An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Review of the Satellite Earth Station Licensing Scheme

Non-Confidential Submissions to Documents 21/135 and 21/135a

Submissions to Consultation

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Content

1 Amazon Web Services

AWS Comments on the Review of the Satellite Earth Station Licensing Scheme Consultation (ComReg 21/135)

Purpose

Amazon Web Services (**AWS**), an Amazon.com, Inc. company, welcomes the Commission for Communications Regulation's (**ComReg**) Review of the Satellite Earth Station Licensing Scheme consultation (ComReg 21/135) (**Consultation**). As ComReg correctly recognizes, new technological advances in the satellite industry require an updated licensing framework "fit for purpose and future proofed."[1] AWS is pleased to provide this submission (in addition to the Stakeholder interview), and supports the goal of harmonizing the Irish framework with European standards and supporting growth in satellite earth station (SES) usage. In particular, AWS supports aligning usage of S-band transmit in Ireland with the ITU's spectrum allocation.

Background

As the leading global provider of cloud computing services, AWS helps space operators in the private and public sector build satellites, conduct space and launch operations, and reimagine space exploration. In 2018, we launched 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. Since the cost of deploying satellites and other related ground infrastructure (which can often involve multiple ground stations for low and medium earth orbit satellites) is a significant capital and operational expenditure, AWS Ground Station allows satellite operators to conduct operations without the long-term commitment and costs involved in setting up new infrastructure. With capabilities like AWS Ground Station, satellite operators are able to scale up their ground segment use commensurate with the deployment of their on-orbit assets, reducing delay both in their infrastructure buildout and service delivery to end-users.

Our global satellite operator customers users rely on AWS Ground Station's global footprint of antenna systems to control satellite communications and process data when and where they need it and can save up to 80% of their ground station costs by paying only for the actual antenna time used and relying on the global footprint of ground stations to download data when and where customers need it.

Currently, we have Ground Station rolled-out in 10 locations in the world. The AWS Ground Station antenna system in Dublin, Ireland launched in April 2020, and was the sixth location to launch. Customers can now transmit and receive data using AWS Ground Station antennas in the following locations: US (Oregon), US (Ohio), Middle East (Bahrain), Europe (Stockholm), Asia Pacific (Sydney), Europe (Ireland), Africa (Cape Town), US (Hawaii), Asia Pacific (Seoul), and South America (Punta Arenas). Customers can deliver data and configure their contacts with the AWS Ground Station console in the following regions: US West (Oregon), US East (Ohio), Middle East (Bahrain), Europe (Stockholm), Asia Pacific (Sydney), Europe (Ireland), Africa (Cape Town), US East (N. Virginia), Europe (Frankfurt), Asia Pacific (Seoul), and South America (São Paulo).

[1] Review of the Satellite Earth Station Licensing Scheme (ComReg 21/135), Section 1.5, Page 6 (17/12/2021).

The AWS Ground Station model is primarily a telemetry, tracking and control system (**TT&C**). AWS Ground Station's customers are primarily non-geostationary satellite orbit **(NGSO)** constellations engaged in Earth exploration satellite services **(EESS)**, and these operators require a geographically diverse global terrestrial infrastructure to support their operations**.** NGSO EESS satellites orbit the Earth approximately once every 90 minutes, and an AWS Ground Station antenna will only make contact with a satellite for about six minutes during each orbit. Because of this, global coverage is important as space operators want the ability to connect to the satellites at any time during the 90-minute orbit.

AWS Ground Station satellite customers are constrained in the range of frequencies they use, and AWS Ground Station does not select frequencies independently of the satellite fleets we support. A significant number of the necessary ranges are in S-Band below 3 GHz because operators use this frequency range for commanding their spacecraft and receiving state-of-health data from their satellites. They generally conform to ITU spectrum allocations, which often directly inform the national frequency plans of jurisdictions.

AWS recommends that ComReg harmonize its national frequency plan with ITU allocations or European standard usage to expand SES usage below 3 GHz. Much of the national frequency plan already broadly follows this pattern, as such, many the preliminary conditions are set for allowing operation of TT&C ground stations.[2] However, ComReg requires enabling regulations *additional* to its national frequency plan before issuing a corresponding spectrum authorization, and currently, none exist to allow for TT&C operations below 3 GHz.[3] AWS strongly supports ComReg's adoption of enabling regulation for SES usage below 3 GHz, both to match the country's existing national frequency plan, where it already supports such usage, and harmonize it further in that direction. This would allow Ireland to host TT&C facilities, which have become capital actors in the development of current and future satellite applications.

Existing licensing types and spectrum band usage does not encompass AWS Ground Station operations *(includes response to Q1, Q2, Q3, Q9).*

The current licensing framework for SES in Ireland does not fit the AWS Ground Station model because, as the Consultation points out in Section 3.8, it does not contemplate spectrum usage below 3 GHz.[4] AWS Ground Station operations in Ireland are constrained by the limited use of available spectrum.[5] As DotEcon notes in Section 4.5.2, "license types available should not preclude any particular use case" and "the license region should be suitable for emerging and established

[2] Radio Frequency Plan for Ireland, ComReg 20/583R (20 December 2021).

[3] A relative exception to this is ComReg's forward-looking Test & Trial Licensing Programme, which allows ComReg broader latitude in issuing spectrum authorizations.

[4] ComReg 21/135, Section 3.8, Page 14 (17/12/2021). The Consultation included the full listing of frequency bands available for SES as Annex 1, which they are all above 3 GHz.

[5] AWS recognizes that currently, receive-only stations can operate on a non-protected, licence-exempt basis. However, AWS would appreciate clarity from ComReg on whether that exemption would continue if spectrum under 3 GHz became available.

technologies[.]"[6] AWS supports opening spectrum usage below 3 GHz to support these aims.

As mentioned above, AWS Ground Station's customer use cases are primarily NGSO EESS**.** Our global satellite operator customers' need determines our (AWS Ground Station's) choice of bands. These operators require nearly constant communications with their spacecraft globally, so their selected communications are driven by ITU allocations to enable use of the same communications platform in up to 20 locations globally for each pass.

We currently support customers in S-band receive (2200 to 2300 MHz), S-band transmit (2025 to 2120 MHz), and X-band receive (7750-8400 MHz). Our bandwidth requirements vary greatly depending on the purpose of the communications and which band is being used. Our S-band TT&C transmit from earth to space range from 60 kHz to about 2 MHz. TT&C space to earth is about the same range. For payload data downlink bandwidth usage ranges from 1 MHz to 375 MHz in X-band for the full range of 8025-8400 MHz.[7] As discussed in Section 3.26, a significant amount of this spectrum is below 3 GHz (i.e. VHF, UHF, and part of S-band) and therefore not available under the existing licensing regime. Most of our customer use-cases need the ability to uplink and downlink simultaneously.[8]

AWS respectfully suggests that the SES licence regulatory framework be reconsidered and expanded to include additional spectrum use (e.g. S-band transmit) to align with ITU allocation.

AWS Ground Station's operates without harmful interference *(includes response to Q4, Q5, Q6).*
Section 3.35 of the Consultation states that there is some potential that SES could "cause or experience harmful interference from other SES using the same frequency bands."[9] However, AWS Ground Station's global operations have not resulted in any interference reports in its 10 locations throughout the globe since operations began in May 2019. AWS Ground Station's 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. At this time, AWS does not have space interference concerns related to AWS Ground Station's operations as spectrum is used only as the satellite passes over the field of view.

In the same vein, Section 3.38 of the Consultation states that there is also potential "interference from existing terrestrial services to SES."[10] In response, AWS attests that it does not have terrestrial interference concerns related to AWS Ground Station's operations because it has proven it can co-exist with terrestrial users in similar bands. In other jurisdictions, Ground Station has been able to demonstrate its ability to operate without interference of terrestrial users at the same frequency

[6] DotEcon Report, Satellite Earth Station Licensing Review, Section 4.5.2, Page 33 (December 2021).
[7] While our bandwidth requirements vary based on satellite operator, it is important to note AWS Ground Station operates on a shared spectrum basis.
[8] ComReg 21/135, Section 3.26, Page 18 (17/12/2021).
[9] ComReg 21/135, Section 3.35, Page 19 (17/12/2021).
[10] ComReg 21/135, Section 3.38, Page 20 (17/12/2021).

usage unless the user is within 400m.

Licensing fees should be competitive and proportional *(includes response to Q8).*

AWS supports ComReg's position in Section 3.47 to ensure that license fees "are objectively justified, transparent, non-discriminatory and proportionate in relation to their intended purpose."[11] The high costs to build or operate international earth stations already is a major barrier to entry into the space industry, but predictable, low fees would assist startups entering the industry.

AWS Ground Station supports a wide range of NGSO use cases like EESS and IoT. New and novel space-based applications, especially in the burgeoning EESS and IoT segments, spur economic growth and job creation. With capabilities like AWS Ground Station, satellite operators are able to scale up their ground segment corresponding with the deployment of their on-orbit assets, reducing delay both in their infrastructure buildout and service delivery to end-users. As an earth observation provider, AWS Ground Station aims to keep fees low so that it remains accessible to small companies, start-ups, and universities, all of which play a significant role in EESS.

Fee Recommendations

In order to encourage the entry of start-ups in the space sector, AWS recommends ComReg set SES licensing fees to a reasonable amount, preferably a nominal, competitive, low fee. A low fee (sometimes issued as a flat annual fee) that covers the cost of processing and coordinating requests is the norm in most jurisdictions. Like DotEcon notes in its findings, low fees make sense for use cases with low administrative costs, for example, for earth stations, which have little to no interference protection.[12] For the same reason, AWS supports DotEcon's proposal to charge Earth stations within limited area as if they were a single Earth Station.[13]

Spectrum costs likewise should not prevent the development of innovative services. AWS believes the spectrum cost formula for TT&C systems should be a low flat annual fee, like other jurisdictions such as Sweden[14] and South Africa[15]. This allows for accurate financial forecasting and avoids unintended large-scale cost effects as spectrum usage grows. Additionally, AWS supports eliminating redundant spectrum fees for earth station licensees repeatedly accessing the same spectrum bandwidths, as AWS Ground Station operates on a non-protected, non-interference basis.

AWS respectfully advises that when ComReg is setting fees for SES, ComReg should be cautious about setting fees in linear progression to nominal bandwidth consumption without considering usage patterns. In particular, services with low duty cycles (even with potentially high bandwidth requirements) should not be charged as if they made 24/7 use of the spectrum. This is the case with TT&C models such as AWS Ground Station and others.

[11] ComReg 21/135, Section 3.47, Page 22 (17/12/2021).
[12] Satellite Earth Station Licensing Review, Section 4.3, Page 30 (December 2021).
[13] ComReg 21/135, Section 3.48, Page 22 (17/12/2021). See also, Satellite Earth Station Licensing Review, Section 4.3, Page 29 (December 2021).
[14] Regulations of the Swedish Post and Telecom Agency on Fees (17 December 2019).
[15] Radio Frequency Spectrum Fee Regulations 2010, as amended.

Regulatory alignment with the ITU *(includes response to Q10).*

AWS believes that the spectrum allocation and regulation should align with the ITU technical requirements (e.g. 2025-2110 MHz ITU primary allocations are for EESS uplink).[16] As stated earlier in the document, AWS Ground Station's customers selected communication bands are driven by ITU allocations. Harmonizing national regulations with EU and CEPT standards regarding SES usage in bands below 3 GHz will continue to make Ireland an investment-friendly destination for satellite services innovation.

[16] ITU allocations are reprised in ComReg's Radio Frequency Plan for Ireland, ComReg 20/583R (20 December 2021).

2 Avanti

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COMMISSION FOR COMMUNICATIONS REGULATION
Ireland

Ref.: Preliminary Consultation – Review of the Satellite Earth Station Licensing Scheme

Dear sirs,
We are pleased to hear that the Commission is taking action into updating the satellite regulatory framework and taking the Industry's views to construct a more fir for purpose framework. We can see how Ireland has a special interest in fostering a digital enviorment where satellite is included and we commend such an effort.

Regarding the questionnaire proposed, it is important for Avanti to first reiterate that regulations for satellite networks and operators should be harmonious and comprehensive. Currently there is a fragmentation amongst the regulatory tools, rules and regulations for the satellite industry in Ireland. By issuing yet another piece of regulation that is limited to Earth Stations, the satellite framework will continue to be a puzzle open to one regulation lagging behind another, creating voids and making it harder to be kept up to date with the industry's development and lacking reassurance for investment. For these reasons, we encourage ComReg to lift the limitation it currently applies in this consultation and look for a more harmonious approach that will encompass a more coherent, modern and up to date regulation for the satellite industry as s whole.

We want to reiterate the recommendations Avanti did during the interview process with DotEcon and that also other satellite operators have proposed in the sense of restructuring not only the Earth Station regulations but including also other aspects of the satellite networks that are equally important such as user terminals and general authorizations. We urge ComReg to be mindful that what it's at stake in this proposed consultation shall guarantee the safe operations and interference free communications amongst not only different orbit operators, but also amongst different terminals and antennas, be them Earth Stations and User Terminals. It is important to highlight that understanding how these terminals interact in the same and adjacent frequencies, and how important it is to comply with technical parameters like distanced locations and protection masks. With the entrance of LEO constellations, the potential for harmful interference increases, for both satellite vehicles, earth stations and user terminal if not properly regulated. We invite ComReg to look more into the detail of the interactions all of these elements have to guarantee not only the safe operation of the new LEO constellations but also the whole satellite environment, especially with 5G deployments.

We applaud the fact that ComReg is making this consultation and that the regulatory process as open and participative as possible. We trust that all the efforts we and the rest of the satellite community has put into giving the consultants as much information and support as possible will in fact be reflected in the proposed document. The update of the satellite regulation in Ireland has been long awaited and we hope our input will finally be taken into account when formulating these new regulations.

With kind regards,

Andrea Hols
Senior Manager Market Access

3 Eir

eir Response to ComReg Consultation

Review of the Satellite Earth Station Licensing Scheme

ComReg Document 21/135

28 January 2022

DOCUMENT CONTROL

Document name	eir response to ComReg 21/135
Document Owner	eir
Status	Non Confidential

The comments submitted in response to this consultation document are those of Eircom Limited and Meteor Mobile Communications Limited (trading as ‘eir’ and ‘open eir’), collectively referred to as ‘eir Group’ or ‘eir’.

Response to consultation

1. eir welcomes the opportunity to comment on ComReg's Satellite Earth Station (SES) licensing review. eir is responding from the perspective of a user of spectrum for fixed links and mobile services. Our responses are limited accordingly.

Q. 1 ComReg seeks views of interested parties regarding the current SES licence types.

2. No comment.

Q. 2 ComReg seeks views of interested parties regarding the frequency bands currently available for SES as set out in ComReg document 00/64R3, and on the potential for opening up of frequency bands not already available, in relation to either the bands mentioned above, or any other bands considered relevant (noting that this does not include frequencies for use with licence-exempt terminals, which is not within the scope of this project). Views on use cases for these bands and likely time scales around demand for the spectrum would be helpful.

3. The 3.4 to 3.8 GHz band is currently licensed for 5G and so should be protected. Future bands standardised for 5G according to 3GPP (3GP 38-101 V16-8 FR2) are in the Ka and V band and so allocation of frequencies for SES in these bands should be outside the 3GPP standardised frequency ranges. Similarly ComReg is also consulting on fixed links and again coordination of frequencies for SES should not conflict with bands used for fixed links. The availability of 17 frequency bands for SES seems to be a very large allocation compared to other frequency use cases and deployments leading one to consider if overlapping of SES licenses into those bands used for fixed links and mobile services is necessary. eir believes it is important to ensure that spectrum used for valuable and widespread use types should not be negatively impacted by SES.

4. Terrestrial base stations are a key component of supplying mobile communications, services, especially large bandwidth, low latency communications. Frequencies used for technologies such as LTE(4G) and NR(5G) etc. should be fully protected from interference with frequencies allocated to SES.

Q. 3 ComReg seeks views of interested parties regarding:
a) any use cases that do not fall into the broad categories outlined above; and
b) views on any of the use cases identified and the understanding of these set out in the DotEcon report, in particular with regard to market trends (e.g. commercial viability) and factors relating to use of satellite earth stations and licensing requirements.

5. No comment.

Q. 4 ComReg seeks views in relation to any potential harmful interference between SES ground stations and also any potential for harmful interference that may occur as a result of newly launched LEO systems.
Q. 5 ComReg seeks views from interested parties regarding any potential interference to SES from other terrestrial uses, such as 5G.
Q. 6 ComReg seeks views from interested parties regarding any potential interference between SES and fixed links.

6. While there is little evidence in our network of harmful interference from SES this is due to the fact there is currently no overlap between frequencies used for the different technologies and applications. As such we strongly recommend that any future licensing decisions continue this and do not licence SES in frequency ranges that overlap harmonised bands for mobile services and bands allocated for fixed links.

Q. 7 ComReg seeks views from interested parties on what type of information would help operators resolve coordination problems and the extent to which this would reduce the risk of interference (both between SES and between SES and terrestrial services)?

7. eir believes there is merit in plotting the location of SES deployments in SiteViewer or a similar application. This transparent tool would be very useful to help understand deployment scenarios and possible interference risks and mitigations.

Q. 8 ComReg seeks views from interested parties on the above including:
a) the proper definition of SES to apply for licensing purposes given the potential for 'light-weight' ground stations being used for some applications (such as IoT downlinks);
b) the structure of the fee schedule (e.g., per earth station, per satellite constellation, bandwidth).
c) any pricing methodologies or approaches that would be suitable for estimating SES fees. ComReg also seeks views of interested parties on the existing charging structure and aspects of that approach that require change or not.
d) what basis should be used to allocate administrative costs, especially given that some SESs may need little or no interference protection (i.e., different fees for different licence types.;
e) how to deal with competing terrestrial uses that might be precluded in exclusion zones around SESs needing interference protection and reflect the opportunity cost imposed so that new ground stations locate themselves efficiently.

8. It may be appropriate to align fees to the specific use case. For example if SES is used to provide mobile services the SES licence fee should be proportionate to the spectrum fees paid by mobile network operators.

Q. 9 ComReg seeks views from interested parties on which frequency bands could be opened to SES in Ireland?

9. As noted previously eir strongly recommends that any future licensing decisions continue do not licence SES in frequency ranges that overlap with harmonised bands for mobile services and bands allocated for fixed links.

Q. 10 ComReg seeks any additional views from interested parties on the current SES licensing regime and guidelines?

10. No comment.

Q. 11 ComReg seeks any additional views from interested parties on the current process for the implementation of ECC Decisions for the exemption from licensing of TSS?

11. Exemption of licensing should follow similar technical conditions and type approval processes as those for other use cases such as mobile communication terminals.

4 Eutelsat

Commission for Communications Regulation
One Dockland Central, Guild Street,
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Ireland

Friday, 28 January 2022

Subject: Submissions to ComReg Document 21/135 – Eutelsat's response to ComReg's consultation on its Review of the Satellite Earth Station Licensing Scheme

Eutelsat, one of the world's leading satellite operators, would like to thank the Commission for Communications Regulation (ComReg) for the opportunity to comment on its Review of the Satellite Earth Station (SES) Licensing Scheme. Eutelsat appreciates that ComReg is reviewing the SES licensing scheme to adapt to the evolution of satellite activities and wishes to respond to the questions raised by ComReg in the following paragraphs.

Q.1 - ComReg seeks views of interested parties regarding the current SES licence types. Please provide evidence and reasoning for your views.

Eutelsat welcomes the difference made by ComReg in its licensing framework between Terminals for Satellite Services (TSS) and Satellite Earth Stations (SES).

Eutelsat agrees with the suggestion of paragraph 3.6 that it would be beneficial in the licensing process if multiple stations at the same location could be treated as one entity. More flexibility in terms of licensing and fees would be appreciated for teleport licenses to be more attractive.

Q.2 - ComReg seeks views of interested parties regarding the frequency bands currently available for SES as set out in ComReg document 00/64R316, and on the potential for opening up of frequency bands not already available, in relation to either the bands mentioned above, or any other bands considered relevant (noting that this does not include frequencies for use with licence-exempt terminals, which is not within the scope of this project). Views on use cases for these bands and likely time scales around demand for the spectrum would be helpful. Please provide evidence and reasoning for your views.

Eutelsat considers that all the frequency bands that currently are available for SES in the C-band (3.4-4.2 GHz, 4.5-4.8 GHz downlink, and 5725-7075 MHz uplink) and Ku-band (10.7 -12.75 GHz downlink and 12.75-13.25 GHz, 13.75-14.50 GHz uplink) are useful for satellite services. The C-band is fundamental with its unique characteristics such as ubiquitous coverage and rain resilience. The Ku-band is key to offer direct-to-home broadcasting services, as well as connectivity services for enterprise networks.

While Eutelsat appreciates that part of the Ka-band is opened for SES in Ireland (17.3-17.7 GHz, 19.7-20.2 GHz downlink, and 17.3-18.1 GHz, 29.5-30 GHz uplink), as stated in paragraph 3.11, Eutelsat would welcome the opening of the 27.5-29.5 GHz band in uplink, but also the 17.7-19.7 GHz band in downlink.

ERC Decision (00)07 decided that national administrations should enable the deployment of fixed stations, coordinated FSS earth stations and uncoordinated FSS earth stations in the bands 17.7-19.7 GHz. This decision also provides a list of mitigation techniques to avoid interferences between fixed services and satellite services. In fact, the 17.7-19.7 GHz band and parts of the 27.5-29.5 GHz band (in accordance with ECC Decisions (05)01, (13)01 and (15)04) are already opened for TSS in Ireland.

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). The Ka-band is currently used on more than one hundred satellites in geostationary orbit and over a thousand satellites in non-geostationary orbit globally to provide among others broadband services to consumers and enterprises. For instance, Eutelsat operates since 2020 EUTELSAT KONNECT satellite in Ka-band and will operate from 2022 EUTELSAT KONNECT VHTS satellite in the same band, providing high quality broadband services over Europe.

Eutelsat believes it is also necessary for Ireland to open the Q and V bands (37.5-42.5 GHz downlink, 42.5-43.5, 47.2-50.2 and 50.4-52.4 GHz uplink) for SES, as this band enables access to wide bandwidths for the gateways of the forthcoming generation of high and very high throughput satellites. Eutelsat recommends implementing ECC Decision (21)01 that designates the frequency bands 47.2-48.2 GHz and 50.4-52.4 GHz for coordinated FSS gateway earth stations (uplink) and designates the frequency band 48.2-50.2 GHz for uncoordinated and coordinated FSS earth stations (uplink). 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) should be followed as well.

Even though the demand in the 70/80 GHz band will probably not rise in the short term, the interest from the satellite operators to use these bands in the future should be noted. Ireland could consider the identification of this band for SES.

Q.3 - ComReg seeks views of interested parties regarding:

a) **any use cases that do not fall into the broad categories outlined above; and**
b) **views on any of the use cases identified and the understanding of these set out in the DotEcon report, in particular with regard to market trends (e.g. commercial viability) and factors relating to use of satellite earth stations and licensing requirements.**
c) **Please provide evidence and reasoning for your views.**

Eutelsat would like to thank ComReg and DotEcon for identifying and describing the different use cases of satellite earth stations.

Eutelsat would like to make some comments on the fixed broadband application, to complete the paragraphs 3.27 to 3.30. Even though low earth orbit (LEO) satellite constellation can provide low latency communication services, the services that new high throughput and very high throughput

geostationary (GSO) satellites can provide must not be overlooked. On this point, Eutelsat appreciates the mention of its GSO broadband services in paragraph 3.30. This latest generation satellite service enables all types of users, from consumers to businesses, schools, hospitals, and governments to enjoy the social and economic opportunities that internet connectivity entails, whether they are in urban, rural or the remotest locations at affordable prices.

It can also be noted that satellite connectivity services are especially adapted to aircraft and maritime connectivity, and are a key connectivity asset for disaster relief when terrestrial services are not usable.

Q.4 - ComReg seeks views in relation to any potential harmful interference between SES ground stations and also any potential for harmful interference that may occur as a result of newly launched LEO systems. Please provide evidence and reasoning for your views.

Eutelsat agrees with ComReg that interference issues can more easily be managed between GSO systems and between GSO and LEO systems than between LEO systems. In any case, difficulties may arise if satellite systems are not well coordinated.

Eutelsat recommends asking licensees to be compliant with their coordination obligations at International Telecommunications Union (ITU) level. Eutelsat believes that encouraging cooperation is a key solution to mitigate risks of interferences.

Q.5 - ComReg seeks views from interested parties regarding any potential interference to SES from other terrestrial uses, such as 5G. Please provide evidence and reasoning for your views.

Interferences coming from International Mobile Telecommunications (IMT) base stations to SES is a great concern for Eutelsat and the satellite industry.

For downlink bands, the long distance over which the signal must be transmitted makes it very weak compared to terrestrial signals such that earth stations are very sensitive to interference from other users in the band and adjacent bands. In the case of satellite uplink bands, it is not only the interference to IMT stations from transmitting satellite Earth station which needs to be considered for compatibility studies, but also the aggregate interference from IMT stations into the satellite receiver.

In the case of co-frequency co-coverage sharing, strong constraints must be applied on both earth stations and base stations for their coexistence because of high level of interferences, which is in practice almost unfeasible.

Sharing in adjacent bands also raises difficulties and requires mitigation techniques for compatibility. IMT base station out-of-band emissions can indeed saturate the low noise block converter of FSS earth stations in the adjacent band, as well as cause in-band interference to FSS signals. Mitigation techniques include, among others, the use of guard bands, filters, emission limits to be applied at the base station and separation distances. It should be noted that it may not be feasible to ensure separation, in particular if FSS earth stations are deployed in large numbers or without the knowledge of their locations

Eutelsat therefore encourages ComReg to ensure the protection of satellite services from harmful interference coming from 5G base stations, especially in the 3.8-4.2 GHz and the 27.5-30 GHz bands. In the Q and V bands, Eutelsat feels special care should be given to the protection of the satellite gateways and earth stations before any conclusion is taken regarding the use of the 40.5-43.5 GHz band for IMT.

Q.6 - ComReg seeks views from interested parties regarding any potential interference between SES and fixed links. Please provide evidence and reasoning for your views.

Eutelsat supports ComReg's view in paragraph 3.41 that the shared use of a band by FSS and FS should be subject to a national coordination process and appreciates that ComReg considers studies undertaken at regional and international levels.

Eutelsat is of the view the coexistence in the same band of SES and fixed point to point links is possible as long as the fixed stations' location is known, and coordination is completed.

Eutelsat welcomes the intention from ComReg explained in paragraph 3.42 to publish information on fixed links licences in Ireland to help in the prevention of interference between FSS and FS.

Q.7 - ComReg seeks views from interested parties on what type of information would help operators resolve coordination problems and the extent to which this would reduce the risk of interference (both between SES and between SES and terrestrial services)? Please provide evidence and reasoning for your views.

As stated in the previous question, Eutelsat welcomes the intention to publish information on fixed links licenses. Eutelsat agrees that it could be useful to have some information on the deployment of fixed links and earth stations such as the coordinates, frequencies and power, to prevent some interference issues.

Eutelsat is however of the view that this information should not replace a coordination process (at international level for satellite systems), and that it cannot resolve interference issues. Eutelsat believes the regulator has a role to play in managing interferences.

Q.8 - ComReg seeks views from interested parties on the above including:

- **a) the proper definition of SES to apply for licensing purposes given the potential for 'light-weight' ground stations being used for some applications (such as IoT downlinks);**
- **b) the structure of the fee schedule (e.g., per earth station, per satellite constellation, bandwidth).**
- **c) any pricing methodologies or approaches that would be suitable for estimating SES fees. ComReg also seeks views of interested parties on the existing charging structure and aspects of that approach that require change or not.**
- **d) what basis should be used to allocate administrative costs, especially given that some SESs may need little or no interference protection (i.e., different fees for different licence types.;**

e) **how to deal with competing terrestrial uses that might be precluded in exclusion zones around SESs needing interference protection and reflect the opportunity cost imposed so that new ground stations locate themselves efficiently.**

On the current licensing scheme, Eutelsat would like to comment that the fees can become very high for large bandwidths. In the Ka-band and the Q and V bands especially, the bandwidths are now usually much wider than for the previous satellite systems and are thus leading to dissuasive fees with the current scheme. Eutelsat would then recommend reducing or capping the fees for higher frequencies and/or for wider bandwidths.

On the opposite side, IoT services can lead to the use of very narrow bands, and Eutelsat would like to suggest the introduction of smaller fees for stations with a bandwidth below a certain amount to be defined for narrowband applications.

Eutelsat believes that sharing is an essential element of frequency management, and that exclusion zones, when they are necessary, are merely a consequence of coordination procedures. As a result, there is no need to have fees that depend on the outcome of the coordination process.

Q.9 - ComReg seeks views from interested parties on which frequency bands could be opened to SES in Ireland? Please provide evidence and reasoning for your views, along with supporting international harmonisation measures for these bands.

Eutelsat would like to refer to the response to question 2. In short, the opening of the 17.7-19.7 GHz, 27.5-29.5 GHz (parts of the Ka band), the Q and V bands (37.5-42.5 GHz downlink, 42.5-43.5, 47.2-50.2 and 50.4-52.4 GHz uplink), and the 70/80 GHz band would be welcomed.

For frequencies below 3 GHz, Eutelsat would recommend following the development on the matter at the ITU.

Q.10 - ComReg seeks any additional views from interested parties on the current SES licensing regime and guidelines? Please provide evidence and reasoning for your views.

Eutelsat would like to thank ComReg for opening reflections on its satellite earth station licensing scheme following development in the satellite industry.

Eutelsat supports in general the difference made by ComReg in its licensing framework between SES and TSS, between shared and exclusive bands.

Eutelsat agrees with the general comments mentioned in paragraph 3.58. about the importance of a stable regulatory environment. This is indeed crucial for the satellite industry to have a long-term visibility on the regulation considering the fact the investments are made on satellites that have a lifetime of more than 15 years in the case of geostationary communication satellites, and because of the necessity to secure ITU filings years before the launch.

Q.11 - ComReg seeks any additional views from interested parties on the current process for the implementation of ECC Decisions for the exemption from licensing of TSS? Please provide evidence and detailed reasoning for your views.

Eutelsat would like to thank ComReg for its rapid implementation of ECC Decisions regarding satellite earth stations and terminals for satellite services, thus ensuring a thriving ecosystem for the deployment of satellite activities in Ireland.

Eutelsat would like to thank ComReg for considering the above comments and looks forward to contributing to the next steps of the revision of the SES licensing scheme.

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5 GSOA

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28 January 2022

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Submissions to ComReg Document 21/135 – SES Licensing

GSOA would like to thank the Commission for Communications Regulation ("ComReg") for the opportunity to provide comments on their Review of the Satellite Earth Station (SES) Licensing Scheme ("consultation"). GSOA notes that ComReg's consultation is notably based on DotEcon report (Document 21/135a) on SES Licensing Review.[1]

GSOA[2] (the Global Satellite Operators Association) is the global CEO-driven association representing global and regional satellite operators. GSOA provides a platform for collaboration between satellite operators globally and a unified voice for the sector. Our vision is to help policymakers improve the state of the world by continuously bridging digital, education, health, social, gender and economic divides across diverse geographies and across mature and developing economies.

As highlighted by ESOA in its response to the previous consultation from ComReg on the national spectrum strategy (November 2021), the satellite communications sector is going through several major innovation trends. Non-geostationary systems, Medium-Earth-Orbit (MEO) as well as Low-Earth-Orbit (LEO), have deployed that are capable of providing unprecedented connectivity levels, including for very high-gigabit capacity, low-latency applications. Geostationary (GEO) platforms have been also subject to strong capacity enhancements driven by a systematic digitisation of space technologies, the 'softwarisation' of satellite operations and other virtual network functions. Combined with the advent of new ground antennas and reliance on steerable spot beams using various frequency bands, these progresses have greatly increased satellite systems' flexibility in geographical coverage and spectrum use.

GSOA commends ComReg for their recognition that "recent developments within satellite industry such as new use cases and related technology advancements" requires a licensing regime that is "fit for purpose and future proofed." We note that this is a first consultation step to be followed by another consultation and a final decision to be adopted around 2023.

GSOA reiterates the importance of taking into account the needs of different stakeholders, while respecting international framework from ITU and CEPT. We are also grateful to Ireland for the opportunity to expose our views on the need to provide the certainty of spectrum allocated to Fixed Satellite Services ("FSS") to ensure our sector can access the frequencies of importance in the L, S, C, Ku and Ka-bands as well as in the Q/V bands.
Below are our responses to the consultation questions.

[1] Available from: Satellite Earth Station Licencing Review – Interim Report | Commission for Communications Regulation (comreg.ie)
[2] The members, activities, and other details about GSOA can be found at www.gsoasatellite.com

GSOA Responses to ComReg Consultation's Questions

Q.1 ComReg seeks views of interested parties regarding the current SES licence types. Please provide evidence and reasoning for your views.

Overall, the approach taken by the Irish regulator Comreg in licensing SES is satisfactory and the categories fit for purpose.
GSOA notes that, surprisingly, licence-exempt Terminals for Satellite Services (TSS), defined as *"a type of radio equipment used to communicate with a satellite from the Earth (terrestrial, at sea or aeronautical)"* are not within the scope of the Review – but *"their current and future use will be taken into account when considering SES use cases."* We understand that MSS mobile terminals using spectrum below 3 GHz or FSS fixed terminals of all kind, incl. ESIMs, are therefore not treated in this consultation. Nonetheless, when looking at the latest Comreg regulation on permitted exemptions for TSS, dated December 2021,[3] GSOA wishes to commend Comreg for their ongoing implementation of the license-exemption regime established by the CEPT and ECC decisions in the European region. In addition, GSOA is pleased to refer to the most recent ECC Decision of 5 November 2021 on the use of the bands 47.2-50.2 GHz and 50.4-52.4 GHz by the fixed-satellite service (Earth-to-space) which we expect ComReg to adopt when further amending their TSS regime.

At the same time GSOA would like to express its concern regarding additional technical limitations for TSS in the Ka-band, as follows:
(1) the e.i.r.p. limitation of 50 dBW for residential fixed user terminals within portions of the 27.5-30 GHz band; and
(2) the exclusion zone of 12 nm around the Dublin port for ESOMPs in the 27.5-30 GHz/17.3-20.2 GHz bands.

GSOA believes that the technical limitations that are outlined in ECC Decision (05)01, ECC Decision (06)03 and ECC Decision (13)01, ECC Decision (15)04 provide sufficient protection to existing systems and services and any additional restrictions are redundant. Therefore, GSOA recommends that ComReg is harmonizing the national regulation of TSS with the technical conditions as defined in ECC Decisions for license exempt user terminals for satellite services (TSS) operating within the 27.5-30 GHz and 17.7-20.2 GHz bands, including those used for services to aircraft and ships.

GSOA acknowledges that *"ComReg's frequency plan aligns with applicable ITU allocations and the associated European Common Allocation (ERC Report 025)"*,[4] which is well reflected in the Radio Frequency Plan for Ireland, as updated in 2021.[5] Such a transparent and consistent line of conduct in ComReg's policy is indeed essential to the satellite sector to access spectrum.

[3] Permitted Licence Exemptions for Terminals for Satellite Services, ComReg 20/47R3 (6.12.21), https://www.comreg.ie/media/2021/12/Permitted-Licence-Exemptions-for-Terminals-for-Satellite-Services_R3.pdf.
[4] Satellite Earth Station Licencing Review – Interim Report | Commission for Communications Regulation (comreg.ie)
[5] ComReg-20-58R3.pdf

The existence of a specific licensing regime for tests and trials is also welcome and should be maintained as a fast-track approach to licensing, noting the absence of such a scheme in many jurisdictions of other countries makes it unduly cumbersome to satellite players.

The current charging structure (fees applicable to SES licensing) depends on the type of frequency used (exclusive or shared) and looks proportionate to the administrative costs. For Fixed Earth Stations (FES), however, the charging structure applicable to Teleports seems exorbitant, especially for bandwidth larger than 2 GHz.
ComReg also indicates that *"stakeholder interviews [conducted by ComReg in 2021] suggested there is an interest in multiple ground stations at the same site being treated as one entity and subject to one application."* Such an approach would greatly facilitate the licensing of satellite antennas notably for the transmission from Earth to NGSOs which rely on the usage of multiple identical tracking together several MEO or LEO satellites of the same constellation, from the same site using the same spectrum. While each antenna will be tracking a different satellite at any one time, the overall range of antenna pointing angles and operating frequency range will be within the same envelope. In other words, additional antennas do not significantly add to the spectrum denial of a single one. As such, GSOA suggests that, in such cases, a single licence would apply for multiple identical antennas on one site, operating within the same satellite system and the same frequency (i.e. no additional fees for earth stations in addition to the fist one on the same site).

Q.2 ComReg seeks views of interested parties regarding the frequency bands currently available for SES as set out in ComReg document 00/64R316, and on the potential for opening up of frequency bands not already available, in relation to either the bands mentioned above, or any other bands considered relevant (noting that this does not include frequencies for use with licence-exempt terminals, which is not within the scope of this project). Views on use cases for these bands and likely time scales around demand for the spectrum would be helpful. Please provide evidence and reasoning for your views.

GSOA indeed notes that some spectrum recommended for satellite services by the ITU is not currently available for SES licensing in Ireland:
• Frequencies below 3 GHz
• Frequencies in the Ka band where only 500 MHz is available for Earth-to-space links (in 29.5-30.0 GHz), with the corresponding space-to-Earth allocation (19.7-20.2 GHz)

In fact, GSO and NGSO satellite services using significant parts or the entire Ka-band spectrum 27.5-30.0 GHz and 17.7-20.2 GHz have long deployed in many regions of the world for all sorts of business and consumer services, including in Europe (e.g. Avanti gateways in the UK). The spectrum used by several satellite operators is not only for license-exempt terminals, but also for satellite earth stations of different kinds and different sizes used for very high-throughput transmissions, making it necessary to protect both uses in the same band, and therefore provide hand-in-hand regulation for both SES and user terminals. As a few examples:

- Satellite earth stations connecting to the O3b MEO constellation are everywhere in the world, including on board ships cruising in Europe.

- OneWeb itself is relying on feeder-links for its LEO constellation that are using large parts of the 2.5 GHz of FSS Ka-band.
- The frequency bands of Telesat Lightspeed include the 17.8-18.6 GHz and 18.8-20.2 GHz bands in the space-to-Earth direction, and the 27.5-29.1 GHz and 29.5-30.0 GHz bands in the Earth-to-space direction for both user terminals – such as Earth Stations In Motion (ESIM) and VSATs – and gateway earth stations.
- Amazon's Project Kuiper will operate in the full FSS Ka-band to service user terminals and Earth Stations in Motion.

If ComReg is serious about modernising its licensing framework to attract satellite ventures and businesses, it is essential that their SES licensing regime reflect this reality.
In addition, indeed, Q and V bands will become important for additional satellite capacity in the future. This year, satellite system using 40-50 GHz frequencies will be in service. These bands are currently under a lot of discussion and many operators are developing projects around this available spectrum. It is important to note that as per RR. No.5.516B, a number of bands have been identified for High Density Fixed Satellite Services (HD-FSS) in Region 1: 27.5-27.82 GHz, 28.45-28.94 GHz, 29.46-30 GHz (Earth to space), 17.3-17.7 GHz, 19.7-20.2 GHz, 39.5-40.5 GHz, 47.5-47.9 GHz, 48.2-48.54 GHz, 49.44-50.2 GHz (space to Earth). As examples:

- The Hughes Network Systems, LLC Jupiter 3 satellite will be launched this year with the use of frequencies in the 40/50 GHz band.
- OneWeb has filed with ITU to use Q/V band for its future generation of LEO constellation.
- Kuiper has filed with the ITU to use Q/V band for its future generation of LEO constellation.

The CEPT-ECC most recently adopted a decision on the use of the bands 47.2-50.2 GHz and 50.4-52.4 GHz by the fixed-satellite service (Earth-to-space).[6] The ECC decision explains the motivation for the adoption of this text:

> "Many satellite operators which currently use the lower frequency bands (C-band, Ku-band and Ka-band) have already launched or are developing systems that will use the Q/V band allocations in the near future. The satellite industry will need access to spectrum for gateway stations and for terminals. A clear and stable regulatory environment is important to give confidence to the industry in investing in these new systems and technologies. This demand for access to Q/V band is driven by a number of factors:
>
> - the lower Ka-band frequencies are becoming congested, with around 138 GSO satellites operating in Ka-band and numerous non-GSO systems, some with thousands of satellites, in various stages of development and deployment;
> - Q/V band spacecraft and terminal technology is becoming more mature and cost-effective;
> - the development of satellite communication terminals using a new reconfigurable antenna technology, known as Metamaterials Surface Antenna, offering electronic beam-steering performance of a typical phased array antenna. Such technology is ideally suited to Q/V band, allowing small, low profile user terminals."

[6] Available from: ECC Decision (21)01 (cept.org)

Q.3 ComReg seeks views of interested parties regarding:
a) any use cases that do not fall into the broad [use cases] categories outlined above; and
b) views on any of the use cases identified and the understanding of these set out in the DotEcon report, in particular with regard to market trends (e.g. commercial viability) and factors relating to use of satellite earth stations and licensing requirements.
c) Please provide evidence and reasoning for your views.

GSOA notes the following satellite use cases identified by ComReg:

1. Broadcasting
2. Mobile Communications
3. Internet of Things (IoT)
4. Earth Exploration & Remote Sensing
5. Broadband
6. GPS and navigation

GSOA is an association of satellite operators essentially dealing with communications, which excludes activities under 4 and 6 above. Furthermore, we would like to clarify that satellite operators' connectivity solutions encompass a wider portfolio of areas, based on various space and ground technologies:

- Satellite notably provides fixed and mobile broadband solutions on Earth, on sea and in sky. The various ECC decisions on ESOMPs which Ireland has adopted are precisely about the usage of earth stations on board trains, ships or planes
- Satellite provides connectivity and secure communications solutions to institutions and government, enterprises and individual users
- Satellite contributes to the 5G and Cloud ecosystems. This is precisely what we understand from ComReg's statement that: *"There is potential for satellites to serve as a complement or substitute to terrestrial links in mobile communications networks. Satellites can be used as a back-up to terrestrial links and/or as an alternative to backhaul services in remote areas that have no available terrestrial links."*
- Inter-satellite services are also being developed in order to enhance permanent connectivity. For example, although GSOA does not have direct applications in Earth Exploration and Remote sensing, inter-satellite services are expanding to accommodate data-dumping at any given time for Earth exploration satellite constellations to deliver images in real time.
- Satellite constellations today operate in GEO, MEO and LEO orbits, and the ground stations are getting increasingly diverse to better respond to the market demand.

As illustrations:

- The role of satellite communication for 5G: all use cases have been extensively identified and explained in our 2020 brochure available from our GSOA website: https://gsoasatellite.com/wp-content/uploads/2020-11-5G-Ecosystems-UPDATE-NOV-2020.pdf

- The innovative trends in satellite antennas: earth stations that are SES or TSS (using ComReg's terminology) are now designed to be e.g. multi-orbit, multi-frequency or adapted to the moving platform they are installed on (e.g. flat panel antennas).
  Satellite operators also successfully demonstrated integrated GEO and LEO broadband service.[7]

The market trends are clear, as reported in the most NSR and Euroconsult studies,[8] with the advent of LEO mega-constellations, the further deployment of MEO platforms and the launch of very high throughput GEO networks. These developments will enable satellite operators to offer 5G ecosystem services and Cloud connectivity, bridge the digital divide everywhere including in Europe (as revealed by the recent pandemics), connectivity to flights, ships, trains and cars, M2M / IoT and dedicated connectivity platforms to civil and military governments as well as international organisations (UN, NGOs, etc.). Also, as ComReg is mentioning, satellite is vital to restore connectivity in case of natural disaster (yet not only through mobile communications) or terrestrial blackout (resilience).[9]

Finally, GSOA wishes to confirm that "there is still a large installed base of satellite TV receivers" all over Europe, including in the UK and in Ireland, so "the need for broadcasters to use Earth stations to uplink the broadcast to geostationary satellite is expected to remain important for the foreseeable future." This is well reflected by the ongoing satellite TV business pursued by operators such as SES (operating the ASTRA fleet in Europe), Intelsat and Eutelsat.

Q.4 ComReg seeks views in relation to any potential harmful interference between SES ground stations and also any potential for harmful interference that may occur as a result of newly launched LEO systems. Please provide evidence and reasoning for your views.
ComReg states:

"there have also been suggestions that there is potential for harmful interference between ground stations for different LEO constellations and that significant geographical separation may be necessary to manage this.
The multi-directional antennas used to communicate with various satellites in a constellation from the same ground station means that the techniques available to limit interference between GSO ground stations may not be as effective in the case of LEO systems."

Gateways on NGSO systems consist of arrays of antennas tracking several satellites at the same time. The complexity of gateway operation and lower elevation angle can lead to more interference scenarios between LEO and MEO systems than GEO. Coordination is needed between NGSO systems to ensure that gateways of different systems do not interfere with each other. Various mitigation

[7] https://spacenews.com/intelsat-and-oneweb-demonstrate-integrated-geo-and-leo-broadband-service/

[8] See NSR Global Space Economy - NSR or Euroconsult estimates that the global space economy totaled $370 billion in 2021 - Euroconsult (euroconsult-ec.com)

[9] From the consultation document: *"Satellite earth stations can be used in mobile communications to fill gaps in coverage and also to extend mobile communications to areas that would otherwise be unreachable by terrestrial links. Satellite earth stations in mobile communications would be beneficial to, for example, customers in remote areas, in aiding disaster response, search and rescue operations, and for industries operating in remote locations such as forestry or mining. Satellite earth stations can also provide resilience for fixed and mobile networks in the event any issues are experienced with the physical infrastructure."*

techniques can be used to facilitate co-existence, including separation distances, power limitations, use of high gain antennas with high off-axis discrimination.

Q.5 ComReg seeks views from interested parties regarding any potential interference to SES from other terrestrial uses, such as 5G. Please provide evidence and reasoning for your views.

Coexistence of IMT with other radiocommunications systems in general has been a long and fiercely debated problem that has raised, and is still raising, a lot of concerns. This is not specific to the satellite sector, as several other valuable spectrum users (e.g. broadcasters, WIFI, fixed links operators, radars, scientific community) are suffering from the increasing spectrum demand from the mobile operators and vendors and the potential for harmful interference. GSOA expects ComReg to be fully aware of the exponential spectrum demand for mobile terrestrial 5G systems which high-power emissions in ubiquitous deployments implies very spurious effects, not only *within* the frequency bands which the 5G equipment is using, but also in *adjacent* bands used for other services, including satellite.
Numerous ITU and CEPT reports have established the strict conditions under which IMT and FSS can coexist. For example, ITU-R Report M.2109 (WRC-15) and S.2368 (WRC-19) have concluded on separation distances in the order of 100km between the services. ComReg rightly refers to the ECC and EC deliverables concerning the usage of the 3400-3800 MHz and 24.25-27.5 GHz bands:
"Concerns have also been raised by stakeholders regarding 5G services, for example, that the emergence of 5G could limit the spectrum available to satellite operators. In that regard, ComReg notes that in respect of both the 3.6 GHz and 26 GHz bands such issues have been considered and addressed by the ECC in CEPT Reports 67 and 68 and ECC Report 254, and by the European Commission in Decision (EU) 2020/590 and Decision (EU) 2019/235."

GSOA is concerned about potential out-of-band emissions from the adjacent 26 GHz band by terrestrial IMT/5G systems into the 28 GHz band. Increases in power by terrestrial IMT/5G systems in the 26 GHz band could increase terrestrial IMT/5G out-of-band emissions into the 28 GHz band. Increased out-of-band emissions in the 26 GHz band could adversely affect the interference environment in the 28 GHz band by interfering with the ability of satellite receivers in space to receive signals from earth stations. Therefore, GSOA respectfully requests that ComReg limit out-of-band emissions from terrestrial IMT/5G operations in the 26 GHz band into the 28 GHz band to protect satellite broadband service in the adjacent 28 GHz band. GSOA also requests that ComReg ensure that the *aggregate level* of terrestrial IMT/5G out-of-band emissions from the 26 GHz band into the adjacent 28 GHz band does not cause harmful interference to satellite receivers in the 28 GHz band.

The problem has also become acute for satellite services using C-band. Despite ECC and EC reports and decisions, and the numerous comments provided by the satellite industry to European and national authorities, most countries in Europe have not implemented any mitigation measures ensuring the protection of FSS in 3400-3800 MHz, basically forcing the users of satellite services to migrate their operations above 3800 MHz (and in a few cases, to other FSS frequency bands). Even worse, some European countries have not established the conditions to ensure appropriate protection of FSS operating above 3800 MHz from the out-of-band emissions of IMT 5G operating in 3400-3800 MHz, in the absence of IMT power limits and / or guard bands. In other cases, some administrations acknowledge the issue of poorly filtered 5G unwanted emissions and note that adjacent band impact into FSS Earth stations would still present critical issues.

GSOA members are aware that SES relying on C-band in Europe are not many, but some are used for essential links providing critical national or international services (GMDSS, satellite earth stations used for Galileo, vital communications platforms such as emergency.lu, international data connectivity with Africa, international broadcasters such as BBC World, etc.). Given that the EC has now issued a mandate to the CEPT to study the usage of 3800-4200 MHz for private mobile networks (for verticals and industry players) ECC(21)069, GSOA would much welcome ComReg's support in the CEPT groups to make sure this limited part of C-band remains accessible to FSS on a primary and non-interference basis.

Q.6 ComReg seeks views from interested parties regarding any potential interference between SES and fixed links. Please provide evidence and reasoning for your views.

Coexistence between Fixed Service links (FS) and SES has long been managed through appropriate on-site coordination ensured by national regulators, conditioned to the need for SES to have a license subject to appropriate coordination conditions. The situation is now evolving differently with the introduction of FWA using 5G technology, especially if it is used for point-to-multipoint links. GSOA believes that the implementation of 5G technology in FS applications such as FWA presents important risks of interference to incumbent services, including into FSS Earth station receivers. These new FWA application need to be scrutinized and specific frameworks would need to be developed to ensure that other incumbent services are duly protected.
GSOA notes that ComReg specifically refers to the 17.7-19.7 GHz band which an increasing number of Ka-band satellite systems in GEO, MEO or LEO are using to deliver services in all regions, including in Europe. This band is earmarked as part of ECC Decisions 13(01) and 15(04) on ESOMPs (GSO and NGSO) which Ireland has implemented: it would be very unfortunate if the license-exemption which several categories of satellite terminals (TSS) are benefiting from could be challenged by the introduction of new types of 5G FWA services using the same frequency bands.
GSOA therefore asks ComReg to exercise an extreme vigilance on the type of Fixed Radio Links that are licensed in the 17.7-19.7 GHz band to avoid a situation where coexistence with FSS may be seriously challenged.

Q.7 ComReg seeks views from interested parties on what type of information would help operators resolve coordination problems and the extent to which this would reduce the risk of interference (both between SES and between SES and terrestrial services)? Please provide evidence and reasoning for your views.

Coordination between satellite systems is done among operators under the well-established and internationally recognised ITU Coordination Procedures. At domestic level, and as indicated in Q4, coordination discussions and information sharing may allow for co-located gateways or may indicate that there is a required distance separation between NGSO gateways. Additionally, coordination discussions and information sharing, if successful, can reduce the risk of interference.
Making the locations of licensed Earth stations known and exchanging ephemeris data are solutions that may practically be implemented. Other ideas such as providing general operational characteristics can help other non-GSO operators with interference avoidance techniques. Information sharing of licensed SES and terrestrial services available can help initiate the coordination process and reduce

the risk of interference by potentially providing operators the ability to implement preventive techniques to minimize in-line events with other systems. ComReg should encourage the completion of good faith coordination and implementation of interference avoidance techniques to manage interference situations.

Q.8 ComReg seeks views from interested parties on the above including:
a) the proper definition of SES to apply for licensing purposes given the potential for 'light-weight' ground stations being used for some applications (such as IoT downlinks);
b) the structure of the fee schedule (e.g., per earth station, per satellite constellation, bandwidth).
c) any pricing methodologies or approaches that would be suitable for estimating SES fees. ComReg also seeks views of interested parties on the existing charging structure and aspects of that approach that require change or not.
d) what basis should be used to allocate administrative costs, especially given that some SESs may need little or no interference protection (i.e., different fees for different licence types;
e) how to deal with competing terrestrial uses that might be precluded in exclusion zones around SESs needing interference protection and reflect the opportunity cost imposed so that new ground stations locate themselves efficiently.

GSOA encourages ComReg to maintain and further develop a blanket licensing regime for satellite earth stations that are widely deployed using the same characteristics, such as for IoT terminals, mobile devices, VSATs, etc. In addition, fees should always be based on administrative costs, thus enabling low-cost services to users. Similarly, with individual licensed earth station there should be a single fee, based on administrative costs. These approaches are consistent with practice throughout Europe.
In relation to the Current Fee Structure, GSOA notes that the current fees depend on the bandwidth and EIRP. GSOA proposes to assign the spectrum licence fee to the maximum amount of spectrum that can be used at once, rather than the full frequency range of possible operation. It is not uncommon for satellite service providers to use only a certain amount of spectrum within a broader authorized range. This use is intended to reflect the fact that it is the global satellite operators that allocate the spectrum to their service provider customers, based on their coordination agreements and operational needs. Additionally, there are some systems that are able to dynamically assign spectrum within a broad range but are limited by the fact that there is a maximum amount of spectrum that they can use at one time.
It is also unclear how ComReg classifies a NGSO gateway in the current fee structure. As mentioned previously, the same LEO satellite operator deploys multiple antennas using the same frequency in the same location. GSOA would like to seek clarification whether such gateway would be charged as multiple FES or as a Teleport in the current fee structure.
If a NGSO gateway is classified as multiple FES, although the charge seems reasonable for an individual FES, the charge become very high when applied to 10-15 antennas in a typical LEO gateway. However, the spectrum denial in such an array of antennas is not larger than a single antenna, and it is therefore proposed the whole gateway is charged as a single FES.
If a NGSO gateway is classified as a Teleport, the proposed fee is exorbitant when applied to large bandwidth. A typical Ka band teleport using 2GHz uplink and 2 GHz downlink in the Ka band would pay over 2.5 MEuros just in fees. This need to be lowered significantly if Ireland were to attract such gateway deployment in the country.

Q.9 ComReg seeks views from interested parties on which frequency bands could be opened to SES in Ireland? Please provide evidence and reasoning for your views, along with supporting international harmonisation measures for these bands.

GSOA appreciates that ComReg is well aware of the following bands of interest for satellite services, as reflected in the table below (extracted from the consultation document):

Band	Frequencies (GHz)
L-Band	1.518-1.675
S-Band	2
C-Band	3.4 – 7.025
Ku-Band	10.7 – 14.5
Ka-Band	17.3 - 30
V-Band	40 - 70
E-Band	60 - 90

GSOA has also noted the frequency bands (above 3 GHz) that are available for SES use in Ireland (Annex 1), as replicated below:

Table 1 Frequency bands applicable to SES transmit operation

Frequency (GHz)	Other Primary (bold) and Secondary (plain) Sharing Services
5.15 – 5.25	
5.25 – 5.35	Short Range Devices (SRD)
5.35 – 5.47	
5.47 – 5.57	Meteorological, Amateur, Short Range Devices (SRD)
5.725 – 5.85	Amateur, SRD, FWA (5.725–5.875 GHz)
5.85 – 5.925	SRD, FWA (5.725–5.875 GHz)
5.925 – 6.7	L6 & U6 GHz P2P Links
6.7 – 7.075	U6 & L7 GHz P2P Links
7.9 – 8.4	L8 & U8 GHz P2P Links & Meteorological Satellite & Earth Exploration Satellite
10.7 – 11.7	11 GHz Point to Point Links
12.5 – 12.75	Satellite Exclusive Band
12.75 – 13.25	13 GHz Point to Point Links
13.75 – 14.0	Short Range Devices (SRD) (movement detection and alert equipment)
14.0 – 14.25	Satellite Exclusive Band (14.0 -14.5GHz VSAT uplinks)
14.25 – 14.5	
17.3 – 18.1	Feeder link bands for BSS
29.5 – 30.0	

Table 2 Frequency bands applicable to SES receive operation

Frequency (GHz)	Other Primary (bold) and Secondary (plain) Sharing Services
3.4 – 3.6	FWPMA & FWALA (3.4 – 3.8 GHz)
3.6 – 4.2	FWALA (3.4 – 3.8 GHz)
4.5 – 4.8	
6.7 – 7.075	U6 & L7 GHz Point to Point Links
7.25 – 7.3	L7 GHz Point to Point Links & Meteorological Satellite
7.3 – 7.45	L7 & 7 GHz Point to Point Links
7.45– 7.55	7 GHz Point to Point Links & Meteorological Satellite
7.55– 7.75	7 GHz Point to Point Links
7.9 – 8.025	L8 GHz Point to Point Links & Meteorological Satellite
8.025 – 8.175	L8 GHz Point to Point Links & Meteorological Satellite
8.175 – 8.215	L8 GHz Point to Point Links & Meteorological Satellite
8.215 – 8.4	L8 GHz Point to Point Links & Meteorological Satellite
10.7 – 11.7	11 GHz Point to Point Links
11.7 – 12.5	MMDS (if interference protection is required the tabulated fee applies.)
12.5 – 12.75	Exclusive (interference protection not required as this band is exclusive to satellite services)
17.3 – 17.7	Feeder link bands for BSS.
19.7 – 20.2	

GSOA believes that to make it clear and fully transparent, all L, S, C, Ku, Ka, Q and V frequency bands that are available and subject to TSS or SES licenses in Ireland, whether below or above 3 GHz, should be catalogued together. Referring to our comments above in response to Q2, the two tables above should therefore be extended to the L / S / Ka / Q / V-bands that are most relevant to satellite, as referred in the table below:

Band	Frequencies (GHz)
L-band	1.518-1.675
S-band	1.98-2.01 and 2.17-2.2
Ka-band	17.7-20.2 (Receive) and 27.5-30 (Transmit)
V-band	37.5-43.5, 47.2-50.2 and 50.4-52.4

Q.10 ComReg seeks any additional views from interested parties on the current SES licensing regime and guidelines? Please provide evidence and reasoning for your views.

GSOA would like to remind that the satellite industry requires a long investment horizon, and the certainty and predictability of regulatory regime is key to its future. Therefore, it is critical that the spectrum allocated to the industry today remains available in the long term in order not to jeopardize its investment.

Q 11 ComReg seeks any additional views from interested parties on the current process for the implementation of ECC Decisions for the exemption from licensing of TSS? Please provide evidence and detailed reasoning for your views.

GSOA refers to our comments above in response to Q2. GSOA commends ComReg for their scrupulous policy to stick to the license-exemption regime established by the CEPT and ECC decisions in the European region.[10] GSOA then invites ComReg to adopt the most recent ECC Decision of 5 November 2021 on the use of the bands 47.2-50.2 GHz and 50.4-52.4 GHz by the fixed-satellite service (Earth-to-space) which we expect ComReg to adopt when further amending their TSS regime.

GSOA also notes ComReg's plan to open the 40.5-43.5 GHz band to IMT for 5G. As explained in our response to Q2 above, given the increasing congestion in FSS usage of the Ka-band with over 130 GSO satellites and several NGSO constellations now in operation, the satellite industry is now developing into Q/V-bands. In term of ITU Radio Regulation, footnote 5.516B identifies 39.5-40.5GHz in Region 1 for ubiquitous deployment of High Density FSS ("HD-FSS"). ERC Decision (00)02 designates the band 39.5-40.5 GHz for uncoordinated FSS and MSS earth stations. The full Q/V-band FSS spectrum 37.5-50.2 GHz is required for satellite gateways, in accordance with current ECC Decisions and those currently under development. ECC has also recently adopted ECC Decision (21)01 to harmonise use of the bands 47.2-50.2 GHz and 50.4-52.4 GHz for FSS uplinks.

Therefore, GSOA asks ComReg to take these Decisions into account when licensing this band to IMT and requires provisions to ensure that future 5G operation do not prevent the licensing of TSS in the 37.5-43.5 GHz band. It will be important to ensure that FSS gateways can benefit from SES licenses in all of the 37.5-43.5 GHz, 47.2-50.2 GHz and 50.4-52.4 GHz bands in Ireland.

Finally, GSOA kindly recommends ComReg to harmonise technical conditions for ESOMPS and ESIMS operating in Ka-band, based on relevant ECC Decisions and increase the allowed e.i.r.p. up 60 dBW for uncoordinated TSS and to remove the exclusion zone around Dublin port for ESOMPs according to ECC Decision (13)01 and (15)04.

[10] Permitted-Licence-Exemptions-for-Terminals-for-Satellite-Services.pdf (comreg.ie)

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28 Jan 2022

Submission to ComReg Document 21/135 - Review of the Satellite Earth Station (SES) Licensing Scheme

In response to the preliminary consultation on Review of the Satellite Earth Station Licensing Scheme, OneWeb would like to provide the following comments to COMREG.

General Background on OneWeb

OneWeb is a global telecommunications provider, with our main European Union office in Luxembourg. The OneWeb system will provide low latency, high capacity broadband connectivity solutions to customers through a new generation of low-earth orbit (LEO) satellites. OneWeb believes that satellite systems have a key role to play in a multi-network broadband ecosystem, often in a complementary way to terrestrial telecommunication solutions.

OneWeb is being deployed worldwide and the OneWeb commercial services in northern Europe – including Ireland – are starting. OneWeb sells satellite capacity on a wholesale, business-to-business model (in other words, not directly to consumers), and our distribution partners are the telecom service providers and mobile network operators in each country, along with large enterprises and government institutions themselves, all of whom then provide broadband internet connections directly to unconnected, underserved end-users and citizens.

Q. 1 ComReg seeks views of interested parties regarding the current SES licence types. Please provide evidence and reasoning for your views.

To date, the lack of an array-based approach has impeded the development of NGSO systems owing to the multitude of separate license applications, which have ended up imposing

onerous fees on the operation of the multiple antennas required for certain NGSO gateways and user terminals. The proposal for an array-based approach, defined as multiple co-located antennas using the same frequencies and managed by the same licensee, is strongly supported.

In terms of regulatory fees, such an approach is also more aligned with opportunity cost of spectrum, for which a co-located array of antennas, using the same frequencies, does not deny more spectrum from other users than a single antenna would. This gateway licensing approach has been adopted in many countries around the world. For example, the US considers that *"Multiple antennas in an NGSO FSS gateway earth station complex located within an area bounded by one second of latitude and one second of longitude may be regarded as a single earth station for purposes of coordination with terrestrial services."*[1]
This also bring access charges more in line with those imposed in other jurisdictions and will encourage investment in the Ireland space industry.

Q. 2 ComReg seeks views of interested parties regarding the frequency bands currently available for SES as set out in ComReg document 00/64R316, and on the potential for opening up of frequency bands not already available, in relation to either the bands mentioned above, or any other bands considered relevant (noting that this does not include frequencies for use with licence-exempt terminals, which is not within the scope of this project). Views on use cases for these bands and likely time scales around demand for the spectrum would be helpful. Please provide evidence and reasoning for your views.

Fixed Satellite Services (FSS) such as those offered by OneWeb are currently using the Ka-band to provide critical communications services– including broadband services needed to reduce the digital divide. The 27.5-30.0 GHz uplink band paired with 17.8-19.3 GHz downlink is used for the gateway earth station-to-satellite link in our current satellite design.

In addition, given the current congestion in the Ka band with over 130 GSO satellites and several NGSO constellations, the satellite industry is increasingly looking at Q/V as the new frontier for future development of satellite communication. Furthermore, the whole of the spectrum range between 37.5-50.2 GHz is required by feeder link Earth stations in the FSS allocations which require high spectrum bandwidth; such applications will alleviate the pressure on the Ka-band.

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. Similarly, any required licensing applications will be submitted to Ireland when appropriate.

Looking higher in the bands, 70/80 GHz will also be used by satellite operators in the future.

Q. 3 ComReg seeks views of interested parties regarding:

[1] 47 CFR § 25.203 (c)(6) - Choice of sites and frequencies:

a) any use cases that do not fall into the broad categories outlined above; and
b) views on any of the use cases identified and the understanding of these set out in the DotEcon report, in particular with regard to market trends (e.g. commercial viability) and factors relating to use of satellite earth stations and licensing requirements.
c) Please provide evidence and reasoning for your views.

OneWeb respectfully submits its view that LEO satellite services are not limited to fixed broadband, but have wider applications in many other areas, including providing backhaul to mobile communications; disaster relief; and connectivity to government services, whether for civilian usage such as schools or hospitals in remote regions, or defence use.

Furthermore, LEO systems will be used to bring broadband connectivity on the move. OneWeb will be offering solutions that have been specifically tailored to the unique needs of the maritime and aviation services by 2023. Whether it is improving access to real time performance data, or enhancing customer experiences for plane and cruise passengers, our capabilities enable user access to fast, flexible, secure connectivity as a standardised service.

Q. 4 ComReg seeks views in relation to any potential harmful interference between SES ground stations and also any potential for harmful interference that may occur as a result of newly launched LEO systems. Please provide evidence and reasoning for your views.

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. As a matter of fact, by following these existing ITU rules, OneWeb is able to collocate its gateways with some GSO gateways in several jurisdictions.

Gateways for NGSO systems generally consist of several antennas that track multiple satellites constantly on the move which increases the complexity of gateways and interference scenarios between NGSO systems. Coordination is needed between NGSO systems to ensure that gateways of different systems do not interfere with each other. The ITU Coordination Procedure is the well-established and internationally recognised framework used to ensure coordination between satellite networks and avoid harmful interference.

A minimum separation distance is generally needed between the gateways of different NGSO systems. The required separation distance would depend on the specific technical and operational characteristics of the concerned systems and would be negotiated during coordination discussions after detailed analyses. Further mitigation techniques can be used to facilitate co-existence, including power limitations, use of high gain antennas with high off-axis discrimination.

Q. 5 ComReg seeks views from interested parties regarding any potential interference to SES from other terrestrial uses, such as 5G. Please provide evidence and reasoning for your views.

OneWeb believes that allocation of the 26 GHz band for terrestrial 5G and the 28 GHz band for space-based (satellite) usage is sound and will avoid interference in these bands.

However, OneWeb would like to request that proper consideration be taken before licensing the 42 GHz (40.5-43.5 GHz) range for terrestrial 5G. As mentioned in question 2, OneWeb is currently developing its second-generation constellation which will be deployed from 2024. That constellation will use the Q/V satellite frequency allocations (38/48 GHz ranges). This co-frequency scenario between NGSO satellite gateways and 5G deployment will have to be studied, in order to define adequate protection criteria around the gateway location as part of the 5G licensing process.

Q. 6 ComReg seeks views from interested parties regarding any potential interference between SES and fixed links. Please provide evidence and reasoning for your views.

As mentioned in Question 2, OneWeb's current generation of gateways operates in the 27.5-30.0 GHz uplink band, paired with 17.8-19.3 GHz downlink. OneWeb notes the band 17.7-19.7 is currently only available for Fixed links in Ireland. Co-existence between fixed links and gateways is generally possible, especially when the location of the fixed service is known. In this regard, OneWeb would like to commend ComReg for making fixed link information publicly accessible, as it will help satellite operators to choose the appropriate location with less potential interference.

Once a satellite gateway license is granted, ComReg would also need to inform and seek opinions for any new fixed radio link application in the vicinity of the gateway.

Q. 7 ComReg seeks views from interested parties on what type of information would help operators resolve coordination problems and the extent to which this would reduce the risk of interference (both between SES and between SES and terrestrial services)? Please provide evidence and reasoning for your views.

Coordination between satellite systems is handled directly among operators under the well-established and internationally-recognised ITU Coordination Procedures. Following ITU framework, 99.95% of spectrum assigned to satellite networks was free from reported harmful interference[2]. As indicated in question 4, such coordination would 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.

If a separation distance between gateways is required, this can be included in the formal Coordination Agreement. Until such a Coordination Agreement is signed between two NGSO systems, the ITU Radio Regulations require the later-filed system to eliminate any harmful interference into the earlier-filed system.

In the absence of a formal Coordination Agreement between two NGSO systems, OneWeb believes that new gateway earth station licenses should not be issued for locations within a certain distance of another already-licensed gateway earth station. Therefore, making the locations of licensed Earth stations and other terrestrial services available publicly can help coordination discussions. In the case of harmful interference that can't be resolved, ComReg should have the power to require licensees to change or cease operations. OneWeb

[2] https://www.itu.int/bestofwrs20/wp-content/uploads/sites/4/2021/05/WRS-20-Orbit-Spectrum-Internatio_nal-Regulatory-Framework.pdf

suggests that any action ComReg takes to resolve degradation to services is done so in alignment with ITU coordination obligations and procedures regarding harmful interference[3], i.e., that later-filed systems should be asked to modify their operations to ensure that there is no harmful interference into more senior filings.

Q. 8 ComReg seeks views from interested parties on the above including:
a) the proper definition of SES to apply for licensing purposes given the potential for 'light-weight' ground stations being used for some applications (such as IoT downlinks);
b) the structure of the fee schedule (e.g., per earth station, per satellite constellation, bandwidth).

c) any pricing methodologies or approaches that would be suitable for estimating SES fees. ComReg also seeks views of interested parties on the existing charging structure and aspects of that approach that require change or not.
d) what basis should be used to allocate administrative costs, especially given that some SESs may need little or no interference protection (i.e., different fees for different licence types.;
e) how to deal with competing terrestrial uses that might be precluded in exclusion zones around SESs needing interference protection and reflect the opportunity cost imposed so that new ground stations locate themselves efficiently.

It is unclear how ComReg classify an NGSO gateway in the current fee structure. As mentioned previously, the same LEO satellite operator deploys multiple antennas using the same frequencies in the same location. OneWeb would like to seek clarification whether such a gateway would be charged as multiple FES or as a Teleport in the current fee structure.

If an NGSO gateway is classified as multiple FES, although the charge seems reasonable for an individual FES, the charge become very high when applied to 10-15 antennas in a typical LEO gateway. However, as mentioned in Question 1, a gateway composed of several antennas using the same frequencies in the same location should be given a single license and, since the opportunity cost for an array of such antennas is no different than for a single antenna, the array licence should charge the same fee as for one antenna, with possibly some administrative fees per antenna.

If an NGSO gateway is classified as a Teleport, OneWeb also has concerns with the current high licence fee incurred for a Teleport facility with large bandwidths. As mentioned above, OneWeb uses approximately 2 GHz of uplink and 1.3 GHz of downlink in the Ka-band for its gateways. Calculations using the current fee schedule indicate a license fee of over 2M Euros for such a gateway.

If Ireland truly wishes to encourage broadband services for all its people, then punitive fees for a technology that uses broad bandwidth is not effective. OneWeb believes the fee schedule should be revised: unit prices should be reduced significantly as the bandwidth

[3] Article 15 of the Radio Regulations

grows and should take into account the much wider bandwidth used by modern satellite systems (rather than the old-fashioned “tens of MHz” as defined in current schedule for Teleport). Only with revised fees and associated with the revised array licensing approach described above will the economics make Ireland attractive for operators such as OneWeb to plan satellite gateways in the country.

Q. 9 ComReg seeks views from interested parties on which frequency bands could be opened to SES in Ireland? Please provide evidence and reasoning for your views, along with supporting international harmonisation measures for these bands.

See question 2

Q. 10 ComReg seeks any additional views from interested parties on the current SES licensing regime and guidelines? Please provide evidence and reasoning for your views.

Satellites of all types have a very long development and investment cycle: unlike terrestrial technologies, it takes years to secure spectrum at the ITU and then make and launch the satellites. It is also nearly impossible to change the system design or swap the frequencies used once the satellite is launched. Therefore, it is of critical importance that ComReg takes a long-term view of the regulatory framework, including spectrum allocation, and provide certainty and visibility to attract satellite industry investment.

Q. 11 ComReg seeks any additional views from interested parties on the current process for the implementation of ECC Decisions for the exemption from licensing of TSS? Please provide evidence and detailed reasoning for your views.

OneWeb would like to congratulate ComReg for swiftly incorporating ECC decisions into Irish regulations. This rapid adoption ensures that new technologies such as OneWeb’s broadband satellite services will be deployed without delay in Ireland.

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
Director of Government affairs and Policy

7 SpaceX

SPACEX

January 28, 2022

An Coimisiún um Rialáil Cumarsáide
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Re: *Review of the Satellite Earth Station Licensing Scheme (ComReg 21/135)*

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 (ComReg 21/135) (the "Consultation").[1] 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 100 missions to space.

SpaceX is leveraging its accumulated expertise in space system manufacturing, design, and operations, to develop Starlink, a constellation of satellites 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. Starlink 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.

[1] *See* ComReg 21/135, "Review of the Satellite Earth Station Licensing Scheme", 17 December 2021.

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 seeks views of interested parties regarding the current SES licence types. Please provide evidence and reasoning for your views.

SpaceX agrees with the DotEcon report that "[i]t is important that the licensing regime is broadly neutral."[2] For that reason, SpaceX supports the continued availability of both fixed earth station licences and teleport facility licences. Access to both licences will provide flexibility for operators to choose the approach that best meets their individual needs, while leaving room for future innovation in earth station design and deployment.

To promote licensing neutrality, SpaceX further urges ComReg to harmonize the licence duration for both fixed earth station licences and teleport facilities licences. Specifically, SpaceX suggests establishing a licence term of not less than ten (10) years, with the ability to renew at the end of the term. Longer licence terms and renewal options provide important certainty and predictability to market entrants that can help justify the significant upfront and operational expenses necessary to deploy earth stations that can support connectivity for consumers and businesses.

Finally, while SpaceX supports ComReg's test and trial program, more can be done to increase the value and attractiveness of the program for innovative companies. For example, as currently structured, the trial program does not appear to adequately support trial licences for services other than those provided directly to consumers—such as trials of new backhaul spectrum. ComReg should clarify that trial licences may be used in connection with backhaul networks that support consumer services, but are not purchased directly by consumers. This flexibility will allow providers to test groundbreaking technology while it is integrated in their networks, ensuring Irish customers receive the best possible connectivity in the long run. Finally, while it is appropriate not

[2] ComReg 21/135a, "DotEcon Report: Satellite Earth Station Licensing Review", at 20, 17 December 2021 ("DotEcon Report").

to provide full interference protection to experiments and trials, SpaceX encourages ComReg to include test and trial licensees within its SiteViewer system as a signal to subsequent licensees that a test or trial is ongoing.

Response to Question 2: ComReg seeks views of interested parties regarding the frequency bands currently available for SES as set out in ComReg document 00/64R316, and on the potential for opening up of frequency bands not already available, in relation to either the bands mentioned above, or any other bands considered relevant (noting that this does not include frequencies for use with licence-exempt terminals, which is not within the scope of this project). Views on use cases for these bands and likely time scales around demand for the spectrum would be helpful. Please provide evidence and reasoning for your views.

Access to adequate spectrum is critical to ensure consumers reap the benefits of any communications technology, including satellite broadband. SpaceX urges ComReg to make as much spectrum available for fixed satellite earth stations as possible to maximize the value of satellite networks for consumers, including in rural and remote areas. To start, SpaceX suggests focusing on opening bands where the fixed-satellite service enjoys a co-primary allocation—including within the Ka-band (17-40 GHz), Q/V-band (33-75 GHz), and E-band (71-76 GHz / 81-86 GHz).

First, SpaceX agrees with the several other respondents that ComReg should open the entire 27.5-30 GHz band ("upper Ka-band") to satellite earth station use.[3] The upper Ka-band is critical for current and future satellite systems. In contrast to even higher frequencies, Ka-band has the advantage of lower rain fade, enabling robust connections even in inclement weather. Access to the upper Ka-band will not impact incumbent fixed users, due to the highly directional nature of fixed links and consequent ease of coordination between satellite earth stations and fixed links.

With respect to Q/V band spectrum, SpaceX agrees with DotEcon that this band will be useful "in the foreseeable future," particularly for gateway connections to support growing consumer demand for real-time applications.[4] There is a pressing need for access to the band as SpaceX—along with several other operators—has been authorized to deploy Q/V band satellites. To promote rapid access to this critical band, SpaceX urges ComReg to adopt ECC Decision (21)/01 at or before the May 2022 deadline and expeditiously extend access to other co-primary parts of the band (e.g., 37.5-40 GHz).

In addition, as explained more in its answer to Question 9 below, SpaceX supports opening 71-76 GHz and 81-86 GHz spectrum (the "70/80 GHz bands") for fixed-satellite service use. The ITU and CEPT have allocated the 70/80 GHz bands to the fixed-satellite service on a co-primary basis, and footnote 5.561 of the ITU table already requires fixed, mobile, and broadcasting services in the 74-76 GHz band to protect stations of the fixed-satellite service. Moreover, due to their high-gain, pencil-beam nature, fixed-satellite service gateway links can be designed such that they present a low risk of interference toward the horizon similar to traditional fixed links in the bands.

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3 *See* Consultation at ¶ 3.11; DotEcon Report at 5.

4 *See id.* at 6.

As such, coordination between terrestrial and fixed-satellite service gateway links in the bands is straightforward and achievable with only minor changes to the existing terrestrial licensing process. Lastly, contrary to the DotEcon report,[5] development of 70/80 GHz antennas for satellite earth stations is far beyond the experimental stage; indeed, this spectrum will form an essential part of SpaceX's constellation in the very near future and will directly benefit Irish consumers.

Finally, ComReg can use this opportunity to authorize the use of spectrum bands above 100 GHz that are allocated on a co-primary basis to the fixed-satellite service. As Ofcom noted in a recent discussion document,[6] these bands show significant promise for high-capacity satellite gateways, particularly as lower frequency bands become more congested and consumers demand greater capacity to support bandwidth-intensive, real-time applications. Moreover, the high-gain, directional nature of these high-frequency links will facilitate coexistence similar to other high frequency bands, allowing these bands to be efficiently and intensively used by a number of different operators. Consistent with Ofcom's goals, ComReg should establish a licensing regime that "adopts spectrum sharing by default" in these bands. A "unified light-licensing" framework supported by a transparent database of fixed links and satellite earth stations, as suggested in Question 9 below, would be fit for this purpose.

Response to Question 3: ComReg seeks views of interested parties regarding: a) any use cases that do not fall into the broad categories outlined above; and b) views on any of the use cases identified and the understanding of these set out in the DotEcon report, in particular with regard to market trends (e.g. commercial viability) and factors relating to use of satellite earth stations and licensing requirements. c) Please provide evidence and reasoning for your views.

While SpaceX has no additional broad use cases to add, two areas within Fixed Broadband warrant inclusion.

First, in addition to providing service to consumer homes and businesses, fixed-satellite service broadband can provide connectivity to community anchor institutions—such as schools, libraries, and community centers—that currently lack reliable broadband access. While these institutions play a critical role in all communities, they are particularly valuable in rural and remote areas—including small islands—where consumers may lack robust connectivity at home. Moreover, as central places of learning, exploration, civic engagement, and economic activity, these institutions can supercharge local communities that have for too long found themselves on the wrong side of the digital divide. Starlink already has been deployed around the world to serve community institutions. For example, Starlink serves the Sotomo Alto community in Chile, which can only be accessed by sea. That community of approximately 100 residents uses Starlink at the local school, which will also serve as a community center.

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5 *See id.*

6 Ofcom, "Unlocking the potential of Terahertz radio spectrum: The role of spectrum management," Discussion Document, at 3 (2 Dec. 2021).

Second, fixed satellite services can also play a role in disaster preparedness and response. Satellite services including Starlink have long played a role in connectivity during disasters, connecting impacted individuals and first responders. For example, after extreme floods in western Germany last year, SpaceX temporarily deployed 100 Starlink terminals to the affected regions with help from local municipalities, organizations and fire departments. About half the units were installed at first responder sites such as fire departments and hospitals, with the other half for local communities to connect with their family members. Similarly, following devastating wildfires in Washington state in the United States, SpaceX dispatched Starlink user terminals to respond to the crisis. First responders used Starlink Internet to coordinate where to drop water and to request additional resources and supplies. Affected families were able to connect to Internet to begin rebuilding their lives.

In both of the above two cases, having satellite earth station infrastructure in place well in advance of terminal deployment, including access to adequate spectrum to meet growing demand, was critical. To facilitate this access and rapid deployment, ComReg should first ensure that spectrum allocated on a co-primary basis to fixed-satellite services is made available for licensing expeditiously. Access to additional spectrum—including Q/V- and E-band millimetre wave spectrum—will ensure that satellite providers can serve more people with higher quality broadband, meeting growing demand for real-time applications and improving resilience in the wake of natural disasters. Moreover, ComReg should enhance its SiteViewer and eLicensing process to enable satellite operators to more efficiently plan their networks and obtain licences for ground equipment (as described in the answer to Question 6, below). These changes will benefit consumers, promote coexistence, limit interference, and encourage the shared use of spectrum among operators in Ireland.

Response to Question 4: ComReg seeks views in relation to any potential harmful interference between SES ground stations and also any potential for harmful interference that may occur as a result of newly launched LEO systems. Please provide evidence and reasoning for your views.

SpaceX agrees that "[t]here is little practical limitation on the number of [satellite earth stations] within Ireland arising from interference between them,"[7] and "any interference experienced" between satellite earth stations "can likely be easily managed due to the operational nature of SES."[8]

While SpaceX appreciates ComReg's focus on facilitating coordination and reducing the risk of interference between satellite earth stations, it cautions ComReg against adopting overly prescriptive, complex, mediated, or inefficient siting or coordination requirements that could slow deployment to consumers and impose unnecessary and massive time and cost burdens on operators and ComReg alike. Instead, SpaceX urges ComReg to prioritize private operator-to-operator coordination, which is the gold standard for managing earth station interference, supported by policies that promote timely completion of coordination and efficient use of spectrum. Well-

7 DotEcon Report at 22-23.
8 Consultation at ¶ 3.35.

designed rules will drive rapid operator-to-operator coordination without preconceived conditions that could unintentionally undermine technical discussion.

For example, ComReg could consider imposing a spectrum-splitting backstop in the event operator-to-operator coordination is not completed by the time both operators have commenced service in Ireland. Under this approach, operators would strive to reach a coordination agreement before both systems have commenced service in Ireland. In the event that such an agreement is not reached, the operators would split the spectrum evenly once operational. Because spectrum splitting is not an ideal solution for either party, the prospect of splitting would incentivize operators to find a better solution through private coordination. In fact, one of the only countries to formally consider this issue—the United States—adopted such an approach and is already seeing widespread deployment of NGSO systems.

To create further incentives to construct spectrally efficient systems capable of better spectrum sharing, ComReg could also consider providing first choice of spectrum in the split to the more technologically efficient, flexible, and robust system. This approach will create a "race to the top" effect that will promote innovation and competition. This race to the top will allow more systems to share the spectrum, ultimately leading to more choices for Irish consumers.

Operator-to-operator coordination, coupled with efficiency-rewarding policies, is far superior to other alternatives. For example, ComReg should reject calls by those with inefficient systems to shift the burden to their competitors by imposing unnecessary separation distances between satellite earth stations. Well-designed systems are already capable of a range of technical solutions beyond physical separation that enable close siting of satellite earth stations. In contrast, minimum separation distances would harm consumers by arbitrarily limiting the number of operators that can site satellite earth stations, limiting capacity while rewarding inflexible systems that have failed to implement even the most basic spectrum sharing technologies, thereby creating incentives for others to employ spectrally inefficient networks.

Response to Question 5: ComReg seeks views from interested parties regarding any potential interference to SES from other terrestrial uses, such as 5G. Please provide evidence and reasoning for your views.

SpaceX agrees with stakeholders that the "expansion of 5G services could limit the spectrum available to satellite operators."[9] In its response to the 26 GHz consultation, SpaceX explained that its network uses gateway earth stations in frequency bands (27.5-29.1 GHz) immediately adjacent to the upper portion of the 26 GHz band, beginning with two earth stations that were recently authorized in Ireland. These earth stations are essential to provide the backhaul for the high-speed data traffic used by Irish consumers and will continue to be essential as SpaceX deploys its next generation infrastructure.

To ensure customers that rely on this ground infrastructure are protected in bands where the fixed-satellite service and mobile services are co-primary, ComReg should adopt appropriate

[9] DotEcon Report at 23; *see also* Consultation at ¶ 3.39.

technical and operational rules to ensure that 5G services do not cause harmful interference to satellite earth stations.[10] By striking this careful balance, ComReg can ensure all Irish consumers and businesses have access to broadband connectivity in even the farthest reaches of the country.

Response to Question 6: ComReg seeks views from interested parties regarding any potential interference between SES and fixed links. Please provide evidence and reasoning for your views.

As a general matter, the risk of interference between directional, point-to-point fixed links and satellite earth stations is low and readily managed through common frequency planning and coordination techniques.[11] This is particularly true in higher frequencies, where both fixed links and satellite earth stations feature high gain, directional beams that enable users to coexist with minimal physical and angular separation, both in rural and urban areas.[12] To manage this interference, SpaceX recommends that ComReg make sufficient data about fixed links available in its SiteViewer tool to facilitate network planning, siting, and coordination.

As ComReg notes in its "Guidelines for Satellite Earth Station Licences in frequencies above 3 GHz," where satellite earth stations and fixed links are co-primary, the "priority of both services is equal," and therefore applications are rightly processed "on a first-come-first served basis."[13] To ensure equal access to spectrum, SpaceX recommends that ComReg develop a unified light-licensing process for fixed links and satellite earth stations in higher frequency bands such as the Ka, Q/V, and E bands. Under this framework, satellite operators would apply for earth stations through the eLicensing system and—provided there is no risk of cause harmful interference to earlier-in-time users—automatically receive a licence. This process will ensure that both fixed links and satellite operators can have equitable access to shared spectrum with similar application processing times.

Response to Question 7: ComReg seeks views from interested parties on what type of information would help operators resolve coordination problems and the extent to which this would reduce the risk of interference (both between SES and between SES and terrestrial services)? Please provide evidence and reasoning for your views.

With respect to coordination between satellite operators, SpaceX reiterates that private, good faith operator-to-operator coordination—coupled with policies that reward efficient use of spectrum such as a spectrum-splitting backstop—is the gold standard for promoting coexistence

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[10] As explained below in the response to Question 8, SpaceX urges ComReg not to adopt fees based on exclusion zones, but rather to focus on adopting spectrum policies that promote efficiency and coexistence.

[11] DotEcon Report at 24.

[12] Indeed, through techniques including but not limited to shielding, angular discrimination, and low sidelobes toward the horizon, satellite earth stations can reduce risk of interference toward the horizon and thereby coexist with terrestrial users in more congested areas.

[13] ComReg 00/64R3, "Guidelines for Satellite Earth Station (SES) Licences operating in spectrum above 3 GHz", § 4.1, 17 May 2017.

between satellite operators. During these private discussions, operators can share sensitive information about their systems pursuant to non-disclosure agreements that enable those operators to reach efficient solutions that permit both to deploy.

At the same time, some operators have failed to deploy even the most basic spectrum sharing capabilities in their systems, leveraging this inefficiency to stonewall coordination discussions and establish large keep-out zones around their ground stations. To prevent this sort of gamesmanship, ComReg should consider establishing minimum spectrum sharing capabilities—including steerable beams, satellite diversity, and spectrum-splitting capabilities—as conditions for granting satellite earth station licences to non-geostationary satellite networks. Moreover, to prevent less capable systems from foisting undue obligations on more capable systems, ComReg should clarify that more capable systems have first priority in earth station siting. Those systems without any, or with minimal, sharing capabilities should accept interference from, and not cause interference to, systems that have been designed to be efficient spectrum users.

As for coordination between satellite earth stations and fixed link terrestrial users, ComReg should ensure that its SiteViewer tool includes sufficient and current data about fixed links to enable meaningful interference. At a minimum, this information about fixed links should include the latitude, longitude, altitude, and azimuth of the transmitting and receiving antennas and the radiofrequency properties of each (e.g., center frequency, bandwidth, antenna input power density, antenna maximum gain, antenna gain pattern, receive noise figure, polarization). The publication of detailed fixed links data on Siteviewer not only will aid terrestrial operators, but also will aid satellite earth stations by enabling more rapid gateway siting, coordination, and deployment. This facilitation is particularly important for spectrum bands that are shared on a co-primary basis between terrestrial and satellite networks.

Response to Question 8: ComReg seeks views from interested parties on the above including:

a) the proper definition of SES to apply for licensing purposes given the potential for 'light-weight' ground stations being used for some applications (such as IoT downlinks);

b) the structure of the fee schedule (e.g., per earth station, per satellite constellation, bandwidth).

c) any pricing methodologies or approaches that would be suitable for estimating SES fees. ComReg also seeks views of interested parties on the existing charging structure and aspects of that approach that require change or not.

d) what basis should be used to allocate administrative costs, especially given that some SESs may need little or no interference protection (i.e., different fees for different licence types.;

e) how to deal with competing terrestrial uses that might be precluded in exclusion zones around SESs needing interference protection and reflect the opportunity cost imposed so that new ground stations locate themselves efficiently.

As a general matter, SpaceX agrees with the DotEcon Report that licensing fees should be designed to recover administrative costs of processing licences.[14] A cost-recovery model minimizes the cost of deploying vital services to otherwise unserved Irish consumers by basing spectrum licence fees only on the cost to recover the administrative expenses of processing the licence itself. Moreover, SpaceX agrees with DotEcon that due to the low risk of interference, the "opportunity costs of the spectrum used by SES will in most cases be close to zero,"[15] negating the need for fees above cost-recovery. Even in situations where satellite earth stations and terrestrial users share spectrum in a geographic area, common frequency planning techniques can eliminate the need for exclusion zones, and thus the need for additional fees. Finally, SpaceX agrees that that "administrative costs and opportunity costs do not vary significantly with either the number of constellations served from a given ground station, or the number of antenna used at a given location."[16]

For these reasons, ComReg should limit all satellite earth station fees to administrative cost recovery to ensure that satellite operators can focus their limited resources on serving consumers. Of course, the administrative effort required to process an application may differ depending on the complexity of the analysis required. In contrast, as DotEcon rightly notes, incentive-based fees would rely on speculation about opportunity costs and therefore lack a compelling justification.[17] Indeed, imposing additional fees not tied to administrative cost-recovery—e.g., exclusion zones—would create perverse incentives to claim larger exclusion zones that would negatively impact consumers by limiting competition and quality of service. Moreover, "high or poorly structured fees"[18] can drive satellite operators—including those offering broadband service—from otherwise promising markets by making deployment uneconomical, or could harm consumers by requiring operators to pass on additional costs to consumers through regulatory fees. Finally, SpaceX agrees with DotEcon that "there is no obvious rationale" for consumption-based or per-antenna, per-constellation, or per-earth station fees.[19]

Response to Question 9: ComReg seeks views from interested parties on which frequency bands could be opened to SES in Ireland? Please provide evidence and reasoning for your views, along with supporting international harmonisation measures for these bands.

SpaceX encourages ComReg to take a wide lens when opening new spectrum bands for satellite earth stations in Ireland, including for the Q/V bands and 70/80 GHz bands, for which SpaceX has active ITU filings. These bands will play an important near-term role in ensuring critical backhaul to meet the growing demands of consumers and businesses across the country, including in rural and remote areas where terrestrial service is lacking.

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14 *See* DotEcon Report at 29.
15 *Id.*
16 *Id.* at 30
17 *See id.* at 28.
18 *Id.* at 30.
19 *Id.*

The 70/80 GHz bands in particular are critical for fixed-satellite service operators to meet the growing demands of consumers for high-speed, low-latency broadband connectivity. Contrary to statements in the DotEcon report, development of non-geostationary satellite earth station technology for the 70/80 GHz bands has passed the experimental stage and is ready for deployment imminently.[20] Indeed, the 70/80 GHz bands constitute a core part of SpaceX's second-generation constellation, and will provide gateway links to support consumer and business connections.

The 70/80 GHz bands have been allocated on a co-primary basis to the fixed-satellite service for over twenty years, with specific protections for the fixed-satellite service enshrined in the ITU-R Radio Regulations.[21] The European Allocation Table and Radio Frequency Plan for Ireland also include a co-primary allocation for fixed-satellite service in the 70/80 GHz bands.[22] ECC Recommendation (05)07, while focused on fixed services, notes generally that "[c]onsidering . . . the possible use of high directional/high gain antennas of relatively small size, these wide bandwidths are valuable in supporting applications such as extremely-high-speed data transmission over significant hop lengths, while offering an inherent reduced interference occurrence probability similar to that experienced in lower FS bands . . . ."[23] Based on these technical characteristics, the recommendation states that "[m]ultiple services and applications can be implemented, with simplified coordination mechanisms, ensuring highly efficient re-use of the frequency band." To that end, the recommendation references ECC Report 80 on light-licensing, a model that has been adopted successfully in markets around the world, including in Europe.

The same logic that drove regulators around the world to adopt a more flexible framework for fixed links in the 70/80 GHz bands also supports a flexible approach to accommodating fixed-satellite service earth stations in the bands. Specifically, fixed-satellite service gateways in the 70/80 GHz bands can operate using highly directional/high gain "pencil beam" antennas, high minimum elevation angles that largely eliminate the risk of in-line events, and low power toward the horizon that can meet or exceed terrestrial limits in the bands through the use of readily accessible techniques (e.g., site shielding). These technical and operational characteristics will result in small, predictable coordination zones and facilitate high frequency reuse and a low risk of interference to incumbent and future links. Any risk of interference can be efficiently managed using available coexistence techniques and further enhanced through software-driven processes and self-coordinated light licensing.

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20 In contrast, research into geostationary satellite networks in the 70/80 GHz bands is still preliminary and may be a decade or more away. *See* Sam Morrar, "Using E-Band for Wideband Satcom: Opportunities and Challenges," Microwave Journal, at 1-2 (Aug. 13, 2021), *available at* https://www.hughes.com/sites/hughes.com/files/2021-08/Microwave-Journal-Aug-2021.pdf.

21 *See* ITU-R Radio Regulations, Article 5, Section IV, Footnote 5.561.

22 *See* ERC Report 25, "The European Table of Frequency Allocations and Applications in the Frequency Range 8.3 kHz to 3000 GHz", approved October 2021; ComReg 20/58R3, "Radio Frequency Plan for Ireland," 20 December 2021.

23 ECC Recommendation (05)07, at 1 (17 May 2013).

To maximize the value of these bands for Irish consumers and businesses, ComReg should extend its existing process for the 70/80 GHz bands to accommodate both fixed links and "pencil beam" fixed-satellite service gateways in a common light-licensing framework. This framework would allow operators to register ground equipment on a first-come, first-served, site-by-site basis under a simple set of technical rules, and would only require a minor adaptation of current rules and online processes.[24]

This technology neutral approach would have several important benefits. Specifically, a multi-service light-licensing approach in higher frequency bands such as the 70/80 GHz bands speeds review and approval time by automating basic compliance and coexistence checks; reduces administrative cost and labor associated with manual reviews for all but the most complex interference scenarios; facilitates coordination between different co-primary services through a common platform; and promotes rapid deployment of ground equipment for high-speed, low-latency wireless networks, benefitting people and businesses alike. This model could dramatically improve the satellite earth station licensing process in Ireland while providing better connectivity for Irish consumers.

Response to Question 10: ComReg seeks any additional views from interested parties on the current SES licensing regime and guidelines? Please provide evidence and reasoning for your views.

SpaceX has no comment on this question.

Response to Question 11: ComReg seeks any additional views from interested parties on the current process for the implementation of ECC Decisions for the exemption from licensing of TSS? Please provide evidence and detailed reasoning for your views.

SpaceX appreciates the opportunity to provide additional views on the current process for the implementation of ECC Decisions for licence exemption of satellite terminals.

Document 20/47 is a welcome development that will provide considerable certainty and flexibility for satellite service providers while reducing equipment costs and time to market for next-generation user terminals, meaning more people can be connected, faster. SpaceX particularly

[24] In the United States, the 70/80 GHz database manager Comsearch has noted that its system could accommodate non-terrestrial ground stations with only "minor," "straightforward" changes. *See* Comsearch, Aeronet Aviation and Maritime Communications Systems; Compatibility with Incumbent E-band Fixed Services and Link Registration System, at 4, 42 (May 2, 2019), attached to Letter from Samuel L. Feder, Counsel to Aeronet Global Communications Inc. to Marlene H. Dortch, Secretary, FCC, RM-11824 and RM-11825 (filed May 10, 2019); Comsearch, Loon E-Band Backhaul; Analysis of Compatibility with Incumbent Fixed Services, Use of the Link Registration System, and Review Versus Passive Services, attached to Letter from Julie M. Kearney, Loon, to Marlene H. Dortch, FCC, WT Docket No. 20-133, at 38 (Jan. 12, 2021).

appreciates ComReg's decision to adopt technical requirements from ECC Decisions 17(04) and 18(05) for fixed satellite terminals and earth stations in motion ("ESIMs"), respectively.

SpaceX agrees that ComReg should continually seek opportunities to streamline its licensing requirements, and that more can still be done to facilitate deployment of innovative user terminals and ESIMs. For example, SpaceX encourages ComReg to explicitly reference ETSI standard 303 981 in its exemption for ESIMs communicating with NGSO fixed satellite systems (Section 2.9). Adopting this standard for ESIMs would be consistent with ComReg's decision to reference the standard in its exemption for fixed satellite terminals, and would ease regulatory burdens on ComReg while enabling the rapid deployment of services such as Starlink to Irish consumers and businesses.

SpaceX respectfully disagrees with DotEcon that it would be inappropriate to adopt provisional versions of European regulations in part because it would provide "no benefits to promoting innovation" and because ComReg's test and trial scheme "is already able to support innovative use."[25] As an initial matter, there is a significant innovation benefit to opening up new markets and spectrum bands to serve consumers and businesses with next-generation connectivity, particularly where the new services are spectrally efficient (with a low risk of harmful interference to incumbent users) and independent of whether a harmonized framework exists. If ComReg is concerned about pre-empting final rules, it could issue licences on a no protection, non-interference basis pending final rules, and operators would then assume the risk of changes in the regulatory structure. Moreover, while ComReg's test and trial scheme is a helpful mechanism for enabling operators to explore innovative new technologies, it is not a panacea. To increase the value of the program, SpaceX offers several suggestions in its response to Question 1 above.

Conclusion

SpaceX is very grateful for ComReg's consideration and collaboration and looks forward to continuing to serve Irish customers with even faster speeds as we continue to launch more satellites and deploy more ground infrastructure around the world.

Respectfully submitted,

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[25] DotEcon Report at 32-33.