An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Review of the Satellite Earth Station Licensing Regime

Non-Confidential Submissions to Documents 22/56 and 22/56a

Submissions to Consultation

Reference: ComReg 23/32s

Date: 31/03/2023

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1 Amazon

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

12 August 2022

Dear ComReg,

AMAZON'S SUBMISSIONS TO COMREG DOCUMENT 22/56

Kuiper Systems LLC (**Kuiper**), a wholly owned subsidiary of Amazon.com Services LLC (**Amazon**) welcomes the opportunity to provide our observations on the Commission for Communications Regulation (**ComReg**) Document 22/56 on the Review of the Satellite Earth Station (**SES**) Licensing Regime.

Firstly, we commend ComReg's proactive efforts to update the SES licensing regime in Ireland. We value ComReg's engagement with stakeholders, which will encourage investment in satellite services and associated innovation. We trust that our comments below will assist ComReg and are pleased to discuss further.

Background

Amazon plans to launch and operate a constellation of non-geostationary satellite orbit (**NGSO**) satellites in low earth orbit (**LEO**) known as the Kuiper System to deliver high-speed, low-latency broadband connectivity to unserved and underserved communities around the world, including in Ireland where Kuiper will be a complement to the Irish Government's ambitious plans under the National Broadband Plan. The Kuiper System will operate in the 27.5-30.0 GHz range for Earth-to-space communications (uplink), and in the 17.7-18.6 GHz and 18.8-20.2 GHz ranges for space-to-Earth communications (downlink). The Kuiper System will be deployed at several altitudes and in multiple orbital inclinations in order to provide high-speed, low-latency broadband to a wide range of customers, including individual households, schools, hospitals, businesses, government agencies, disaster relief operations, mobile operators, and other organizations working in places without reliable internet connectivity.

Amazon's Comments on Document 22/56

Q.1 ComReg welcomes views of interested parties on its proposed satellite licence types as detailed above. Please provide evidence and reasoning for your views

Amazon supports ComReg's efforts to simplify the SES licensing framework as set out in paragraphs 3.9 to 3.15 of Document 22/56, including the removal of the teleport licence which

we agree is outdated. In particular, we agree with ComReg that a single SES licence to allow a licensee to operate (transmit/receive, or transmit) any number of antennas/earth stations within a given radius at a single site under a single SES licence allows for more flexible operations.

One point of clarification: at para 3.6 of Document 22/56, ComReg notes that *"Non-geostationary orbit (NGSO) satellites occupy a range of orbital positions and LEO satellites are located between 700 km to 1,500km from the Earth, MEO satellites are located at 10,000km from the Earth…".* According to the European Commission (through its *Digital Transformation Monitor* publication), the defined altitude for a LEO system is between *160km and 2000km*. For reference, Amazon will operate satellites in LEO with an altitude range of 590km to 630 km. We kindly urge ComReg to consider incorporating this in its note and/or definition of LEO systems.

Q. 2 ComReg welcomes views of interested parties on its proposals regarding frequency bands for SES as detailed above. Please provide evidence and reasoning for your views

Amazon welcomes the proposal to include the following frequency bands for SES licensing: 27.5–30 GHz, 47.2–50.2 GHz and 50.4–52.4 GHz, as set out in paragraphs 3.39 to 3.45 of Document 22/56. Further, we note that in both the current and proposed licensing framework (para 3.2 of ComReg 00/64 R3) appears to cover both transmit and receive operations. Amazon requests for ComReg to clarify that the 17.7-20.2 GHz band (which is co-primary for fixed-satellite service (FSS) systems) will be available for receive SES licensing for FSS.

Q. 3 ComReg welcomes views of interested parties on its proposals regarding sharing and compatibility of NGSO SES as detailed above. Please provide evidence and reasoning for your views.

Amazon supports ComReg's proposed approach as set out at paragraphs 3.52 to 3.57 of Document 22/56, which includes:

- the introduction of a notification process for new NGSO SES licence applications;
- confirmation that no inter-operator coordination process is needed between SES and Fixed Service (FS) links in the same band, as this would be managed by ComReg during the application process;
- provision of technical information regarding existing licences; and
- publication of the parameters set out in paragraph 3.57.

Amazon welcomes ComReg's intention in paragraphs 4.20-4.22 of Document 22/56 to make greater information in relation to existing deployments available via Siteviewer, and we agree that greater transparency about what services are deployed in particular areas will offer assistance to current and prospective licensees for network planning and interference resolution.

Q. 4 ComReg welcomes views of interested parties on its proposals regarding technical conditions for SES as detailed above. Please provide evidence and reasoning for your views.

Amazon supports ComReg's approach as set out at paragraph 3.58 to 3.78 of Document 22/56 to align the Irish licensing regime with international standards and the relevant European Directives/Decisions (such as ECC/DEC/(05)01, ECC/DEC/(13)01, ECC/DEC/(15)04), as this gives greater certainty and visibility to interested parties who are considering future deployments in Ireland. To ensure consistency in approach, we suggest that ComReg provide further clarification/comfort to parties as to:

- the polarisation aspect in the parameters; and
- the parameters associated to downlink operations in the Ka-band range.

Amazon proposes that ComReg issue SES licences for a ten-year term (with an option for renewal) to allow operators to achieve regulatory certainty. Absent a ten-year term, we believe it will be helpful for ComReg to confirm that the one-year term proposed in Document 22/56 would mean the SES licence, once granted, has an indefinite term subject to annual fee payments and no additional application or paperwork is required for renewal. Amazon also encourages ComReg to put in place a process to ensure that SES site locations and licenced spectrum are used by licensees for actual SES deployments.

Amazon comment on proposed fees

Amazon recommends that the SES licensing fee structure be cost based – and driven by the principle of covering ComReg's administrative cost base to issue the licence. This follows the internationally recognised ITU principle[1] of cost-recovery in spectrum allocation.

That said, we support ComReg's preferred approach of Option 4 (retention of bandwidth) to simplify the proposed fee calculation to make the fees clearer to calculate. Amazon requests that ComReg clarify that for transmit/receive licences, it will only charge for transmit bandwidth (and will not charge for receive bandwidth) in the FSS.

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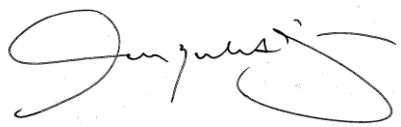
Amazon greatly values the opportunity to offer our views, and would be delighted to discuss these further with the ComReg in further detail.

Yours Sincerely,



Gonzalo de Dios
Head of Global Licensing
Project Kuiper

[1] ITU Telecommunications Development Sector, Guidelines for the review of spectrum pricing methodologies and the preparation of spectrum fee schedules (2016), at https://www.itu.int/en/ITU-D/Spectrum-Broadcasting/Documents/Publications/Guidelines_SpectrumFees_Final_E.pdf.

2 Amazon Web Services

15 August 2022
The Commission for Communications Regulation
Ireland

RE: Amazon Web Services, Inc. (AWS) Submission to the Commission for Communications Regulation Ireland's (ComReg) Review of the Satellite Earth Station Licensing Regime Response to Consultation and Further Consultation (Document 22/56)

AWS welcomes the opportunity to again comment on the ComReg's Review of the Satellite Earth Station (SES) Licensing Scheme, and commends Comreg's focus on modernizing their regulatory structure to reflect new and forthcoming innovations within the satellite industry.

Attached hereto is the AWS contribution submitted in relation to its operation of the AWS Ground Station service. AWS recognizes ComReg's efforts towards this process and are grateful for the opportunity to express our views.

Sincerely,

/s/ Richard Scannell

Richard Scannell
Senior Public Policy Manager, EMEA
Amazon Web Services

AWS Comments on the Review of Satellite Earth Station Licensing Scheme Consultation (ComReg 22/56)

Purpose. Following initial consultations, ComReg has issued a *Review of the Satellite Earth Station Licensing Scheme* (ComReg Document 22/56) (**Review**).[1] Amazon Web Services (**AWS**), an Amazon.com, Inc. company, is pleased that in the Review ComReg supports the opening up of bands below 3GHz to Satellite Earth Station (**SES**) licensing, in particular in the 400MHz and 2GHz bands. AWS appreciates the opportunity to make further comments below on the issues on which ComReg has invited additional consultation.

Background. In 2018, AWS announced AWS Ground Station, which is a managed service that lets space operators control their satellite communications, downlink and process satellite data, and scale their satellite operations quickly, easily, and cost-effectively, without having to worry about building or managing their own ground station infrastructure. AWS Ground Station allows satellite operators to conduct operations without the long-term commitment and costs involved in setting up new ground station infrastructure. With capabilities like AWS Ground Station, satellite operators are able to reduce delays both in their infrastructure buildout and service delivery to end-users.

AWS Ground Station currently has 11 global antenna locations,[2] including one in Ireland that was established in April 2020[3] and marked the second European location to launch. AWS Ground Station customers are primarily non-geostationary satellite orbit (**NGSO**) constellations engaged in Earth exploration satellite services (**EESS**). These EESS operators require a geographically diverse earth station network to support their operations. NGSO satellites orbit the Earth approximately once every 90 minutes. Global coverage and spectrum harmonization are important for space safety as space operators need the ability to connect to their satellites at any time during an orbit.

Harmonization of all bands to comply with ITU allocation *(includes response to Q2*). AWS supports ComReg opening S-band in Ireland for SES licensing to align with the ITU allocation for EESS.[4] Specifically, AWS supports the opening of earth-to-space communications in 2025-2110 MHz and 401-403 MHz and space-to-earth communications in 2200 to 2300 MHz.[5] AWS and other industry participants have commented on the widespread allocation of the 2 GHz band to various satellite services of interest, [6] and AWS believes opening up additional bands, at a minimum on a secondary basis, is critical for innovation and business growth in Ireland. The bands below 3 GHz would be used by organizations and in use cases such as Telemetry, Tracking, and Control (**TT&C**) users in S-band (used by many organizations for various use cases, like earth observation, weather mapping, and synthetic aperture radar) and UHF (primarily used by universities and researchers), which creates more opportunity for innovation and growth.

[1] *Review of the Satellite Earth Station Licensing Scheme* (ComReg 22/56), Section 2.35, Page 17 (04/07/2022).
[2] *AWS Ground Station Antenna Locations*, https://aws.amazon.com/ground-station/locations/.
[3] 22 April 2020 - *AWS Ground Station is now available in the EU (Ireland) Region*, https://aws.amazon.com/about-aws/whats-new/2020/04/aws-ground-station-now-available-ireland/.
[4] ComReg 22/56, Section 2.40, Page 18 (04/07/2022).
[5] *Id.*
[6] ComReg 22/56, Section 2.36, Page 17 (04/07/2022); *see also* DotEcon Report, Satellite Earth Station Licensing Review, Section 3.2, Page 15 (July 2022).

Similarly, AWS acknowledges ComReg's report that multiple Test & Trial licences have been issued in the 2GHz band for satellite usage.[7] AWS confirms that this presents strong evidence that current usage patterns in that band allow competing services to exist harmoniously.

Harmonization will not cause harmful interference *(includes response to Q3*)**.** AWS further contributes that over the several years of such usage, it has not been made aware of any instance of harmful frequency interference with terrestrial fixed links or others in relation to such licensed usage. AWS Ground Station antennas are highly-directional and use a focused, narrow beamwidth with restricted antenna transmission angle to track a quickly-moving satellite and only transmit along its path. AWS Ground Station operations can co-exist with terrestrial users in similar bands without causing interference. Similarly, other industry participants agree that the prevention and mitigation of harmful interference between SES is best managed by cooperation and coordination between the various satellite operators.[8] All noted that satellite systems must be coordinated in accordance with ITU coordination obligations.[9]

Ensuring predictability of licensing fees. AWS supports ComReg's efforts to ensure that spectrum fees are "objectively justified, transparent, non-discriminatory and proportionate."[10] In accordance with that mission, AWS offers two additional proposals to further ComReg's goal to set forth equitable and predictable licensing fees.

ComReg sets forth Option 4 for assessing spectrum fees, which proposes to replace the current methodology of satellite spectrum pricing with a fee of €30 per MHz in all bands allocated to SES services.[11] AWS understands the appeal of this approach,[12] but suggests eliminating redundant spectrum fees for SES licensees repeatedly accessing the same spectrum bandwidth common for TT&C systems.

First, TT&C stations tend to have a lower impact on spectrum usage than other types of SES licensees, even where notional bandwidth licensed is numerically the same. For example, AWS Ground Station has twin earth stations, located immediately next to each other, both using the same frequencies and bandwidth at any given time. This results in the same effective uptake of bandwidth for two stations as for one, so that any impact on either scarcity or competing usage in the relevant bands is the same for two as for one. DotEcon recommends charging a single fee for SES licensees with multiple antennas,[13] which ComReg appears to support,[14] but AWS requests clarification that ComReg's intent is to charge a single fee for both stations in such cases.

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[7] ComReg 22/56, Section 2.39, Page 17 (04/07/2022).
[8] ComReg 22/56, Section 2.83, Page 30 (04/07/2022).
[9] *Id*.
[10] ComReg 22/56, Section 4.24, Page 75 (04/07/2022).
[11] *See generally* ComReg 22/56, Section 5.2-5.8, Pages 118-19 (04/07/2022).
[12] In its previous submission, AWS cautioned against setting fees in linear progression to nominal bandwidth consumption because it does not account for TT&C models with low duty cycles (even with potentially high bandwidth requirements) that do not have constant spectrum needs. AWS stands by this approach, but takes note of ComReg's perspective on the feasibility of a spectrum fee structure based on use case, and its efforts to support TT&C systems through the licence-exempt status for receive-only operations and the reasonable €30 multiplier for bandwidth. *See* ComReg 22/56, Section 4.68, Page 88 (04/07/2022).
[13] DotEcon Report, Satellite Earth Station Licensing Review, Section 8.3, Page 52 (July 2022).
[14] ComReg 22/56, Section 3.9, Page 52 (04/07/2022) (advocating for a single SES licence to operate multiple antennas within a certain radius).

Second, TT&C licensees are prone to needing to make separate frequency authorization requests, which can and do routinely result in overlapping spectrum being licensed. Unless this is addressed in the cost formula to preserve the relationship between cost and usage on which the formula is based, spectrum costs should be calculated on the total actual spectrum usage at a given time by a licensee, regardless of the number of licences that party may hold at a given time. Otherwise, a TT&C licensee will end up paying more, for the same or less spectrum usage as another SES licensee. This would cause identical usage to be billed differently and arbitrarily, which would bring the formula in default of the regulatory framework.

For those reasons, AWS urges that the spectrum formula, if based on bandwidth usage, be applied in such a manner as to charge all spectrum used as a unified total in the hands of a single same licensee, irrespective of the number of individual carriers, or applications made in respect of the relevant transmitter.

Framework for sharing licence information should address security and confidentiality concerns of licenseholders *(includes response to Q3)*. AWS notes that the list of information proposed for publication in Section 3.57 of the Review includes technical information which certain industry actors may consider confidential, particularly, the disclosure of SES coordinates correlated to licensee name.[15] Disclosing this information would effectively put the location of critical infrastructure in the public sphere and make it easier for non-industry actors to inflict harm on network operations. Additionally, disclosure of this technical information will not necessarily affect all licensees similarly in terms of security impacts. For some industry stakeholders, this confidential information is less related to sensitive technical information than to other activity parameters, while for others that same technical information carries confidentiality and security concerns. AWS requests that ComReg considers adopting a program in which SES licensees can opt out of sharing sensitive confidential information, such as SES coordinates correlated to licensee name, for security reasons. In order to continue promoting coordination amongst industry stakeholders, AWS suggests that opted-out licenseholders provide an alternative contact method to address any interference concerns, and reveal additional licence details as needed on a case-by-case basis. AWS also encourages ComReg to ensure access to information is limited to industry operators such as licenseholders and licence applicants.

A 12-Month licence duration is reasonable and effective *(Includes response to Q4).* AWS agrees with ComReg that a 12-month, renewable licence term is a reasonable and effective term as a default condition.[16] As is currently the case with FSES licences, AWS proposes that pro-rated terms of a minimum of one month, or any monthly duration of up to 12 months, be made available for shorter-term use cases.

[15] ComReg 22/56, Section 3.57, Page 61 (04/07/2022).
[16] ComReg 22/56, Section 3.84, Page 38 (04/07/2022).

3 Eutelsat

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

Friday, 12 August 2022

Subject: Submissions to ComReg Document 22/56 – Eutelsat's comments on ComReg's further consultation on its Review of the Satellite Earth Station Licensing Regime

Eutelsat would like to thank the Commission for Communications Regulation (ComReg) for publishing its Response to Consultation and Further Consultation on the Review of the Satellite Earth Station (SES) Licensing Regime. Eutelsat would like to take this opportunity to comment the document and respond to the questions raised by ComReg in the following paragraphs.

Response to Submissions received to Document 21/135

Eutelsat is of the view that there are many positive outcomes of the first consultation phase:

- The simplification of licences, with a Fixed Earth Station (FES) licence able to accommodate multiple antennas at the same location (2.20).
- The opening of the entire Ka-band for coordinated SES, in accordance with relevant ECC decisions (2.48).
- The future implementation of ECC Decision (21)01 to open the Q/V-band for satellite services (2.58).
- The future development of a website with information on SES and fixed radio links licences (2.134), that could prevent some interference issues.
- ComReg's intention to follow regulatory developments for introduction of satellite services in the E-band (2.63).
- Comeg's intention to review in the future the Terminals for Satellite Services (TSS) licensing regime, and conditions for ESOMPs in Dublin Port (2.24).

Eutelsat very much appreciates ComReg's review of its SES licensing scheme to adapt to the evolution of satellite activities.

Proposed Revised Licensing Framework for Fixed Satellite Services

Q.1 – ComReg welcomes views of interested parties on its proposed licence types as detailed above. Please provide evidence and reasoning for your views.

Eutelsat welcomes once again the difference made by ComReg in its licensing framework between TSS and SES. Eutelsat will follow the future review of TSS licensing framework.

Eutelsat supports ComReg's proposal to remove TES licences and allow FES to cover any number of stations in a given radius of a single site (3.13). This will ease the comprehension of ComReg's licensing regime and simplify the administrative process for entities wishing to deploy earth stations in Ireland's territory.

Regarding the licensing of the receiving signals, mentioned in paragraphs 3.14 and 3.15, Eutelsat would like to underline the fact that in some cases receive-only earth stations of the Fixed Satellite Service (FSS) might require SES licences to be protected. In some frequency bands, it can indeed appear important for operators of receive-only earth stations to obtain licences in order to ensure their protection over the long term, even if the risk of harmful interference is not expected in the short term. It is especially relevant as the satellite industry requires long-term visibility.

Q.2 - ComReg welcomes views of interested parties on its proposals regarding frequency bands for SES as detailed above. Please provide evidence and reasoning for your views.

S-band

Eutelsat notes ComReg's invitation to provide views on the potential opening of the 2025-2100 MHz and 2200-2290 MHz bands (3.36). Eutelsat believes this band is useful for space operation services, including telemetry and telecommand of satellites. The opening of such band for space operation services could contribute to the development of the satellite industry in Ireland.

C-band

Eutelsat welcomes the statement from ComReg in paragraph 3.38 that it will continue to make the 3.8-4.2 GHz band available for SES licensing. The C-band is indeed fundamental for satellite services with its unique characteristics such as ubiquitous coverage and rain resilience. Eutelsat would like to highlight that the European Commission mandate to CEPT "on technical conditions regarding the shared use of the 3.8-4.2 GHz frequency band for terrestrial wireless broadband systems providing local-area network connectivity in the Union" clearly asks that these technical conditions "ensure the protection and the possibility of future evolution and development of incumbent spectrum users in this band, notably receiving satellite earth stations in the fixed satellite service".

Ka-band

The Ka band is getting more and more interest from satellite operators, leading to a need for a larger access to these frequencies. Eutelsat and the satellite industry have invested a significant amount of time and budget in the development of satellites and complete ecosystem in this band, for provision in particular of fixed broadband access and connectivity to earth stations in motion (ESIM). Eutelsat therefore supports ComReg's proposal to open the 27.5-30 GHz band for SES licensing in accordance with the ITU and ECC Recommendations and Decisions (3.42). This decision will further enable the deployment of satellite services in Ireland to support connectivity for people and businesses.

Q/V band

For the development of Q/V band satellite services, which are key for the forthcoming generation of high and very high throughput satellites, Eutelsat strongly supports the proposal from ComReg to open the 47.2-50.2 and 50.4-52.4 GHz bands for SES licensing by implementing ECC Decision (21)01 (3.45).

Eutelsat also encourages ComReg to take into account the revision of ERC Decision (00)02 that addresses the use of the band 37.5-40.5 by downlink fixed satellite services (FSS) and fixed services (FS). The last revision adds the designation of the band 37.5-39.5 GHz for the use of coordinated FSS earth stations.

Eutelsat would like to also raise ComReg's attention on the ECC Decision (22)06 and associated Recommendations (22)01 and (22)02 currently under consultation at ECC before adoption. These are setting the framework for deployment of MFCN in the band 40.5-43.5GHz while keeping the possibility to operate earth stations. Eutelsat would therefore recommend ComReg to make the whole 37.5-42.5 GHz (space-to-Earth) and 42.5-43.5 GHz (Earth-to-space) bands available for satellite services and SES licensing.

E-band and above

Eutelsat is supportive of ComReg's monitoring of the discussions at ITU and CEPT level on the E-band to potentially open this band in the future for SES licensing (3.49). This frequency band is gaining attention from satellite operators to be used in the future generations of satellites.

Fees

Eutelsat would like to thank ComReg for considering the review of the SES fees. Eutelsat however believes that the proposed fees are still very expensive for large bandwidths. Large bandwidths are often related to higher frequency bands, meaning that the frequency band is an important factor that should be considered in the definition of SES licence fees.

Indeed, for the satellite services being developed especially in the higher frequencies such as the Ka and Q/V bands, the bandwidths are now usually much wider than for the previous satellite systems. The use of these bands is increasing, and we could expect even larger bandwidth for future satellite services in the E-band.

Among applications that will require such large bandwidths are the gateways of the forthcoming generation of high and very high throughput satellites, enabling for instance the provision of fixed broadband access to citizens and businesses regardless of their location and connectivity to earth stations in motion.

For example, a frequent design for the recent generation of satellites is deploying gateways in Ka-band to connect with earth stations in Ku-band. A single gateway operating in Ka-band in Ireland in the 27.5-30 GHz band would be charged for 2500 MHz, leading to an annual fee of 75100 euros with the proposed fees. This amount would cover more than half of the current estimated administrative costs for SES licensing as provided in 5.3. And this could be multiplied with gateways in Q/V bands.

The proposed linear fees in proportion to bandwidth could therefore be dissuasive for the growing number of SES using large bandwidths. For this type of use, the proposed framework leads to higher

fees than under the current framework, which already involved significant amounts. Eutelsat thus recommends reducing or capping the fees for higher frequencies and/or for wider bandwidths to facilitate market entry in Ireland and offer citizens and businesses a larger and cheaper access to connectivity services.

Eutelsat would like to thank ComReg for considering the above comments and looks forward to seeing the conclusions of this further consultation. Eutelsat remains at ComReg's disposal to further discuss the points highlighted in this contribution.

4 Inmarsat

From: Patricia Lopez
Sent: 03 August 2022 07:47
To: Dylan Groarke
Cc: Francesco Toschi
Subject: FW: Further Consultation on ComReg's Review of the Satellite Earth Station Licensing Regime

Dear Mr. Groarke,

Thank you very much for giving Inmarsat the opportunity to comment on this consultation.
We have reviewed the document and can confirm that have no specific comments, we agree with the approach taken by Comreg on this matter.
Kind regards,

Patricia LOPEZ
Senior Regulatory and Market Access Specialist

Inmarsat, 99 City Road, EC1Y 1AX, London.

Enabling Market Access faster and better with agility and customer focus

5 OneWeb

OneWeb Communications SARL
16, rue Jean l'Aveugle
L-1148
Luxembourg

The Commission for Communications Regulation
Ireland

15 Aug 2022

Submission to ComReg Document 22/56 – Further consultation of the Satellite Earth Station (SES) Licensing Scheme

In response to the Response to consultation and further consultation on Review of the Satellite Earth Station Licensing Scheme, OneWeb would first like to thank ComReg to consider views provided by OneWeb in the previous iteration, and appreciates that many of ComReg's subsequent assessment align with our views. OneWeb would like to provide the following specific comments to COMREG.

Q. 1 ComReg welcomes views of interested parties on its proposed satellite licence types as detailed above. Please provide evidence and reasoning for your views.

OneWeb welcomes the simplification of licenses by removing Teleport licenses, and clear difference between FES and TES. This rationalisation will clarify considerably the licensing procedure for the satellite industry. Furthermore, a single SES licence allowing the licensee to operate any number of antennas/earth stations (within a given radius at a single site) is also more aligned with opportunity cost of spectrum, for which a co-located array of antennas, using the same frequency, does not deny more spectrum from other users than a single antenna would. T

Q. 2. ComReg welcomes views of interested parties on its proposals regarding frequency bands for SES as detailed above. Please provide evidence and reasoning for your views

Ka band

OneWeb welcomes ComReg's decision to open the 27.5 GHz – 30 GHz band for SES licensing, this will align the license framework with both ITU and ECC decisions. This decision will enable satellite companies such as OneWeb to provide critical communications services – including broadband services needed to reduce the digital divide.

Q/V band

OneWeb agrees that ComReg's plan to open the 47.2 GHz – 50.2 GHz and 50.4 GHz – 52.4 GHz bands for SES licensing in line with ECC Decision (21)01. However, it is unclear if ComReg is considering the rest of Q/V band, and especially the ranges between 37.5 to 42.5 GHz for feeder links for our next generation of gateways. As mentioned in our previous submission, in the case of OneWeb, we are intending to use extensively the FSS allocation in Q/V band (which ranges between 37.5 to 50.2 GHz) for feeder links for our next generation of gateways. As such, OneWeb has already submitted satellite filings at the ITU and has also requested a license in the USA, i.e., submitted a request in an FCC processing round regarding this frequency band.

In this regard, OneWeb would like also to point out that that **ERC Decision (00)02**[1] harmonises the band 37.5-40.5 GHz inter alia for FSS operations in the space-to-Earth direction; **that ECC Decision (02)04**[2] identifies that the band 40.5-42.5 GHz may be used by coordinated FSS earth stations in the space-to-Earth direction, and that uncoordinated Earth stations in the fixed satellite and broadcasting satellite services shall not claim protection from fixed and broadcasting stations.

Therefore, OneWeb would like to humbly request ComReg to consider open 37.5-42.5 GHz for SES licensing.

Q. 3. ComReg welcomes views of interested parties on its proposals regarding sharing and compatibility of NGSO SES as detailed above. Please provide evidence and reasoning for your views.

Regarding implementation of the inter-operator coordination framework

GSO-NGSO

As submitted in our response to the previous iteration, there is generally no concern about interference between GSO and NGSO system gateways. The ITU has already defined EPFD limits in the Radio Regulations to protect GSO networks from NGSO systems, and there are limits on GSO networks in Article 22 and Resolution 169 to protect NGSO systems.

NGSO-NGSO

OneWeb agrees with ComReg that inter operator coordination is necessary between NGSO systems to ensure that gateways of different systems do not interfere with each other.

Coordination between satellite systems is handled directly among operators under the well-established and internationally-recognised ITU Coordination Procedures. Such coordination would generally include a discussion on the separation distance required between NGSO gateways and on any further mitigation techniques to be used to reduce the risk of harmful interference.

[1] ERC Decision (00)02: "The use of the band 37.5-40.5 GHz by the fixed service and Earth stations of the fixed - satellite service (space-to-Earth)", approved March 2000

[2] ECC Decision (02)04: "The use of the band 40.5 – 42.5 GHz by terrestrial (fixed service/ broadcasting service) systems and uncoordinated Earth stations in the fixed satellite service and broadcasting-satellite service (space to Earth)", approved March 2002

OneWeb also agrees with ComReg that "spectrum splitting" proposal is difficulty to implement, and might not lead to the most efficient usage of spectrum.

We would like ComReg to be mindful that its proposed notification process for new NGSO SES licence applications should not contradict with the well-established ITU coordination procedure. In the absence of a formal Coordination Agreement between two NGSO systems, and irrespective of the when a system first been licensed in Ireland, the ITU Radio Regulations require the later-filed system to eliminate any harmful interference into the earlier-filed system. OneWeb would like to submit that this is the most logical coordination mechanism, as although in some cases speed of implementation can be desired in the name of efficiency, it usually takes years for a satellite operator to secure spectrum at the ITU and then make and launch the satellites. The later filed system benefits from the hindsight and design details of previously filed system, while it is nearly impossible for earlier filed system to change the system design or swap the frequencies used once the satellite is launched.

Fees

OneWeb is encouraged by the review of the fees as the proposed fee structure is lower than the current fee structure. However, as submitted in our previous submission, OneWeb is planning to use approximately 2 GHz of uplink and 1.3 GHz of downlink in the Ka-band for its current generation of its gateways. Furthermore, it is also planning to use approximately 6 GHz of Q-V band for its next generation of gateway within the next 5 years. Under the proposed fee, OneWeb would need to pay over 250,000 Euros per year just for the spectrum fees, this is prohibitive and would not be sustainable for our business.

OneWeb further note that irrespective of the frequency band, the unit price per MHz is the same 30 euros per MHz. OneWeb would like to submit that flat unit price might not reflect higher frequency bands will have higher bandwidth available, and limited spectrum denial impact than lower bands.

We humbly submit that a more adequate mechanism should be using a weighting factor depending on the frequency, we have seen such weighting factor implemented in a recent Australia ACMA pricing review[3]. As can be seen in the table from ACMA below, **the unit price for Ku and Ka band is over 25x cheaper than in the C-band**, and **Q/V band is again 3.5x lower than in Ku and Ka band**.

[3] https://www.acma.gov.au/consultations/2021-10/response-implementation-spectrum-pricing-review-part-2-consultation-382021

Spectrum location	Aus-wide
30 MHz and below	4.315
>30 to 403 MHz	9.747
>403 to 520 MHz	10
>520 to 960 MHz	10
>960 to 2,690 MHz	9.985
>2,690 to 5,000 MHz	9.974
>5.0 to 8.5 GHz	4.2105
>8.5 to 14.5 GHz	0.3711
>14.5 to 31.3 GHz	0.3711
>31.3 to 51.4 GHz	0.1012
51.4 GHz to 100 GHz	0.01
Above 100 GHz	0

While OneWeb is not proposing for ComReg to adopt the exact same factors as Australia, we strongly believe ComReg should consider a similar weighting factor that reduces the unit price for higher frequency bands to take into account higher bandwidth available, and limited spectrum denial impact.

OneWeb remains at the disposal of the COMREG for any clarifications on the OneWeb network and services should that be useful.

Yours truly,

Peng Zhao
Vice President,
Government affairs and Policy
OneWeb

6 SpaceX

SPACEX

August 15, 2022

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

Re: *Review of the Satellite Earth Station Licensing Scheme: Response to Consultation and Further Consultation (ComReg 22/56)*

To Whom It May Concern:

Starlink Internet Services Ltd. ("SpaceX") appreciates the opportunity to provide comments on the Commission for Communications Regulation's ("ComReg") Review of the Satellite Earth Station Licensing Scheme Response to Consultation and Further Consultation (ComReg 22/56) (the "Further Consultation"). Below is a general overview of SpaceX and its Starlink product, along with specific responses to the Consultation.

Background

SpaceX is a private company founded in 2002 to revolutionize space technologies, with the ultimate goal of enabling humanity to become a multi-planetary species. SpaceX has achieved a series of historic milestones and is proud to have become the first private company in history to send astronauts to orbit, safely returning them to Earth. To date, SpaceX has successfully launched more than 165 missions to space.

SpaceX is leveraging its accumulated expertise in space system manufacturing, design, and operations, to develop a constellation of satellites and its commercial service, Starlink, designed to provide high-speed, low-latency, competitively priced broadband service to locations in Ireland and anywhere around the globe. SpaceX's first-generation constellation consists of over 4,400 non-geostationary orbit (NGSO) satellites and extensive ground infrastructure employing advanced communications and space operations technology. SpaceX has invested billions of dollars in this system and is currently launching 120 satellites per month on average, along with building gateway and end-user terminal antennas. SpaceX's satellite system is designed to make efficient use of radio spectrum resources by optimizing its ability to flexibly share spectrum with other licensed satellite and terrestrial users, including through advanced beam-forming and digital processing technologies. SpaceX currently links satellites to the customer user terminals in the Ku-band for both uplink and downlink frequencies, with gateway links in the Ka-band.

The events of the past two years have reminded us all of the importance of being able to connect people and businesses through high-speed Internet service, whether to complete school lessons, connect with distant family and friends, conduct business, or even to run a government. Powerful next-generation satellite systems supported by robust backhaul connectivity will enable all consumers across Ireland to use the bandwidth-intensive, real-time applications that have

become essential to accessing remote work, school, and public services. To meet these evolving consumer needs, whether in the suburbs of Dublin or the most remote corner of Ireland, SpaceX is currently building and deploying its next iteration of its Starlink commercial satellite service. This next-generation technology includes upgraded end-user terminals, new satellite technology, and improved gateway ground stations that will provide customers with even higher speeds. For example, ground stations in this next generation of deployment will be able to use 71-76 GHz and 81-86 GHz frequencies (the "E-band" or "70/80 GHz bands") for gateway communications and will support higher capacity and faster speeds for the Starlink network.

SpaceX began Starlink service in limited parts of Ireland on July 14, 2021. Today, Starlink is capable of serving the entire country and operates two first-generation gateways. Starlink customers in Ireland typically experience speeds exceeding 100 Mbps, with reliability nearing 100 percent. In the coming months, SpaceX is excited to expand its customer base in Ireland, with a particular desire to reach those who are currently unserved or underserved by broadband.

Response to Question 1: ComReg welcomes views of interested parties on its proposed satellite licence types as detailed above. Please provide evidence and reasoning for your views.

SpaceX supports ComReg's proposal in paragraph 3.13 of the Further Consultation to permit SES licences to accommodate multiple antennas/earth stations at a single site. This approach will simplify the earth station application process while providing flexibility to deploy gateway sites that meet consumer demand for high-speed, low-latency satellite broadband service. SpaceX agrees that under this model, the teleport licence category is no longer necessary.

While not specifically relevant to the proposed satellite licence types, SpaceX suggests that ComReg make one factual correction in paragraph 3.6 of the Further Consultation. Specifically, in that paragraph, ComReg states that non-geostationary orbit ("NGSO") satellites "occupy a range of orbital positions," identifying low-Earth orbit satellites as falling between 700-1500 kilometres. However, SpaceX's NGSO constellation operates below 650km, which provides distinct benefits compared to higher-altitude operations, including lower latency that improves service quality and shorter demise times that enhance space sustainability. SpaceX recommends that DotEcon and ComReg correct the definition of LEO in its final report and emphasize this important distinction between lower and higher altitude operations.

Response to Question 2: ComReg welcomes views of interested parties on its proposals regarding frequency bands for SES as detailed above. Please provide evidence and reasoning for your views.

To meet growing consumer demand for high-speed, low-latency broadband service, satellite operators require access to adequate spectrum in key frequency bands—including the Ku-, Ka-, and 70/80 GHz bands—that have been allocated on a co-primary basis to the fixed-satellite service. For that reason, SpaceX strongly supports ComReg's proposal in paragraph 3.42 of the Further Consultation to open the 27.5-30 GHz band for satellite earth station licences. As SpaceX noted in its initial consultation response, the Ka-band is a critical frequency band for satellite earth

stations, and access to the full 27.5-30 GHz range is essential for gateway uplinks to keep pace with consumer demand for high-quality broadband and to facilitate interservice competition.

With respect to millimetre wave spectrum, SpaceX urges ComReg to permit operations in the 70/80 GHz band on an expedited basis. Fortunately, authorizing satellite earth stations in the 70/80 GHz band will not provide a "first mover advantage" because the narrow links in the band do not foreclose other operators from siting new links or earth stations, even in close proximity. Indeed, in this consultation, ComReg has recognized that there is no spectrum scarcity issue for satellite earth stations even in bands that satellite operators use heavily, such as the Ka-band. In the case of the 70/80 GHz band, where spectrum remains abundant despite years of terrestrial deployments, the risk of spectrum scarcity is even lower—including for satellite earth stations—due to the unique physical properties of links in the band. Rather than bar access to this important band in anticipation of a harmonized decision, SpaceX urges ComReg to permit commercial licensing of SES in the 70/80 GHz band subject to any future harmonized efforts, and further encourages ComReg to support these efforts in these bands in international forums.

Finally, SpaceX supports ComReg's proposal to continue monitoring bands above 100 GHz. Today, the fixed-satellite service is allocated at the ITU on a co-primary basis in a number of promising spectrum bands above 100 GHz, including several bands in the Space-to-Earth direction (e.g., 123-130 GHz, 158.5-164 GHz, 167-174.5 GHz, and 232-240 GHz) and others in the Earth-to-Space direction (e.g., 209-226 GHz and 265-275 GHz). In terms of prioritization of these frequencies for assignment, frequencies closer to 100 GHz—including the 120-170 and 210-310 GHz bands—are more useful to serve consumers of fixed-satellite services in the near term than even higher frequency bands because lower frequencies generally experience lower levels of atmospheric attenuation. This relatively lower attenuation is essential to enable satellite ground infrastructure to close long links with satellites. In contrast, bands in the 310 GHz – 20 THz range have extremely high atmospheric attenuation, causing the atmosphere to be nearly opaque to electromagnetic waves and therefore difficult to use with current technology, except over short distances. As ComReg monitors these bands and assesses how to maximize the value of the band for consumers, it should consider the impact of atmospheric attenuation on various use cases, avoid misallocation of scarce spectrum resources, and seek opportunities to optimize 100-310 GHz spectrum (e.g., making available additional uplink spectrum), noting that these frequencies may not be as fungible as those in other lower-frequency bands.

Response to Question 3: ComReg welcomes views of interested parties on its proposals regarding sharing and compatibility of NGSO SES as detailed above. Please provide evidence and reasoning for your views.

As SpaceX noted in its original comments, because satellite operators are in the best position to understand their networks and capabilities, good faith operator-to-operator coordination is the "gold standard" for ensuring efficient sharing of satellite spectrum between operators. These sharing arrangements obviate the need for regulatory intervention or overly conservative rules—such as minimum separation distances between gateways—which can have the pernicious effect of impairing service for consumers and limiting access to critical sites for

new entrants. Instead, SpaceX urges ComReg to create incentives for efficient sharing while encouraging good-faith private coordination among operators.

SpaceX has significant experience coordinating with both GSO and NGSO operators to ensure efficient spectrum sharing. With respect to GSO-to-NGSO coordination, while existing protection rules for GSO satellites are overly conservative, SpaceX and GSO operators have been able to reach coordination agreements under those existing frameworks. As for NGSO-NGSO coordination, SpaceX has coordinated in good faith with operators around the world. Indeed, earlier this year SpaceX and OneWeb reached an historic coordination agreement, without regulator intermediation, confirming that their respective constellations can efficiently coexist with one another.

Based on its extensive experience coordinating with other satellite operators, SpaceX urges ComReg not to adopt the proposed notification process in paragraph 3.52 of the Further Consultation for new NGSO satellite earth station licence applications. The proposed notification and comment process would duplicate and potentially undermine private coordination efforts, encouraging inefficiency and inviting gamesmanship without any offsetting interference benefit. For example, an incumbent operator that has failed to adopt basic spectrum-sharing technologies could claim a massive keep-out zone that prevents other operators from deploying well into the future. For that reason, rather than adopt a notification process, ComReg should incentivize all operators to adopt spectrum sharing technologies that permit coexistence within reasonable proximity to other operators, while eliminating opportunities for some operators to leverage inefficiency to curb competition.

SpaceX agrees with ComReg that publishing licensing information facilitates earth station siting and coordination. Services such as SiteViewer and eLicensing enhance ComReg's "open by default" approach to data by providing tools that enable operators to efficiently plan their networks, identify coordination needs, and apply for licences. SpaceX supports ComReg's preliminary view in paragraph 3.57 of the Further Consultation with respect to the specific data that it will publish. As ComReg continues to develop its information policy, SpaceX urges it to develop automated tools that speed the licensing process, including by checking prospective earth stations against incumbent sites for interference based on accepted methodologies and rapidly granting licenses where harmful interference will not occur.

Response to Question 4: ComReg welcomes views of interested parties on its proposals regarding technical conditions for SES as detailed above. Please provide evidence and reasoning for your views.

SpaceX agrees that ComReg should incorporate relevant ITU, CEPT, and ETSI standards where appropriate to provide clarity to operators about sharing conditions. For example, ComReg's decision to explicitly add ETSI standard 303 981 to the most recent update to the Permitted Licence Exemptions for Terminals for Satellite Services document 20/47R4 will drive rapid deployment of next-generation user terminals, including earth stations in motion, to consumers throughout Ireland.

With respect to power limits, SpaceX requests that ComReg align its maximum transmit power regime with international best practices, including relevant ECC Decisions, Reports, and/or ITU Recommendations. However, limiting main beam EIRP to below 60 dBW—particularly in the Ka-band and in higher frequency bands—would have a detrimental impact on the ability of satellite operators to provide quality service to end users and would conflict with relevant ITU Radio Regulations. At the very least, ComReg should clarify that any such limits do not apply to gateway earth stations that are fixed at a specified point.

SpaceX agrees with the DotEcon report and ComReg that site clearance mechanisms are unnecessary to prevent harmful interference between operators and therefore should be removed from the Guidelines. Similarly, SpaceX cautions ComReg against establishing overly conservative protection criteria for airfields, particularly when those conservative criteria depart from the harmonized ECC Report 272. Because earth station siting requires access to adequate fiber, power, and a point of presence, often satellite operators must deploy their earth stations within relatively close proximity to one another. Overly conservative airfield protections, particularly near critical points of presence, could unnecessarily limit available earth station sites, impairing competition and broadband service for Irish consumers. As such, SpaceX recommends that ComReg align its airport zones with those of ECC Report 272.

Finally, SpaceX recommends that ComReg extend the current 12-month licensing period to at least five years. A five-year licence would achieve the goals that ComReg set forth in paragraph 3.82 of the Further Consultation, particularly the ability to "allow licensees sufficient time to make a return on their investments, in line with the expected life-cycles of any technologies deployed." The particular life cycle of a satellite earth station typically exceeds one year, and the life cycle of a typical satellite in low-Earth-orbit typically exceeds five years. Aligning the fixed licence duration with the typical life cycle of the underlying technology will provide important certainty to providers without sacrificing flexibility to address international harmonization, which also operates in multi-year cycles. Granting multi-year licences will also reduce the burden on ComReg and operators by reducing the number of renewals required for a satellite earth station. At the same time, SpaceX recommends that ComReg consider one-year commercial licenses in innovative new spectrum bands beyond the Test & Trial program, particularly for uses that are not provided directly to consumers (e.g., gateway spectrum). SpaceX has seen this model successfully adopted in other markets (in close collaboration with regulatory authorities) to demonstrate the efficiency of new technology in the market.

Response to the Draft Fees Regulatory Impact Assessment ("RIA")

SpaceX appreciates the opportunity to comment on ComReg's draft fees RIA. Establishing a rational fee structure is essential to promote competition, innovation, connectivity, and consumer value. In its initial comments on this issue, SpaceX supported an administrative-cost-recovery-based fee framework, and agreed with DotEcon that fee frameworks that attempt to capture the "value" of different spectrum bands are a poor substitute for well-designed spectrum policies. However, SpaceX does not agree with ComReg's proposal to use bandwidth as the primary driver of its fee calculation and strongly urges ComReg to consider a flat fee structure for SES licensees.

The proposed bandwidth-focused methodology in Option 4 undermines both the core value of the administrative cost recovery model—low, predictable fees tailored to cover the costs of processing the licences—and ComReg's statutory obligations in accordance with Section 12 of the 2022 Act. Indeed, DotEcon previously noted that 'there is no obvious rationale" for consumption-based fees,[1] and the RIA does not explain how greater bandwidth use results in higher administrative costs for ComReg. As explained below, Option 4 would harm innovation, investment, competition, and consumers with no offsetting benefit and long-lasting negative effects. Consequently, ComReg should revisit its preliminary decision and instead select Option 5, which represents a true administrative cost recovery fee.

Option 4 will discourage efficient spectrum use and hinder innovation in new satellite earth stations by disincentivizing operators from maximizing the value of higher-frequency bands (such as the Q/V-, 70/80 GHz, and +100 GHz bands), as they will become too costly. In these bands, the high-gain, narrow, directional properties of links allow operators to use the entire available bandwidth in close proximity to other users with a low risk of interference regardless of bandwidth. However, ComReg's proposed fee framework would make such wide channels uneconomical, requiring operators to pay over €150,000 annually for 5 GHz of spectrum, over €300,000 annually for 10 GHz of spectrum, and millions in consumption-based fees over the life of a satellite system. In these situations, operators are faced with the prospect of limiting their technological capabilities (i.e., reducing the number of channels they use) to manage costs, or declining to deploy earth station infrastructure using those bands in Ireland. These tradeoffs are ultimately unnecessary—as ComReg itself has recognized—and will reduce quality of service for customers including residences, schools, libraries and emergency services. And even if ComReg ultimately decided to change the per-MHz factor to facilitate wider channels in higher frequency bands, it could not do so without creating distinctions between frequency bands similar to Option 2, which ComReg has found to be both "unreasonable" and to have "no basis."

Option 4 would further negatively impact consumers by taxing efficient use of high bandwidths in high-frequency bands, depriving customers of high-bandwidth backhaul that could improve service quality. This harm would fall disproportionately on rural and remote users who rely on satellite broadband for connectivity. Furthermore, when presented with high licensing and spectrum fees, operators are often forced to pass this cost onto the consumer, increasing the price of critical services for those who are already on the disadvantaged side of the digital divide. Even where operators do not pass fees on to the consumer, a consumption-based fee structure diverts scarce resources away from improving service quality and customer service. This negative externality will continue to disproportionally affect lower-income customers, who often live in more remote areas and have the greatest need for services like satellite broadband.

SpaceX does agree with several proposed aspects of the RIA, including the importance of information policy as an important driver of spectrum efficiency, aiding network planning, coordination, and reducing the risk of harmful interference. For that reason, SpaceX appreciates ComReg's proposal to include information for both fixed links and satellite earth stations in the Siteviewer tool. Together with private operator-to-operator coordination, information policy can

[1] *See* DotEcon report, ComReg 21/135a, at 30.

reduce the administrative burden on operators and ComReg alike while achieving the goal of promoting the efficient and optimal use of spectrum in the public interest.

SpaceX also agrees with ComReg and DotEcon that "there is no efficiency role for the fees in terms of ensuring licences are assigned to the highest value users," due to the low scarcity and likelihood of interference between coprimary users, that "[t]he overall level of fees does not need to be any higher than necessary to cover ComReg's administrative costs"[2] and that "[i]t is easier to resolve conflicts between SES by operator coordination,"[3] rather than through fees. Finally, SpaceX agrees with ComReg that "there is no basis for charging different fees depending on the frequency band required by a licensee."[4]

As a result, SpaceX urges ComReg to adopt Option 5, which provides a flat, predictable fee structure that better enables operators to focus available resources on innovation, competition, and consumer service; is scalable to accommodate future use of high-frequency bands; and creates strong incentives for administrative efficiency.

Conclusion

SpaceX's priority is to rapidly serve as many customers in Ireland with affordable, high-speed, low latency internet as possible. SpaceX appreciates the intentional and thoughtful work ComReg has already completed in pursuit of this goal for all operators who seek to bridge the digital divide and invest in Ireland's rich technology sector, and looks forward to continuing to collaborate with ComReg on its review of the satellite earth station licensing scheme.

Respectfully submitted,

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1 Rocket Road
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2 Further Consultation at 4.62.
3 *Id.* at 4.65.
4 *Id.* at 4.100.