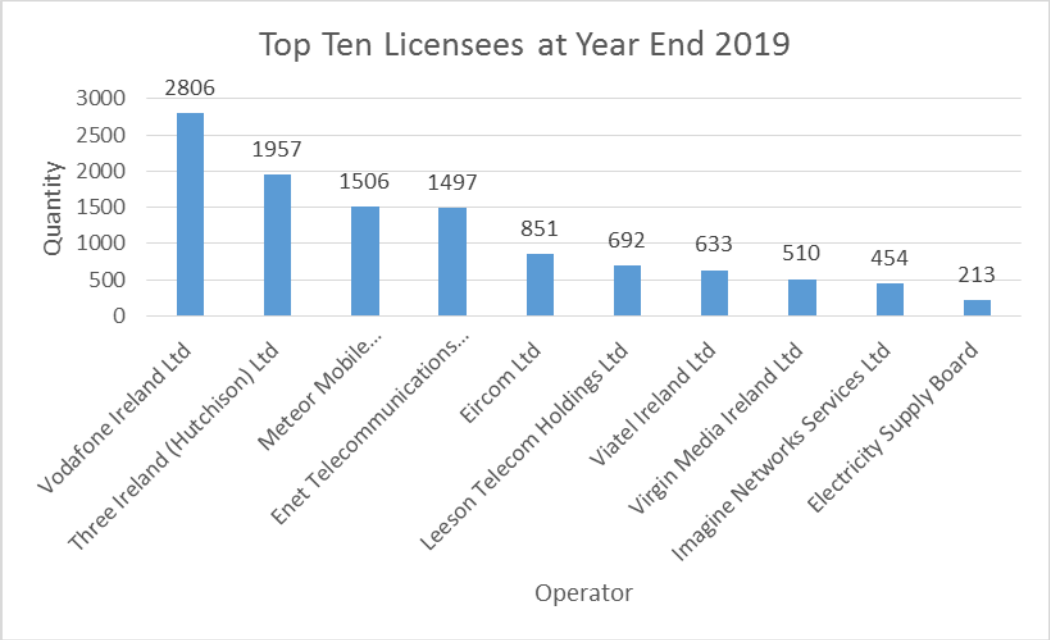

Figure 4: Top Ten Licensees at 30 June 2019

4.10 The high demand for and usage of fixed radio links has also resulted in an increase in the number of unmet fixed radio link applications. Figures 5 and 6 below outline the number of fixed radio links applications not approved per band during the period 2017-2019. The frequency bands 13 GHz, 18 GHz and 23 GHz have the largest number of applications not approved over the past 3 years. This is a result of a number of factors such as:

- Applications being applied for in high demand bands and in areas with high usage paths with limited channel availability;
- Applications for channels with higher capacity rates and bandwidths which are not available due to high demand for those channels in specific areas; and
- Applications not meeting the minimum technical requirements as set out in ComReg Document 09/89R2.

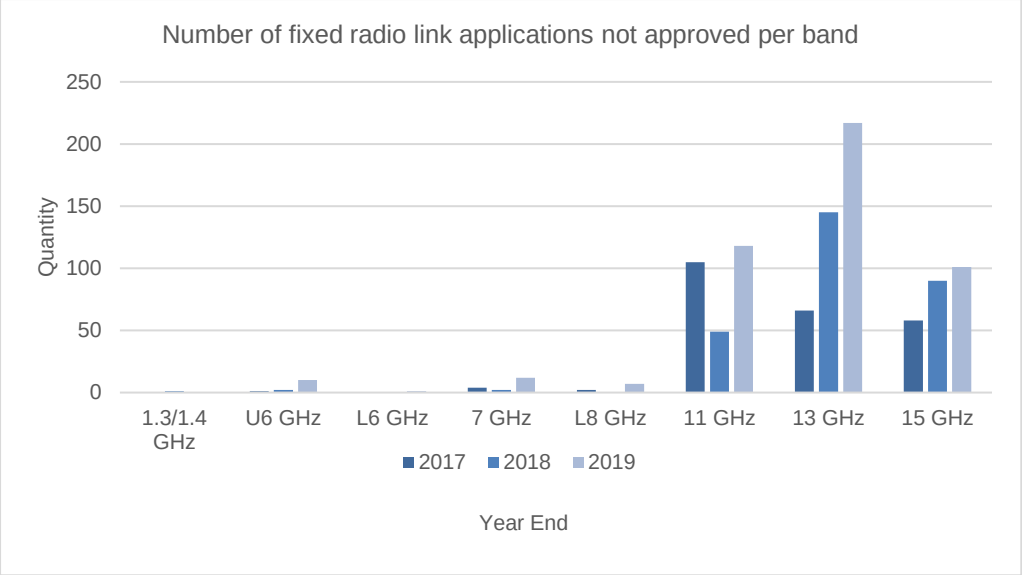

Figure 5: Fixed radio link applications not approved per band (2017-2019)

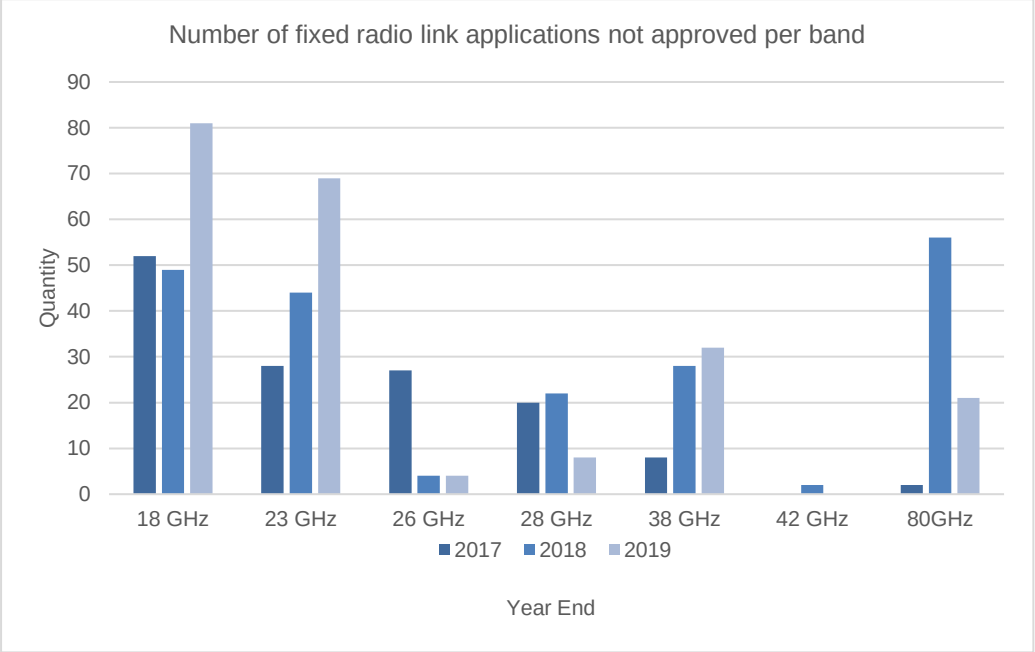

Figure 6: Fixed radio link applications not approved per band (2017-2019)

4.11 Figure 7 shows that the number of P-MP of live licences has decreased in the last 5 years. The sudden decrease during the 2018-2019 operating year was due to the ESB cancelling a number of their P-MP licences.

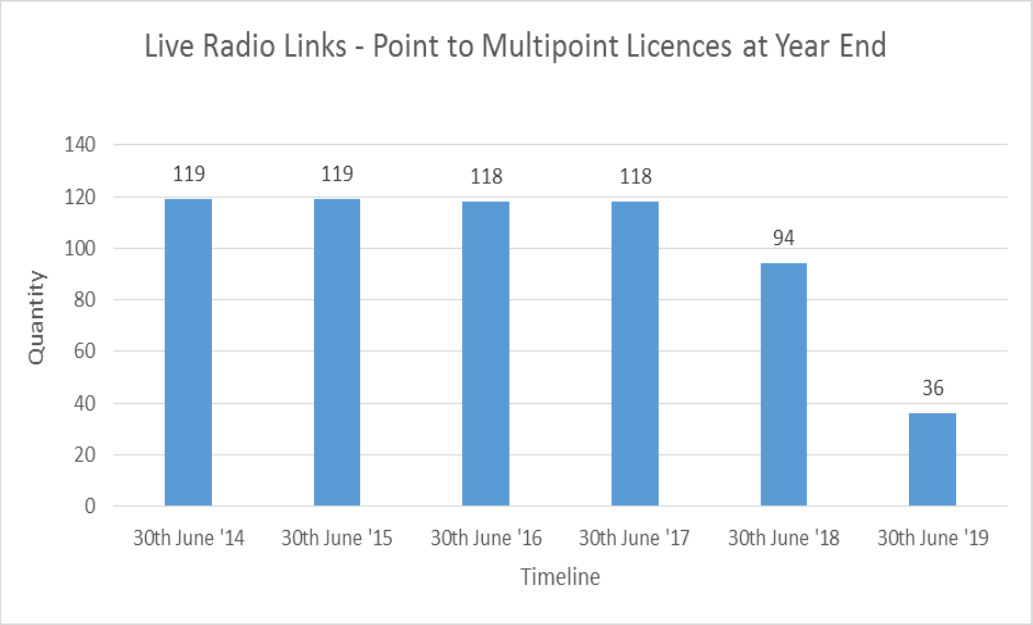

Figure 7: Live Fixed radio links: Point-to-Multipoint licences at Year End

Chapter 5

5 Going Forward

5.1 This fixed radio links report is the first of what will become an annual publication to provide an understanding of fixed radio link deployment in Ireland and assist all operators in the planning of their radio networks.

5.2 Noting that the demand for fixed radio links seems likely to continue for the foreseeable future ComReg has, in its Action Plan for 2019/2020[17], committed to reviewing the technical conditions associated with fixed links and opening new frequency bands. Relevant consultation documents will be published on www.comreg.ie in due course seeking the views of interested parties.

[17] https://www.comreg.ie/media/2019/07/Annual-Action-Plan-Ye-30-June-2020.pdf