



6712-01

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 2 and 25

[IB Docket Nos. 17-95, 18-315; FCC 20-66; FRS 16866]

Earth Stations in Motion

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: In this document, the Federal Communications Commission (Commission) amends its rules to facilitate the deployment of earth stations in motion (ESIMs) communicating with geostationary (GSO) and non-geostationary orbit (NGSO) fixed-satellite service (FSS) satellite systems.

DATES: This rule is effective: **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

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SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Report and Order, IB Docket Nos. 17-95 and 18-315, FCC 20-66, adopted on May 13, 2020, and released on May 14, 2020. The full text of this document is available at <https://docs.fcc.gov/public/attachments/FCC-20-66A1.pdf>. The full text of this document is also available for inspection and copying during business hours in the FCC Reference Information Center, Portals II, 445 12th Street SW., Room CY-A257, Washington, DC 20554. To request materials in accessible formats for people with disabilities, send an email to FCC504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (TTY).

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Synopsis

In this *Second Report and Order in IB Docket No. 17-95 and Report and Order in IB Docket No. 18-315 (Report and Order) and Further Notice of Proposed Rulemaking (Further Notice)*, the Commission continues to facilitate the deployment of, and reduce the regulatory burdens on, Earth Stations in Motion (ESIMs).¹ First, we allow ESIMs to communicate in additional frequency bands with geostationary-satellite orbit (GSO) satellites operating in bands allocated to the fixed-satellite service (FSS). Second, we adopt rules for ESIMs to communicate with non-geostationary orbit (NGSO) satellites in specific frequency bands allocated to the FSS. Finally, we seek to further develop the record regarding potential interference from out-of-band emissions of ESIMs in the 28.35-28.6 GHz band into the adjacent 27.5-28.35 GHz band used by Upper Microwave Flexible Use Service (UMFUS). These actions will promote innovative and flexible use of satellite technology, as well as provide regulatory equity between GSO and NGSO FSS systems.

¹ The term “ESIMs” is the collective designation for three types of earth stations that the Commission authorizes to transmit while in motion: Earth Stations on Vessels (ESVs), Vehicle-Mounted Earth Stations (VMESs), and Earth Stations Aboard Aircraft (ESAAs) to communicate with space stations using frequencies allocated to the fixed satellite service. Broadly stated, Earth Stations on Vessels refers to earth stations that communicate with a satellite while located on maritime vessels such as boats, cargo ships or cruise ships, whereas Vehicle-Mounted Earth Stations and Earth Stations Aboard Aircraft refer to earth stations that communicate with satellites while located on land-based vehicles or aircraft, respectively.

Report and Order

Because of the interrelated nature of the two proceedings, we address both proceedings in here. In the discussion below, we first address the addition of frequency bands in which ESIMs can communicate with GSO FSS satellites. Specifically, we adopt our proposal to allow ESIMs to operate in all of the frequency bands in which earth stations at fixed locations operating with GSO FSS satellite networks can be blanket-licensed, and to allow ESIMs to receive signals from GSO FSS satellite space stations in the Ka-band, with some restrictions. We then address the issues raised in the *NGSO ESIMs NPRM*, and adopt a regulatory framework for ESIMs communications with *NGSO FSS* systems that is analogous to that which currently exists for ESIMs communicating with *GSO FSS* systems, with the exception of the frequency bands 18.6-18.8 GHz, 28.35-28.4 GHz, and 29.25-29.5 GHz. We also extend blanket earth station licensing to ESIMs communicating with *NGSO FSS* systems. We defer consideration of our proposal to allow ESIMs to operate in the 28.35-28.4 GHz band while we study the potential interference from out-of-band emissions of ESIMs into the adjacent 27.5-28.35 GHz band.

ESIMs Communications with GSO Satellites in Additional Frequency Bands (IB Docket No. 17-95)

In the *GSO ESIMs FNPRM*, the Commission sought comment on allowing ESIMs to operate in all of the frequency bands in which earth stations at fixed locations operating in *GSO FSS* satellite networks can be blanket-licensed. The Commission believed in this situation operation of earth stations in motion should not introduce a material change to the interference environment created or to the protection required.² Many commenters support these changes and no commenters opposed.³ Boeing points out that among other benefits, the use of many of these frequencies by ESIMs will help to align the *FSS* frequencies that are available for use by ESIMs

² *GSO ESIMs FNPRM*, 33 FCC Red at 9358, para. 91.

³ See, e.g., Boeing *FNPRM* Comments at 1; Hughes *FNPRM* Comments at 2; Inmarsat *FNPRM* Comments at 2.

in different regions of the world, and that this alignment is important because many ESIMs—including those on airplanes and ships—do not limit their operations to single continents.⁴ SES, O3b, and Intelsat note that expanding the frequencies available for GSO ESIM networks will allow more intensive spectrum use and is fully consistent with other authorized operations in these frequency bands.⁵

We agree that, for the reasons stated by commenters, the public interest is served by the addition of frequency bands in which ESIMs are allowed to communicate with GSO FSS satellites. We address the individual frequency bands in turn below. We then address general issues that are not specific to any particular frequency band.

The Extended Ku-band

The Commission sought comment on expanding the Ku-band frequency ranges in which ESIMs can be authorized to receive transmissions from GSO FSS satellites⁶ to include the 10.7-10.95 GHz and 11.2-11.45 GHz bands.⁷ These frequency bands are allocated on a co-primary basis to the fixed service and FSS (space-to-Earth), but GSO FSS use of both bands is limited to international systems (that is, to communications that do not originate and terminate within the United States).⁸ The Commission noted, however, that in the 10.95-11.2 GHz (space-to-Earth) and 11.45-11.7 GHz (space-to-Earth) bands, communications of ESIMs with GSO satellites is allowed subject to the condition that these earth stations may not claim protection from

⁴ See Boeing FNPRM Comments at 3.

⁵ SES, O3b and Intelsat FNPRM Reply Comments at 1-2.

⁶ See 47 CFR 2.106, NG527A.

⁷ See *GSO ESIMs FNPRM*, 33 FCC Rcd at 9354, para. 90. As we noted in the *FNPRM*, the Commission's part 25 rules currently allow for blanket licensing in the 10.7-10.95 GHz, 11.2-11.45 GHz, and 17.8-18.3 GHz (space-to-Earth) on an unprotected basis with respect to the fixed service.

⁸ 47 CFR 2.106, NG52 (“Except as provided for by NG527A, use of the bands 10.7-11.7 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by geostationary satellites in the [FSS] shall be limited to international systems, *i.e.*, other than domestic systems.”).

transmissions of non-Federal fixed service stations.⁹ The Commission requested comment on whether communications in the 10.7-10.95 GHz and 11.2-11.45 GHz (space-to-Earth) bands could also be allowed on an unprotected basis with respect to other services.¹⁰

Satellite operators overwhelmingly support allowing ESIMs to receive transmissions from GSO FSS satellites on an unprotected basis in these bands.¹¹ Commenters state that, because ESIMs operations are receive-only in the 10.7-10.95 GHz and 11.2-11.45 GHz bands, allowing ESIMs to operate in these frequency bands does “not increase the potential for harmful interference” to other spectrum users.¹² In addition, they state that because ESIMs operate on mobile platforms (that is, in aeronautical, maritime and land-mobility applications) and often far from other co-frequency systems and services (for example, aircraft in flight or vessels in international waters), there is no need to protect ESIMs reception in these bands.¹³ Commenters also assert that access to additional ESIM receive spectrum would enhance flexibility, data rates, and aggregate capacity for ESIM operators and consumers.¹⁴

Based on the record, including the lack of opposition to this proposal, we will allow communications from GSO FSS satellites to ESIMs in the 10.7-10.95 GHz and 11.2-11.45 GHz (space-to-Earth) bands on an unprotected basis vis-à-vis fixed service stations. We agree that ESIMs can receive transmissions from GSO FSS satellites in the 10.7-10.95 GHz and 11.2-11.45 GHz bands without requiring protection from fixed service stations that have primary status in

⁹ 47 CFR 2.106, NG527A. *See also GSO ESIMs FNPRM*, 33 FCC Rcd at 9340, para. 44.

¹⁰ *GSO ESIMs FNPRM*, 33 FCC Rcd at 9355, para. 91.

¹¹ *See, e.g.*, Boeing FNPRM Comments at 2-3; Hughes FNPRM Comments at 2-3; SES FNPRM Comments at 1-2; Viasat FNPRM Comments at 1, 3.

¹² Panasonic FNPRM Comments at 2; *see also* Boeing FNPRM Comments at 3.

¹³ *Id.*

¹⁴ Panasonic FNPRM Comments at 2; *see also* Boeing FNPRM Comments at 3; SES FNPRM Comments at 2; Viasat FNPRM Comments at 3-4.

these bands.¹⁵ The Fixed Wireless Communications Coalition (FWCC) asks the Commission to clarify that fixed service will not be required to protect ESIMs in the 10.7-10.95 GHz and 11.2-11.45 GHz (space-to-Earth) bands from interference.¹⁶ We so clarify. Accordingly, we amend footnote NG527A to include 10.7-10.95 GHz and 11.2-11.45 GHz (space-to-Earth) in the frequency bands in which ESIMs may be authorized to communicate with GSO satellites, subject to the condition that ESIMs may not claim protection from transmissions of non-Federal fixed service stations.¹⁷ In addition, CORF notes that radio astronomers make important observations in the 10.6-10.7 GHz band,¹⁸ and that the U.S. Table requires operators to protect radio astronomy service from satellite downlinks emissions into the 10.68-10.70 GHz portion of the band.¹⁹ Footnotes to the U.S. Table already provide such protections,²⁰ and satellite licenses and grants of U.S. market access are issued by the Commission subject to such footnotes. Accordingly, no additional action is necessary.

The Ka-band

The Commission sought comment on allowing ESIMs to receive signals from GSO FSS satellites on a secondary basis in the 17.8-18.3 GHz (space-to-Earth) band and on a primary basis in the 19.3-19.4 GHz (space-to-Earth) and 19.6-19.7 GHz (space-to-Earth) bands.²¹ The Commission also requested comment on whether to allow ESIMs to communicate with GSO FSS satellites in the 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space) bands

¹⁵ GSO FSS downlink transmissions are already permitted in these frequency bands, subject to power flux density limit designed to protect fixed service stations from unacceptable interference. *See* International Telecommunication Union (ITU) Article 21.

¹⁶ FWCC FNPRM Comments at 1-2.

¹⁷ *See* Appendix B, 47 CFR 2.106, NG572A(a).

¹⁸ Although on page 7 of its FNPRM Comments CORF mentions 10.6-11.7 GHz, it is clear from the context that their intention was to reference the 10.6-10.7 GHz band which has a primary allocation to the Radio Astronomy Services. 47 CFR 2.106.

¹⁹ CORF FNPRM Comments at 7.

²⁰ *See, e.g.*, 47 CFR 2.106, US211 and US246.

²¹ *GSO ESIMs FNPRM*, 33 FCC Rcd at 9355, para. 91.

on an unprotected, non-interference basis with respect to NGSO FSS satellite systems.²² It sought comment on any possible effects these proposals may have on existing or future services in these frequency bands or adjacent frequency bands and on any necessary changes to our rules that may be appropriate to accommodate them.²³

We address each of these frequency bands in turn below. Specifically, we will allow ESIMs to receive signals from GSO FSS space stations on a secondary basis in the 17.8-18.3 GHz band and on a primary basis in the 19.3-19.4 and 19.6-19.7 GHz band. We will also allow ESIMs to operate with GSO FSS satellite networks in the 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space) bands on an unprotected, non-interference basis with respect to NGSO FSS satellite systems.

17.8-18.3 GHz, 19.3-19.4 GHz, and 19.6-19.7 GHz.—Commenters observe that satellite space-to-Earth transmissions in the 17.8-18.3 GHz, 19.3-19.4 GHz, and 19.6-19.7 GHz bands are already subject to power flux density limits designed to protect terrestrial systems,²⁴ and reception of satellite signals by ESIMs has no effect on these power flux density levels set forth in the Commission’s rules.²⁵ Satellite operators therefore state that ESIMs can co-exist with terrestrial fixed service operations in these bands.²⁶ Commenters also point out that the authorization of ESIMs to receive signals from GSO networks in the 17.8-18.3 GHz band will

²² *Id.*

²³ *Id.*

²⁴ 47 CFR 25.208(c).

²⁵ SES FNPRM Reply Comments at 2; *see also* Boeing FNPRM Comments at 3 (stating that the existence of ESIMs in these frequencies will not interfere with fixed service networks because they will continue to be protected by the power flux density limits on satellite downlink communications that are maintained by the ITU to protect primary terrestrial uses of the 17.7-18.3 GHz frequencies).

²⁶ SES FNPRM Comments at 2; Inmarsat FNPRM Comments at 2-3; Viasat FNPRM Comments at 3-4. *See also* Boeing FNPRM Comments at 4-5 (stating that ESIMs experiencing interference can either shift to a different receiving frequency or can move to a new location where the interference does not exist; further, given the relatively high speeds in which many ESIMs will be in motion, any unacceptable interference received from fixed service transmitters will only be momentary in duration and likely result in no detectable interference to the ESIM end user’s services).

help to align the frequencies available to ESIMs in the United States with those that are available in the rest of the world.²⁷ In addition, ESIMs communications with GSO FSS satellites in these bands will be required to be coordinated with Federal FSS systems pursuant to the U.S. Table.²⁸ No commenters disagree with allowing ESIMs to receive signals from GSO FSS satellites in these bands.

We proposed allowing ESIMs to receive signals from GSO FSS satellites in the 17.8-18.3 GHz (space-to-Earth) band on a secondary basis. FSS is allocated in the space-to-Earth direction on a secondary basis to the fixed service in the 17.8-18.3 GHz band and no parties objected to our proposal. Thus, we add NG527A(d) in the U.S. Table of Allocations to allow ESIMs to receive signals from GSO FSS satellites in the 17.8-18.3 GHz (space-to-Earth) band on a secondary basis.

Further, we proposed allowing ESIMs to receive signals from GSO FSS satellites in the 19.3-19.4 GHz (space-to-Earth) and 19.6-19.7 GHz (space-to-Earth) bands on a co-primary basis with fixed service and Federal FSS. However, given the difficulties with coordinating ESIM operations with terrestrial stations, we conclude here, as proposed by FWCC,²⁹ that in the 19.3-19.4 GHz (space-to-Earth) and 19.6-19.7 GHz (space-to-Earth) bands, ESIMs should be allowed to operate on an unprotected basis with regard to fixed service and Federal FSS. Allowing such ESIM operations will not change the existing interference environment in these bands. FSS is already allocated in the space-to-Earth direction on a co-primary basis with fixed service in the 19.3-19.4 GHz and 19.6-19.7 GHz bands subject to power flux density limits designed to protect terrestrial systems. Accordingly, we revise NG527A(a) in the U.S. Table of Allocations to allow

²⁷ Boeing FNPRM Comments at 4.

²⁸ 47 CFR 2.106, US334.

²⁹ See FWCC Comments at 1, 3.

ESIMs to receive signals from GSO FSS satellites in the 19.3-19.4 GHz (space-to-Earth), and 19.6-19.7 GHz (space-to-Earth) bands on an unprotected basis.

18.8-19.3 GHz and 28.6-29.1 GHz.—The record supports a finding that allowing ESIMs to communicate with GSO FSS satellites in the 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space) bands serves the public interest. Viasat asserts that such a change can expedite consumer access to mobile applications of satellite broadband services technologies.³⁰ Boeing believes that ESIMs communicating with GSO and NGSO satellites in these bands could complement each other by providing very robust coverage and throughput to end users using a combination of NGSO and GSO satellites.³¹

We find that it is possible with a high degree of coordination among operators for ESIMs to communicate with GSO FSS satellites in the 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space) bands without causing interference to NGSO FSS systems. Inmarsat, for example, states that “[t]echniques for managing interference between FSS systems are well understood” and the “introduction of ESIMs into FSS spectrum does not materially change these interference scenarios.”³² ViaSat concurs, asserting that “[i]t is well-established that ESIMs can perform within the same technical envelope as fixed earth stations through highly accurate antenna pointing mechanisms and compliance with appropriate power limits” and “[t]herefore, in the 18.8-19.3 GHz and 28.6-29.1 GHz (Earth-to-space) bands, where the Commission has determined that the GSO FSS successfully can operate on a secondary basis to the NGSO FSS, adding ESIMs would not change this conclusion.”³³

³⁰ Viasat FNPRM Comments at 2.

³¹ Boeing FNPRM Reply Comments at 4.

³² Inmarsat FNPRM Comments at 3.

³³ Viasat FNPRM Comments at 3.

We agree with these commenters that it is technically feasible for ESIMs to communicate with GSO FSS space stations in these bands without causing interference to NGSO FSS systems provided the operators coordinate their operations. GSO earth stations transmitting to a GSO space station would have to stop transmissions whenever an NGSO space station using the same frequency band is within the earth station transmitting beam. Similarly, during transmissions from GSO space stations, GSO space station operators will need to take into account the presence of a beam through which an earth station is receiving co-frequency signals from an NGSO space stations. Such co-existence will necessitate a high degree of coordination between the GSO and NGSO systems to ensure interference does not result to NGSO FSS operations and, when authorizing ESIMs to communicate with GSO FSS satellites in these bands, the secondary nature of such communications will need to be fully taken into account.³⁴

We agree with Boeing that the priority of NGSO FSS systems in these frequencies is critical to their growth and operation.³⁵ As explained by Telesat, the demand for “mobile aeronautical, maritime and land services is one of the key drivers of the burgeoning NGSO demand for this spectrum.”³⁶ While recognizing that it would be inequitable to alter the regulatory status between NGSO and GSO FSS systems in the 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space) frequency bands, allowing communications between ESIMs and GSO FSS satellites in these frequency bands on an unprotected, non-interference basis with respect to NGSO FSS satellite systems leads to more efficient use of spectrum without imposing

³⁴ The Commission has been requiring that, in these bands, GSO operations with fixed earth stations must accept interference from and not cause harmful interference to NGSO operations. *See, e.g.* Satellite Policy Branch Information Action Taken, Report No. 01258 (IBFS File No. SAT-LOA-20160624-00061) Aug. 4, 2017, Jupiter 2 Grant at condition 5. A similar condition would be imposed on ESIMs operations. Operations with ESIMs are no different, as ESIMs are supposed to operate as a fixed earth station that can be anywhere within the satellite beam.

³⁵ Boeing FNPRM Reply Comments at 5.

³⁶ Telesat FNPRM Reply Comment at 3.

a burden on NGSO FSS operations in this band.³⁷ The GSO system, operating on a non-interference, non-protected basis, is expected to show, to the NGSO system satisfaction, that it is capable of protecting the NGSO's operation. The only burden on the NGSO system is to examine the GSO showing in good faith to determine its acceptability.

Accordingly, we will allow ESIMs to communicate with GSO FSS satellites in the 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space) bands on an unprotected, non-interference basis with respect to NGSO FSS satellite systems.³⁸ Both these bands are allocated to FSS on a primary basis, but GSO FSS operations are conducted on an unprotected, non-interference basis with respect to NGSO FSS.³⁹ We find that the record supports allowing ESIMs to communicate with GSO FSS satellites in these bands, consistent with the existing status of GSO FSS vis-à-vis NGSO FSS.

General Issues

The Commission sought comment on any possible effects that expanding the frequencies available to ESIMs communicating with GSO FSS satellite networks may have on other services in these frequency bands or adjacent frequency bands in the United States.⁴⁰ National Academy of Sciences' Committee on Radio Frequencies (CORF) expresses concern about other services

³⁷ Boeing FNPRM Comments at 6-8 (asking the Commission to be diligent in ensuring the subordinate status of GSO FSS networks vis-a-vis NGSO FSS operations); SES FNPRM Comments at 2 (stating that SES supports allowing GSO ESIM use of these frequency bands, provided that the Commission adopts its proposal to specify that GSO operations in the band segments are "on an unprotected, non-interference basis with respect to NGSO FSS satellite systems" to ensure NGSO use of these critical frequencies is not impaired). As discussed below, we reject Echostar's proposal to give equal status to ESIMs operating with GSO and NGSO space stations as this would contradict the secondary designation of GSO systems in these bands. *See infra* paras. 32-33.

³⁸ *See* Appendix B (where a reference to footnote NG527A has been added to the 18.8-19.3 GHz band in the non-Federal Table and where the text of footnote NG527A has been revised accordingly).

³⁹ 47 CFR 2.106, NG165 (stating, "In the bands 18.8-19.3 GHz and 28.6-29.1 GHz, geostationary-satellite networks in the fixed-satellite service shall not cause harmful interference to, or claim protection from, non-geostationary-satellite systems in the fixed-satellite service.").

⁴⁰ *ESIMs GSO FSS FNPRM*, 32 FCC Rcd at 9354, para. 90.

and adjacent bands.⁴¹ In addition, Boeing proposes that consideration be given to opening the 19.4-19.6 GHz band to both GSO and NGSO FSS systems, including those operating with ESIMs.⁴²

CORF expresses concerns regarding potential interference to protected passive scientific observations caused by GSO FSS downlink transmissions to ESIMs.⁴³ Specifically, CORF is concerned that the reception of GSO FSS satellite signals by ESIMs in the 10.7-10.95 GHz, 17.8-18.3 GHz, 18.8-19.3 GHz (space-to-Earth), and 19.6-19.7 GHz (space-to-Earth) bands, which, CORF asserts, could result in additional interference to Earth exploration-satellite service systems and radio astronomy service operating in adjacent frequencies. CORF advocates for more stringent out-of-band emissions limits for GSO FSS satellite signals that would be received by ESIMs using the 10.7-10.95 GHz band.⁴⁴ CORF also suggests that the Commission prohibit the reception of satellite signals by ESIMs in the bottom 25 megahertz portion of the 10.7-10.95 GHz band in order to create a guard band to further protect scientific monitoring by Earth exploration-satellite service systems.⁴⁵

We decline to adopt new limits on out-of-band emissions or prohibitions on GSO FSS downlink use in this proceeding. References to ESIMs communications with GSO FSS satellites as “ESIM downlinks” are inaccurate, and concerns regarding the difficulty of addressing interference from “moving targets” are misplaced, because the only transmissions in the frequency ranges discussed by CORF will be from GSO satellites, not from ESIM terminals.⁴⁶

Accordingly, CORF concerns are not with ESIMs, which solely receive in the frequency bands

⁴¹ See generally CORF FNPRM Comments. The FWCC’s concerns were previously addressed in the discussion on the individual frequency bands.

⁴² Boeing FNPRM Reply Comments.

⁴³ See generally CORF FNPRM Comments.

⁴⁴ CORF FNPRM Comments at 8.

⁴⁵ CORF FNPRM Comments at 9.

⁴⁶ SES FNPRM Reply Comments at 2-3.

that CORF identified as being of concern, but rather with the space-to-Earth transmissions of GSO FSS satellites, which are not the subject of this rulemaking. In this respect, we note that the Commission's rules already impose specific limits on out of band emissions in the frequency bands and services at issue here.⁴⁷ Possible revisions to these limits are the subject of a separate rulemaking.⁴⁸ In addition, as mentioned above, protection of radio astronomy service observations is also ensured through specific footnotes to the U.S. Table of Allocations.⁴⁹

Additionally, CORF expresses concern about the use of the 18.6-18.8 GHz (space-to-Earth) band, which was not proposed as an additional frequency band for communications of ESIMs with NGSO FSS satellites.⁵⁰ This band is allocated for passive scientific observation use on a co-primary basis with GSO FSS in the space-to-Earth direction, with GSO FSS downlinks subject to power flux density limits designed to protect other authorized spectrum users.⁵¹ Specifically, CORF states that any new use by ESIMs in these frequency bands should be mindful of the need to preserve the extensive existing scientific use of the 18.6-18.8 GHz (space-to-Earth) band.⁵² The Commission has previously concurred with this need,⁵³ and no further action is appropriate because the 18.6-18.8 GHz band is not one of the additional frequency bands included in this proceeding.⁵⁴

Boeing proposes to open the 19.4-19.6 GHz band to both GSO and NGSO FSS systems, including those operating with ESIMs, on a secondary basis with respect to feeder links to

⁴⁷ 47 CFR 25.202(f).

⁴⁸ *Further Streamlining Part 25 Rules Governing Satellite Services*, Notice of Proposed Rulemaking, 33 FCC Rcd 11502, 11507-08, paras. 18-19 (rel. Nov. 19, 2018) (*2018 Part 25 Further Streamlining Notice*).

⁴⁹ 47 CFR 2.106, US211 and US246.

⁵⁰ See generally CORF FNPRM Comments.

⁵¹ 47 CFR 2.106, US255.

⁵² CORF FNPRM Comments at 10.

⁵³ *GSO ESIMs Report & Order and FNPRM*, 33 FCC Rcd at 9347-48, para. 63.

⁵⁴ We note that GSO FSS space-to-Earth operations are already subject to prior coordination with Federal users in this band pursuant to footnote US334 to the U.S. Table. 47 CFR 2.106, US334.

NGSO MSS space stations operating in these frequencies.⁵⁵ Boeing argues that GSO and NGSO FSS systems are already permitted to operate below 19.4 GHz and above 19.6 GHz, so the reception of these transmissions by ESIMs will not alter the spectrum sharing conditions.⁵⁶ We disagree. As Iridium accurately notes, the Ka-band plan and U.S. Table of Frequency Allocations prohibit any earth station—fixed, in motion, individually-licensed, or blanket-licensed—from communicating with an FSS space station in this frequency band.⁵⁷ Further, Iridium points out that this proposal is beyond the scope of the current rulemaking.⁵⁸ We agree with Iridium, and find that this proceeding is not the appropriate forum to address Boeing’s proposal.

Regulatory Framework for Communications of ESIMs With NGSO Satellites (IB Docket No. 18-315)

In the *ESIMs NGSO NPRM*, the Commission sought comment on allowing ESIMs to communicate with NGSO FSS satellites in the 11.7-12.2 GHz (space-to-Earth); 14.0-14.5 GHz (Earth-to-space); 18.3-18.6 GHz (space-to-Earth); 19.7-20.2 GHz (space-to-Earth); 28.35-28.6 GHz (Earth-to-space); and 29.5-30.0 GHz (Earth-to-space) bands, as well as the 18.8-19.3 GHz (space-to-Earth), and the 28.6-29.1 GHz (Earth-to-space) bands, the 10.7-11.7 GHz (space-to-Earth) bands, the 17.8-18.3 GHz (space-to-Earth) band, and the 19.3-19.4 GHz and 19.6-19.7 GHz (space-to-Earth) bands,⁵⁹ which encompass most of the same conventional Ku-band, extended Ku-band, and Ka-band frequencies that were allowed or proposed for communications

⁵⁵ Boeing FNPRM Comments at 5-6.

⁵⁶ *Id.* at 6.

⁵⁷ Iridium FNPRM Reply Comments at 1-2.

⁵⁸ *Id.* at 2-3.

⁵⁹ FSS operation in the 18.6-18.8 GHz band is limited to communications with GSO space stations. 47 CFR 2.106 NG164. Transmissions to NGSO space stations in the 29.25-29.5 GHz band are limited to feeder links to MSS space stations. See 47 CFR 2.106 NG535A. Thus, the frequency bands 18.6-18.8 GHz (space-to-Earth) and 29.25-29.5 GHz (Earth-to-space) were not included in the proposed bands for ESIMs NGSO FSS operations.

of ESIMs with GSO FSS satellites.⁶⁰ Second, the Commission sought comment on extending blanket earth station licensing, which is available to ESIMs communicating with GSO FSS satellites, to ESIMs communicating with NGSO FSS satellites in frequency bands in which NGSO FSS systems have a primary status, or have been found to be able to operate on a secondary or non-conforming basis, without causing interference to primary users of the bands.⁶¹ Finally, the Commission sought comment on revisions to specific rule provisions to implement these changes.⁶²

As a general matter, we conclude that the public interest is served by adopting a regulatory framework for communications of ESIMs with NGSO FSS satellites that is analogous to that which exists for ESIMs communicating with GSO FSS satellites and offers a similar streamlined path to deployment. Given the growing number of NGSO FSS entities that propose to provide service to earth stations at fixed locations as well as to ESIMs,⁶³ it is important to have streamlined rules in place for NGSO ESIMs operations, both for parity among ESIM operators and regulatory certainty for potential operators.⁶⁴ Doing so will facilitate the spread of accessible,

⁶⁰ *NGSO ESIMs NPRM*, 33 FCC Rcd at 11418-19, para. 7; *ESIMs Report and Order and Further Notice*, 32 FCC Rcd at Appendix F (proposing frequencies available for ESIMs in a revision to § 25.202(a)(10)).

⁶¹ *NGSO ESIMs NPRM*, 33 FCC Rcd at 11420, para. 15.

⁶² The Commission did not seek comment on, and we do not address here, the operations of traditional NGSO satellite constellations offering mobile-satellite service (MSS), such as those operated by Iridium LLC, Globalstar, Inc., or ORBCOMM License Corp.

⁶³ During the preceding years, licenses or grants of U.S. market access have been given to a number of NGSO FSS satellite providers. See, e.g., *O3b Limited, Request for Modification of U.S. Market Access for O3b Limited's Non-Geostationary Satellite Orbit System in the Fixed-Satellite Service and in the Mobile-Satellite Service*, Order and Declaratory Ruling, 33 FCC Rcd. 5508 (2018); *Space Exploration Holdings, LLC, Application for Approval for Orbital Deployment and Operating Authority for the SpaceX NGSO Satellite System*, Memorandum Opinion, Order and Authorization, 33 FCC Rcd 3391 (2018); *Telesat Petition for Declaratory Ruling to Grant Access to the U.S. Market for Telesat's NGSO Constellation*, Order and Declaratory Ruling, 32 FCC Rcd. 9663 (2017); *WorldVu Satellites Limited, Petition for Declaratory Ruling Granting Access to the U.S. Market for the OneWeb NGSO FSS System*, Order and Declaratory Ruling, 32 FCC Rcd 5366 (2017).

⁶⁴ Letter from Ryan W. King, Vice President & Head of Legal, Americas, Speedcast Americas Inc. to Marlene H. Dortch, Secretary, Federal Communications Commission (filed Sept. 25, 2019).

broadband mobility services;⁶⁵ promote global spectrum harmonization, allow customers to take advantage of seamless connectivity;⁶⁶ increase investment in NGSO FSS capacity that can serve remote and rural areas and provide restoration if terrestrial networks are damaged due to natural disasters;⁶⁷ and ensure that antenna manufacturers are able to bring their antennas to the market quickly, enabling a faster return on their investment, and thus making the U.S. a desirable market in which to introduce innovative new equipment.⁶⁸ We agree with many of the public interest benefits expressed in the record of the proceeding and adopt the framework discussed in the *NGSO ESIMs NPRM*.

Ku- and Ka- Frequency Bands

11.7-12.2 GHz, 14.0-14.5 GHz, 18.3-18.6 GHz, 19.7-20.2 GHz, 28.35-28.6 GHz, and 29.5-30.0 GHz.—The Commission sought comment on allowing, to the extent feasible, ESIMs to communicate with NGSO FSS systems in the Ku- and Ka-bands where the Commission’s rules allow ESIM communications with GSO FSS space stations. The Commission proposed to allow ESIMs to communicate with NGSO FSS systems under the existing primary FSS allocation in the following six frequency bands: 11.7-12.2 GHz (space-to-Earth); 14.0-14.5 GHz (Earth-to-space); 18.3-18.6 GHz (space-to-Earth); 19.7-20.2 GHz (space-to-Earth); 28.35-28.6 GHz (Earth-to-space); and 29.5-30.0 GHz (Earth-to-space).⁶⁹ There are no allocations to terrestrial services in any of these bands. Under the Commission’s rules, NGSO FSS operations

⁶⁵ ESIM Coalition NPRM Comments at 5, SES and O3b NPRM Comments at 1, 3. *See also* Letter from Mariah Dodson Shuman, Corporate Counsel, Project Kuiper, Kuiper Systems LLC to Marlene H. Dortch, Secretary, Federal Communications Commission (filed Nov. 26, 2019).

⁶⁶ SES and O3b NPRM Comments at 4, 5-6.

⁶⁷ *Id.* at 5.

⁶⁸ SES and O3b NPRM Comments at 5; Viasat NPRM Comments at 3.

⁶⁹ *ESIMs NGSO FSS NPRM*, 33 FCC Rcd at 11419, para. 9. T-Mobile asks the Commission to clarify that its proposals in this proceeding will not expand use of ESIM operations in the 3.7-4.2 GHz band. T-Mobile NPRM Comments at 1-3. We so clarify here.

cannot cause interference to, or claim protection from, GSO FSS networks.⁷⁰ Accordingly, the Commission sought comment on adding new paragraphs to footnote NG527A of the Table of Frequency Allocations set forth at 47 CFR 2.106 to indicate that ESIMs can operate with NGSO FSS space stations in these six frequency bands.

We adopt the proposal to add a paragraph to footnote NG527A to specify that ESIMs may be authorized to communicate with NGSO FSS satellites in these six bands, with the exception of the 28.35-28.4 GHz band, under the existing primary FSS allocation. Many commenters agree that the Commission should adopt its proposal to allow ESIMs to communicate with NGSO FSS systems on a primary basis in these frequency bands.⁷¹ For example, the ESIM Coalition supports adoption of the proposal to add a paragraph to footnote NG527A to indicate that ESIMs can operate with NGSO FSS satellites in these six frequency bands.⁷² This will ensure that the part 25 rules accurately reflect the current NGSO-GSO sharing framework and extend this well accepted framework to NGSO FSS operations with ESIMs.

Some concerns, however, were recently raised about potential interference from out-of-band emissions of ESIMs in the 28.35-28.6 GHz band into the adjacent 27.5-28.35 GHz band used by UMFUS, generated by ESIM transmissions to NGSO FSS space stations in frequencies above 28.35 GHz.⁷³ Contrarily, others have argued that the Commission already considered and dismissed similar concerns when it authorized ESIMs to communicate with GSO satellites, and the authorization of ESIM communications with NGSOs does not raise any new concerns.⁷⁴

⁷⁰ 47 CFR 25.289.

⁷¹ ESIM Coalition NPRM Comments at 2-3; Hughes NPRM Comments at 3.

⁷² *See also* SES and O3b NPRM Comments at 7.

⁷³ Letter from Daudeline Meme, Verizon and US Cellular to Marlene H. Dortch, Secretary, Federal Communications Commission (filed May 4, 2020) (Verizon May 4 Ex Parte Letter).

⁷⁴ Letter from Suzanne Malloy, Vice President of Regulatory Affairs for SES Americom, Inc. and O3b Limited, Kimberly M. Baum Vice President, Regulatory Affairs Hughes Network Systems, LLC, and EchoStar Satellite Services, L.L.C. to Marlene H. Dortch, Secretary, Federal Communications Commission (filed May 6, 2020) (SES Americom, Inc. and O3b Limited, Inmarsat, Inc., Hughes Network Systems, LLC, and EchoStar Satellite Services,

Given these differences of opinion, we are initiating a *Further Notice* to further develop the record on these issues. As such, we will not permit ESIM operations with NGSO FSS space stations in the lowest 50 megahertz of the 28.35-28.6 GHz band (28.35-28.4 GHz), subject to further consideration. However, in the interest of avoiding delay in potential ESIMs operations in the remaining 200 megahertz of the 28.35-28.6 GHz band, we will permit the filing and processing of ESIMs applications for use of spectrum between 28.4-28.6 GHz, with any grants conditioned on compliance with any future determinations made in this proceeding. Based on the current record, we do not anticipate that ESIM operations above 28.4 GHz will have a significant out-of-band emissions impact on UMFUS operation below 28.35 GHz.⁷⁵ Additionally, should parties have concerns about specific applications for ESIMs use, they can be addressed as part of the public comment review process for each ESIM application filed before the Commission. Before granting any of these applications, the possible need to require more stringent limits than those in § 25.202(f), even for ESIM operations with NGSO FSS space stations above 28.4 GHz, can be considered and addressed as appropriate.

Several commenters believe that the use of the term “primary” to describe the status of communications of ESIMs with NGSO FSS satellites in these six bands is potentially confusing because of the need of such communications to protect GSO FSS operations.⁷⁶ We clarify here and in the new paragraph (c) to footnote NG527A, that NGSO ESIMs operations in these bands are on an unprotected, non-interference basis only with respect to GSO FSS operations. As Intelsat correctly states, we do not propose to elevate the NGSO protection status vis-à-vis GSO

L.L.C. May 6 Ex Parte Letter); Letter from John P. Janka, Chief Officer, Global Government Affairs & Regulatory, Viasat, Inc. to Marlene H. Dortch, Secretary, Federal Communications Commission (filed May 6, 2020) (Viasat May 6 Ex Parte Letter).

⁷⁵ As per § 25.202(f), ESIM emissions will be attenuated by approximately 35 dB at 28.35 GHz.

⁷⁶ ESIMS Coalition NPRM Comments at 2-3; Intelsat NPRM Reply Comments at 2.

operations.⁷⁷ Rather, communications of ESIMs with NGSO FSS satellites is an application in the FSS,⁷⁸ which has a primary allocation in these bands.⁷⁹ The rules for communications of ESIMs with both NGSO and GSO satellites maintain the existing protection status offered to GSO operations vis-à-vis NGSO operations, which is articulated in the proposed revision to footnote NG527A. In other words, NGSO ESIM operations will be provided the same protections, and have the same obligations, as NGSO FSS already possesses. This includes the obligation for NGSO FSS to protect GSO FSS—including GSO FSS communications to ESIMs—in these frequency bands under part 25 of the Commission’s rules.⁸⁰

Some commenters noted the Commission used the term “harmful interference” in some contexts and “unacceptable interference” in the NPRM.⁸¹ The specific obligation on NGSO FSS operations is that they do not cause unacceptable interference to GSO FSS networks.⁸² We believe that “unacceptable interference” is the appropriate term to use here.⁸³ To the extent that “harmful interference” was used elsewhere in the *ESIMs NGSO NPRM*, we clarify that there was no intent to alter the “unacceptable interference” obligation.

18.8-19.3 GHz and 28.6-29.1 GHz.—The Commission proposed to allow ESIMs to communicate with NGSO FSS systems on a primary basis in the 18.8-19.3 GHz (space-to-Earth), and the 28.6-29.1 GHz (Earth-to-space) bands. In these bands, there are no terrestrial allocations, and GSO FSS operations are secondary with respect to NGSO FSS. Accordingly, the

⁷⁷ Intelsat NPRM Reply Comments at 2.

⁷⁸ See U.S. Table of Frequency Allocations, 47 CFR 2.106, n. NG527A.

⁷⁹ *Id.*

⁸⁰ 47 CFR 25.289 (stating that, unless provided otherwise, “an NGSO system licensee must not cause unacceptable interference to, or claim protection from, a GSO FSS...network”).

⁸¹ ESIMs Coalition NPRM Comments at 3; SES and O3b NPRM Comments at 8; Intelsat NPRM Reply Comments at 3.

⁸² 47 CFR 25.289.

⁸³ See 47 CFR 25.289; *ESIMs NGSO FSS NPRM*, 33 FCC Rcd at 11425-28, App. A. (The Commission used the term “unacceptable interference” in proposed footnote NG527A).

Commission sought comment on adding a new paragraph (e) to footnote NG527A to indicate that ESIMs can operate both with a GSO FSS space station and with NGSO FSS systems in these two frequency bands, but that GSO FSS operations in these bands must not cause unacceptable interference to, or claim protection from, NGSO FSS networks.⁸⁴ We adopt this proposal.

Boeing and other commenters support this proposal.⁸⁵ Boeing asserts that the Commission already appropriately treats ESIMs as a permitted application of FSS, employing the same frequency allocation and protection rights as FSS.⁸⁶ Hughes, on the other hand, supports permitting NGSO ESIM operation in the 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space) bands, not on a primary basis as the Commission proposes, but “with a status equal to that of any GSO operation that takes place in the frequency band.”⁸⁷ Hughes notes that, to date, the Commission has authorized use of these bands by GSO FSS on a secondary basis with respect to communications between NGSO systems and fixed earth stations, and that Hughes has successfully entered into coordination agreements with several NGSO system operators to utilize these frequency bands in its GSO satellite networks, with the expectation that coordination would require analysis only of networks with fixed earth stations.⁸⁸ According to Hughes, allowing NGSO ESIMs to operate on a primary basis would complicate the ability of GSO licensees to seek coordination agreements with NGSO systems that will allow these frequency bands to be used with maximum efficiency.⁸⁹ Therefore, Hughes argues the Commission should permit all GSO operations and ESIM NGSO operations to have equal status,

⁸⁴ *ESIMs NGSO FSS NPRM*, 33 FCC Rcd at 11419, para. 10.

⁸⁵ See Boeing NPRM Comments at 7; ESIM Coalition at 3; SES and O3b NPRM Comments at 8.

⁸⁶ Boeing NPRM Comments at 7.

⁸⁷ Hughes NPRM Comments at 4.

⁸⁸ *Id.*

⁸⁹ *Id.* at 4-5.

with each having secondary status with respect to fixed earth stations communicating with NGSO satellites in these frequency bands.⁹⁰

We agree with Boeing that Hughes' proposal overreaches with respect to the appropriate regulatory treatment of ESIMs operating in the 18.8-19.3 GHz (space-to-Earth) and the 28.6-29.1 GHz (Earth-to-space) bands.⁹¹ As Hughes acknowledges, these frequency bands constitute one of the few FSS allocations where NGSO FSS systems have priority over GSO FSS networks.⁹²

Nonetheless, Hughes urges the Commission to treat ESIMs operations with NGSO FSS systems as co-equal with GSO FSS networks in this spectrum.⁹³ As the Commission has stated, "limiting the primary designation in these frequency bands to NGSO FSS systems will give operators of these systems greater flexibility in the coordination discussions and ultimate deployment."⁹⁴

Further, we agree with Boeing that Hughes' private agreements with certain NGSO FSS operators are immaterial to Commission policy regarding the rights of future NGSO FSS systems.⁹⁵ Accordingly, we decline to lower the status of ESIMs communicating with NGSO FSS satellites below that of other earth stations communicating with NGSO FSS satellites.

Viasat argues that the Commission must ensure that any primary NGSO ESIM operations that may be allowed in the 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space) band segments within the United States do not impact GSO operations outside of the United States,

where GSO and NGSO systems are co-primary and are subject to ITU coordination

⁹⁰ See Letter from Jennifer A. Manner, Senior Vice President, Regulatory Affairs, Hughes Network Systems, to Marlene H. Dortch, Secretary, Federal Communications Commission, IB Docket No. 18-315, at 2 (Apr. 19, 2019).

⁹¹ Boeing NPRM Reply Comments at 2.

⁹² Hughes NPRM Reply Comments at 4. As Boeing notes, Hughes does not explain how its proposal for co-equal status would work. Presumably, however, Hughes' existing Ka-band GSO FSS operations would have first-in-time priority over ESIMs operating with NGSO FSS systems given the fact that ESIMs are not yet authorized in this spectrum. Boeing NPRM Reply Comments at 3.

⁹³ Hughes NPRM Comments at 4.

⁹⁴ See *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 7809, 7814-15, ¶ 14 (2017) (*NGSO FSS Report and Order*).

⁹⁵ Boeing NPRM Reply Comments at 3.

requirements.⁹⁶ Similarly, Hughes requests that the Commission clarify that while GSO operations are secondary to NGSO operations in the United States in these frequency bands, the services are co-primary outside the United States.⁹⁷ As has been the Commission's policy in other situations involving operations outside the United States, ESIM operations in a NGSO FSS system licensed by the United States will: (i) have higher status than operations in a GSO FSS satellite network licensed by the United States anywhere in the world; (ii) have higher status than operations in a GSO FSS satellite network that holds a grant to access the U.S. market only for communications to or from the U.S. territory; and (iii) be co-primary with a GSO FSS satellite network in all other cases.⁹⁸

In addition, CORF raises concerns regarding the Earth exploration-satellite service co-primary allocation at 18.6-18.8 GHz (space-to-Earth).⁹⁹ Specifically, CORF is concerned that NGSO ESIM operations in 18.3-18.6 GHz (space-to-Earth) and 18.8-19.3 GHz (space-to-Earth) may contaminate Earth exploration-satellite service observations, as radio interference from moving targets is even more difficult to flag and remove than interference from fixed stations.¹⁰⁰ CORF also notes that increased usage of the adjacent bands may degrade this band if out-of-band emissions are not severely curtailed.¹⁰¹ CORF raised similar arguments against operation in these bands in the context of ESIM operation with GSO FSS satellites. As we noted in addressing their arguments there, CORF's concerns are not with ESIMs, which solely receive in the frequency bands that CORF identified as being of concern, but rather with the space-to-Earth transmissions

⁹⁶ Viasat NPRM Comments at 5.

⁹⁷ Hughes NPRM Reply Comments at 1-2.

⁹⁸ *NGSO FSS Report and Order*, 32 FCC Rcd at 7814-15, para. 14.

⁹⁹ See CORF NPRM Comments.

¹⁰⁰ *Id.* at 12.

¹⁰¹ *Id.* at 13.

of NGSO satellites, which are not the subject of this rulemaking.¹⁰² Therefore, as before, we note that the Commission's rules already impose specific limits on out of band emissions.

Kymeta argues for even further streamlining than the Commission has proposed.¹⁰³ For example, in the case of existing licensees seeking to operate with NGSO satellite systems on a primary basis in the 28.6-29.1 GHz (Earth-to-space) band, Kymeta states that no additional technical information should be required.¹⁰⁴ Further, Kymeta requests the Commission to find that for existing licensees seeking to operate with NGSO satellite systems on a primary or secondary basis in all other authorized Ku-band and Ka-band frequencies, the only additional technical showing required would be a demonstration that the ESIM complies with the equivalent power flux density up limits referenced in § 25.289. While other commenters do not oppose Kymeta's proposals as a general matter, commenters disagree about the specific technical showing that should be required.¹⁰⁵ We note that such proposals are well beyond the current rulemaking. Moreover, any showing of the kind proposed by Kymeta would be more appropriately provided by the licensee of the NGSO FSS system since equivalent power flux density limits refer to the aggregate of all emissions within the system. We therefore decline to adopt Kymeta's proposals at this time.

10.7-11.7 GHz.—The Commission sought comment on allowing ESIMs to receive signals from NGSO FSS space stations in the 10.7-11.7 GHz (space-to-Earth) band, on an unprotected basis, with respect to transmissions from non-Federal fixed service stations. FSS and fixed service are co-primary in these frequency bands, and receive terrestrial stations are

¹⁰² See *supra* para. 22.

¹⁰³ Kymeta NPRM Comments at 4-5.

¹⁰⁴ *Id.* at 4.

¹⁰⁵ See, e.g. SES NPRM Reply Comments at 8.

protected by existing power flux density limits on space station transmissions.¹⁰⁶ Accordingly, the Commission sought comment on revising paragraph (a) of footnote NG527A to indicate that ESIMs can operate with NGSO FSS systems on an unprotected basis with regard to non-Federal fixed service in this frequency band. Many commenters support this proposal.¹⁰⁷ Also, in this frequency band, NGSO FSS operations must not cause unacceptable interference to, or claim protection from, GSO FSS networks.¹⁰⁸ Boeing states that the downlink transmissions from NGSO FSS satellites to ESIMs will be indistinguishable from existing NGSO FSS downlink transmissions.¹⁰⁹ We agree with Boeing and find that the operation of ESIMs in this band will be indistinguishable from other NGSO FSS operations. Because the mechanisms the Commission already has in place to protect GSO FSS networks from NGSO FSS will also provide protection against NGSO ESIM operations, we adopt the revisions proposed to paragraph (a) of footnote NG527A, which will allow ESIMs to operate on an unprotected basis with regard to non-Federal fixed service in this frequency band.¹¹⁰

CORF asserts that there is a significant risk of interference to radio astronomy observations from downlinks in the 10.7-11.7 GHz band.¹¹¹ We agree that protection of these services is important but find that existing protections are sufficient to guard against interference to radio astronomy operations. CORF suggests protection of the primary allocation of Earth exploration-satellite service in the 10.68-10.70 GHz portion of the frequency band either through

¹⁰⁶ 47 CFR 25.146(a)(1).

¹⁰⁷ Boeing NPRM Comments at 8; Hughes NPRM Comments at 5; Kepler NPRM Comments at 2; Viasat NPRM Comments at 4.

¹⁰⁸ 47 CFR 25.289. Commenters here again raise the issue of use of the term “unacceptable interference” versus “harmful interference” in the NPRM. *See, e.g.*, SES and O3b NPRM Comments at 8. This issue is addressed at paragraph 30, *supra*.

¹⁰⁹ Boeing NPRM Comments at 8.

¹¹⁰ Consistent with our decision in paragraph 8 above, we revise footnote NG527A to allow ESIMs to communicate with NGSO satellites, subject to the conditions that ESIMs may not claim protection from transmissions from non-Federal fixed service stations and that NGSO FSS systems may not cause unacceptable interference to, or claim protection from, GSO FSS networks. *See* Appendix B, NG527A.

¹¹¹ CORF NPRM Comments at 8.

use of a guard band of 25 megahertz, so that the lowest frequency of this ESIM downlink band would be 10.725 GHz, or through use of a more stringent out-of-band emission standard for ESIM downlinks to protect Earth exploration-satellite service observations in the 10.68-10.70 GHz band.¹¹² As CORF notes, however, radio astronomy service observations in the 10.6-10.7 GHz band¹¹³ are already entitled to protection under the Commission’s rules,¹¹⁴ as established by footnote US74, which states that “the radio astronomy service shall be protected from unwanted emissions only to the extent that such radiation exceeds the level which would be present if the offending station were operating in compliance with the technical standards or criteria applicable to the service in which it operates.”¹¹⁵ Since our actions today do not change this balance that the rules strike, and since the question of modifying the current protection of radio astronomy observation is part of an ongoing Commission proceeding regarding out-of-band-emissions,¹¹⁶ the appropriate forum to address these requests is that proceeding. Accordingly, we decline to address those requests here. CORF also asks the Commission to include a requirement for NGSO operators transmitting in the 10.7-11.7 GHz band to coordinate with radio astronomy observatories; however, as CORF acknowledges, such a requirement is already included in footnote US131.¹¹⁷

¹¹² *Id.* at 9-10.

¹¹³ As we note in fn 27, CORF mentions 10.6-11.7 GHz on page 7 of its FNPRM Comments. However, it is clear from the context that their intention was to reference the 10.6-10.7 GHz band which has a primary allocation to the Radio Astronomy Services. 47 CFR 2.106.

¹¹⁴ *Id.* In the 10.68 GHz-10.70 GHz portion of the frequency band, radio astronomy service has a primary allocation and is protected domestically by footnote US246, and by RR No. 5.340 worldwide. Pursuant to US246, “[n]o station shall be authorized to transmit” at 10.68-10.7 GHz, and pursuant to RR 5.340, “[a]ll emissions are prohibited” at 10.68-10.7 GHz. *See* 47 CFR 2.106, US246. Similarly, in footnote US211, applicants for airborne or space station assignments at, among other frequency bands, 10.7-11.7 GHz, are urged to take all practicable steps to protect radio astronomy observations in the adjacent bands from harmful interference. 47 CFR 2.106, US211; *see also* 47 CFR 2.106, US131 (requiring prior coordination with specific radio astronomy service sites).

¹¹⁵ 47 CFR 2.106, US74.

¹¹⁶ CORF NPRM Comments at 9-10. *See 2018 Part 25 Further Streamlining Notice*, 33 FCC Rcd at 11507-08, paras. 18-19.

¹¹⁷ CORF NPRM Comments at 8-9; 47 CFR 2.106, US131.

17.8-18.3 GHz.—The Commission sought comment on allowing ESIMs to receive signals from NGSO FSS systems on a secondary basis in the 17.8-18.3 GHz (space-to-Earth) band. This frequency band is allocated to the fixed service on a primary basis and, given the FSS secondary status, ESIM receive earth stations are not entitled to protection. Protection of terrestrial operations in this band will be ensured by imposing on space station transmissions the appropriate power flux density limits.¹¹⁸ Accordingly, the Commission sought comment on adding a paragraph to footnote NG527A to indicate that ESIMs can operate on a secondary basis with regard to non-Federal fixed service in this frequency band, both with a GSO FSS space station and with NGSO FSS systems.¹¹⁹

The ESIM Coalition and other commenters support the proposal to allow ESIMs to receive signals from NGSO FSS space stations on a secondary basis in the 17.8-18.3 GHz (space-to-Earth) band, and no commenter opposed this proposal.¹²⁰ As the Commission explained in the *NGSO ESIMs NPRM*,¹²¹ NGSO ESIMs can ensure adequate protection of terrestrial operations via compliance with the existing International Telecommunication Union power flux density limits, currently codified in the Commission’s rules.¹²² Accordingly, we adopt the proposed addition of paragraph (d) to footnote NG527A.

19.3-19.4 GHz and 19.6-19.7 GHz.—The Commission sought comment on allowing ESIMs to receive signals from NGSO FSS space stations in the 19.3-19.4 GHz and 19.6-19.7 GHz (space-to-Earth) bands, on an unprotected basis, with respect to transmissions from non-Federal fixed service stations. FSS and fixed service are co-primary in these frequency bands,

¹¹⁸ 47 CFR 25.146(a)(1).

¹¹⁹ In this band, NGSO FSS operations must not cause unacceptable interference to, or claim protection from, GSO FSS networks. *See* 47 CFR 25.289.

¹²⁰ Boeing NPRM Comments at 10; ESIM Coalition NPRM Comments at 4; SES and O3b NPRM Comments at 8; Viasat Comments at 4.

¹²¹ *ESIMs FSS NGSO NPRM*, at para. 13.

¹²² ESIM Coalition NPRM Comments at 4; *see also* 47 CFR 25.146(a)(1).

and receive terrestrial stations are protected by imposing the appropriate power flux density limits on space station transmissions.¹²³ In addition, NGSO FSS operations must not cause unacceptable interference to, or claim protection from, GSO FSS networks.¹²⁴ Accordingly, the Commission sought comment on revising footnote NG527A to indicate that ESIMs can operate with NGSO FSS systems in these two frequency bands on an unprotected basis with regard to non-Federal fixed service. The Commission also proposed revisions to footnote NG527A to indicate that ESIMs can operate with NGSO FSS systems in these two frequency bands, provided that NGSO FSS operations not cause unacceptable interference to, or claim protection from, GSO FSS satellite networks.¹²⁵ Commenters support all of these proposals and raise no concerns.¹²⁶

Accordingly, we further revise paragraph (a) of footnote NG527(A) to state that NGSO ESIM operations in the 19.3-19.4 GHz and 19.6-19.7 GHz (space-to-Earth) bands may be authorized on an unprotected basis with respect to fixed service and NGSO FSS systems operating with ESIMs may be authorized on an unprotected, non-interference basis with respect to GSO FSS satellite networks.¹²⁷

Additional Frequency Bands

Several parties filed comments requesting that we consider including frequency bands that were not proposed in the *NGSO ESIMs NPRM*. Boeing states that the Commission should permit GSO and NGSO ESIMs in every frequency band that is allocated for use by FSS.¹²⁸ SES encourages the Commission to consider NGSO ESIMs matters as part of any future proceeding

¹²³ 47 CFR 25.146(a)(1).

¹²⁴ 47 CFR 25.289.

¹²⁵ *ESIMs NGSO NPRM*, 33 FCC Rcd at 11420, para. 12.

¹²⁶ Boeing NPRM Comments at 8; ESIM Coalition NPRM Comments at 4; OneWeb NPRM Comments at 10; SES and O3b NPRM Comments at 8; Viasat NPRM Comments at 4.

¹²⁷ See Appendix B, NG527A.

¹²⁸ Boeing FNPRM Comments at 1.

developing service rules for “V-band” FSS in the 37.5- 52.4 GHz range of frequencies.¹²⁹ Other commenters ask that the Commission authorize NGSO systems to support ESIMs in additional space-to-Earth frequency bands including 12.2-12.7 GHz, and throughout the V-band.¹³⁰ While some other parties join these proposals, other commenters oppose them.¹³¹ For example, Iridium strongly objects to proposals to include the 19.4-19.6 GHz and the 29.1-29.5 GHz bands, arguing that these bands are beyond the scope of this proceeding.¹³² MDS Operations argues that allowing NGSO ESIM links in the 12.2-12.7 GHz band would create insurmountable coordination challenges for incumbent licensees.¹³³ The MVDDS 5G Coalition concurs.¹³⁴ Specifically, they assert that ensuring that the 12.2-12.7 GHz band remains free of ESIMs communications with NGSO FSS satellites would protect in-band terrestrial services and preserve the possibility of future two-way mobile 5G services.¹³⁵ CTIA asserts that permitting ESIM operations in the UMFUS bands would be inconsistent with the carefully calibrated framework the Commission adopted in the *Spectrum Frontiers* proceeding,¹³⁶ which allows for limited siting of new earth stations under very specific rules.¹³⁷

¹²⁹ SES and O3b NPRM Comments at 9; SES and O3b NPRM Reply Comments at 6-7.

¹³⁰ Boeing NPRM Reply Comments at 1; Viasat NPRM Comments at 3; WorldVu NPRM Comments at i-ii, 3-7, WorldVu NPRM Reply Comments at 1-3.

¹³¹ MDS Operations support the Commission’s proposal to exclude the 12 GHz MVDDS band from the bands in which ESIMs may communicate with NGSOs. MDS Operations NPRM Reply Comments at 2. MDS Operations asserts that allocation for ESIM use in the 12 GHz band would stymie investment and innovation for MVDDS use. *Id.*

¹³² *See generally* Iridium NPRM Reply Comments.

¹³³ MDS NPRM Reply Comments at 3-4.

¹³⁴ MVDDS 5G Coalition NPRM Reply Comments at 1-4.

¹³⁵ *Id.* at 1.

¹³⁶ *See Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al., Report and Order and Further Notice of Proposed Rulemaking*, 31 FCC Rcd 8014 (2016); *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al., Second Report and Order and Order on Reconsideration*, 32 FCC Rcd 10988 (2017); *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al., Third Report and Order*, 33 FCC Rcd 5576 (2018); *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al., Fifth Report and Order*, 34 FCC Rcd 2556 (2019).

¹³⁷ Letter from Jennifer L. Oberhausen, Director, Regulatory Affairs, CTIA to Marlene H. Dortch, Secretary, Federal Communications Commission (filed May 1, 2020) (CTIA May 1 Ex Parte Letter) at 2; Letter from Jennifer L.

These additional frequency bands were not included in this proceeding, and the record is insufficient for us to consider use of these bands for ESIMs communications with NGSO FSS satellites. Moreover, allowing ESIMs to transmit in the UMFUS bands would be inconsistent with the Commission's decisions adopted in the *Spectrum Frontiers* proceeding. Accordingly, we decline to include these additional frequency bands in the rules adopted in this proceeding.

Blanket Licensing

In the *NGSO ESIMs NPRM*, the Commission proposed extending blanket licensing for communications of ESIMs with NGSO FSS systems since such licensing would be limited to frequency bands in which NGSO FSS systems have a primary status or have been found to be able to operate on a secondary or non-conforming basis without causing interference to primary users of those bands. The Commission sought comment on extending blanket licensing to ESIMs operating with NGSO FSS space stations in all the frequency bands being proposed here for ESIM NGSO operation.

Commenters were uniformly supportive of blanket licensing.¹³⁸ Commenters argue that blanket licensing would be more efficient than individually licensing ESIM terminals,¹³⁹ and that individual licensing is only necessary to facilitate site-by-site coordination, which is not needed for terminals in-motion, which employ technical means to operate on a shared basis with other spectrum users.¹⁴⁰ In the past, the Commission has granted blanket licenses to ESIMs communicating with GSO FSS satellites for each specific type of ESIM—Earth Stations on Vessels, Vehicle-Mounted Earth Stations, and Earth Stations Aboard Aircraft—concluding that blanket licensing would be far more effective and administratively efficient than employing an

Oberhausen, Director, Regulatory Affairs, CTIA to Marlene H. Dortch, Secretary, Federal Communications Commission (filed May 6, 2020) (CTIA May 6 Ex Parte Letter).

¹³⁸ ESIM Coalition NPRM Comments at 5; Kymeta NPRM Comments at 2-3; SES and O3b NPRM Comments at 10; WorldVu NPRM Comments at 10-11; Boeing NPRM Comments at 12-13.

¹³⁹ ESIM Coalition NPRM Comments at 5.

¹⁴⁰ Kymeta NPRM Comments at 2-3.

individual licensing approach for these types of earth stations.¹⁴¹ We find that the proposed blanket licensing does not pose any increased risk of harmful interference and that the reasons that blanket licensing is appropriate for communications of these terminals with GSO FSS satellites applies equally to communications of such terminals with NGSO FSS systems. Accordingly, we conclude that blanket licensing is appropriate for communications of ESIMs with NGSO FSS satellites and adopt this proposal.¹⁴²

Implementing Rule Revisions

In the paragraphs below, we address other changes to our rules, in addition to those discussed above in connection with the frequency bands being proposed for NGSO FSS ESIM operation. The Commission sought comment on these changes, and on any other revisions necessary to implement the ESIM NGSO FSS operations described here.¹⁴³

Section 25.202. The Commission sought comment on amending the list of frequencies available to ESIMs in § 25.202(a)(8), (a)(10), and (a)(11) to reflect changes made in this *Report and Order* to frequency bands in which ESIMs can communicate with NGSO FSS satellites.¹⁴⁴

¹⁴¹ *Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands*, IB Docket No. 02-10, Report and Order, 20 FCC Rcd 674, 722, para. 115 (2005); *Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum and Adopt Service Rules and Procedures to Govern the Use of Vehicle-Mounted Earth Stations in Certain Frequency Bands Allocated to the Fixed-Satellite Service*, IB Docket No. 07-101, Report and Order, 24 FCC Rcd 10414, 10464, para. 162 (2009); *Revisions to Parts 2 and 25 of the Commission's Rules to Govern the Use of Earth Stations Aboard Aircraft Communicating with Fixed-Satellite Service Geostationary-Orbit Space Stations Operating in the 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.2 GHz and 14.0-14.5 GHz Frequency Bands*, IB Docket No. 12-376, Report and Order, 27 FCC Rcd 16510, 16550, para. 104 (Dec. 28, 2012).

¹⁴² SES and O3b ask for confirmation that when the Commission stated in the *NGSO ESIMs NPRM* that “ESIMs’ communications with NGSO FSS systems would be limited to frequency bands in which NGSO FSS systems have a primary status, or have been found to be able to operate on a secondary or non-conforming basis, without causing interference to primary users of those bands,” the Commission was referring to the frequency bands to be authorized for NGSO ESIMs through this proceeding. SES and O3b NPRM Comments at 10. SES and O3b state that such a confirmation would remove any concern that the Commission intends to require a separate compatibility showing for a given frequency band to be eligible for blanket licensing. To the extent such a confirmation is necessary, we so confirm here.

¹⁴³ *ESIMs NGSO FSS NPRM*, 33 FCC Rcd at 11422, paras. 16-21. The Commission stated that there would not be significant cost associated with the rule changes for NGSO ESIMs but invited comment to help with the costs and benefits analysis. See *ESIMs NGSO FSS NPRM*, 33 FCC Rcd at 11422, para. 23. No comments were received.

¹⁴⁴ The Commission released an Erratum on December 20, 2018 to correct the *ESIMs NGSO NPRM* which initially suggested revisions to, rather than removal of, § 25.202(a)(11). See *Erratum to the ESIMs NGSO FSS NPRM*.

Other than the objections to the 28.35-28.6 GHz band discussed above, there were no objections to this change, and we amend § 25.202, with the exception of 28.35-28.4 GHz, also taking into account the additional frequencies made available for ESIM operation with GSO FSS satellites, as specified in section III.A of this *Report and Order*.

Section 25.115. The Commission sought comment on changes to extend the rules adopted for GSO FSS ESIMs to NGSO FSS ESIMs, with the appropriate conforming technical changes. Specifically, comment was sought on excluding NGSO ESIMs from rules that pertain to “two-degree spacing”¹⁴⁵ for GSO FSS space stations.¹⁴⁶ Comment was also sought on adding a new paragraph (o) to § 25.115 to codify these requirements for ESIMs that communicate with NGSO FSS space stations.¹⁴⁷ The Commission also sought comment on changing the cross-references contained in the information requirements for earth station applications set forth in § 25.115 for earth stations communicating with GSO and NGSO FSS space stations. All commenters who addressed this issue support this approach and agree that the rules should exclude NGSO ESIMs from the application of off-axis Equivalent Isotropically Radiated Power (EIRP) density requirements for two-degree spaced GSO FSS earth stations.¹⁴⁸ We adopt these conforming revisions with a small modification to take into account that § 25.115(e)(2) is limited to GSO FSS earth stations.

¹⁴⁵ “Two-degree spacing” refers to angular separation in the GSO arc between adjacent co-frequency space stations. *See Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Second Report and Order, 30 FCC Rcd 14713, 14747, para. 92 (2015).

¹⁴⁶ Sections 25.115(l)-(n) contain requirements in paragraphs (1), (2), and (3)(i) that pertain to the two-degree spacing rules for ESIMs communicating with GSO FSS space stations, which are not applicable to NGSO systems. The requirements in paragraphs (3)(ii)-(iv) of this section, however, are also appropriate for ESIMs operating in NGSO FSS systems.

¹⁴⁷ *ESIMs NGSO NPRM*, 33 FCC Rcd at 11421, para. 18.

¹⁴⁸ ESIM Coalition NPRM Comments at 5-6; Viasat NPRM Comments at 6.

Finally, the Commission's Ka-band Plan has a secondary designation for NGSO FSS operations in the 29.5-30.0 GHz band, as described in the *NGSO FSS Order*.¹⁴⁹ The licensing provisions in § 25.115(f) adopted in the *NGSO FSS Order*, however, inadvertently omitted the 29.5-30.0 GHz band.¹⁵⁰ In the *NGSO ESIMS NPRM*, the Commission proposed to correct this omission and proposed to extend the provisions of § 25.115(f) to the 29.5-30.0 GHz band. Commenters did not address this specific point. We adopt the revision to correct the omission consistent with the Ka-band Plan as previously adopted by the Commission.

Section 25.228. Section 25.228 contains requirements in paragraphs (a), (b), and (c), that codify the two-degree spacing requirements for ESIMs communicating with GSO FSS satellite networks, but the paragraphs are not specifically worded to apply only to such ESIMs. The Commission sought comment on adopting revisions to clarify that these paragraphs apply only to ESIMs communicating with GSO FSS satellite networks.¹⁵¹

Intelsat notes that the proposed changes may have been interpreted differently by different commenters,¹⁵² and Kepler states that further clarification may be necessary because of the separate purposes these rules address.¹⁵³ Despite this disagreement, commenters are uniformly concerned that the proposed revision eliminates the NGSO ESIM self-monitoring and network monitoring and control requirements,¹⁵⁴ and many commenters argue against adding language specifying that § 25.228(a), (b), and (c) are GSO-specific. The ESIM Coalition, for example, believes ESIM terminal self-monitoring and network control and monitoring center requirements are essential to ensuring operations are conducted in accordance with applicable

¹⁴⁹ *NGSO FSS Report and Order*, 32 FCC Rcd at 7813, para. 9.

¹⁵⁰ *ESIMs NGSO NPRM*, 33 FCC Rcd at 11421, para. 21.

¹⁵¹ *Id.* at para. 19.

¹⁵² Intelsat NPRM Reply Comments at 3.

¹⁵³ Kepler NPRM Comments at 1-2, and n4.

¹⁵⁴ *See* ESIM Coalition at 5-6; Eutelsat at 2; SES at 9; Intelsat NPRM Reply Comments at 3.

license provisions, consistent with the ESIM rules, and without causing interference to other satellite and earth station operations. They argue that there is no basis to treat GSO FSS and NGSO FSS ESIMs differently with respect to these important requirements.¹⁵⁵ Eutelsat concurs, stating this revision appears to suggest elimination of self-monitoring and network control and monitoring center requirements for NGSO FSS ESIMs.

We agree with these concerns. Therefore, we adopt modified language to ensure that GSO and NGSO FSS ESIM operators comply with the same general monitoring and control requirements, and limit applicability to GSO ESIMs only for § 25.228(a). Specifically, to confirm the applicability of §§ 25.228(b) and 25.228(c) to both GSO and NGSO FSS ESIMs, we do not include the word “GSO” in the initial sentence, and include clauses specifically applicable to GSO and NGSO in the remaining text of the rule.¹⁵⁶ We agree with commenters that there should be parity between the GSO and NGSO ESIM self-monitoring and network monitoring and control requirements.¹⁵⁷ We also agree with commenters that self-monitoring and network monitoring and control requirements are necessary to ensure operations are in accordance with the Commission’s rules and licensing conditions.¹⁵⁸

Relatedly, we note that the adoption of the § 25.228 rules in the *GSO ESIMs Report & Order and FNPRM* inadvertently created an inconsistency with regard to network control and monitoring centers for Earth Stations on Vessels.¹⁵⁹ Specifically, in that decision, the Commission adopted § 25.228(e)(1) which states, in part, that Earth Stations on Vessels operators must control Earth Stations on Vessels by a network control and monitoring center

¹⁵⁵ ESIM Coalition NPRM Comments at 5-6. *See also* Eutelsat NPRM Comments at 2.

¹⁵⁶ *See* § 25.228(b) and (c) in Appendix B of the Report and Order.

¹⁵⁷ ESIM Coalition NPRM Comments at 5-6; Eutelsat NPRM Comments at 2; SES NPRM Reply Comments at 9; Intelsat NPRM Reply Comments at 3; WorldVu NPRM Reply Comments at 4.

¹⁵⁸ Intelsat NPRM Reply Comments at 3.

¹⁵⁹ *GSO ESIM Report & Order*, 33 FCC Rcd at Appendix B.

located in the United States, but it fails to include the option of using an equivalent facility, as § 25.228's paragraph (c) does for ESIMs.¹⁶⁰ Because Earth Stations on Vessels are a type of ESIM, and because § 25.228(c) as adopted in the *GSO ESIM R&O* already provided that “[e]ach ESIM must be monitored and controlled by a network control and monitoring center (NMC) *or equivalent facility*,” the addition of “equivalent facility” to the language in § 25.228(e)(1) simply conforms the two provisions of the rules in accordance with the *GSO ESIM Report & Order*.¹⁶¹ Therefore, we fix that inconsistency here by adding the phrase “or equivalent facility” (which appears in § 25.228(c)) to § 25.228(e)(1), to state that Earth Stations on Vessels operators must control all Earth Stations on Vessels by a network control and monitoring center or equivalent facility located in the United States.¹⁶²

Kepler argues that further clarification may be required on how various systems should operate their ESIMs, and in particular notes that a satellite network need not be controlled in “real-time” from a network control and monitoring center, but may instead rely either on Artificial Intelligence (“AI”) or predetermined rules in order to mitigate interference as it relates to aggregate EIRP.¹⁶³ Kepler further asserts that while this does not preclude the requirement for a network control and monitoring center, it should be clarified that operations without bent-pipe architecture may implement alternate safety measures, and could use the satellite itself as an “equivalent facility.”¹⁶⁴ Although we agree that technology may evolve to such a point in the future, we find that such a discussion is beyond the scope of this rulemaking.

¹⁶⁰ See 47 CFR 25.228(c) and (e).

¹⁶¹ *GSO ESIM Report & Order*, 33 FCC Rcd 9327.

¹⁶² See Appendix B (setting forth amendments adopted herein to 47 CFR 25.228(e)) (emphasis added). Because this change is editorial and non-substantive, we find good cause to conclude that notice and comment are unnecessary for its adoption. See 5 U.S.C. 553(b)(B).

¹⁶³ Kepler NPRM Comments at 2.

¹⁶⁴ See also Kepler NPRM Comments at 2.

Paragraph (j) of § 25.228 is explicitly limited to ESIMs transmitting to GSO FSS satellites, and the Commission sought comment on revising the language of the rule to apply to Ku-band ESIMs communicating with NGSO FSS space stations as well.¹⁶⁵ Additionally, in the 14.0-14.2 GHz (Earth-to-space) band, there is a secondary allocation to the Space Research service. In order to ensure compatibility with Space Research operations, the Commission sought comment on modifying § 25.228(j) to extend to NGSO FSS systems conditions that currently apply to ESIM operation with GSO FSS space stations.¹⁶⁶ CORF asserts that since radio astronomy observatories are just as vulnerable to interference from NGSO uplinks as from GSO uplinks, the Commission should modify the text of § 25.228(j) to apply the same coordination requirement to NGSO operators.¹⁶⁷ Viasat agrees with the Commission and CORF that such a requirement would be reasonable.¹⁶⁸ We adopt the revision.

Section 25.103. Consistent with these changes, the Commission proposed to amend the definitions of Earth Stations on Vessels, Vehicle-Mounted Earth Stations, and Earth Stations Aboard Aircraft in § 25.103, which restrict communications to “geostationary-orbit FSS space stations.”¹⁶⁹ Pursuant to what was described above, Earth Stations on Vessels, Vehicle-Mounted Earth Stations, and Earth Stations Aboard Aircraft would also be permitted to operate in NGSO FSS systems. Accordingly, the Commission sought comment on removing the word “geostationary-orbit” from these definitions. No commenters objected to this change, and we adopt it herein.

¹⁶⁵ *ESIMs NGSO NPRM*, 33 FCC Rcd at 11421, para. 19.

¹⁶⁶ *Id.* at 11419, para. 9.

¹⁶⁷ CORF NPRM Comments at 11.

¹⁶⁸ Viasat NPRM Reply Comments at 7-8.

¹⁶⁹ *ESIMs NGSO NPRM*, 33 FCC Rcd at 11421, para. 20; 47 CFR 25.103.

Additional conforming changes. Pursuant to changes to part 25 of the Commission’s rules in another proceeding,¹⁷⁰ we take this opportunity to eliminate cross-references to § 25.223, which has been removed and reserved. Specifically, we delete the cross references in §§ 25.103, *Routine processing or licensing*, 25.115(g)(1)(vii), and 25.209(f).¹⁷¹ Further, we add text in § 25.218(a) and (j) to incorporate the 24.75-25.25 GHz band that had been included in the now reserved § 25.138.¹⁷²

Additionally, we take this opportunity to harmonize the language of the revisions to § 25.115(l)(3)(i)-(n)(3)(i) adopted in the *GSO ESIMs Report & Order and FNPRM* with the text of that decision.¹⁷³ Specifically, in the *GSO ESIMs Report & Order and FNPRM*, we stated that § 25.115(l)(3)(i)-(n)(3)(i) would require all applicants to “provide a certification that the ESIM system is capable of detecting and automatically ceasing emissions when an individual ESIM transmitter exceeds the relevant off-axis EIRP spectral density limits specified in § 25.218, or the limits provided to the target satellite operator for operation under § 25.220.”¹⁷⁴ However, in the text of the rules, we stated that an application would need to certify that “an individual ESIM transmitter ” meets these requirements.¹⁷⁵ The revisions here conform the text of the rule to the

¹⁷⁰ *Spectrum Frontiers Third Report and Order*, 33 FCC Rcd 5576 (2018).

¹⁷¹ Because these changes are editorial and non-substantive, we find good cause to conclude that notice and comment are unnecessary for their adoption. *See* 5 U.S.C. 553(b)(B).

¹⁷² In the *Spectrum Frontiers Third Report and Order*, the Commission amended § 25.138 of the Commission’s rules to include the 24.75-25.25 GHz band vis-à-vis GSO FSS earth station licensing requirements. 33 FCC Rcd 5576. Based on the timing of rules becoming effective, that section was subsequently “reserved” in the Code of Federal Regulations. *See GSO ESIM Report & Order*, 33 FCC Rcd 9327, 33 FCC Rcd at Appendix B. Therefore, bringing the adopted edits into the appropriate rule section is a simple ministerial update. As such, we find good cause to conclude that notice and comment are unnecessary for their inclusion. *See* 5 U.S.C. 553(b)(B).

¹⁷³ *GSO ESIMs Report & Order and FNPRM*, 33 FCC Rcd at 9351, para. 75.

¹⁷⁴ *Id.* (emphasis added).

¹⁷⁵ *See, e.g.*, 47 CFR 25.115(l)(3)(i)

language of the *Order* regarding “systems,” and therefore they are editorial and non-substantive changes.¹⁷⁶

Final Regulatory Flexibility Analysis. Pursuant to the Regulatory Flexibility Act of 1980, as amended, 5 U.S.C. 601 *et seq.* (RFA), the Commission’s Final Regulatory Flexibility Analysis (FRFA) on the possible significant economic impact on small entities of the policies and rules was addressed in this *Second Report and Order* in IB Docket No. 17-95 and *Report and Order* in IB Docket No. 18-315,. The Commission’s Consumer and Governmental Affairs Bureau, Reference Information Center, will send a copy of this *Second Report and Order* in IB Docket No. 17-95 and *Report and Order* in IB Docket 18-315, including the FRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).

Paperwork Reduction Act. This document does not contain new or modified information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. In addition, therefore, it does not contain any new or modified information collection burden for small business concerns with fewer than 25 employees, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, see 44 U.S.C. 3506(c)(4).

Congressional Review Act. The Commission has determined, and the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget, concurs that these rules are non-major under the Congressional Review Act, 5 U.S.C. 804(2). The Commission will send a copy of this *Second Report and Order* in IB Docket No. 17-95 and *Report and Order* in IB Docket 18-315 and *Further Notice of Proposed Rulemaking* to Congress and the Government Accountability Office pursuant to 5 U.S.C. 801(a)(1)(A).

ORDERING CLAUSES

¹⁷⁶ See Appendix B, Final Rules.

IT IS ORDERED, pursuant to sections 4(i), 7(a), 303, 308(b), and 316 of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 157(a), 303, 308(b), 316, that this *Second Report and Order* in IB Docket No. 17-95 and *Report and Order* in IB Docket No. 18-315 IS ADOPTED, the policies, rules, and requirements discussed herein ARE ADOPTED, and parts 2 and 25 of the Commission's rules ARE AMENDED as set forth in Appendix B.

IT IS FURTHER ORDERED that the rules and requirements adopted in the *Second Report and Order* in IB Docket No. 17-95 and *Report and Order* in IB Docket No. 18-315 WILL BECOME EFFECTIVE 30 days from the date of publication in the *Federal Register*.

IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this *Second Report and Order* in IB Docket No. 17-95 and *Report and Order* in IB Docket No. 18-315 and *Further Notice of Proposed Rulemaking*, including the Final and Initial Regulatory Flexibility Analyses, to the Chief Counsel for Advocacy of the Small Business Administration.

IT IS FURTHER ORDERED that the Commission, SHALL SEND a copy of this *Second Report and Order* in IB Docket No. 17-95 and *Report and Order* in IB Docket No. 18-315 to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. 801(a)(1)(A).

List of Subjects

47 CFR Part 2

Radio, Table of frequency allocations.

47 CFR Part 25

Administrative practice and procedure, Earth stations, Satellites.

Federal Communications Commission.

Marlene Dortch,
Secretary.

Final Rules

For the reasons discussed in the preamble, the Federal Communications Commission amends 47

CFR parts 2 and 25 as follows:

PART 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS;

GENERAL RULES AND REGULATIONS

1. The authority citation for part 2 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

2. Section 2.106, the Table of Frequency Allocations, is amended as follows:

- a. Pages 52 and 53 are revised.

- b. In the list of Non-Federal Government (NG) footnotes, footnote NG527A is revised.

The revisions and additions read as follows:

§ 2.106 Table of Frequency Allocations.

* * * * *

15.63-15.7 RADIOLOCATION 5.511E 5.511F AERONAUTICAL RADIONAVIGATION			15.63-15.7 RADIOLOCATION 5.511E 5.511F US511E AERONAUTICAL RADIONAVIGATION US260 US211	15.63-15.7 AERONAUTICAL RADIONAVIGATION US260 US211 US511E	Aviation (87)
15.7-16.6 RADIOLOCATION 5.512 5.513			15.7-16.6 RADIOLOCATION G59	15.7-17.2 Radiolocation	Private Land Mobile (90)
16.6-17.1 RADIOLOCATION Space research (deep space) (Earth-to-space) 5.512 5.513			16.6-17.1 RADIOLOCATION G59 Space research (deep space) (Earth-to-space)		
17.1-17.2 RADIOLOCATION 5.512 5.513			17.1-17.2 RADIOLOCATION G59		
17.2-17.3 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) 5.512 5.513 5.513A			17.2-17.3 EARTH EXPLORATION- SATELLITE (active) RADIOLOCATION G59 SPACE RESEARCH (active)	17.2-17.3 Earth exploration-satellite (active) Radiolocation Space research (active)	
17.3-17.7 FIXED-SATELLITE (Earth-to-space) 5.516 (space-to-Earth) 5.516A 5.516B Radiolocation 5.514	17.3-17.7 FIXED-SATELLITE (Earth-to-space) 5.516 BROADCASTING-SATELLITE Radiolocation 5.514 5.515	17.3-17.7 FIXED-SATELLITE (Earth-to-space) 5.516 Radiolocation 5.514	17.3-17.7 Radiolocation US259 G59 US402 G117	17.3-17.7 FIXED-SATELLITE (Earth-to-space) US271 BROADCASTING-SATELLITE US402 NG163 US259	Satellite Communications (25)
17.7-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE	17.7-17.8 FIXED FIXED-SATELLITE (space-to-Earth) 5.517 (Earth-to-space) 5.516 BROADCASTING-SATELLITE Mobile 5.515	17.7-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE	17.7-17.8 US334 G117	17.7-17.8 FIXED FIXED-SATELLITE (Earth-to-space) US271 US334	Satellite Communications (25) TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
	17.8-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE 5.519		17.8-18.3 FIXED-SATELLITE (space-to- Earth) US334 G117	17.8-18.3 FIXED Fixed-satellite (space-to-Earth)	
18.1-18.4 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B (Earth-to-space) 5.520 MOBILE 5.519 5.521			US519 18.3-18.6 FIXED-SATELLITE (space-to- Earth) US334 G117	US334 US519 NG527A 18.3-18.6 FIXED-SATELLITE (space-to-Earth) NG527A	Satellite Communications (25)
18.4-18.6 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B MOBILE			US139	US139 US334	

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.522B MOBILE except aeronautical mobile Space research (passive) 5.522A 5.522C	18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.522B MOBILE except aeronautical mobile SPACE RESEARCH (passive) 5.522A	18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.522B MOBILE except aeronautical mobile Space research (passive) 5.522A	18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED-SATELLITE (space-to-Earth) US255 US334 G117 SPACE RESEARCH (passive) US139 US254	18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED-SATELLITE (space-to-Earth) US255 NG164 NG527A SPACE RESEARCH (passive) US139 US254 US334	Satellite Communications (25)
18.8-19.3 FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.523A MOBILE			18.8-20.2 FIXED-SATELLITE (space-to-Earth) US334 G117	18.8-19.3 FIXED-SATELLITE (space-to-Earth) NG165 NG527A US139 US334	
19.3-19.7 FIXED FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.523B 5.523C 5.523D 5.523E MOBILE				19.3-19.7 FIXED FIXED-SATELLITE (space-to-Earth) NG166 US334 NG527A	Satellite Communications (25) TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
19.7-20.1 FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A Mobile-satellite (space-to-Earth) 5.524	19.7-20.1 FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528 5.529	19.7-20.1 FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A Mobile-satellite (space-to-Earth) 5.524		19.7-20.2 FIXED-SATELLITE (space-to-Earth) NG527A MOBILE-SATELLITE (space-to-Earth) 5.525 5.526 5.527 5.528 5.529 US334	Satellite Communications (25)
20.1-20.2 FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528			US139		
20.2-21.2 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Standard frequency and time signal-satellite (space-to-Earth) 5.524			20.2-21.2 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Standard frequency and time signal-satellite (space-to-Earth) G117	20.2-21.2 Standard frequency and time signal-satellite (space-to-Earth)	
21.2-21.4 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)			21.2-21.4 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) US532		Fixed Microwave (101)
21.4-22 FIXED MOBILE BROADCASTING-SATELLITE 5.208B 5.530A 5.530B 5.530D	21.4-22 FIXED MOBILE 5.530A	21.4-22 FIXED MOBILE BROADCASTING-SATELLITE 5.208B 5.530A 5.530B 5.530D 5.531	21.4-22 FIXED MOBILE		

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NON-FEDERAL GOVERNMENT (NG) FOOTNOTES

* * * * *

NG527A Earth Stations in Motion (ESIMs), as regulated under 47 CFR part 25, are an application of the fixed-satellite service (FSS) and the following provisions shall apply:

(a) In the bands 10.7-11.7 GHz, 19.3-19.4 GHz, and 19.6-19.7 GHz (space-to-Earth), ESIMs may be authorized for the reception of FSS emissions from geostationary and non-geostationary satellites, subject to the conditions that these earth stations may not claim protection from transmissions of non-Federal stations in the fixed service and that non-geostationary-satellite systems not cause unacceptable interference to, or claim protection from, geostationary-satellite networks.

(b) In the bands 11.7-12.2 GHz (space-to-Earth), 14.0-14.5 GHz (Earth-to-space), 18.3-18.8 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 28.35-28.6 GHz (Earth-to-space), and 29.25-30.0 GHz (Earth-to-space), ESIMs may be authorized to communicate with geostationary satellites on a primary basis.

(c) In the bands 11.7-12.2 GHz (space-to-Earth), 14.0-14.5 GHz (Earth-to-space), 18.3-18.6 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 28.4-28.6 GHz (Earth-to-space), and 29.5-30.0 GHz (Earth-to-space), ESIMs may be authorized to communicate with non-geostationary satellites, subject to the condition that non-geostationary-satellite systems may not cause unacceptable interference to, or claim protection from, geostationary-satellite networks.

(d) In the band 17.8-18.3 GHz (space-to-Earth), ESIMs may be authorized for the reception of FSS emissions from geostationary and non-geostationary satellites on a secondary basis, subject to the condition that non-geostationary-satellite systems not cause unacceptable interference to, or claim protection from, geostationary-satellite networks.

(e) In the bands 18.8-19.3 GHz and 28.6-29.1 GHz, ESIMs may be authorized to communicate with geostationary and non-geostationary satellites, subject to the condition that

geostationary-satellite networks may not cause unacceptable interference to, or claim protection from, non-geostationary satellite systems in the fixed-satellite service.

PART 25 – SATELLITE COMMUNICATIONS

3. The authority citation for part 25 continues to read as follows:

Authority: 47 U.S.C. 154, 301, 302, 303, 307, 309, 310, 319, 332, 605, and 721, unless otherwise noted.

4. Amend § 25.103 by revising the definitions of “Earth Station on Vessel,” “Earth Stations Aboard Aircraft,” “Routine processing or licensing,” and “Vehicle-Mounted Earth Station” to read as follows:

§ 25.103 Definitions.

* * * * *

Earth Station Aboard Aircraft (ESAA). An earth station operating aboard an aircraft that receives from and transmits to Fixed-Satellite Service space stations.

* * * * *

Earth Station on Vessel (ESV). An earth station onboard a craft designed for traveling on water, receiving from and transmitting to Fixed-Satellite Service space stations.

* * * * *

Routine processing or licensing. Expedited processing of unopposed applications for earth stations in the FSS communicating with GSO space stations that satisfy the criteria in § 25.211(d), § 25.212(c) through (f), or § 25.218, include all required information, are consistent with all Commission rules, and do not raise any policy issues. Some, but not all, routine earth station applications are eligible for an autogrant procedure under § 25.115(a)(3).

* * * * *

Vehicle-Mounted Earth Station (VMES). An earth station, operating from a motorized vehicle that travels primarily on land, that receives from and transmits to Fixed-Satellite Service space stations and operates within the United States.

4. Amend § 25.115 by revising paragraphs (f), (g)(1)(vii), (l)(3)(i), (m)(3)(i), and (n)(3)(i), and adding paragraph (o) to read as follows:

§ 25.115 Applications for earth station authorizations.

* * * * *

(f) *NGSO FSS earth stations in 10.7-30.0 GHz*. (1) An application for an NGSO FSS earth station license in the 10.7-30.0 GHz band must include the certification described in §25.146(a)(2).

(2) Individual or blanket license applications may be filed for operation in the 10.7-12.7 GHz, 14-14.5 GHz, 17.8-18.6 GHz, 18.8-19.4 GHz, 19.6-20.2 GHz, 28.35-29.1 GHz, or 29.5-30.0 GHz bands; however, ESIMs cannot operate in the 28.35-28.4 GHz band and blanket licensing in the 10.7-11.7 GHz, 17.8-18.3 GHz, 19.3-19.4 GHz, and 19.6-19.7 GHz bands is on an unprotected basis with respect to current and future systems operating in the fixed service.

(3) Individual license applications only may be filed for operation in the 12.75-13.15 GHz, 13.2125-13.25 GHz, 13.75-14 GHz, or 27.5-28.35 GHz bands.

(g) * * *

(1) * * *

(vii) The relevant off-axis EIRP density envelopes in § 25.218 must be superimposed on plots submitted pursuant to paragraphs (g)(1)(i) through (vi) of this section.

* * * * *

(l) * * *

(3) * * *

(i) ESIM applicants that meet the relevant off-axis EIRP density mask must certify that an ESIM system is self-monitoring and capable of automatically ceasing or reducing emissions within 100 milliseconds if the ESIM transmitter exceeds the relevant off-axis EIRP density limits. ESIM applicants that do not meet the relevant off-axis EIRP density mask must provide a detailed showing that an ESIM system is self-monitoring and capable of automatically ceasing or reducing emissions within 100 milliseconds if the ESIM transmitter exceeds the relevant off-axis EIRP density limits. Variable-power ESIM applicants must certify that one or more transmitters are capable of automatically ceasing or reducing emissions within 100 milliseconds of receiving a command to do so from the system's network control and monitoring center, if the aggregate off axis EIRP densities of the transmitter or transmitters exceed the relevant off-axis EIRP density limits.

* * * * *

(m) * * *

(3) * * *

(i) ESIM applicants that meet the relevant off-axis EIRP density mask must certify that an ESIM system is self-monitoring and capable of automatically ceasing or reducing emissions within 100 milliseconds if the ESIM transmitter exceeds the relevant off-axis EIRP density limits. ESIM applicants that do not meet the relevant off-axis EIRP density mask must provide a detailed showing that an ESIM system is self-monitoring and capable of automatically ceasing or reducing emissions within 100 milliseconds if the ESIM transmitter exceeds the relevant off-axis EIRP density limits. Variable-power ESIM applicants must certify that one or more transmitters are capable of automatically ceasing or reducing emissions within 100 milliseconds of receiving a command to do so from the system's network control and monitoring center, if the aggregate

off axis EIRP densities of the transmitter or transmitters exceed the relevant off-axis EIRP density limits.

* * * * *

(n) * * *

(3) * * *

(i) ESIM applicants that meet the relevant off-axis EIRP density mask must certify that an ESIM system is self-monitoring and capable of automatically ceasing or reducing emissions within 100 milliseconds if the ESIM transmitter exceeds the relevant off-axis EIRP density limits. ESIM applicants that do not meet the relevant off-axis EIRP density mask must provide a detailed showing that an ESIM system is self-monitoring and capable of automatically ceasing or reducing emissions within 100 milliseconds if the ESIM transmitter exceeds the relevant off-axis EIRP density limits. Variable-power ESIM applicants must certify that one or more transmitters are capable of automatically ceasing or reducing emissions within 100 milliseconds of receiving a command to do so from the system's network control and monitoring center, if the aggregate off axis EIRP densities of the transmitter or transmitters exceed the relevant off-axis EIRP density limits.

* * * * *

(o) The requirements in this paragraph apply to applications for ESIMs operation with NGSO satellites in the Fixed-Satellite Service, in addition to the requirements in paragraphs (a)(1), (a)(5), and (i) of this section:

(1) An exhibit describing the geographic area(s) in which the ESIMs will operate and the location of hub and/or gateway stations.

(2) The point of contact information referred to in § 25.228(e)(2), (f), or (g)(1) as appropriate.

(3) Applicants for ESIMs that will exceed the guidelines in § 1.1310 of this chapter for radio frequency radiation exposure must provide, with their environmental assessment, a plan for mitigation of radiation exposure to the extent required to meet those guidelines.

* * * * *

5. Amend § 25.202 by revising paragraph (a)(8), adding paragraphs (a)(10)(i) and (ii) and by removing and reserving paragraph (a)(11) as follows:

§ 25.202 Frequencies, frequency tolerance, and emission limits.

(a) * * *

(8) The following frequencies are available for use by Earth Stations on Vessels (ESVs) communicating with GSO FSS space stations, subject to the provisions in § 2.106 of this chapter:

3700-4200 MHz (space-to-Earth)

5925-6425 MHz (Earth-to-space)

* * * * *

(10) * * *

(i) The following frequencies are available for use by Earth Stations in Motion (ESIMs) communicating with GSO FSS space stations, subject to the provisions in § 2.106 of this chapter:

10.7-11.7 GHz (space-to-Earth)

11.7-12.2 GHz (space-to-Earth)

14.0-14.5 GHz (Earth-to-space)

17.8-18.3 GHz (space-to-Earth)

18.3-18.8 GHz (space-to-Earth)

18.8-19.3 GHz (space-to-Earth)

19.3-19.4 GHz (space-to-Earth)

19.6-19.7 GHz (space-to-Earth)

19.7-20.2 GHz (space-to-Earth)

28.35-28.6 GHz (Earth-to-space)

28.6-29.1 GHz (Earth-to-space)

29.25-30.0 GHz (Earth-to-space)

(ii) The following frequencies are available for use by Earth Stations in Motion (ESIMs) communicating with NGSO FSS space stations, subject to the provisions in § 2.106 of this chapter:

10.7-11.7 GHz (space-to-Earth)

11.7-12.2 GHz (space-to-Earth)

14.0-14.5 GHz (Earth-to-space)

17.8-18.3 GHz (space-to-Earth)

18.3-18.6 GHz (space-to-Earth)

18.8-19.3 GHz (space-to-Earth)

19.3-19.4 GHz (space-to-Earth)

19.6-19.7 GHz (space-to-Earth)

19.7-20.2 GHz (space-to-Earth)

28.4-28.6 GHz (Earth-to-space)

28.6-29.1 GHz (Earth-to-space)

29.5-30.0 GHz (Earth-to-space)

6. Amend § 25.209 by revising paragraph (f) to read as follows:

§ 25.209 Earth station antenna performance standards.

* * * * *

(f) A GSO FSS earth station with an antenna that does not conform to the applicable standards in paragraphs (a) and (b) of this section will be authorized only if the applicant demonstrates that the antenna will not cause unacceptable interference. This demonstration must show that the transmissions of the earth station comport with the requirements in § 25.218 or the applicant must demonstrate that the operations of the earth station have been coordinated under § 25.220.

7. Amend § 25.218 by revising paragraphs (a) and (j) to read as follows:

§ 25.218 Off-axis EIRP density envelopes for FSS earth stations transmitting in certain frequency bands.

(a) This section applies to applications for fixed and temporary-fixed FSS earth stations transmitting to geostationary space stations in the conventional C-band, extended C-band, conventional Ku-band, extended Ku-band, conventional Ka-band, or 24.75-25.25 GHz and applications for ESIMs transmitting in the conventional C-band, conventional Ku-band, or conventional Ka-band, except for applications proposing transmission of analog command signals at a band edge with bandwidths greater than 1 MHz or transmission of any other type of analog signal with bandwidths greater than 200 kHz.

(j) Applications for authority for fixed earth station operation in the conventional C-band, extended C-band, conventional Ku-band, extended Ku-band, conventional Ka-band, or 24.75-25.25 GHz that do not qualify for routine processing under relevant criteria in this section, § 25.211, or § 25.212 are subject to the requirements in § 25.220.

8. Amend § 25.228 by revising paragraphs (a), (b), (c), (e)(1), and paragraph (j) introductory text to read as follows:

§ 25.228 Operating and coordination requirements for earth stations in motion (ESIMs).

(a) GSO FSS ESIM transmissions must comport with the applicable EIRP density limits in § 25.218, unless coordinated pursuant to the requirements in § 25.220.

(b) Each FSS ESIM must be self-monitoring and, should a condition occur that would cause the ESIMs to exceed its authorized off-axis EIRP density limits in the case of GSO FSS ESIMs or any emission limits included in the licensing conditions in the case of NGSO FSS ESIMs, the ESIM must automatically cease transmissions within 100 milliseconds, and not resume transmissions until the condition that caused the ESIM to exceed those limits is corrected.

(c) Each FSS ESIM must be monitored and controlled by a network control and monitoring center (NMC) or equivalent facility. Each ESIM must comply with a “disable transmission” command from the NMC within 100 milliseconds of receiving the command. In addition, the NMC must monitor the operation of each ESIM in its network, and transmit a “disable transmission” command to any ESIM that operates in such a way as to exceed the authorized off-axis EIRP density limit for GSO FSS ESIMs or any emission limits included in the licensing conditions in the case of NGSO FSS ESIMs. The NMC must not allow the ESIM(s) under its control to resume transmissions until the condition that caused the ESIM(s) to exceed the authorized EIRP density limits is corrected.

* * * * *

(e) ***

(1) ESV operators must control all ESVs by a NMC or equivalent facility located in the United States, except that an ESV on U.S.-registered vessels may operate under control of a NMC location outside the United States provided the ESV operator maintains a point of contact within the United States that will have the capability and authority to cause an ESV on a U.S.-registered vessel to cease transmitting if necessary.

* * * * *

(j) The following requirements govern all ESIMs transmitting to GSO or NGSO satellites in the Fixed-Satellite Service in the 14.0-14.5 GHz band.

* * * * *

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