EXHIBIT A

INMARSAT-6 F2 (28°W.L.)

Technical Information to Supplement Schedule S

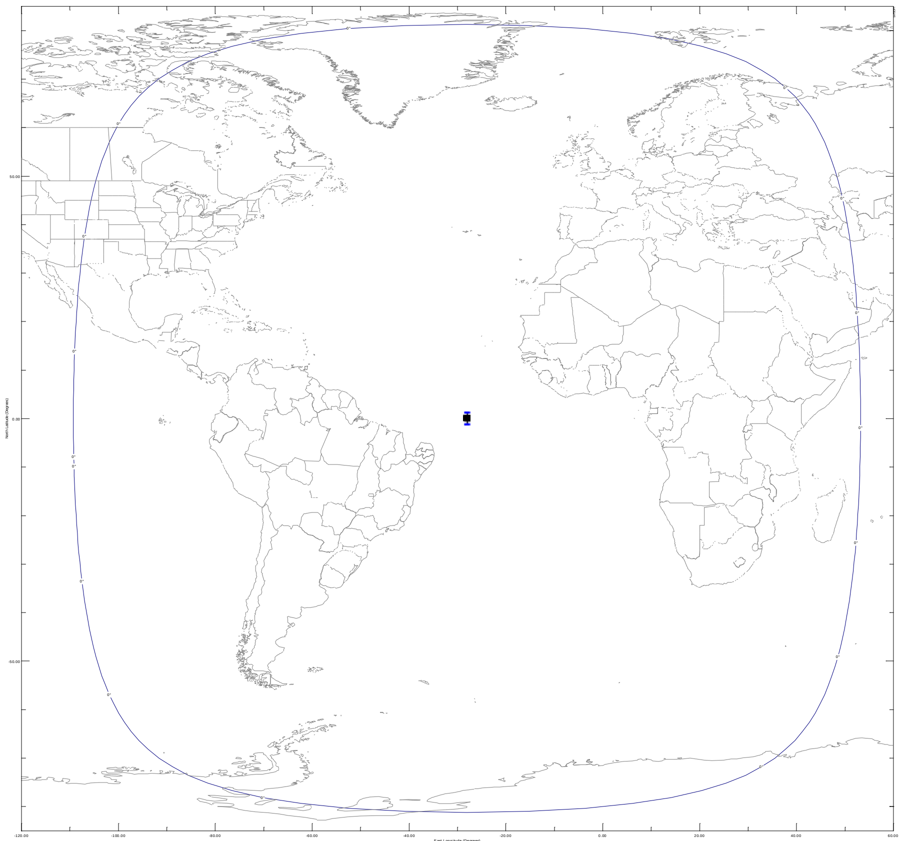
A.1 SCOPE AND PURPOSE

This document provides certain technical information concerning the Inmarsat-6 F2 (hereafter referred to as "I6-F2") satellite located at 28° W.L. insofar as the satellite services that will be provided to US territories is concerned. It accompanies the application for US market access for this satellite. The purpose of this document is to provide the information related to the I6-F2 satellite that is required by §§ 25.117(d), 25.114(d), 25.146 and other sections of the FCC's Part 25 rules that cannot be captured by the Schedule S software. A complete Schedule S is also being submitted with this application which contains all the relevant technical data for the I6-F2 satellite that can be captured by the Schedule S software.

A.2 OVERALL DESCRIPTION OF SYSTEM FACILITIES, OPERATIONS AND SERVICES AND EXPLANATION OF HOW UPLINK FREQUENCY BANDS ARE CONNECTED TO DOWNLINK FREQUENCY BANDS (§25.114(D)(1))

The I6-F2 satellite will be launched in early 2023 and, after a period of electric orbit raising, will be on station in late 2023. It will provide Inmarsat's L-band ELERA mobile satellite service (MSS) and Ka-band Global Xpress fixed satellite service to the parts of the Earth visible from the 28°W.L. orbital position – see Figure A2-1 below which shows the 0° elevation contour from this orbital position.

Figure A2-1 – View of the Earth from the 28°W.L. orbital position showing the 0° elevation angle contour



The I6-F2 satellite includes several communications payloads, but only those that will provide service to the United States and its territories are described in this document and the accompanying Schedule S submission. Those payloads are:

- An L-band ELERA MSS payload providing the traditional Inmarsat services to all types of L-band mobile terminals – land, sea and air. The feeder links for this service use both C-band and Ka-band; C-band feeder links will only be operated through gateways outside the United States, and United States market access is not being sought for C-band feeder links. Ka-band gateways will include the Southbury Gateway through which market access for I6-F2 is being sought. The L-band beams are widely reconfigurable with up to 199 individual small beams over the Earth's surface, a fewer number of larger beams, and a global beam. The interconnection between MSS user links and gateway links is fully flexible by the use of an on-board processor.

- A Ka-band Global Xpress FSS payload which provides two-way services to small Ka-band user terminals. The links to these user terminals use multiple steerable spot beams.

> The Ka-band gateway links for this service also use multiple steerable spot beams. There is a flexible interconnection between the user links and the gateway links.

TT&C transmissions to and from the I6-F2 satellite will not take place from US territories (Inmarsat will utilize a C-band facility at Montcalm, Quebec, Canada, for these purposes).

A.3 PREDICTED SPACE STATION ANTENNA GAIN CONTOURS (§25.114(C)(4)(VI))

The antenna gain contours for the L-band and Ka-band beams are provided, where appropriate, in the accompanying Schedule S, consistent with the requirements of §25.114(c)(4)(vi). Additional explanation of this data for each frequency band is provided in the following sub-sections.

A.3.1 L-Band Beams

As explained in Section A.2 above, the L-band beams, for both receive and transmit, are both shapeable and fully steerable over the visible Earth. Therefore, consistent with §25.114(c)(4)(vi)(A) and (C), no contour diagram data is required as the 0 dB relative antenna gain isoline appears at the Earth's horizon as viewed from the satellite, and no lower gain isoline contours appear on the surface of the Earth.

Consistent with §25.114(c)(4)(vi)(C), the Schedule S data provided for the transmitting L-band beams corresponds to the case of maximum satellite transmit EIRP density which occurs when the beams are configured for the smallest spot beam which has the highest peak gain. The corresponding Schedule S data for the receiving L-band beams includes two cases, as required by §25.114(c)(4)(v): the case of highest gain-to-noise temperature (G/T) and the case of the lowest G/T. These two cases are represented by two separate L-band receive beams in the Schedule S.

A.3.2 Ka-Band Beams

Three types of Ka-band beams, for both receive and transmit, are provided in the accompanying Schedule S, and all of these are steerable. One of these beam types is for the Ka-band user links, while the other two, with different gain values, are used for gateway links. The GIMS antenna gain contour diagrams provided for these beams are for representative beam pointing directions within the stated global service area.

A.4 SYSTEM TECHNICAL CHARACTERISTICS

A.4.1 TT&C and Payload Control Characteristics (§25.202(g))

As noted in Section A.2 above, on-station TT&C for the I6-F2 spacecraft will be provided by gateway earth stations located outside of US territories, and authority from the Commission for TT&C is not therefore being sought in this application.

A.4.2 Cessation of Emissions (§25.207)

All downlink transmissions can be turned on and off by ground telecommand, thereby causing cessation of emissions from the satellite, as required by §25.207.

A.4.3 Frequency and Polarization Plans (§25.114(c)(4)(i) and §25.210(f))

Details of the I6-F2 satellite's frequency and polarization plan is provided in the accompanying Schedule S data for L-band and Ka-band. The frequency re-use requirements of §25.210(f), which apply to the Ka-band beams of I6-F2, are met by a two-fold or more frequency re-use for all beam types. For the gateway beams there is dual orthogonal polarization and for the user beams there is multiple spatial frequency re-use. A complete list of the I6-F2 satellite frequencies is shown in Annex 1. As mentioned above, not all frequencies onboard I6-F2 are being requested by the instant application.

A.5 COMPLIANCE WITH PFD LIMITS (§25.208))

The I6-F2 satellite complies with all applicable FCC and ITU Power Flux Density ("PFD") limits, which are designed to protect co-frequency terrestrial services from downlink interference due to satellite transmissions.

A.5.1 Downlink PFD Limits in L-Band

There are no ITU or FCC PFD limits applicable to MSS downlinks in the L-band frequency range of 1525-1559 MHz which is the subject of this application to the Commission.

A.5.2 Downlink PFD Limit in Ka-Band

There are PFD limits in §25.208(c), and identical ones in the ITU Radio Regulations, which apply across the 17.7-19.7 GHz band, as follows:

- -115 dB (W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
- -115 + 0.5 (δ-5) dB (W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 25 degrees above the horizontal plane; and
- -105 dB (W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

There are no PFD limits, in either the FCC rules or the ITU Radio Regulations, for the 19.7-20.2 GHz band.

In addition, §25.208(d) requires that the PFD across the 200 MHz band 18.6-18.8 GHz produced at the Earth's surface by emissions from a space station under assumed free-space propagation conditions shall not exceed −95 dBW/m^2 for all angles of arrival. This limit may be exceeded by up to 3 dB for no more than 5% of the time.

Compliance with these limits is demonstrated below using a simple worst-case methodology.

The maximum Ka-band downlink EIRP density in any part of the Ka-band is from the user downlink beam with a value of -18.0 dBW/Hz at beam peak, which corresponds to (-18.0 + 10log(1000000) =) +42.0 dBW/MHz. The shortest distance from the satellite to the Earth is 35,786 km, corresponding to a spreading loss of 162.06 dB. Therefore the maximum possible PFD at the Earth's surface would not exceed (+42.0 - 162.06 =) -120.0 dBW/m^2/MHz. This is significantly less than the most stringent -115 dBW/m^2/MHz PFD limit that applies at elevation angles between 0° and 5° in §25.208(c).

Extending this analysis to address the requirements of §25.208(d), the maximum PFD of -120.0 dBW/m^2/MHz computed above can be converted to the 200 MHz reference bandwidth resulting in a value of -97.0 dBW/m^2 per 200MHz. This is below the -95 dBW/m^2 value in §25.208(d) and so compliance with this rule is also assured.

A.6 FREQUENCY SHARING WITH OTHER USERS

In the following subsections we address how the frequencies that are the subject of this application will be successfully shared with other users of the radio frequency spectrum which are authorized by the Commission.

A.6.1 Frequency Sharing in the L-Band MSS

Frequency sharing between L-band MSS satellites operating in the frequency ranges used by the I6-F2 satellite[1] is addressed both internationally and domestically in the Multi-Lateral Meeting (MLM) coordination forum. This forum was established in the 1990's by the administrations representing the L-band satellite systems in operation and has been used successfully ever since to ensure interference-free operation of multiple L-band satellite systems. Inmarsat is and has been an active participant in this coordination forum and will operate the L-band transmissions of the I6-F2 satellite in accordance with all relevant agreements, which include the 2017 multilateral

[1] 1525-1559 MHz space-to-Earth and 1626.5-1660.5 MHz Earth-to-space.

coordination agreement between Inmarsat, Ligado US, Ligado Canada and Telecomm de Mexico, the 2010 Inmarsat/Ligado Cooperation Agreement, and subsequent amendments to both agreements.

A.6.2 Frequency Sharing in the Ka-band

Sharing with other co-directional GSO FSS satellite networks in the 17.7-20.2 GHz and 27.5-30.0 GHz bands (co-directional)

The I6-F2 satellite will also be operated consistent with the requirements of §25.140(a)(3)(iii) which states the conditions necessary to ensure compatibility between GSO satellites spaced 2 degrees apart, or more, in the Ka-band frequency ranges.[2]

Concerning the downlink transmissions, this rule requires that the satellite must not generate PFD levels at the Earth's surface in excess of -118 dBW/m^2/MHz unless such operations have been successfully coordinated with neighboring satellites. In Section A.5.2 above we demonstrate, using a worst-case methodology, that the maximum PFD at the Earth's surface produced by the I6-F2 satellite cannot exceed -120.0 dBW/m^2/MHz, which meets this requirement of §25.140(a)(3)(iii).

Concerning the downlink transmissions in the 17.7-17.8 GHz, the recently adopted rules addressing sharing between GSO FSS and GSO BSS earth station requires that the FSS certify that

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2 Amendment of Parts 2 and 25 of the Commission's Rules to Enable GSO Fixed-Satellite Service (Space-to-Earth) Operations in the 17.3-17.8 GHz Band, to Modernize Certain Rules Applicable to 17/24 GHz BSS Space Stations, and to Establish Off-Axis Uplink Power Limits for Extended Ka-Band FSS Operations; Amendment of Parts 2 and 25 of the Commission's Rules to Enable NGSO Fixed-Satellite Service (Space-to-Earth) Operations in the 17.3-17.8 GHz Band; Report and Order and Notice of Proposed Rulemaking, IB Docket Nos. 20-330, 22-273, FCC 22-63, Appendix A ¶ 8 (rel. Aug. 3, 2022) (revising 47 CFR § 25.140(a)(3)(iii) to require proposed FSS operation in the conventional or extended Ka-bands certify that the proposed space station will not generate power flux density at the Earth's surface in excess of −121 dBW/m2 /MHz) for space-to-Earth FSS transmissions in the 17.3-18.8 GHz band in the region of the contiguous United States, located west of 100 West Longitude).

the space station will not generate a PFD in excess of −121 dBW/m^2/MHz for regions of the contiguous United States west of 100 West Longitude.[3] This geography is visible to I6-F2 at low elevation angles with a nearest slant range of slightly over 40,889 km resulting in a spreading loss of 163.2 dB. Considering an I6-F2 user beam peak EIRP density of 42 dBW/MHz less this spreading loss, the peak PFD over this region of the contiguous United States would be -121.2 dBW/m^2/MHz which meets the requirement of the newly adopted rule.

Concerning the uplink transmissions, §25.140(a)(3)(iii) can be satisfied provided the associated uplink operations do not exceed the applicable EIRP density envelopes in §25.218(i). Inmarsat hereby commits that its uplink operations in Ka-band will be consistent with the applicable EIRP density envelopes in §25.218.

<u>Sharing with terrestrial services in the 17.7-18.3 GHz, 19.3-19.7 GHz, 27.5-28.35 GHz and 29.1-29.25 GHz bands</u>

These frequency ranges are all shared with terrestrial fixed and/or mobile services in the FCC table of frequency allocations.

Protection of such terrestrial services in the Ka-band downlink frequency ranges addressed here is ensured by compliance with the relevant downlink PFD limits which is addressed in Section A.5.2 above. Inmarsat will operate in these bands on a non-protected basis and accept potential interference in them from terrestrial FS transmitters.

In the 27.5-28.35 GHz uplink band, the FSS is secondary and must protect the Upper Microwave Flexible Use Service (UMFUS) according to §25.136(a), although a transmitting earth station in the 27.5-28.35 GHz band that meets the criteria in §25.136(a) may be authorized on an interference-protected basis. Inmarsat includes a demonstration that the proposed operations of the Southbury Gateway will be in compliance with §25.136(a). This demonstration is attached separately in Exhibit C.

Sharing with NGSO satellite systems in the 18.8-19.3 GHz and 28.6-29.1 GHz bands

GSO FSS satellite networks are secondary in this band according to FCC rules. Therefore, Inmarsat will continue to coordinate with FCC authorized NGSO systems to ensure interference protection of those systems to US territories and beyond, as appropriate. Many of these coordinations have already been completed. To the extent Inmarsat has not completed coordination with an NGSO system and actual harmful interference occurs, Inmarsat will cease emissions in those frequencies and relocate the traffic to adjacent frequencies until the harmful interference event has passed.

Sharing with NGSO satellite systems in the 19.3-19.7 GHz and 29.1-29.5 GHz bands

According to the FCC table of frequency allocations, the 29.1-29.25 GHz uplink band and the 19.4-19.6 GHz downlink band are allocated to MSS feeder links with no allocation for GSO FSS.[4] The 19.3-19.4 GHz and 19.6-19.7 GHz bands are allocated to the GSO FSS including ESIM operations.[5] The 29.25-29.5 GHz band is allocated to NGSO MSS feeder links and GSO/FSS on a co-primary basis.[6]

The only FCC-authorized MSS feeder links in these bands are used with the Iridium system. The analysis performed by Inmarsat, details of which are given in Annex 2, demonstrates that Inmarsat's operation of the I6-F2 satellite and the Southbury gateway can be compatible with

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[4] See NG166 in the FCC Table of Frequency Allocations.

[5] See NG527A(a) in the FCC Table of Frequency Allocations.

[6] See NG535A in the FCC Table of Frequency Allocations.

feeder links to and from the Iridium system in the 29.1-29.3 GHz and 19.4-19.6 GHz bands, based on the following:

- For the closest spaced Iridium gateway situation (i.e., at Tobyhanna, PA), the I6-F2 satellite links to and from the Southbury, CT gateway earth station are compatible provided the Inmarsat links and Iridium links operate in opposite polarizations.

Inmarsat's operations in these bands can be compatible with current and future MSS feeder link deployments, even for closely spaced gateway sites. Increased separation of the gateway sites, such as exists for Iridium gateway sites other than Tobyhanna, PA, would increase the compatibility of the systems. Additionally, as a practical matter, any such future MSS feeder link deployments are likely to use, at least in part, the co-primary 29.25-29.5 GHz band segment, and thus will need to ensure adequate geographic isolation from Inmarsat's gateway anyway in order to successfully coordinate operations in that co-primary band segment. Thus, adequate geographic isolation also should be the basis of ensuring compatibility between the Inmarsat gateway and future MSS feeder link operations in the 19.3-19.7 GHz and 29.1-29.25 GHz bands.

Sharing with GSO BSS feeder uplinks in the 17.7-17.8 GHz band

The 17.7-17.8 GHz band is allocated in the Earth-to-space direction for GSO BSS feeder uplinks, which is in the opposite transmission direction from the GSO FSS downlink allocation used by the I6-F2 satellite. Therefore there exists two potential interference paths: satellite-to-satellite and earth station-to-earth station.

Regarding the potential interference from the transmitting I6-F2 satellite into GSO BSS satellites which use this band for feeder uplinks, Section 25.264 of the Commission's rules ensures acceptable interference protection of the BSS feeder uplinks in the 17.3-17.8 GHz band by requiring that the PFD arriving at a potential victim satellite should not exceed -117 dBW/m^2/100kHz unless the agreement of the affected satellite operator has been obtained.

Tables A6.2-1(a) and (b) below provide the worst case (maximum) off-axis gain performance of the I6-F2 satellite transmit antennas that operate in the 17.7-17.8 GHz band, consistent with the requirements of §25.264(a). In fact the data in these tables essentially states that the off-axis gain is at least 30 dB below the peak gain of the antenna in all directions relevant to this interference case. The data provided in these tables apply to both LHC and RHC polarizations, and across the 17.7-17.8 GHz band. Note that additional data for off-axis angles corresponding to greater than +30° in the horizontal direction in Tables A6.2-1(a) and (b), is also provided in these tables in order to address the range of GSO orbital positions of FCC-authorized DBS satellites that operate feeder uplinks in the 17.7-17.8 GHz range, as explained further below.

Table A6.2-1 – Maximum Off-Axis Gain Data for all I6F2 Satellite Antennas that Transmit in the 17.7-17.8 GHz Band

(a) For angles in the X-Z plane relative to the +X direction

		Angle in the X-Z Plane relative to the +X-axis (LHCP and RHCP)													
		-30°	-25°	-20°	-15°	-10°	-5°	0°	+5°	+10°	+15°	+20°	+25°	+30°	>-30°
Angle of Rotation of the X-Z Plane about the Z-axis	-60°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	-50°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	-40°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	-30°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	-20°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	-10°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	0°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	+10°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	+20°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	+30°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	+40°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	+50°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	+60°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9

(b) For angles in the X-Z plane relative to the -X direction

		Angle in the X-Z Plane relative to the -X-axis (LHCP and RHCP)													
		-30°	-25°	-20°	-15°	-10°	-5°	0°	+5°	+10°	+15°	+20°	+25°	+30°	>-30°
Angle of Rotation of the X-Z Plane about the Z-axis	-60°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	-50°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	-40°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	-30°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	-20°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	-10°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	0°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	+10°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	+20°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	+30°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	+40°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	+50°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	+60°	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9

From a review of the FCC-authorized GSO BSS satellites with uplinks in the 17.7-17.8 GHz frequency range, it can be determined that such satellites occupy the orbit arc from 61.35°W to 119.25°W. These orbital positions are at off-axis angles, relative to nadir (i.e., the Z direction), measured along the X-Z plane as defined in §25.264(a), of between 73.3° and 44.4°, respectively, for the 61.35°W and 119.25°W orbital positions.[7] Based on the data in Tables A.6.2-1(a) and (b), the maximum gain of the I6-F2 satellite transmit antenna in these directions is 13.9 dBi, which is 30 dB below the peak gain, and therefore corresponds to a maximum EIRP spectral density of -58.6 dBW/Hz in these directions towards the potential victim GSO BSS satellites.

The PFD arriving at the potential victim GSO BSS satellite can then be calculated from this EIRP density by factoring in the spreading loss to the two orbital positions that bound the effective US GSO BSS arc. For the 61.35°W orbital position the distance is 24,197.3 km, the spreading loss is 158.7 dB, and the resulting maximum PFD at the GSO BSS satellite is -217.3 dBW/m^2/Hz , or -167.3 dBW/m^2/100kHz (i.e., in the reference bandwidth used in §25.264(b)). For the 119.25°W orbital position the distance is 60,275.8 km, the spreading loss is 166.6 dB and the resulting maximum PFD at the GSO BSS satellite is -225.2 dBW/m^2/Hz , or -175.2 dBW/m^2/100kHz. These resulting values of PFD (-167.3 dBW/m^2/100kHz and -175.2 dBW/m^2/100kHz) are significantly below the coordination threshold value of -117 dBW/m^2/100kHz in §25.264(b), and therefore there is no risk of interference to FCC-authorized GSO BSS satellites that operate uplinks in the 17.7-17.8 GHz frequency range.

On the separate matter of the potential interference path between the transmitting feeder link earth stations in GSO BSS satellite networks and nearby I6-F2 receiving earth stations, Inmarsat will accept the risk of this and operate in this portion of Ka-band on a non-conforming, non-protected basis.

A.6.3 Coordination with the US Government Satellite Systems in Ka-Band

Footnote US334 in the US table of frequency allocations requires that non-Federal satellites operating in the 17.8-20.2 GHz frequency range must be coordinated with Federal systems.

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[7] Note that, for the case of the 119.25°W orbital position, the off-axis angle of 44.4° corresponds to an angle in the Z-Z place, relative to the +z direction, of (90°-44.4°=) 45.6°, which is beyond the ±30° range used in §25.264(a).

Inmarsat has already successfully completed coordination with the Federal satellite networks, and specifically those at the nearby orbital locations of 30°W.L. and 30.4°W.L.

A.7 ITU FILING FOR THE I6-F2 SATELLITE NETWORK

The I6-F2 satellite will operate under the INMARSAT-6-28W satellite network filing submitted to the ITU by the UK administration (Ofcom).

A.8 ORBITAL DEBRIS (§25.114(D)(14)(V))

I6-F2's orbit will be determined weeks into the future and takes into account all planned station-keeping maneuvers in this time interval. These ephemerides are then distributed to a number of institutional and commercial partners for conjunction assessment and space traffic coordination, including the 18th Space Defense Squadron ("18 SDS"), the Space Surveillance & Tracking service of the European Union ("EUSST"), the Space Data Association ("SDA"), and the UK Space Command ("UKSpOC").

When a warning of a potential conjunction with a debris is raised, the standard approach is to adjust station-keeping maneuvers between notification and the Time of Close Approach ("TCA") to de-risk the encounter. This is usually sufficient for well-tracked debris. In extreme circumstances, when the debris is not well tracked, Inmarsat actively liaises with the aforementioned entities to increase the number of available observations and improve the debris orbit determination. At this point, if the refined solution still highlights a close approach, Inmarsat can then implement a collision avoidance manoeuvre using propulsion, usually 36 or 12 hours prior to TCA.

As for all Inmarsat satellites, an amount of propellant sufficient for proper end-of-life re-orbit in agreement with the Guidelines of the Inter-Agency Space Debris Coordination Committee ("IADC"), of which the United Kingdom is a member, is pre-allocated in the propellant budget. This will ensure that the I6-F2 spacecraft will be properly decommissioned and will not pose a threat to the safe operations of other satellites.

The United Kingdom is a signatory to four UN space treaties, and takes seriously its international commitment to the safe, responsible, and sustainable use of space. The Civil Aviation

Authority ("CAA") is the UK's national licensing authority for space activities and exercises direct and effective regulatory oversight of space activities registered through the UK via its Outer Space licensing regime. This covers launch and operating of space objects and any activity in outer space. Before granting a license for any operator, the CAA must be satisfied that doing so is consistent with the international obligations of the United Kingdom. Inmarsat has applied for an Outer Space License for its I6-F2 satellite, and Inmarsat will not launch I6-F2 until the license is granted.

Furthermore, the United Kingdom is a member of the IADC, and the CAA actively promotes compliance with the international guidelines and best practice laid down in the IADC Space Debris Mitigation Guidelines for its operators. In addition to that, Inmarsat has signed a Space Situational Awareness ("SSA") Sharing Agreement with the U.S. Department of Defense ("DoD"), through the U.S. Strategic Command ("U.S. STRATCOM").

ANNEX 1:

I6-F2 Frequency Capability

Earth-to-space	Space-to-Earth
1626.5-1660.5 and 1668-1675 MHz	1518-1559 MHz
5850-5930 MHz	3550-3700 MHz
6420-6725 MHz	4198-4200 MHz
27.5-30.0 GHz	17.7-20.2 GHz

ANNEX 2:

Interference Analysis between Iridium and I6-F2 Gateway Link Operations in the 19.3-19.7 GHz and 29.1-29.5 GHz Bands

In this Annex we present the results of interference analyses between the I6-F2 gateway links, operating with the Southbury, CT gateway earth station, and the Iridium gateway links, operating with the closest gateway site which is in Tobyhanna, PA, in the overlapping bands of interest.

Iridium operates HIBLEO-2FL feeder links and TT&C in Ka-band with earth stations currently licensed in Tobyhanna (PA) and other locations in LHC polarization in the frequency bands 19414.85 – 19585.2 MHz in the space-to-Earth direction and in RHC polarization in 29114.6 – 29284.4 MHz in the Earth-to-space direction. HIBLEO-2FL2 operates in LHC polarization in the frequency bands 19402.5 – 19597.5 MHz in the space-to-Earth direction and in RHC polarization in 29102.25 – 29297.75 MHz in the Earth-to-space direction. HIBLEO-2FL2 also operates additional dedicated carriers for TT&C operation of Iridium NEXT in the following frequency bands:

- Telecommand: 1 MHz FM carriers at centre frequencies 29.102, 29.248 and 29.298 GHz, (all RHC polarization);
- Telemetry: 200 kHz FM carriers, 13 carriers spaced at 400 kHz centre frequencies in the range 19.4002 – 19.405 GHz, (all LHC polarization).

The dynamic simulation interference analysis was performed using Visualyze software. Details of the parameters used and results of the interference analysis are given below.

1. Simulation parameters

The I6-F2 gateway site at Southbury, CT is located at latitude 41.45°N and longitude 73.29°W. The Iridium gateway site at Tobyhanna, PA is located at latitude 41.19°N and longitude 75.43°W. The distance between the two sites is 181.1 km.

1.1. HIBLEO-2FL parameters

1.1.1. HIBLEO Satellites

Orbital parameters (as extracted from HIBLEO-2FL ITU filings):

orb_id	nbr_sat_pl	right_asc	inclin_ang	prd_ddd	prd_hh	prd_mm	apog	apog_exp	perig	perig_exp	perig_arg
1	11	195.38	86.4	0	1	40	775		775	0	90
2	11	226.96	86.4	0	1	40	775		775	0	90
3	11	258.54	86.4	0	1	40	775		775	0	90
4	11	290.13	86.4	0	1	40	775		775	0	90
5	11	321.72	86.4	0	1	40	775		775	0	90
6	11	353.31	86.4	0	1	40	775		775	0	90

Satellite antenna transmit / receive contour: ITU-Rec. S.465-5 (see figure below for transmit beam contour).

- Transmit gain: 26.9 dBi (beam peak).
- Receive gain: 30.1 dBi (beam peak).
- Temperature: 1295K.
- G/T: -1 dB/K (beam peak).
- Downlink power spectral density (maximum): -68.1 dBW/Hz.

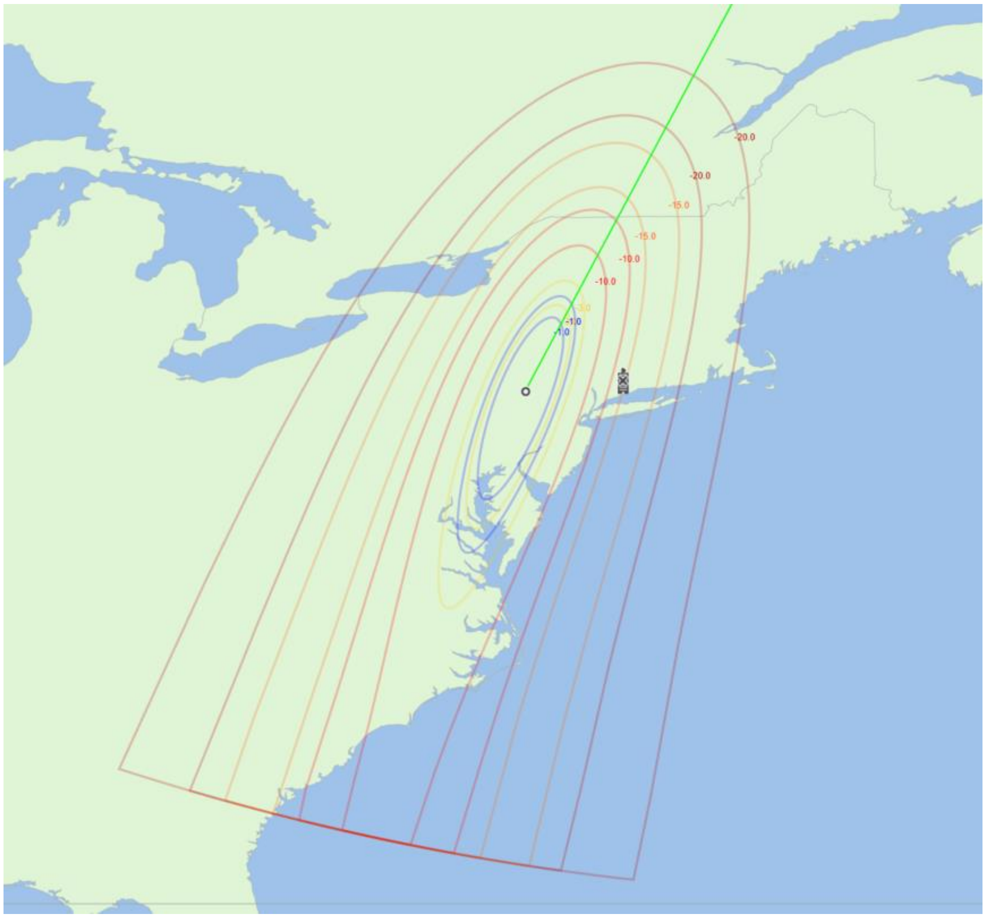
HIBLEO Satellite Tracking:

Minimum elevation: 8 degrees.

Tracking based on: Longest holding time taking into account the minimum elevation angle.

Figure A1-1:

HIBLEO-2FL feeder link transmit beam contours



1.1.2. HIBLEO Earth Station

- Antenna transmit / receive side lobe contour: ITU-Rec. S.580.
- Transmit gain: 56.3 dBi .
- Receive gain: 53.2 dBi.
- Temperature: 731K.
- G/T: 24.6 dB/K.
- Uplink power spectral density (maximum): -52.9 dBW/Hz.
- HIBLEO earth station location: Tobyhanna, PA(41.19°N, 75.43°W).

1.2. Inmarsat-6 F2 parameters

1.2.1. INMARSAT Satellite

- Orbital location: 28°W.
- Gateway beam antenna transmit / receive contour: See figure 2 below for transmit beam contour.
- Transmit gain: 42.5 dBi (typical, beam peak).
- Peak G/T: 9 dB/K.
- Number of feeder link beams: 2 (steerable, to be pointed at the same location so effectively 1 beam).
- Downlink EIRP s.d. (maximum to the gateway antenna in the overlapping frequency band): -31.6 dBW/Hz.

Figure A1-2:

Inmarsat-6 F2 gateway transmit beam contours (satellite at 28º W)

1.1.1. INMARSAT Earth Station

- Gateway antenna transmit / receive side lobe contour: ITU-Rec. S.580.
- Diameter: 13.2 m
- Transmit gain: 68.8 dBi.
- G/T: 41 dB/K
- Clear sky uplink p.s.d. (maximum): -70 dBW/Hz.
- Earth station location: Southbury, CT (41.45°N, 73.29°W)

2. Interference protection criteria

The Iridium interference protection criteria used in the simulations are shown in the table below.

	Uplink Protection Criteria, Single Entry		Downlink Protection Criteria, Single Entry		Unit
	Short Term	Long Term	Short Term	Long Term	
I/N	-2.3	-25.2	-2.3	-25.2	dB
% of time not to be exceeded	0.00057	9.9886	0.00057	9.9886	%

For Inmarsat, a protection criterion of I/N = -12.2 dB for 100% of the time has been used as a reference.

3. Simulation results

3.1. Interference into Iridium

Figure A1-3:

Interference into Iridium – Co-Polar

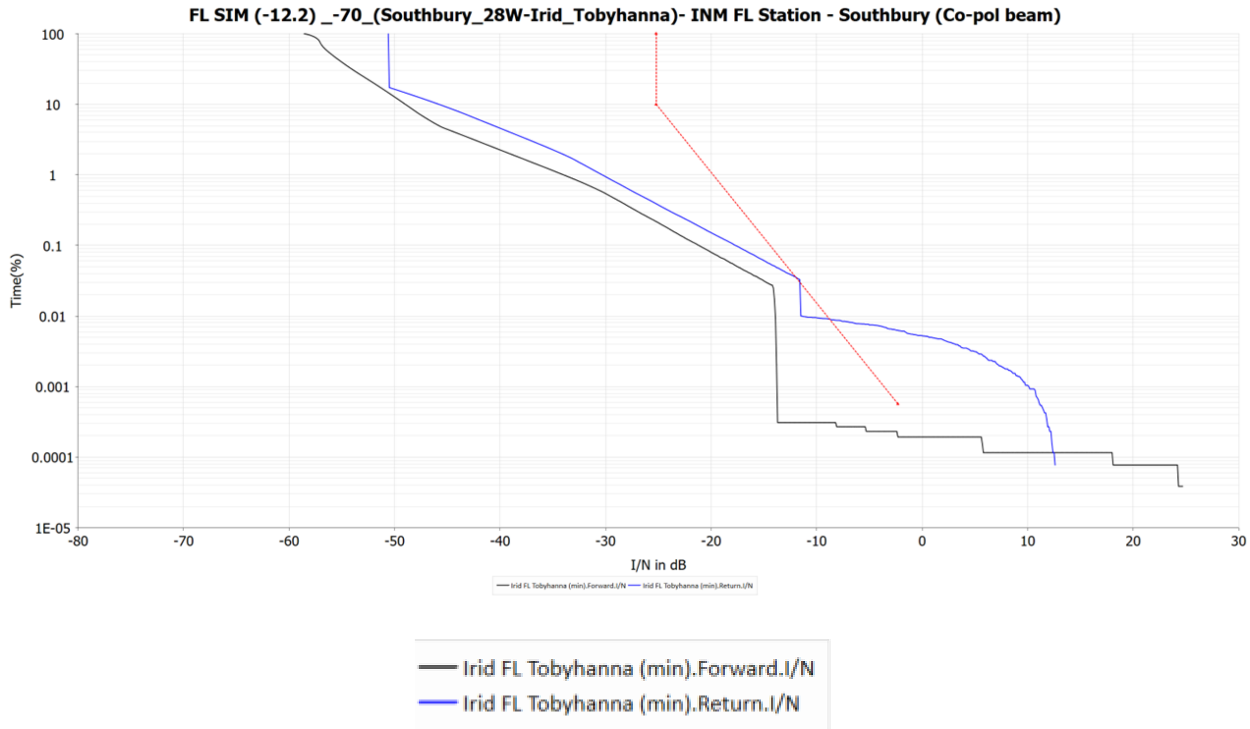
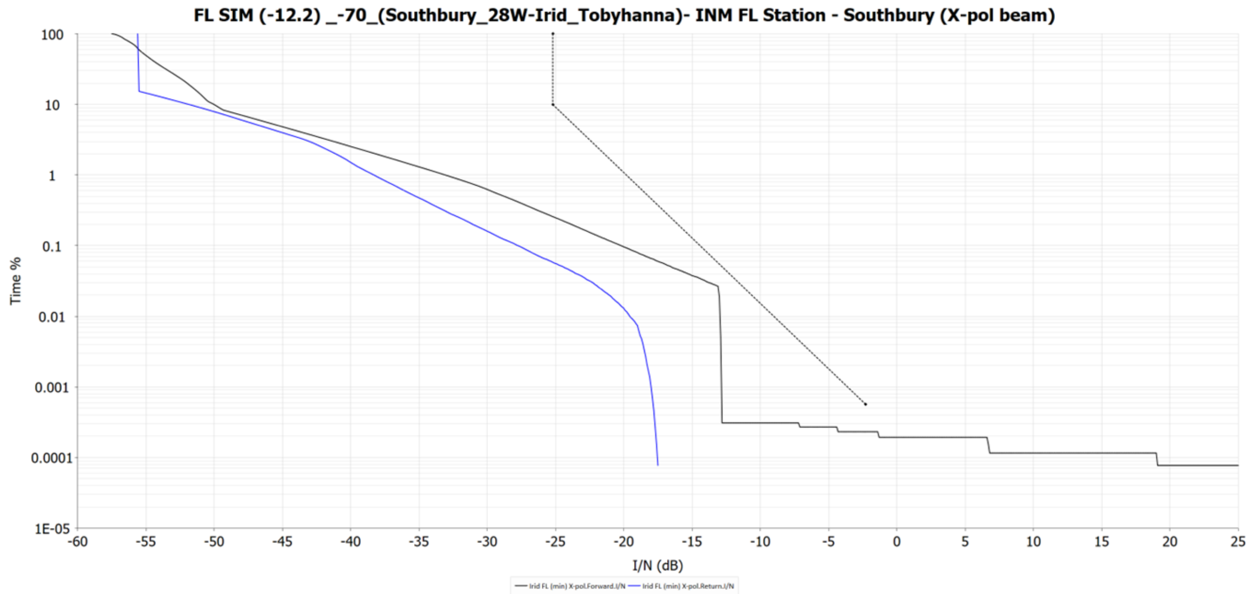
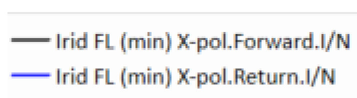


Figure A1-4:

Interference into Iridium – Cross-Polar





3.2. Interference into Inmarsat F2

Figure A1-5:

Interference into Inmarsat – Co-Polar

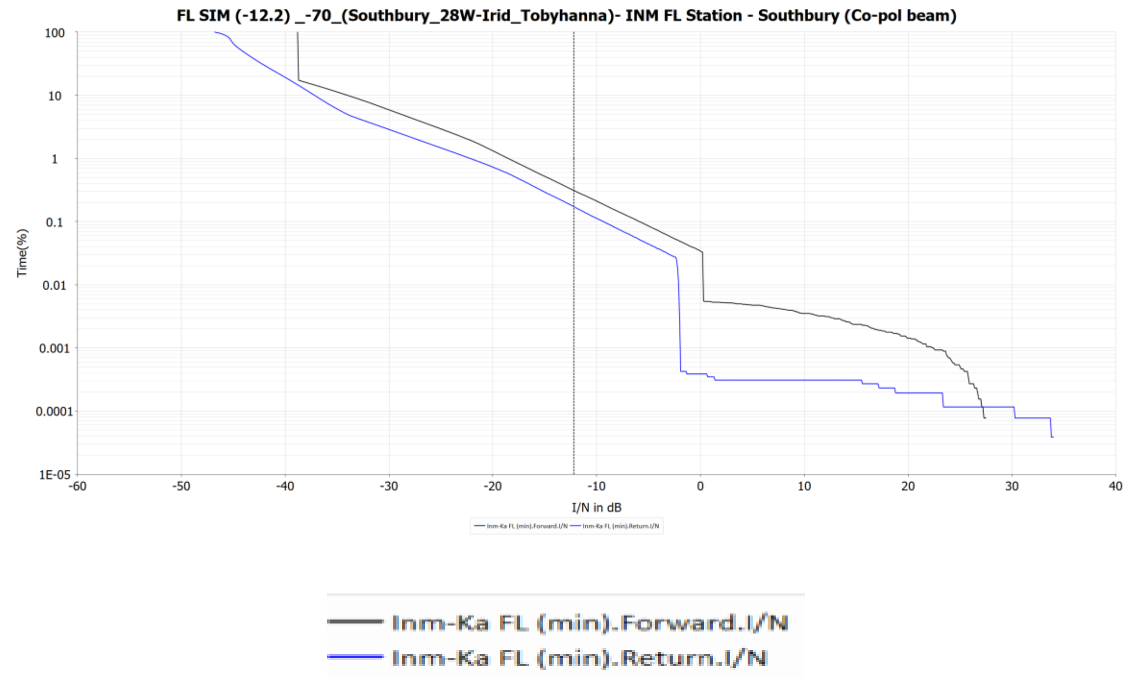
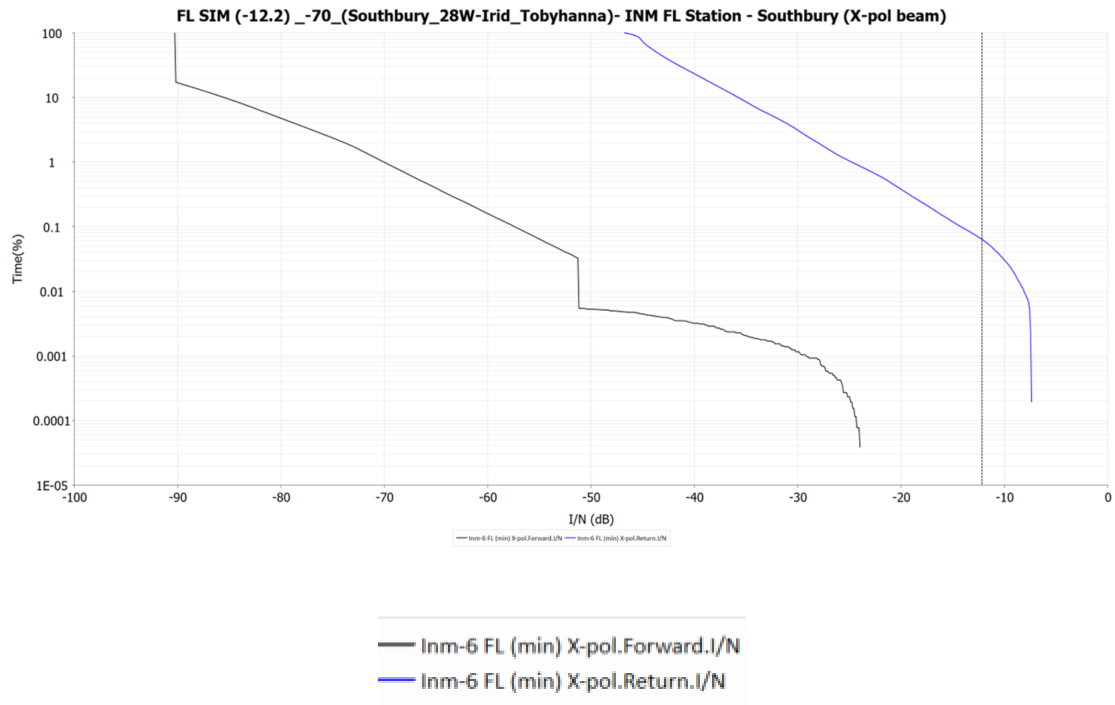


Figure A1-6:

Interference into Inmarsat – Cross-Polar *



* Inmarsat is prepared to accept the marginal excess interference into Inmarsat in the return direction in the X-pol beam operations

4. Conclusions/Observations

The analysis results show the following:

Co-Polar Beam scenario:

- Iridium: RHCP(Up) and LHCP(Dn)
- Inmarsat: RHCP(UP) and LHCP(Dn)

The simulation results show that the I/N levels for interference between INMARSAT-6 F2 feeder links and HIBLEO-2FL feeder links, when both systems are operating co-polar, exceed the interference criteria and therefore it is not possible to share in the overlapping feeder link frequency bands.

X-pol Beam scenario:

- Iridium: RHCP(Up) and LHCP(Dn)
- Inmarsat: LHCP(UP) and RHCP(Dn)

The simulation results show that the I/N levels for interference between INMARSAT-6 F2 feeder links and HIBLEO-2FL feeder links, when the system operate cross-polar relative to each other, meet the interference criteria and therefore it is possible to share in the overlapping feeder link frequency bands.

Taking into account these results, Inmarsat believes that there would be no harmful interference between Inmarsat-6 F2 operations with LHCP in uplink direction and RHCP in downlink direction and Iridium HIBLEO-2FL/-2FL2 feeder links operations with RHCP in uplink direction and LHCP in downlink. **In conclusion, it is possible to share spectrum only in the opposite polarizations.**

In addition, Inmarsat's operations in these bands can be similarly compatible with future MSS feeder link deployments. As an initial observation, compatibility improves for any Iridium gateway located further away from Southbury. Additionally, as a practical matter, any such future MSS feeder link deployments are likely to use, at least in part, the co-primary 29.25-29.5 GHz band segment, and thus will need to ensure adequate geographic isolation from Inmarsat's gateway in order to successfully coordinate operations in that co-primary band segment. Thus, adequate geographic isolation also should exist between the Inmarsat gateway and future MSS feeder link operations in the 19.3-19.7 GHz and 29.1-29.25 GHz bands.

CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING ENGINEERING INFORMATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this application, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this application and that it is complete and accurate to the best of my knowledge and belief.

/s/ Jonas Eneberg
Jonas Eneberg
Vice President, Regulatory Engineering
December 16, 2022