An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Fixed Radio Links Report

Annual Report for 2021

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1 Introduction

1.1 The Commission for Communications Regulation ("ComReg") is the statutory body responsible for the regulation of the electronic communications telecommunications, radio communications and broadcasting networks), postal and premium rate sectors in Ireland and in accordance with European ("EU") and Irish law. ComReg also manages Ireland's radio frequency spectrum ("radio spectrum" or "spectrum") and the national numbering resource. Under the Communications Regulation Act 2002, as amended, ComReg has a range of functions and objectives in relation to the provision of electronic communications networks ("ECN"), electronic communications services ("ECS") and post which includes ensuring the efficient and effective use of the national radio spectrum resource.

1.2 As noted in ComReg's Electronic Communications Strategy Statement 2021 to 2023[1], radio spectrum, as a medium over which data can be transmitted, is an essential input in the supply of wireless/radio-based ECN / ECS for a diverse range of uses and end-users. It is a valuable national resource as it underpins nearly all communications services in the State. These communication services include mobile telephony, wireless broadband, radio and television broadcasting and radio communications used by commercial business and by air and maritime transport. Many services rely on wireless connectivity as part of the backbone linking mobile base stations, providing feeds to broadcast transmitters and telemetry links that allow the monitoring of disperse infrastructure, for example water reservoir levels and remote power transformers.

1.3 The demand for radio spectrum continues to grow, driven by society's ever-increasing requirements in terms of access to data intensive services while on the move. In this context it is ComReg's goal[2] that the management of spectrum facilitates competition, enhances connectivity and promotes efficient investment.

1.4 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 are transport networks (trunking, multi-hop, etc.), mobile backhaul networks, fixed wireless access

[1] ComReg document 21/70 – Electronic Communications Strategy Statement 2021 to 2023 – published 30 June 2021.
[2] ComReg's Competition & Investment strategic intention – Goal 1.6: The management of spectrum and numbers facilitates competition, enhances connectivity and promotes efficient investment.

("FWA")[3] and temporary networks (electronic news gathering and disaster relief).

1.5 On the 30 September 2019, ComReg published its first fixed links annual report as Document 19/89[4]. In that document, ComReg provided an introduction to fixed radio links and the associated licensing frameworks along with information on the demand and trends in fixed link licensing. ComReg has not repeated this here but readers are referred to Document 19/89 if they wish to engage further.

1.6 The purpose of this report is to set out the most up to date information regarding the licensing of fixed radio links granted under S.I. 370 of 2009.[5] The report also provides an update on the demand and trends in fixed link licensing since the fixed links annual report published on the 30 September 2020[6], information on recent improvements to the fixed radio links application process on ComReg's eLicensing website[7], along with information on the European Conference of Postal and Telecommunications Administrations ("CEPT")[8] current fixed services work programme.

1.7 Separately, and as outlined in its Annual Action plan for 2021-2022[9], ComReg is reviewing the fixed radio links licensing regime and associated frequency bands. The objective of the review is to assess the current fixed radio links licensing regime and consider what, if any, changes are required to ensure that the regime is fit for purpose and capable of facilitating future use of fixed radio links and other electronic communication services. The preliminary consultation[10] and consultants report[11] was published in Q4 2020. The response to that consultation, a further consultation along with a consultant's report will be published in Q4 2021.

1.8 The remainder of this report is structures as follows:

[3] Fixed Wireless Access means a radiocommunication services between a base station and fixed subscriber terminals locations

[4] ComReg Document 19/89 – Fixed Radio Links Report Annual Report for 2019 – published 30 September 2019. https://www.comreg.ie/publication-download/fixed-radio-links-annual-report-for-2019

[5] http://www.irishstatutebook.ie/eli/2009/si/370/made/en/pdf

[6] ComReg Document 20/93 – Fixed Radio Links Report Annual Report for 2020 – published 30 September 2020.https://www.comreg.ie/publication/fixed-radio-links-annual-report-2020

[7] https://elicensing.comreg.ie/

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

[9] https://www.comreg.ie/media/2021/07/Annual-Action-Plan-Ye-30-06-2022-as-at-1-07-2021.pdf

[10] https://www.comreg.ie/publication/review-of-the-fixed-radio-links-licensing-regime

[11] https://www.comreg.ie/publication/consultants-report-fixed-links-bands-review

- **Chapter 2** provides the trends on the licensing of fixed radio links in Ireland.
- **Chapter 3** provides information on the frequency bands allocated for fixed radio links up to 30 June 2021.
- **Chapter 4** provides information on ComReg's fixed radio links project.
- **Chapter 5** provides information on ComReg eLicensing application system.
- **Chapter 6** provides information on the CEPT's work programme for fixed services.

Chapter 2

2 Fixed Links Licensing Trends

2.1 During the 2017-2021 period, the demand for fixed radio link licences in the frequency bands ranging from 1.3 GHz to 80 GHz continued to increase, notably in fixed radio link Point-to-Point ("P-P)[12]. As of 30 June 2021, 14,256 P-P links[13] (see Figure 1) and 22 fixed radio link Point-to-Multipoint licences ("P-MP")[14] (see Figure 2) licences were live in Ireland. The number of P-P radio links has increased by 4% while the number of P-MP radio links has decreased by 26% during the same period.

2.2 The increase in number of live P-P links during the 2020-2021 operating year can, in the main, be attributed to continued operator improvement of their backhaul and fixed/wireless broadband networks to address growing consumer demand for increased data capacity. The increase in demand for data capacity can be seen in ComReg's most recent Quarterly Key Data Report for Q2 2021[15]. For example, in Q2' 2021, total fixed broadband traffic increased by 32% while total mobile data increased 26% compared to the same period last year.

[12] A point-to-point – provides a radio communication service by a link between two stations located at specified fixed points.

[13] For dual polarity links the vertical polarisation (V) is counted as one link and the horizontal polarisation (H) is counted as a separate link

[14] 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.

[15] ComReg Document ComReg 21/88– QUARTERLY KEY DATA REPORT – Q2 2021 – published 9 September 2021 - quarterly key data report (comreg.ie)

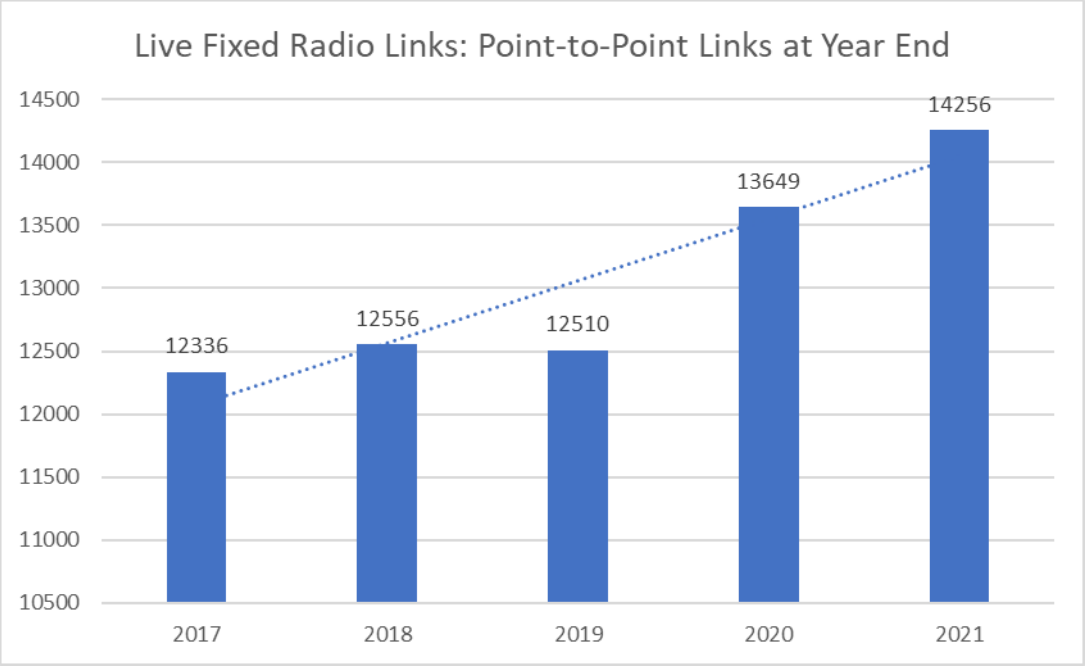


Figure 1: Live Point-to-Point Fixed Links at Year End 30 June

2.3 The number of live P-MP licences continues to decline. Of the 22 P-MP fixed radio link licences, 20 are held by Eir and 2 licences are held by the Office of the Government Chief Information Officer[16]. The decrease of seven P-MP licences in 2020-2021 is due to the non-renewal of Eir's P-MP licences in Galway from 31 January 2021, as outlined in ComReg Document 20/122[17]. The notable decline during 2018-2020 was in the main due to the ESB cancelling its P-MP licences as it migrated to its SCADA[18] telemetry network, utilising its national telemetry licence[19].

[16] gov.ie - Office of the Government Chief Information Officer (www.gov.ie)

[17] See 5.2.3 Updated Information – Eir's RurTel Network and the 2.3 GHz of Multi Band Spectrum Award - Response to Consultation and Decision ComReg Document 20/122 - https://www.comreg.ie/media/2020/12/ComReg20122.pdf

[18] Supervisory, Control and Data Acquisition

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

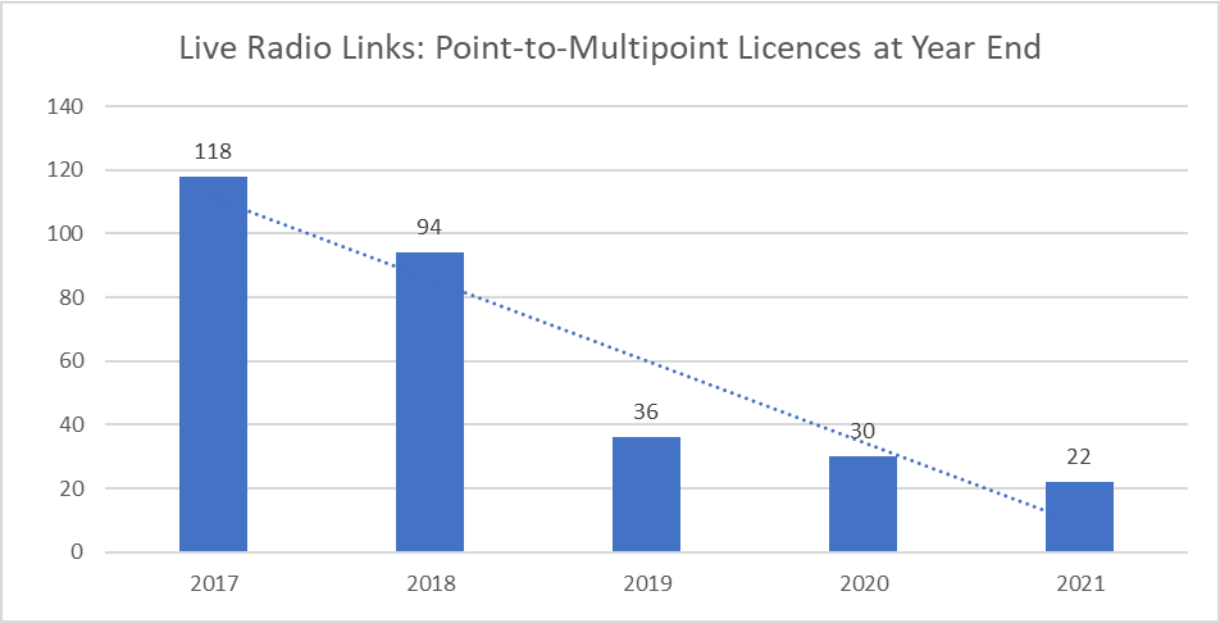


Figure 2: Live Point-to-Multipoint Licences at Year End 30 June

2.4 The number of reports of harmful interference to fixed links continues to decline as outlined in Figure 3 below. The low instances of harmful interference reflects the benefit of having a licensing regime that co-ordinates fixed radio links, providing applicants with more information on fixed links deployments, as we outline in Chapter 5 below, and the ongoing and proactive nature of engagements between ComReg's Spectrum Intelligence and Investigations (SII)[20] team and licensees.

[20] https://www.comreg.ie/industry/radio-spectrum/spectrum-compliance/

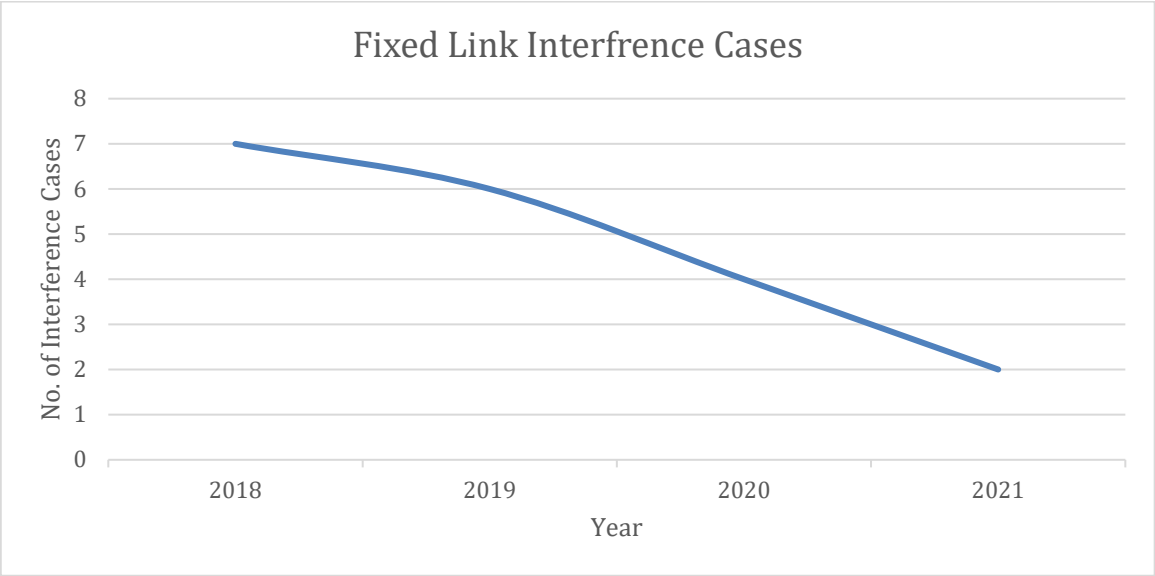


Figure 3: Fixed Link Harmful Interference Cases at Year End 30 June

2.5 Figure 4 below sets out those licensees that held the most fixed radio links at 30 June 2021. The mobile network operators and FWA operators continue to account for circa 80% of all licensed fixed radio links in Ireland, a ratio that has increased by 6% since 2020. The most notable increases come from Viatel Ireland Ltd (+36%), Enet Telecommunications Networks Limited (+18%) and Leeson Telecom Holdings Ltd (+11%).

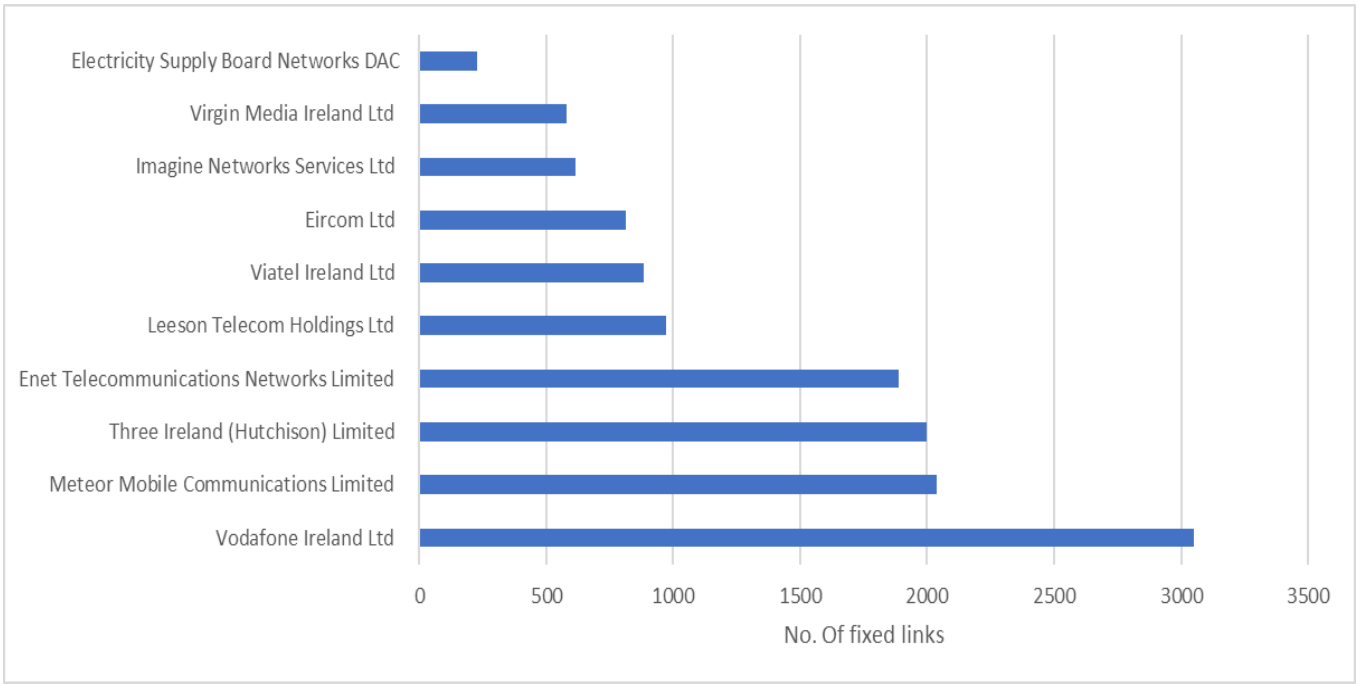


Figure 4: Top 10 Fixed Links Licensees as of 30 June 2021

Chapter 3

3 Fixed Radio Links Frequency Bands

3.1 Twenty frequency bands are currently available for P-P and P-MP fixed radio link licensing and the channel arrangements for those bands based upon internationally agreed allocation made by the ITU and CEPT[21]. While the number of fixed radio links deployed in Ireland continues to grow, certain frequency bands are more in demand than others. The demand for frequency bands for fixed radio links is being shaped by three main trends:

- Increasing bandwidth requirements shifting demand to higher frequencies, in particular the 80 GHz band and also the 18 GHz band;
- an increase in capacity requirements and use of dual polarisation where wider channels are not available; and
- some replacement of microwave links by fibre.

3.2 As outlined in Chapter 2, there are currently 14,256 live P-P fixed radio link licences in Ireland. The continued demand for fixed radio link licences is driven in part by operator's increasing the capacity of their networks to address consumer's current and future demand for data due to the roll-out of new technology standards.

3.3 Figure 5 shows the total number of fixed radio links per frequency band (from 1.3/1.5 GHz to 80 GHz) for the end periods 30 June 2019, 2020 and 2021. The frequency bands 11 GHz to 23 GHz, 38 GHz and 80 GHz continue to be the most used frequency bands for fixed radio link deployment.

[21] ECO Documentation (cept.org)

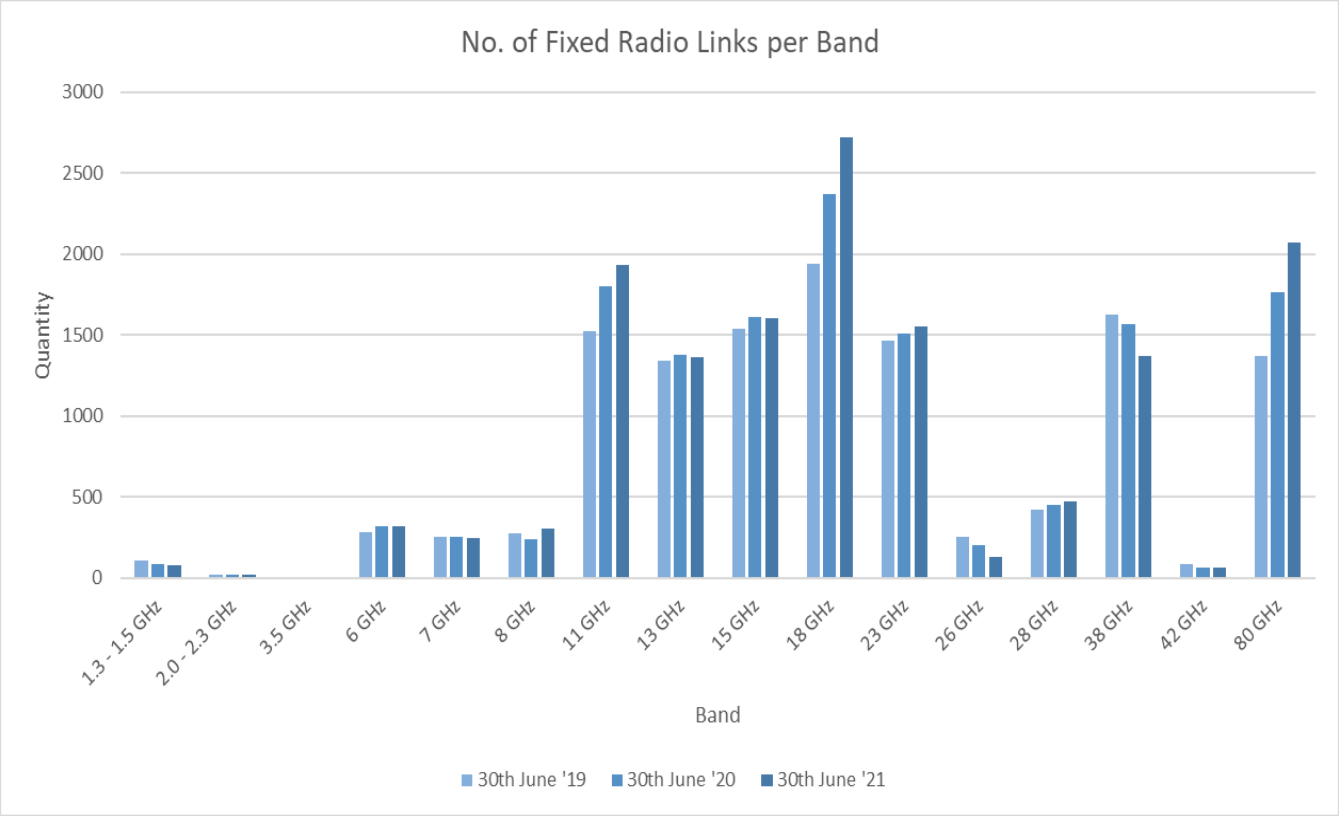


Figure 5: Number of fixed radio links per band (2019 – 2021)

3.4 The number of radio links in the frequency bands 11 GHz to 23 GHz and 80 GHz has steadily increased over the last three years. The increase in these bands can be attributed to the roll out of the "Bands and Carrier Aggregation" concept. Bands and Carrier Aggregation is a technology now being deployed in the mobile backhaul arena. The main idea behind the Bands and Carriers Aggregation (BCA) is to build-on a point-to-point connection, using two or more "carriers" that can occupy different frequency bands and may also have different channel size[22].

3.5 The sustained reduction of licences in the 26 GHz, 38 GHz and 42 GHz bands can likely be attributed to the mobile network operators migrating links to their 26 GHz national block licences which were awarded in 2018[23], as the bands have similar propagation characteristics.

3.6 The 26 GHz Band has been identified as one of three pioneer radio spectrum

[22] ECC Report 173 - Fixed Service in Europe Current use and future trends post 2016 https://docdb.cept.org/download/665

[23] See ComReg Document 18/31 at www.comreg.ie

bands[24] suitable for the deployment of "5G" services in Europe. In January 2021, ComReg commissioned a study of the 26 GHz Band to inform its considerations in relation to the future use of the 26 GHz Band. Readers are referred to ComReg document 21-07a[25] if they wish to consider further. ComReg will continue to monitor developments in the 26 GHz band with respect to 5G.

3.7 The decrease in use experienced in the 1.3 – 1.5 GHz band is due to non-renewal of licences as some licensees have migrated to other technologies such as satellite or to other bands or fibre due to bandwidth limitations in the 1.3 – 1.5 GHz band.

[24] 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.

[25] 26 GHz Band 5G Study ComReg Document 21/07a - https://www.comreg.ie/media/2021/01/ComReg-2107a.pdf

Chapter 4

4 Fixed Radio Links Review

4.1 In 2020, ComReg commenced a project to review its Fixed Radio Links licensing regime and associated frequency bands ("The fixed links review")[26].

4.2 On 9 November 2020, ComReg published its preliminary consultation document ("ComReg Document 20/109[27]") and accompanying consultant's report ("ComReg Document 20/109A[28]). The preliminary consultation document and accompanying consultant's report considered:

- 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;
- 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; 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.

4.3 The fixed links review is a multi-year project and the next consultation stage (including the responses to the preliminary consultation) and consultants' report will be published in Q4 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; 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.

[26] https://www.comreg.ie/media/2021/05/Action-Plan-Ye-300621-Update-as-at-14-May-2021.pdf
[27] https://www.comreg.ie/publication/review-of-the-fixed-radio-links-licensing-regime
[28] https://www.comreg.ie/publication/consultants-report-fixed-links-bands-review

Chapter 5

5 eLicensing Application Process

5.1 As part of ComReg's commitment to continually improving its licensing experience for users, ComReg introduced in early 2021, a mapping graphical user interface ("GUI") on its eLicensing[29] system. ComReg followed this in April 2021 by introducing a preview of the applicants link budget on eLicensing.

5.2 The mapping GUI allows applicants to view the direction of licensed links at sites prior to applying. This mapping GUI is particularly useful to applicants as it means they no longer need to plot coordinates to determine the direction of existing fixed links at a site. Figure 6 illustrates this development.

5.3 These recent developments are designed to assist applicants in determining the likelihood of an application being successful, thus informing the prospective applicant in advance of whether it should proceed with its application or should instead consider alternative frequencies for its needs. This enables a faster and more streamlined application process by making more information available to applicants when engineering their networks while positively impacting ComReg's application turnaround times.

[29] https://elicensing.comreg.ie/

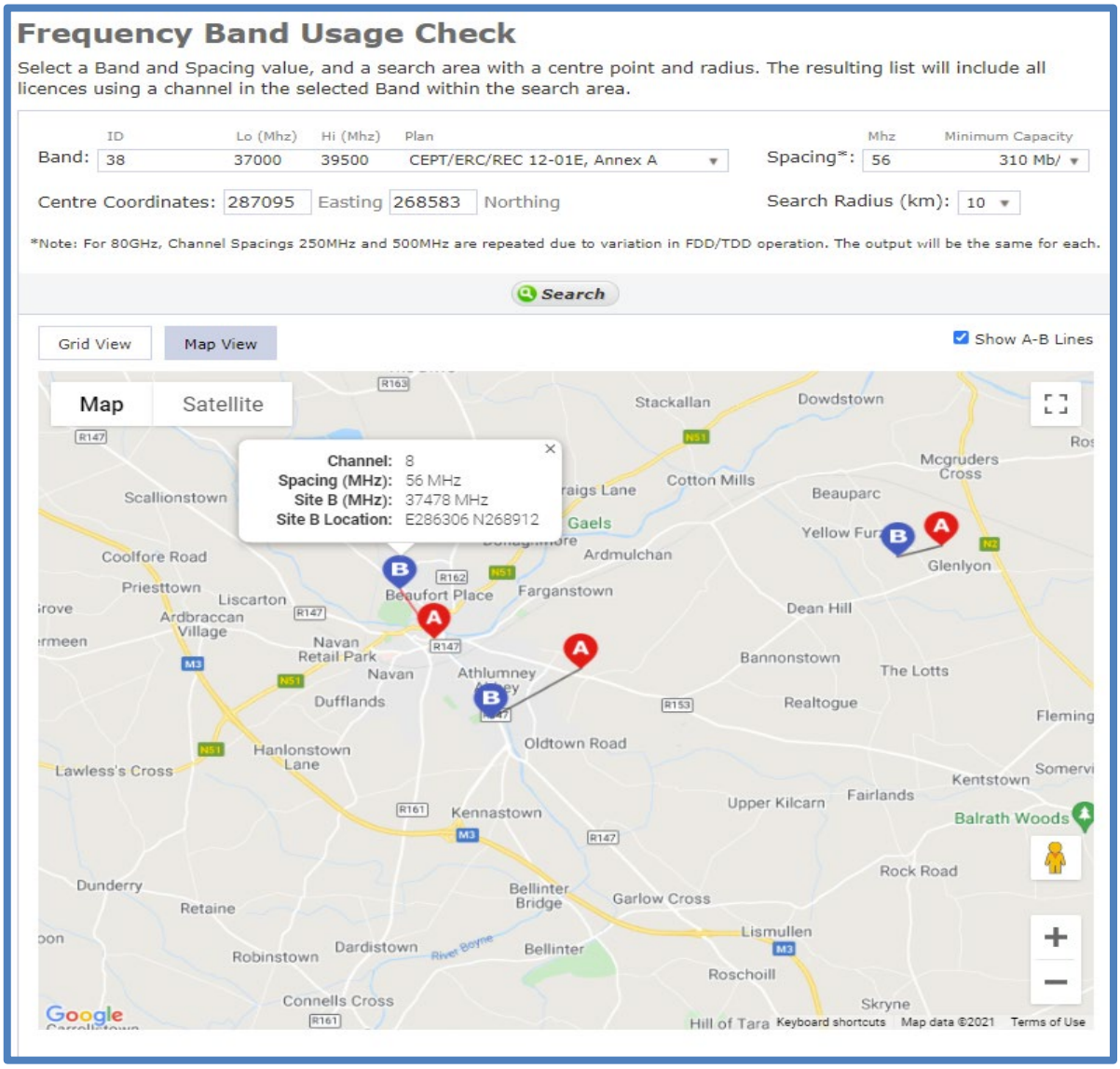


Figure 6: eLicensing mapping GUI

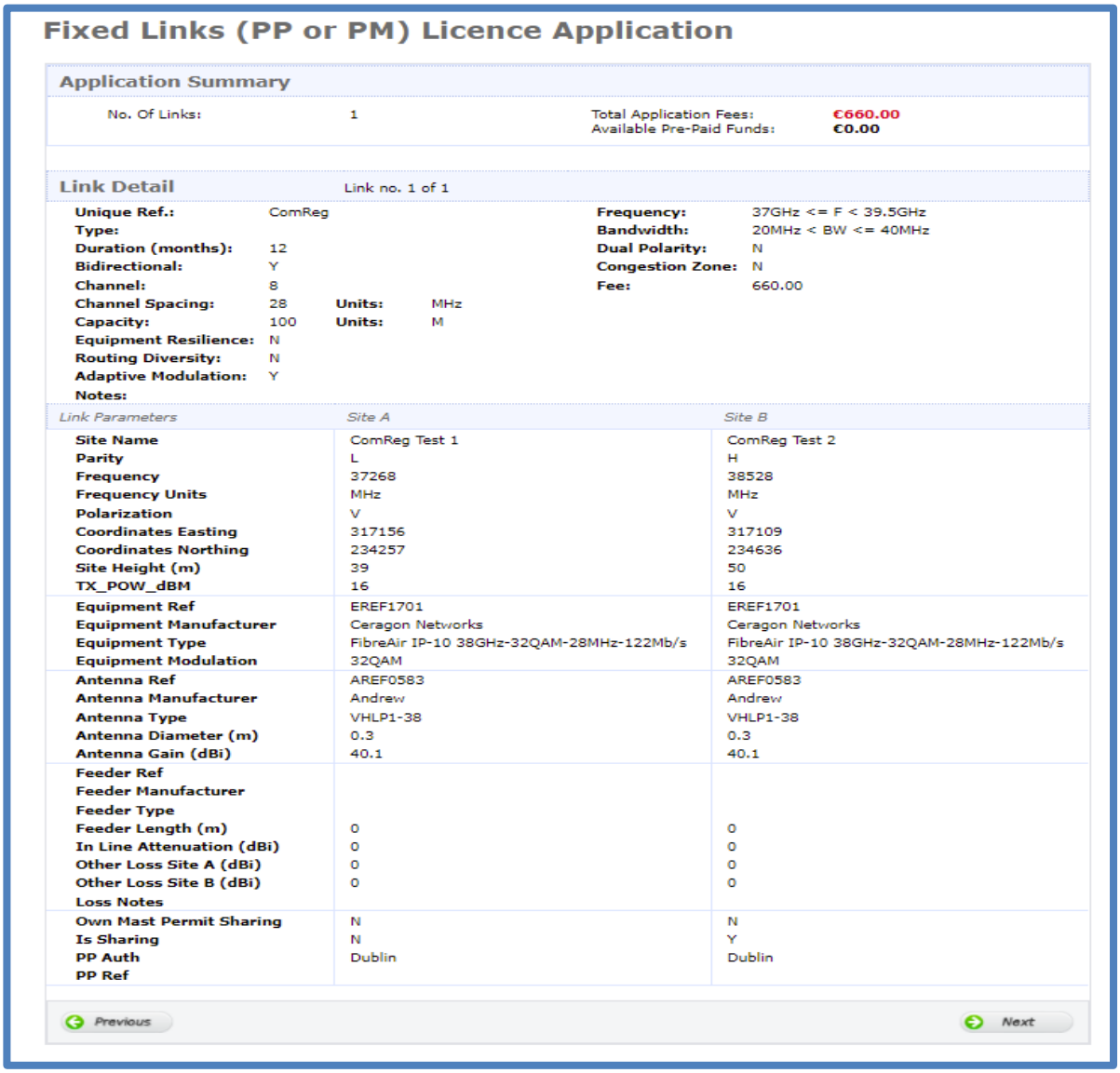
Link Budgets

5.4 A link budget is used to evaluate the coverage of telecommunication system in the downlink or uplink. To calculate the link budget, all power gains and losses from the transmitter to the receiver over the air-interface must be accounted for. Prior to the new developments on eLicensing, an applicant would have to provide a copy of its link budget[30] and path profile by email for the ComReg licensing engineers to review and check against the submitted fixed radio link application. This was an inefficient process as in certain cases there could be a divergence between the link budget and the application which

[30] The link budget would need to be either in portable document format ("PDF") or Microsoft Word (".doc") format.

then required investigation.

5.5 This recent ComReg intervention has addressed this inefficiency and the eLicensing portal now generates a link budget for applicant review. Once satisfied, the applicant can declare same and submit its application. Where there is a divergence, the applicant has the opportunity to address matters and submit and appropriate application. Figure 7 below illustrates an example of an eLicensing generated link budget.



Fixed Links (PP or PM) Licence Application

Application Summary

No. Of Links:	1	Total Application Fees:	€660.00
		Available Pre-Paid Funds:	€0.00

Link Detail Link no. 1 of 1

Unique Ref.:	ComReg			Frequency:	37GHz <= F < 39.5GHz
Type:				Bandwidth:	20MHz < BW <= 40MHz
Duration (months):	12			Dual Polarity:	N
Bidirectional:	Y			Congestion Zone:	N
Channel:	8			Fee:	660.00
Channel Spacing:	28	Units:	MHz		
Capacity:	100	Units:	M		
Equipment Resilience:	N				
Routing Diversity:	N				
Adaptive Modulation:	Y				
Notes:					

Link Parameters	Site A	Site B
Site Name	ComReg Test 1	ComReg Test 2
Parity	L	H
Frequency	37268	38528
Frequency Units	MHz	MHz
Polarization	V	V
Coordinates Easting	317156	317109
Coordinates Northing	234257	234636
Site Height (m)	39	50
TX_POW_dBM	16	16
Equipment Ref	EREF1701	EREF1701
Equipment Manufacturer	Ceragon Networks	Ceragon Networks
Equipment Type	FibreAir IP-10 38GHz-32QAM-28MHz-122Mb/s	FibreAir IP-10 38GHz-32QAM-28MHz-122Mb/s
Equipment Modulation	32QAM	32QAM
Antenna Ref	AREF0583	AREF0583
Antenna Manufacturer	Andrew	Andrew
Antenna Type	VHLP1-38	VHLP1-38
Antenna Diameter (m)	0.3	0.3
Antenna Gain (dBi)	40.1	40.1
Feeder Ref		
Feeder Manufacturer		
Feeder Type		
Feeder Length (m)	0	0
In Line Attenuation (dBi)	0	0
Other Loss Site A (dBi)	0	0
Other Loss Site B (dBi)	0	0
Loss Notes		
Own Mast Permit Sharing	N	N
Is Sharing	N	Y
PP Auth	Dublin	Dublin
PP Ref		

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Figure 7: Sample Link Budget Generated on eLicensing

Siteviewer

5.6 In its Proposed Strategy for Managing the Radio Spectrum 2022 to 2024[31],

[31] Proposed Strategy for Managing the Radio Spectrum 2022 to 2024 ComReg Document 21/90 - https://www.comreg.ie/media/2021/09/ComReg-2190.pdf

ComReg committed to making fixed radio links information *publicly* available on https://siteviewer.comreg.ie/. For fixed radio link applicants this would provide more flexibility for their outsourced service providers in terms of accessing the information rather than having to formally seek passwords to access the applicants' eLicensing accounts.

5.7 In addition, by making information available and in a downloadable format, applicants would be able to re-use it in their own planning tools. For stakeholders in general, having access to fixed radio link information would provide greater transparency regarding what services are deployed in particular areas, and would enable, for example, operators of wind turbines to understand which fixed radio links licensees they need to engage with as part of any planning process.

5.8 ComReg is addressing this matter and will provide further updates as it progresses.

Chapter 6

6 CEPT's Fixed Services Programme

6.1 The CEPT and ITU, in consultation with administrations, determine which frequency bands should be allocated for fixed services, and publish recommendations on the channel arrangements for those bands. As part of that role, CEPT also has a Spectrum Engineering project team (SE 19)[32] which considers matters regarding fixed services and regularly publishes reports and recommendations on the use of P-P and P-MP fixed radio links.

6.2 SE 19 has several current work items on the future use of the fixed service and ComReg will take these into account as part of the fixed radio links review.

6.3 ComReg actively monitors SE 19 meetings and plans to have a representative attend those meeting on a regular basis going forward. ComReg welcomes any views that interested parties may have regarding the SE 19 work items listed below. Any such views may be sent to licensing@comreg.ie or as part of any views submitted in response to the ongoing consultation on the draft Radio Spectrum Management Strategy Statement for 2022-2024 (See ComReg Document 21/90).

Subject	Scope	Start / Target dates	Deliverable
To derive a methodology for protection criteria for FS except long term	To derive a general methodology for "short term" criteria for Fixed service and evaluate the relationship between "long term" and "shortterm" protection criteria and FDP (Fractional Degradation of Performance).	S: 02-10-2019 T: 31-01-2022	ECC Report
New microwave PMP technologies based on active antennas for 5G backhaul above 27.5 GHz	To assess the technical feasibility of a new microwave transport network PMP system based on active antennas, beamforming and interference cancellation techniques.	S: 02-10-2019 T: 31-01-2022	ECC Report

[32] CEPT.ORG - ECC - Groups - ECC - WG SE - SE 19 - News

	To evaluate coordination as well as aspects of planning with existing FS including suitable frequency bands / approaches for these new PMP systems in the bands already allocated to the FS above 27.5 GHz.		
Revision of ECC Report 173	To study and gather up to date information related to developments in the FS in CEPT	S: 20-05-2020 T: 31-05-2022	ECC Report
Representative FS parameters for sharing and compatibility studies	To collect up to date technical FS parameters from CEPT countries and compile thereof a set of representative technical FS parameters for each FS band to be used in sharing and compatibility studies.	S: 11-01-2021 T: 30-09-2022	ECC Report

Table 1: SE 19 Work Programme