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1. Mission Summary

By this application, K2 Space Corporation ("K2 Space") seeks Federal Communications Commission ("FCC") authorization to conduct a space research mission ("Screech 1") in support of the company's long-term goal of building a high-power, low-cost satellite bus platform for use in proliferated low Earth orbit ("LEO"), proliferated middle Earth orbit ("MEO"), and proliferated geosynchronous Earth orbit ("GEO") applications. Screech 1 is a space research mission which will host demonstrations of several novel space communications technologies.

K2 Space, a startup founded in 2022 and based in Torrance, California, has brought together an experienced team of proven engineers to re-invent satellite manufacturing entirely. The K2 Space "Mega Class" satellite bus has the power of a large satellite at the price point and production speed of a small satellite. Instead of being limited to LEO, the Mega bus is designed from the start to operate across LEO, MEO, and GEO. Instead of launching just one satellite on a medium or heavy launch vehicle, the Mega Class satellite bus is designed so that ten 20 kW satellites can be deployed on a single launch. The Mega Class satellite bus makes everything from high LEO/MEO constellations to proliferated GEO possible. The Screech 1 mission consists of one Mega Class satellite (the "Spacecraft").

The FCC granted K2 Space's Gravitas mission an experimental license in Q3 2025.[1] The Screech 1 mission is using the same spacecraft K2 Space used in the Gravitas mission, updated to incorporate ongoing learnings from the Gravitas mission. For the avoidance of doubt, all radio transmissions from the Spacecraft for the purposes of telemetry, tracking, and command ("TT&C") will use the same transmitter the FCC authorized for Gravitas with similar power, frequency, and emission characteristics.[2] We will refer to this as the "operational communications system."

With respect to Gravitas, we are pleased to confirm that the Gravitas spacecraft has been successfully operating in space with no noted instances of interference since it began operations in March 2026.

The key difference between Gravitas and Screech 1 is that, for Screech 1, K2 Space requests authorization for transmissions from the following experimental transmitters:

- A phased array antenna (the "phased array," identified in Form 442 as model number BFA33) which leverages full-digital electronic beam steering to communicate in multiple spatial directions simultaneously without moving parts. The phased array contains an onboard processor to modulate and demodulate signals. In this mission, K2 Space will demonstrate the array's modular software and hardware architecture, allowing future versions to expand in aperture and signal processing capabilities.
- A software-defined radio transceiver (the "SDR," identified in Form 442 as model number BSDR1) which supports reliable communication at S- and Ka-bands. The SDR will be used during Screech 1 on an experimental basis to prove out RF communications capabilities for future missions. The Spacecraft's operational communications system is decoupled from the two experimental transmitters referenced above - failure of any experimental transmitter will not

[1] *See* Grant, ELS File No. 0108-EX-CN-2025, Call Sign WP2XOS (granted Sept. 29, 2025) ("*Gravitas Grant*").

[2] *See id.*

affect K2 Space's ability to control the Spacecraft. Should the FCC have concerns regarding any experimental transmitter, K2 Space respectfully requests that the FCC proceed with licensing the operational communications systems while those concerns are resolved.

The space research service ("SRS") designation applies to spacecraft that engage in "scientific or technological research purposes."[3] The Spacecraft will, as is described above, collect technological research data from prototype hardware with the goal of advancing state-of-the-art in spacecraft communications. Accordingly, Screech 1 should be treated as a space research mission.

Mission Phases

We highlight that the Screech 1 mission timeline mirrors the Gravitas mission timeline that the FCC previously granted an experimental license for.

Screech 1's notional total mission life will be ~156 weeks (~3 years), consisting of insertion into LEO, orbit raising, and operations in MEO, as is further described in the table below.

Out of an abundance of caution, K2 Space requests authorization for three years. K2 Space understands that the Screech 1 mission's duration exceeds the standard experimental license duration of two years.[4] The additional time is warranted because of the time (~12 weeks) and resources needed to achieve the MEO orbit and the resulting value in maximizing the experiments while the Spacecraft is operational. Moreover, there is no debris mitigation benefit in terminating the mission before the target end-of-mission life (in ~156 weeks) because the final operating orbit will be the storage orbit for the Spacecraft.

[3] *See* 47 C.F.R. § 2.1(c).

[4] *See* 47 C.F.R. § 5.71(a)(1).

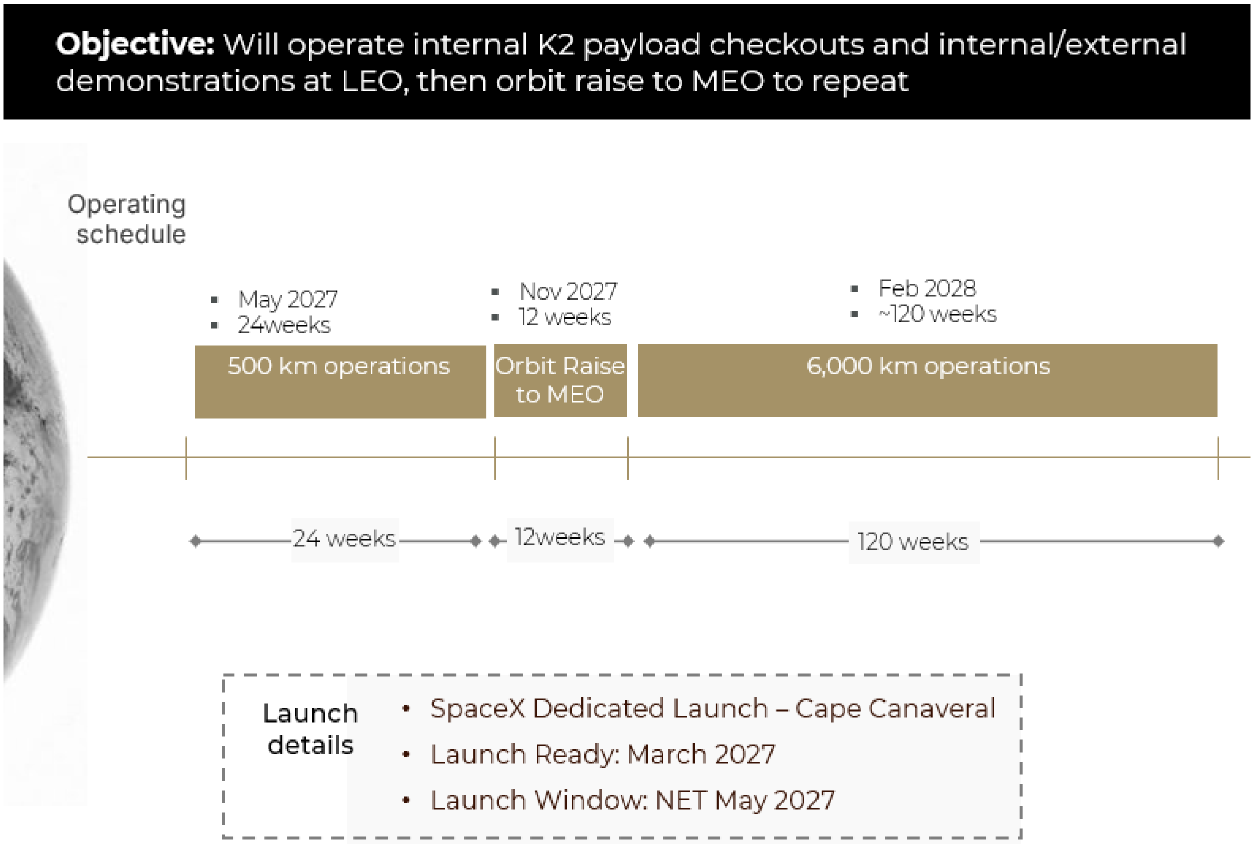

Figure 1: Nominal launch and operations timeline for Screech 1.

Orbit Insertion

The Spacecraft is scheduled to be launched on a contracted SpaceX Falcon 9 launch vehicle no earlier than May 2027 along with three other satellites from K2 Space (the "Trinity launch").[5] The Spacecraft will be inserted into a mid-inclination orbit of 50-deg ± 0.1-deg with a perigee and apogee of 500 km.

Once released from the launch vehicle, the Spacecraft will perform first contact with the ground stations and will undergo health checks of its vehicle subsystems. The commissioning process will use the same set of ground stations and operational frequencies as the Spacecraft will use for TT&C during the mission, specifically UHF, S-band, and X-band for downlink, and S-band for uplink (all as is further defined in Section 4). Once commissioning is completed, the Spacecraft will perform communications experiments with the experimental transmitters at the deployment altitude.

Orbit Raise

Once the above payload experiments are completed at the deployment altitude, the Spacecraft will perform an orbit raise to 6000 km MEO to perform further payload experiments. The Spacecraft will remain at its final altitude of 6000 km until the end of the Screech 1 mission. During the orbit raise phase, the spacecraft will remain in contact and in control via the operational TT&C radios. During orbit

[5] A total of four K2 Space satellites will comprise the Trinity launch, which was named at an earlier time when the initial manifest was only three satellites.

raise and at its final altitude, telemetry downlink will use the S-band and X-band communications systems, and commands will be uplinked using the Spacecraft's S-band communications system. The experimental transmitters will be used for communications experiments.

Disposal

The Spacecraft will be located in an operational orbit that is defined by the NASA Guidelines and Assessment Procedures for Limiting Orbital Debris[6] as semi-synchronous, and that is defined by FCC guidelines as those that are not LEO or GEO.[7] The Spacecraft will spend its final ~120 weeks of spacecraft operations in the following MEO orbit, which is stable for at least 100 years and which will also serve as its end-of-life disposal orbit, consistent with the aforementioned NASA guidelines and relevant FCC requirements (all as is further discussed in "Attachment A. Orbital Debris Assessment Report"):

- Disposal orbit altitude: 6000 km
- Disposal orbit eccentricity: 0
- Disposal orbit inclination: 50 degrees

K2 Space highlights that the Spacecraft will have a reliability of >0.90 for the equipment required to successfully perform the maneuvers to reach this end-of-life orbit. Following the conclusion of the Screech 1 mission, the Spacecraft will be passivated for end-of-life disposal, which will include depleting all remaining onboard propellant and depleting all remaining stored energy.

This disposal approach mirrors what the FCC approved for the Gravitas mission, save for a slight change in our proposed disposal orbit altitude from 7800 km for Gravitas to 6000 km for Screech 1 – but we stress that the differences between these orbits are negligible as they are part of the same orbital regime.

Furthermore, K2 Space has examined industry-standard, publicly available information and confirms that the Spacecraft's disposal orbit will not interfere with the orbits of current or future known MEO operating spacecraft, including spacecraft from O3b, Galileo, GPS, and GLONASS, the K2 Space Gravitas mission, and other satellites on the K2 Space Trinity launch.

To reiterate, the selected orbit is very stable and will not decay to the LEO orbit range, nor will it approach the GSO. The selected disposal orbit creates no possibility of collision with the O3b, GPS, Galileo or GLONASS MEO systems which are (or will be) all above 6000 km in altitude for at least 100 years. The selected orbit also does not create the possibility of collision with any other K2 Space spacecraft located at 6000 km for at least 100 years.

2. Spacecraft Subsystems

The Spacecraft subsystems described below mirror the subsystems on the Gravitas mission that the FCC granted an experimental license for.

[6] NSS 1740.14 Section 6.

[7] *See Mitigation of Orbital Debris in the New Space Age*, Report and Order, 35 FCC Rcd 4156, 4207 ¶ 109 (2020); *Mitigation of Orbital Debris*, Second Report and Order, 19 FCC Rcd 11567, 11603 ¶ 87 (2004).

Guidance, Navigation, and Control Subsystem

The Spacecraft's attitude determination and control system includes four star trackers, four reaction wheels, nine torque rods, three 3-axis magnetometers, three 3-axis inertial measurement units, and three global navigation satellite system ("GNSS") receivers. The reaction wheels and torque rods are designed by K2 Space and have successful flight heritage on the Gravitas mission. All other third-party GNC sensors used by the Spacecraft have flight heritage.

Command and Data Handling Subsystem

The Spacecraft's flight computer ("FC") receives instructions from the ground station(s) via the Spacecraft's communications subsystem. The FC issues commands to all other Spacecraft subsystems and payloads for operation of the Spacecraft. Additionally, the FC collects telemetry from all Spacecraft subsystems and forwards that information to the ground station through the Spacecraft's communications subsystem. The flight computer was designed by K2 Space and has heritage on the Gravitas mission. The entire command and data handling subsystem for Screech 1 builds off the design successfully used during the Gravitas mission which controlled the vehicle through launch, early operations, and orbit raises.

Electrical Power Subsystem

The Spacecraft will be powered from a solar array with two wings that produces ~20 kW power at beginning of life at 25C standard temperature conditions. K2 Space is designing four high-voltage batteries that will provide integrated energy storage, power conversion, and power distribution for the Spacecraft. The Spacecraft's solar array has flight heritage, with multiple spacecraft currently on-orbit with these modules, including Gravitas.

Structure Subsystem

The Spacecraft's primary structure is a K2 Space designed 2.7x3.0x0.4m sized solid aluminum structure that is 3-5 mm thick, providing protection to the internal components from MMOD and radiation effects. K2 Space designed this structure to enable high-rate manufacturing, with a modular design and ability to be integrated in late-stage operations.

Propulsion Subsystem

The Spacecraft's propulsion system is a K2 Space designed fully fault tolerant 20 kW system. Specifically, it utilizes two 20kW thruster systems and Krypton propellant to provide redundancy and known, predictable performance. The propulsion system is built on heritage from the Gravitas mission during which it successfully demonstrated orbit raising and collision avoidance maneuvers.

3. Spacecraft Communications System (TT&C)

As previously noted, the spacecraft's operational communications system for TT&C is decoupled from the experimental communications equipment carried on the Screech 1 mission.

Moreover, the operational communications system is identical to the system that was used in the Gravitas mission that the FCC granted an experimental license for, including the same requested uplink/downlink frequencies.[8] The analyses in this section are similar to those provided for the Gravitas mission, with updates to account for Screech 1's lower insertion orbit. These results demonstrate full compliance with the power flux density ("PFD") masks in ITU RR Table 21-4 and power spectral flux density limits in ITU-R Recommendation SA.1157.

The Spacecraft's communications subsystem has a fully 1-fault tolerant design utilizing two dedicated radios to provide redundancy. Each radio uses:

- UHF connected to a Tx antenna to communicate with ground stations as a contingency beacon;
- S-Band connected to a Tx/Rx antenna to communicate with ground stations for low data rate TT&C and payload data downlink; and
- X-Band connected to a Tx antenna to communicate with ground stations for high data rate TT&C and payload data downlink.

Tables 1 and 2 below show the transmission parameters of the uplink and downlink frequencies to be used for TT&C on the Screech 1 mission, including specific center frequencies, bandwidths, modulations, transmit power, frequency tolerance, and polarization. The Spacecraft will change its bandwidth utilization of each frequency band at predetermined orbit altitudes during the orbit raise phases of the mission to maintain link margin during the orbit raise. A complete list of emission designators for each of these bandwidth changes and the orbit altitudes at which they will occur can be found in Table 1 of Attachment C.

Table 1. Downlink frequencies RF specifications.[9]

	UHF Downlink	**S-Band Downlink**	**X-Band Downlink**
Center Frequency (MHz)	400.4	2222	8480
Max Bandwidth (MHz)	0.013	2	10
Modulation	GFSK	QPSK	QPSK
Max EIRP (dBW)	-0.4	4.1	10.1
Frequency Tolerance (ppm)	20	20	20
Polarization	Linear	RHCP	RHCP

Table 2. Uplink frequency RF specifications.

	S-Band Uplink
Center Frequency (MHz)	2040
Bandwidths (MHz)	0.1 to 2.0
Modulation Scheme	QPSK
Polarization	RHCP

[8] *See Gravitas Grant.*

[9] All of the center frequencies identified in the two tables below are representative channels and subject to coordination with Federal spectrum managers.

The Spacecraft utilizes both S-Band and X-Band frequencies as primary communications links. The S-Band link serves as a low data rate downlink for the transmission of Spacecraft TT&C and payload data to ground stations, and low data rate TT&C to control the Spacecraft. The 2 MHz uplink mode is required in LEO to support flight software uploads and provide sufficient telemetry acknowledgements to the Spacecraft. The X-Band link serves as a high data rate downlink for the transmission of Spacecraft TT&C and payload data to ground stations.

For redundancy, the Spacecraft also utilizes a backup communications downlink using UHF frequencies. The UHF frequency band will be used only as a backup to the primary S-Band and X-Band TT&C links. Backup UHF transmissions will only occur in contingency scenarios where the Spacecraft is unable to use its primary TT&C links in the S-Band or X-Band frequencies, such as when the Spacecraft is tumbling, during LEOP operations/commissioning, and for occasional testing to ensure the operational capability of the Spacecraft's backup communications system.

The Spacecraft's radio communications with ground stations will initiate at elevation angles above 10 degrees and will maximize the full duration of uplink and downlink communications time for mission-critical space operations. A list of the relevant ground stations and their frequency bands is provided in Table 1 of Attachment B. K2 Space will coordinate with authorized federal and non-federal operators to ensure K2 Space's operations do not cause harmful interference.

The following subsections describe the nominal operations of all transmission beams and analyze their potential for causing interference to authorized radio operations. Beam patterns and PFD analyses are included.

UHF Downlink

The 400.15 – 401 MHz (space-to-Earth) band is allocated internationally and in the U.S. for federal and non-federal mobile-satellite and space research use on a primary basis as well as for federal and non-federal space operation use on a secondary basis.[10] K2 Space intends to use the 400.15 – 401 MHz band during commissioning and off-nominal situations as a contingency beacon in the scenario where the Spacecraft is unable to use the primary S-Band or X-Band TT&C links. The beacon will be set to begin automatically transmitting following separation from the launch vehicle. The duty cycle of the transmissions will be 6 seconds every 60 seconds. As a failsafe to ensure termination of the beacon, there is a built-in, 2-week timer that is stored in triple-voted, non-volatile memory. Once the timer expires, the processor in the beacon will turn the radio off.

The operator can power off the beacon at any time via command from the ground.[11] K2 Space will manually turn off the beacon as soon as it is able to obtain accurate tracking information, which could

[10] *See* 47 C.F.R. § 2.106. The 400.15 – 401 MHz band is also allocated to meteorological aids, meteorological-satellite services, and to the space research service in the space-to-space direction for communications with manned space vehicles. *See id.*

[11] *See id*. §§ 5.84, 5.308.

be as soon as one day after launch. The beacon does not automatically re-activate after it has been shut off.[12]

The Screech 1 mission is a space research mission, as discussed above, and thus K2 Space's use of the spectrum for non-federal space research is consistent with the U.S. and International Table of Frequency Allocations. K2 Space will also conduct coordination with federal spectrum managers to facilitate shared use of these frequencies.

K2 Space is aware that the FCC established an October 15, 2019 cut-off deadline for requests to operate, *inter alia*, in the 400.15 – 401 MHz band for the provision of mobile-satellite service.[13] K2 Space proposes to use this band only for commissioning and in off-nominal situations as a contingency beacon, consistent with the U.S. and International Table of Frequency Allocations, and such limited use would not be mutually exclusive with other operations on a long-term basis. Accordingly, the request to use these frequencies should not be treated as inconsistent with the 400.15 – 401 MHz processing round and should not trigger the need for a new FCC processing round.[14] Nonetheless, to the extent necessary, K2 Space requests a waiver of any applicable processing round requirement (and/or associated cut-off deadline).[15]

<u>PFD at the Surface of the Earth in the band 400.15 – 401 MHz</u>

ITU Radio Regulations ("ITU RR") § 5.264 and ITU RR Annex 1 of Appendix 5 § 1.1.1 limit the PFD of transmission over a 4 kHz bandwidth between 400.15 – 401 MHz to -125 dBW/m^2 at the Earth's surface. While not required for space research or space operations use of the band, K2 Space is providing a demonstration of compliance for completeness.

PFD is calculated using the equation: PFD [$dBW/m^2/4$ kHz] = EIRP [dBW] – 11 – 20log10(D) + 36 – 10log10(BW), where EIRP is the maximum EIRP of the transmission; D is the distance between the satellite and the affected surface area in meters; and BW is the bandwidth of the transmission in Hz.

The Spacecraft is expected to have a worst-case operational orbit altitude of 500 km (lowest expected insertion altitude inclusive of launch vehicle uncertainty) during its mission lifetime. Thus, using the UHF downlink parameters given in Table 1, the worst-case PFD in the 400.15 – 401 MHz band at the surface of the Earth over a 4 kHz bandwidth is -130.4 dBW/m^2, showing compliance with the -125 dBW/m^2 limit.

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[12] The operator can reset the beacon via command from the ground. In such event, the beacon will commence transmitting again with another 2-week timer. K2 Space would not reset the beacon without obtaining additional FCC authorization.

[13] *See Cut-off Established for Additional NVNG MSS Applications or Petitions for Operations in the 399.9-400.05 MHz and 400.15-401 MHz Bands*, Public Notice, DA 19-779 (rel. Aug. 15, 2019) ("*400.15-401 MHZ PN*").

[14] *See* 47 C.F.R. § 2.106 nn.5.286 and US87; *see also* Stamp Grant, ICFS File No. SAT-LOA-20230414-00088 (granted January 19, 2024) (authorizing the use of the 400.15 – 401 MHz band for backup TT&C downlinks).

[15] *See* 47 C.F.R. § 25.157; *see also 400.15-401 MHz PN*.

S-Band Uplink[16]

The 2025 – 2110 MHz (Earth-to-space) band is allocated internationally and in the U.S. for Earth exploration-satellite service ("EESS") and space research for non-federal use, subject to the limitation that any use may not cause harmful interference to authorized federal and non-federal operations, and further subject to any additional conditions as may be applied on a case-by-case basis.[17] The Screech 1 mission is a space research mission, and thus K2 Space's use of the spectrum for non-federal space research is consistent with the U.S. and International Table of Frequency Allocations.

Moreover, use of this band can and will be coordinated, ensuring that operations will not cause harmful interference. Sharing of spectrum will be possible because the Spacecraft and other nearby satellites using these frequencies transmit and receive only for short periods of time while visible to a receiving/transmitting earth station main beam. For harmful interference to occur, satellites belonging to different systems would have to be visible to the earth station and transmitting or receiving using the same frequencies at the exact same time. In such an unlikely event, the resulting inline interference could be avoided by coordinating the satellites' transmissions so that they do not occur simultaneously. Accordingly, there is no mutual exclusivity between the Spacecraft and other non-geostationary satellite orbit ("NGSO") systems using the same frequency band. K2 Space will also comply with technical requirements in Part 2 of the Commission's rules and applicable ITU rules and complete coordination with federal spectrum managers, as required.

S-Band Downlink

The 2200 – 2290 MHz band (space-to-Earth) is allocated internationally for EESS, space research, and space operations.[18] The Spacecraft will transmit on these frequencies only to non-U.S. ground stations. The Screech 1 mission is a space research mission, and thus K2 Space's use of the spectrum for non-federal space research is consistent with the U.S. and International Table of Frequency Allocations. As discussed above, shared use of these frequencies can be accomplished and will be coordinated with other operators, ensuring that operations will not cause harmful interference.

<u>PFD at the Surface of the Earth in the band 2200 – 2290 MHz</u>

ITU RR Table 21-4 limits the PFD of transmission over a 4 kHz bandwidth between 2200 – 2290 MHz to the following limits:

- -154 dBW/m^2 in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane.
- -154 + 0.5 * (δ - 5) dBW/m^2 in any 4 kHz band for angles of arrival, δ (in degrees), between 5 and 25 degrees above the horizontal plane.

[16] The S-band uplink information is provided for informational purposes only. The respective ground station operators are separately seeking licensing authority to communicate with the Spacecraft.

[17] *See* 47 C.F.R. § 2.106 n.US347. The 2025 – 2110 MHz (Earth-to-space) band is also allocated to space operations internationally.

[18] *See* 47 C.F.R. § 2.106. In the United States, this band is allocated primarily for federal EESS, space research, and space operations.

- -144 dBW/m^2 in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

PFD is calculated using the equation: PFD [dBW/m^2/4 kHz] = EIRP [dBW] – 11 – 20log10(D) + 36 – 10log10(BW), where EIRP is the maximum EIRP of the transmission; D is the distance between the satellite and the affected surface area in meters; and BW is the bandwidth of the transmission in Hz.

To maintain link margin and ensure compliance with PFD requirements, the Spacecraft will operate using different bandwidths for different orbit altitudes during its mission lifetime. Figure 1 shows the maximum PFD with respect to elevation angle for the worst-case orbit altitude of each emission designator identified in Table 1 of Attachment C using the S-Band downlink parameters in Table 1. K2 Space will ensure that PFD requirements are met during orbit raises by attenuating transmit power as necessary.

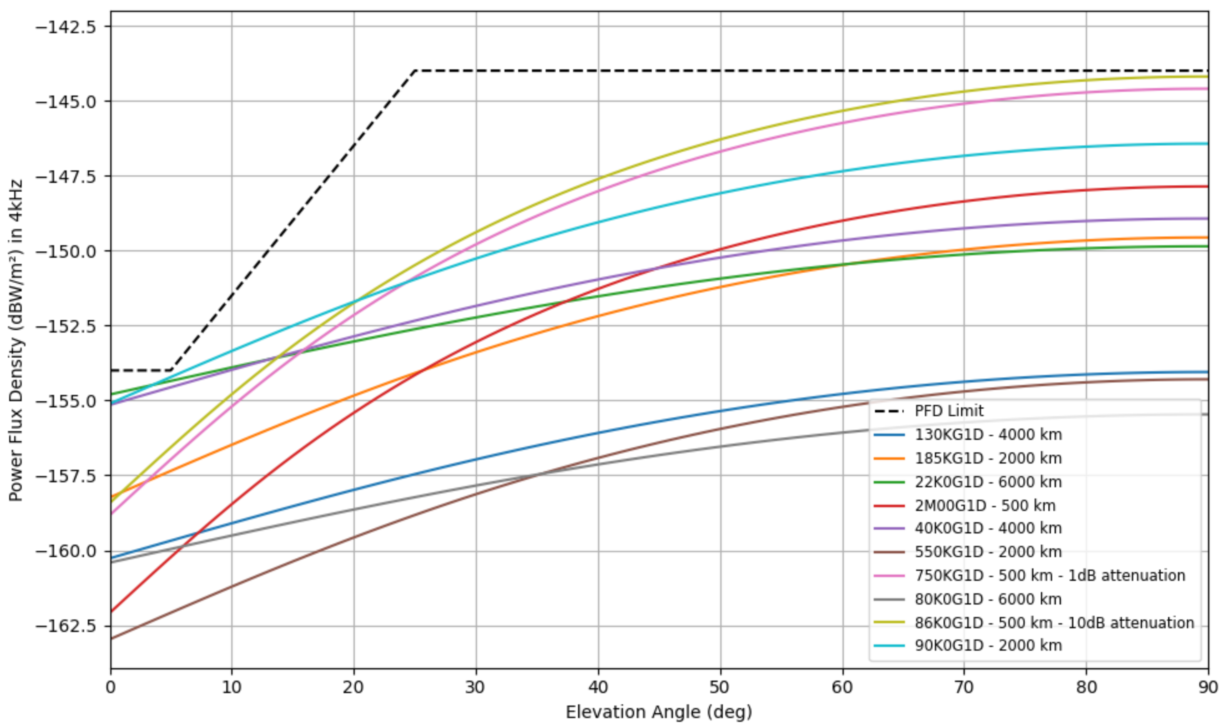


Figure 2. S-Band Power Flux Density at the surface of the Earth.

<u>Power Spectral Flux Density in the band 2290 – 2300 MHz</u>

ITU-R Recommendation SA.1157 specifies that spacecraft transmitting adjacent to the 2290 – 2300 MHz deep-space network ("DSN") band must not exceed a power spectral flux density of -257 dBW/m^2/Hz in the 2290 – 2300 MHz band to protect deep-space earth-station receivers.

At the requested S-Band downlink center frequency of 2222 MHz and a worst-case bandwidth of 750 kHz, the power spectral density at the lower edge of the DSN band (2290 MHz) was measured to be –153.3 dBW/Hz. In a worst-case scenario where the Spacecraft is at its lowest operational orbit altitude of 500 km, and the S-Band downlink antenna is radiating at its peak EIRP directly towards a DSN earth-station, the power spectral flux density is calculated to be –278.3 dBW/m^2/Hz, giving the Spacecraft a 21.3 dB margin in compliance with ITU-R Recommendation SA.1157.

X-Band Downlink

The 8450 – 8500 MHz band (space-to-Earth) is allocated internationally and in the U.S. for space research.[19] As discussed above, shared use of these frequencies can be accomplished and will be coordinated with other operators, ensuring that operations will not cause harmful interference.

<u>PFD at the Surface of the Earth in the Band 8450 – 8500 MHz</u>

ITU RR Table 21-4 limits the PFD of transmission over a 4 kHz bandwidth between 8450 – 8500 MHz to the following limits:

- -150 dBW/m^2 in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane.
- -150 + 0.5 * (δ - 5) dBW/m^2 in any 4 kHz band for angles of arrival, δ (in degrees), between 5 and 25 degrees above the horizontal plane.
- -140 dBW/m^2 in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

PFD is calculated using the equation: PFD [dBW/m^2/4 kHz] = EIRP [dBW] – 11 – 20log10(D) + 36 – 10log10(BW), where EIRP is the maximum EIRP of the transmission; D is the distance between the satellite and the affected surface area in meters; and BW is the bandwidth of the transmission in Hz.

To maintain link margin and ensure compliance with PFD requirements, the Spacecraft will operate using different bandwidths for different orbit altitudes during its mission lifetime. Figure 2 shows the maximum PFD with respect to elevation angle for the worst-case orbit altitude of each emission designator identified in Table 1 of Attachment C using the X-Band downlink parameters in Table 1.

[19] *See* ITU RR 5.466; 47 C.F.R. § 2.106. In Singapore and Sri Lanka, this band is allocated to space research on a secondary basis.

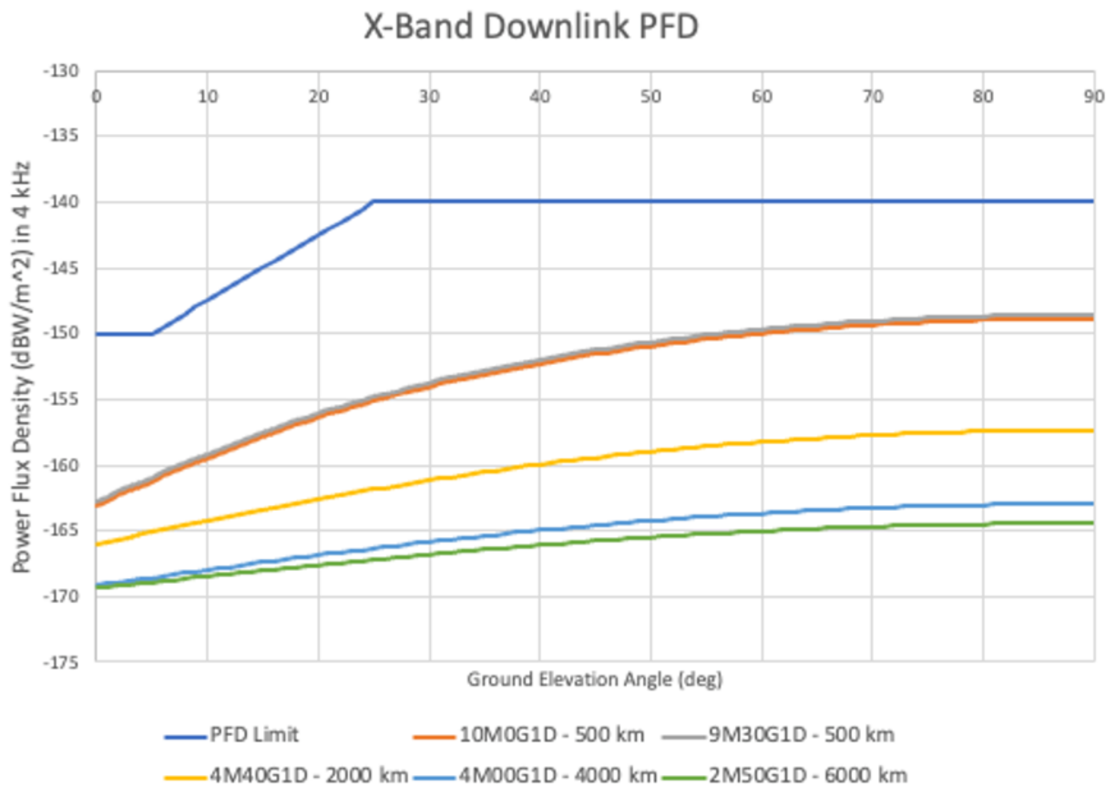


Figure 3. X-Band Power Flux Density at the surface of the Earth.

<u>PFD at the GSO Arc in the band 8025 – 8400 MHz</u>

ITU RR No. 22.5 specifies that in the frequency band 8025 – 8400 MHz, the maximum PFD produced at the geostationary satellite orbit by any EESS space station shall not exceed -174 dBW/m^2 in any 4 kHz band. While not required for adjacent band operations, K2 Space is providing a demonstration of compliance for completeness.

PFD is calculated using the equation: PFD [dBW/m^2/4 kHz] = EIRP [dBW] – 11 – 20log10(D) + 36 – 10log10(BW), where EIRP is the maximum EIRP of the transmission; D is the distance between the satellite and the affected surface area in meters; and BW is the bandwidth of the transmission in Hz.

The minimum possible distance between the Spacecraft and GSO is 35786 km – 6000 km = 29786 km for the highest possible Spacecraft orbit of 6000 km. The X-Band antenna nominally radiates only in the nadir direction, but under a worst-case assumption that the X-Band antenna is radiating at its peak EIRP directly towards the GSO, then using the X-Band downlink parameters given in Table 1, the Spacecraft produces a PFD at the GSO in the 8450 – 8500 MHz of -184.4 dBW/m^2 in any 4 kHz band. Taking into account an additional 45 dBc reduction for spectral masking of out-of-band emissions at 8400 MHz, the Spacecraft produces a worst-case PFD in the 8025 – 8400 MHz band at the GSO of -229.4 dBW/m^2 in any 4 kHz band.

Power Spectral Flux Density in the band 8400 – 8450 MHz

ITU-R Recommendation SA.1157 specifies that spacecraft transmitting adjacent to the 8400 – 8450 MHz DSN band must not exceed a power spectral flux density of -255.1 dBW/m^2/Hz in the 8400 – 8450 MHz band to protect DSN earth station receivers.

At the requested X-Band downlink center frequency of 8480 MHz and a maximum bandwidth of 10 MHz, the measured power spectral density at the upper edge of the DSN band (8450 MHz) was measured to be –113.7 dBW/Hz.

In a worst-case scenario where the Spacecraft is at its lowest operational orbit altitude of 500 km, and the X-Band downlink antenna is radiating at its peak EIRP directly towards a DSN earth-station, the power spectral flux density is calculated to be –238.7 dBW/m^2/Hz. K2 Space acknowledges that this is not in compliance with ITU-R Recommendation SA.1157 and will reduce transmitted power when in line-of-sight of any DSN station to remain below the power spectral flux density threshold.

As noted in Attachment C, at and above 2000 km, the transmitter will narrow its bandwidth to a maximum of 4.4 MHz. In the worst case with the X-Band downlink antenna radiating at its peak EIRP directly towards a DSN earth station, the power spectral flux density is calculated to be –256.2 dBW/m^2/Hz, giving the Spacecraft a 1.1 dB margin in compliance with ITU-R Recommendation SA.1157.

4. Experimental Communications: Phased Array

The K2 Space experimental phased array antenna system comprises an onboard processor to modulate/demodulate signals and RF front end components for analog signal conditioning. The phased array is a complete self-contained communication system with dimensions of approximately 1m x 1m. The phased array operates at separate frequencies from the operational communications systems and flows data which is not critical to operation of the spacecraft.

The phased array will communicate with ground stations at S-band for the purposes of communications demonstrations.[20] From time to time, the phased array will use two frequencies to demonstrate simultaneous communications on electronically formed beams. Appendix C provides a typical beam pattern of the phased array.

S-Band Downlink

Table 3 below specifies the planned downlink characteristics of the phased array. The phased array has significant operational flexibility, such that, if requested by the FCC or federal spectrum users, center frequencies in the 2200 – 2290 MHz band other than the requested 2232.5 MHz or 2242.5 MHz may be allocated without loss of functionality provided those frequencies do not overlap with the operational spacecraft communications system at 2221-2223 MHz.

[20] The phased array has a wide tunable bandwidth which extends beyond S-band. However, only the space research S-band frequencies listed in this section are requested for its demonstration.

Table 3: Phased array S-band downlink RF specifications.[21]

	Downlink 1	Downlink 2
Center Frequency (MHz)	2232.5	2242.5
Max Bandwidth (MHz)	5.0	
Modulation	PSK, APSK	
Max EIRP (dBW)	17.0	
Freq. Tolerance (ppm)	1.0	
Polarization	LHCP, RHCP	

Like the operational TT&C radio, the phased array will adjust transmit power as a function of altitude during orbit raises to maintain compliance with PFD limitations. Polarization of the phased array is digitally controllable. Both LHCP and RHCP will be used for transmissions. A complete list of emission designators for each of these bandwidth changes and the orbit altitudes at which they will occur can be found in Table 1 of Attachment C.

As noted above in discussion of the operational TT&C communications system at S-band, the 2200 – 2290 MHz band (space-to-Earth) is allocated internationally for EESS, space research, and space operations. The phased array will transmit on these frequencies only to non-U.S. ground stations. The Screech 1 mission is a space research mission, and thus K2 Space's use of the spectrum for non-federal space research is consistent with the U.S. and International Table of Frequency Allocations. Furthermore, shared use of these frequencies can be accomplished and will be coordinated with other operators, ensuring that operations will not cause harmful interference.

<u>PFD at the Surface of the Earth in the band 2200 – 2290 MHz</u>

PFD is calculated with the same method as in Section 4. To maintain link margin and ensure compliance with PFD requirements, the Spacecraft will operate using different bandwidths for different orbit altitudes during its mission lifetime. K2 Space will ensure that PFD requirements are met during orbit raises by attenuating transmit power as necessary.

[21] All center frequencies identified in the two tables below are representative channels and subject to coordination with Federal spectrum managers.

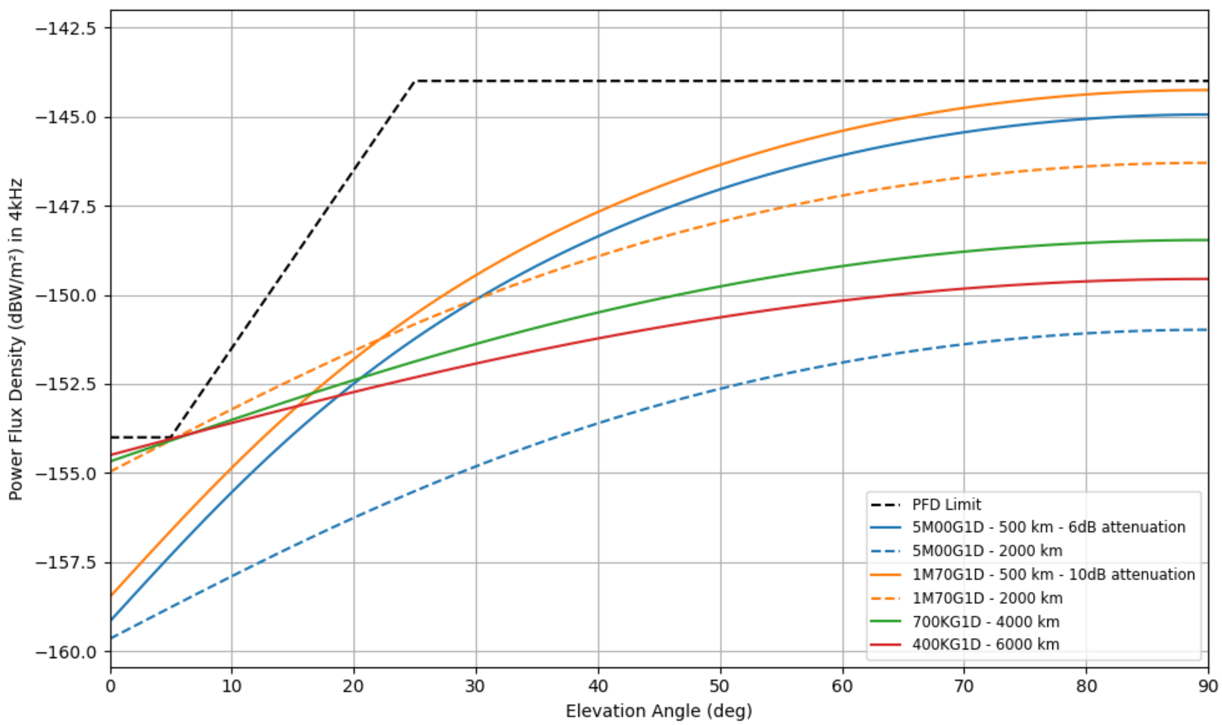


Figure 4: S-band power flux density at the surface of the Earth from phased array transmissions.

<u>Power Spectral Flux Density in the band 2290 – 2300 MHz</u>

As noted in Section 4, ITU-R Recommendation SA.1157 specifies that spacecraft transmitting adjacent to the 2290 – 2300 MHz DSN band must not exceed a power spectral flux density of -257 dBW/m^2/Hz in the 2290 – 2300 MHz band to protect deep-space earth-station receivers.

At the requested S-Band downlink center frequency of 2232.5 MHz, the power spectral density in the DSN band with the transmitter at full power was measured to be -133.7 dBW/Hz. In a worst-case scenario where the Spacecraft is at its lowest operational orbit altitude of 500 km, and the S-Band downlink antenna is radiating at its peak EIRP directly towards a DSN earth-station, the power spectral flux density is calculated to be -258.7 dBW/m^2/Hz, giving the Spacecraft a 1.7 dB margin in compliance with ITU-R Recommendation SA.1157.

At the requested S-Band downlink center frequency of 2242.5 MHz, the power spectral density in the DSN band with the transmitter at full power was measured to be -134.4 dBW/Hz. In a worst-case scenario where the Spacecraft is at its lowest operational orbit altitude of 500 km, and the S-Band downlink antenna is radiating at its peak EIRP directly towards a DSN earth-station, the power spectral flux density is calculated to be -259.4 dBW/m^2/Hz, giving the Spacecraft a 2.4 dB margin in compliance with ITU-R Recommendation SA.1157.

S-Band Uplink

Table 4 below specifies the planned uplink characteristics of the phased array for transmissions from ground station sites.[22] The 5 MHz uplink mode will be used infrequently to evaluate the array's ability to support flight software uploads.

Table 4. Phased array S-band uplink RF specifications.

	Uplink 1	Uplink 2
Center Frequency (MHz)	2052.0	2062.0
Max Bandwidth (MHz)	5.0	
Modulation	PSK, APSK	
Polarization	LHCP, RHCP	

As noted in Section 4, the 2025 – 2110 MHz (Earth-to-space) band is allocated internationally and in the U.S. for EESS and space research for non-federal use. The Screech 1 mission is a space research mission, and thus K2 Space's use of the spectrum for non-federal space research is consistent. Moreover, use of this band can and will be coordinated, ensuring that operations will not cause harmful interference. K2 Space will also comply with technical requirements in Part 2 of the Commission's rules and applicable ITU rules and complete coordination with federal spectrum managers, as required.

5. Experimental Communications: SDR

The K2 Space experimental software-defined radio system comprises a software-defined radio, RF front end components for analog signal conditioning, and antennas at the S- and Ka-band frequencies. On Screech 1, the SDR will be a self-contained communication system, operating at separate frequencies from operational TT&C, and flowing test data which is not critical to operation of the spacecraft.

S-Band Downlink

Table 5 below specifies the planned downlink characteristics of the SDR. The SDR's requested downlink frequency is the same as the phased array and its use is consistent with U.S. and International Table of Frequency Allocations for the Screech 1 space research mission. At S-band, the SDR will use the same downlink frequency as the phased array and the frequency will be time shared between the two systems. The SDR and phased array will never occupy S-band frequencies at the same time.

[22] The S-band uplink information is provided for informational purposes only. The respective ground station operators are separately seeking licensing authority to communicate with the Spacecraft.

Table 5: SDR S-band downlink RF specifications.[23]

Center Frequency (MHz)	2232.5
Max Bandwidth (MHz)	2.0
Modulation	PSK, APSK
Max EIRP (dBW)	14.0
Freq. Tolerance (ppm)	1.0
Polarization	LHCP, RHCP

<u>PFD at the Surface of the Earth in the band 2200 – 2290 MHz</u>

PFD is calculated with the same method as in Section 4. To maintain link margin and ensure compliance with PFD requirements, the Spacecraft will operate using different bandwidths for different orbit altitudes during its mission lifetime. K2 Space will ensure that PFD requirements are met during orbit raises by attenuating transmit power as necessary.

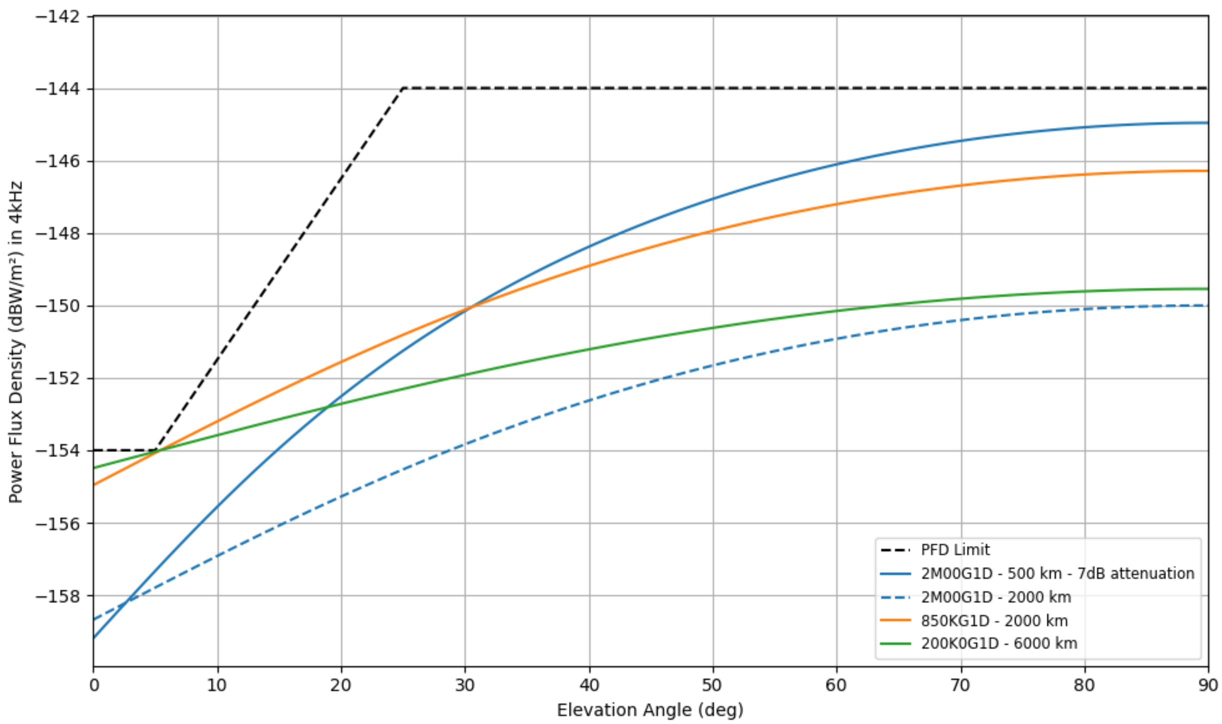


Figure 5: S-band power flux density at surface of the Earth due to SDR transmissions.

[23] All center frequencies identified in the two tables below are representative channels and subject to coordination with Federal spectrum managers.

Power Spectral Flux Density in the band 2290 – 2300 MHz

As noted in Section 4, ITU-R Recommendation SA.1157 specifies that spacecraft must not exceed a power spectral flux density of -257 dBW/m^2/Hz in the 2290 – 2300 MHz DSN band.

At the requested S-Band downlink center frequency of 2232.5 MHz, the power spectral density in the DSN band with the transmitter at full power was measured to be -140.4 dBW/Hz. In a worst-case scenario where the Spacecraft is at its lowest operational orbit altitude of 500 km, and the S-Band downlink antenna is radiating at its peak EIRP directly towards a DSN earth-station, the power spectral flux density is calculated to be –265.4 dBW/m^2/Hz, giving the Spacecraft an 8.4 dB margin in compliance with ITU-R Recommendation SA.1157.

S-Band Uplink[24]

At S-band, the SDR will use the same uplink frequency as the array and the frequency will be time shared between the two systems. The SDR and phased array will never occupy S-band frequencies at the same time. The 2 MHz uplink mode will be used infrequently to evaluate the SDR's ability to support flight software uploads.

As noted in Section 4, K2 Space's use of the spectrum for non-federal space research is consistent with its purpose as a space research mission. K2 Space will also comply with technical requirements in Part 2 of the Commission's rules and applicable ITU rules and complete coordination with federal spectrum managers, as required.

Table 6. SDR S-band uplink RF specifications.

Center Frequency (MHz)	2052.0
Max Bandwidth (MHz)	2.0
Modulation	PSK, APSK
Polarization	LHCP, RHCP

Ka-Band Downlink

The 19.7–20.2 GHz (space-to-Earth) band is allocated internationally and in the United States for Fixed Satellite Service ("FSS") on a primary basis.[25] The band is available to both GSO and NGSO satellite systems, subject to the requirement that NGSO systems not cause unacceptable interference to, and not claim protection from, GSO systems operating in conformance with the ITU Radio Regulations and the Commission's rules.[26]

Screech 1 will use this band for experimental data transfer to evaluate the SDR's utility operating at these bands. K2 Space will protect GSO FSS operations by adhering to applicable equivalent power flux-

[24] The S-band uplink information is provided for informational purposes only. The respective ground station operators are separately seeking licensing authority to communicate with the Spacecraft.

[25] *See* 47 C.F.R. § 2.106.

[26] *See* 47 C.F.R. § 25.261(d).

density limits and GSO-arc exclusion angles, as described later in this section. A conservative degraded throughput analysis will demonstrate proposed operations are probabilistically unlikely to cause harmful interference into authorized and operational co-frequency NGSO systems.

Table 7. SDR Ka-band downlink RF specifications.

Center Frequency (MHz)	19950
Max Bandwidth (MHz)	20.0
Modulation	PSK, APSK
Max EIRP (dBW)	26.8
Freq. Tolerance (ppm)	1.0
Polarization	LHCP, RHCP
Maximum PFD at Earth	-124 dBW/m^2/MHz
Minimum Elevation Angle	20°
GSO Arc Avoidance Angle (α_0)	25°

Additional backoff from maximum EIRP will be applied based on orbital altitude and bandwidth to ensure power flux density at Earth remains at or below the -124 dBW/m^2/MHz used in the below GSO protection analysis.

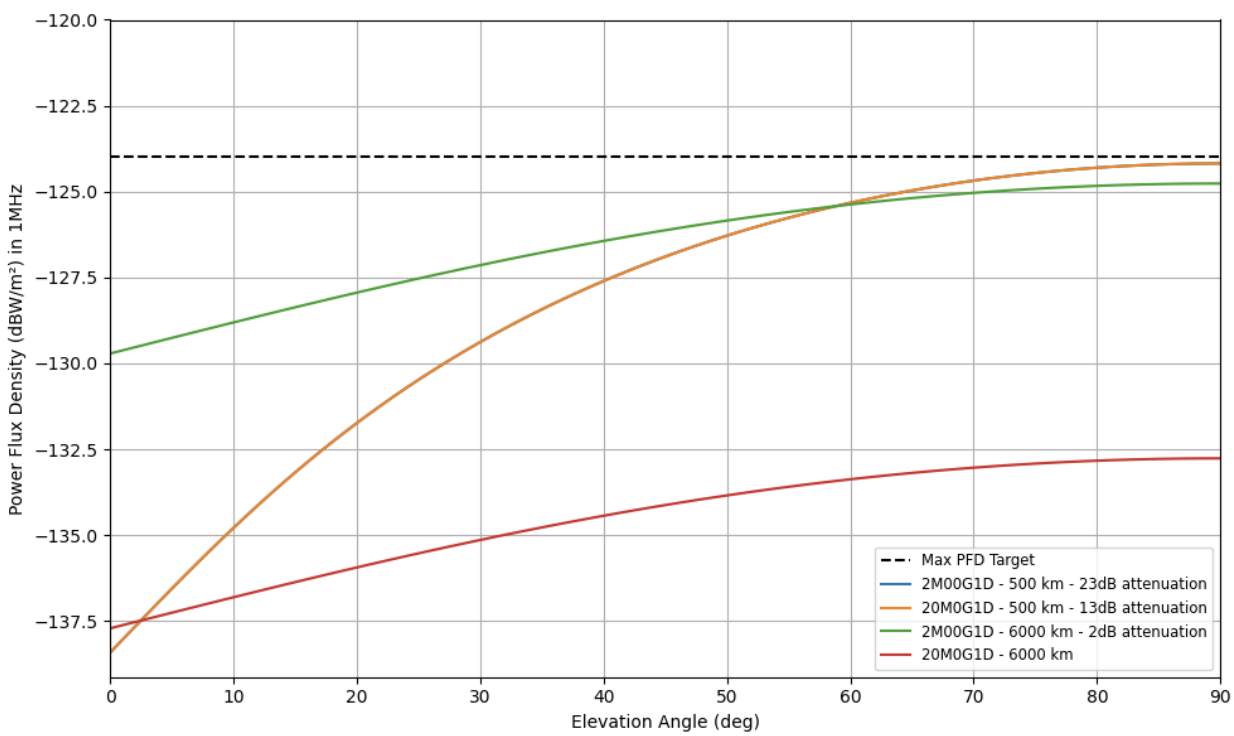


Figure 6: Downlink PFD per emission designator versus the PFD target used in GSO interference protection analysis below.

Ka-Band Uplink

The 29.5–30.0 GHz (Earth-to-space) band is allocated internationally and in the United States for FSS on a primary basis. Similarly, Screech 1 will protect GSO FSS operations through equivalent power flux-density limits and GSO-arc exclusion angles. A degraded throughput analysis, detailed later in this section, will demonstrate proposed operations are probabilistically unlikely to cause harmful interference into authorized and operational co-frequency NGSO systems.

Table 8. SDR Ka-band uplink RF specifications.

	Uplink
Center Frequency (MHz)	29750
Max Bandwidth (MHz)	20.0
Modulation	PSK, APSK
Polarization	LHCP, RHCP
Maximum Uplink EIRP Density at ES Transmitter	53.2 dBW/MHz
Minimum Elevation Angle	20°
GSO Arc Avoidance Angle (α_0)	25°

Interference Protection for Co-Frequency GSO Systems

K2 Space plans to conduct test operations in the Ka-Upper (19.7-20.2 GHz space-to-Earth and 29.5-30.0 GHz Earth-to-space) bands from both LEO orbit (500 km, 50-degree inclination) and MEO orbit (6000 km, 50-degree inclination). K2 Space will operate these links with a minimum elevation angle of 20-degrees, a downlink PFD of -124 dBW/m^2/MHz and a GSO arc avoidance angle of 25-degrees. Back off from the SDR's maximum power will be applied at each orbit to maintain better than -124 dBW/m^2/MHz PFD at Earth's surface.

To ensure protection of GSO operators in this band, equivalent power flux density ("EPFD") analysis was conducted in accordance with Article 22 of the ITU Radio Regulations. As can be seen from the below EPFD Analysis results using the BR provided EPFD SW, K2 Space is fully compliant with the Article 22 EPFD limits from both LEO and MEO.

EPFD at LEO (500 km)

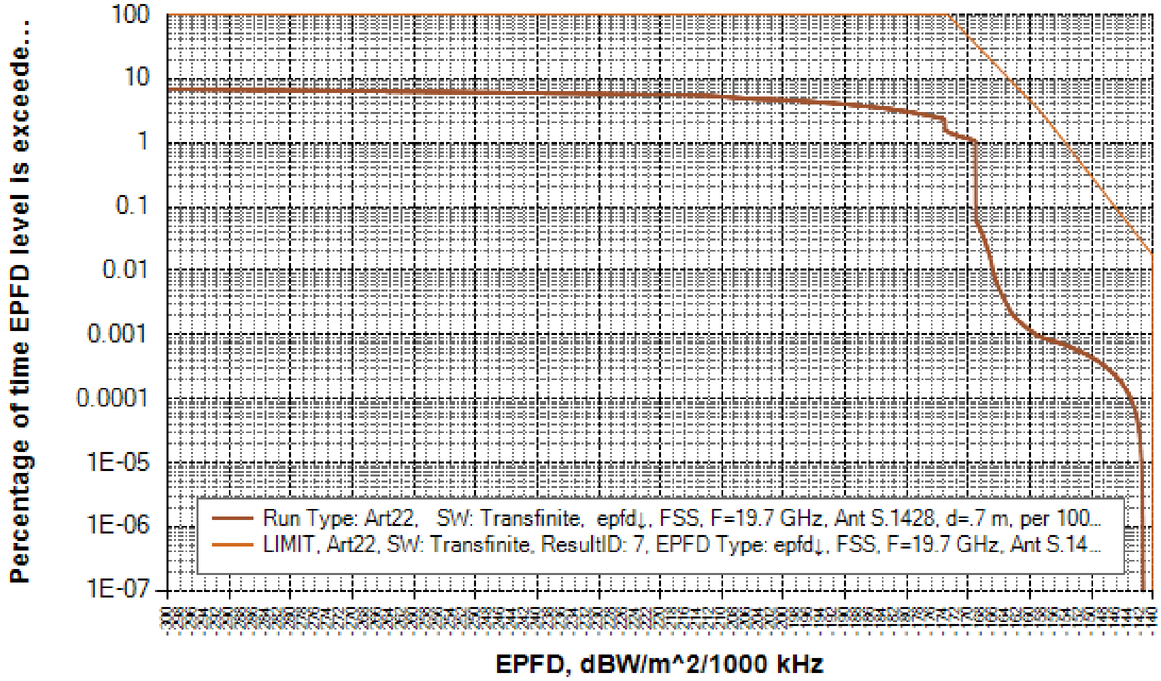


Figure 7: LEO Operations, Downlink EPFD in the 19.7-20.2 GHz band for the 0.7m victim GEO Earth Station.

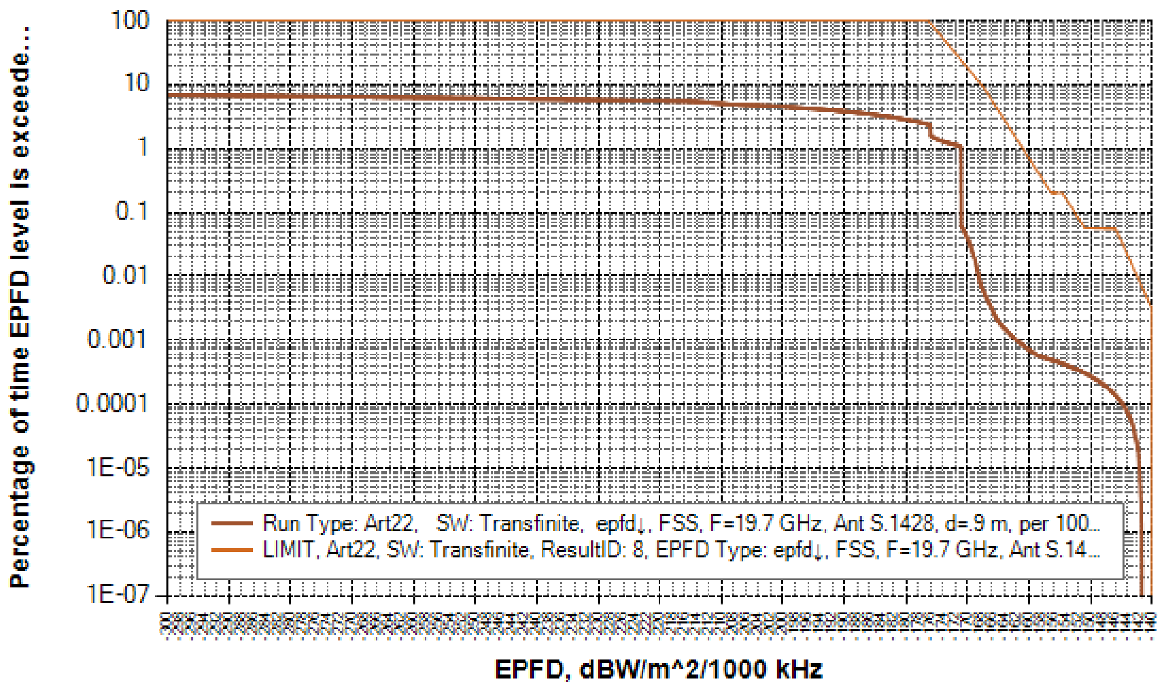


Figure 8: LEO Operations, Downlink EPFD in the 19.7-20.2 GHz Band for the 0.9m Victim GEO Earth Station.

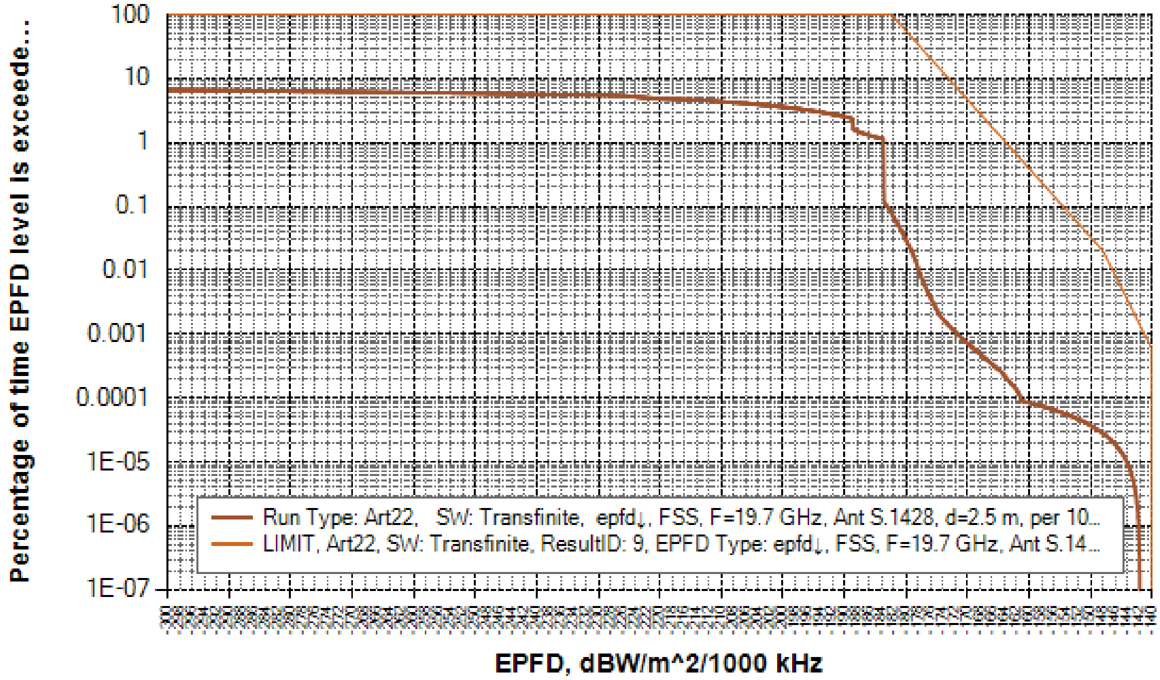


Figure 9: LEO Operations, Downlink EPFD in the 19.7-20.2 GHz Band for the 2.5m Victim GEO Earth Station.

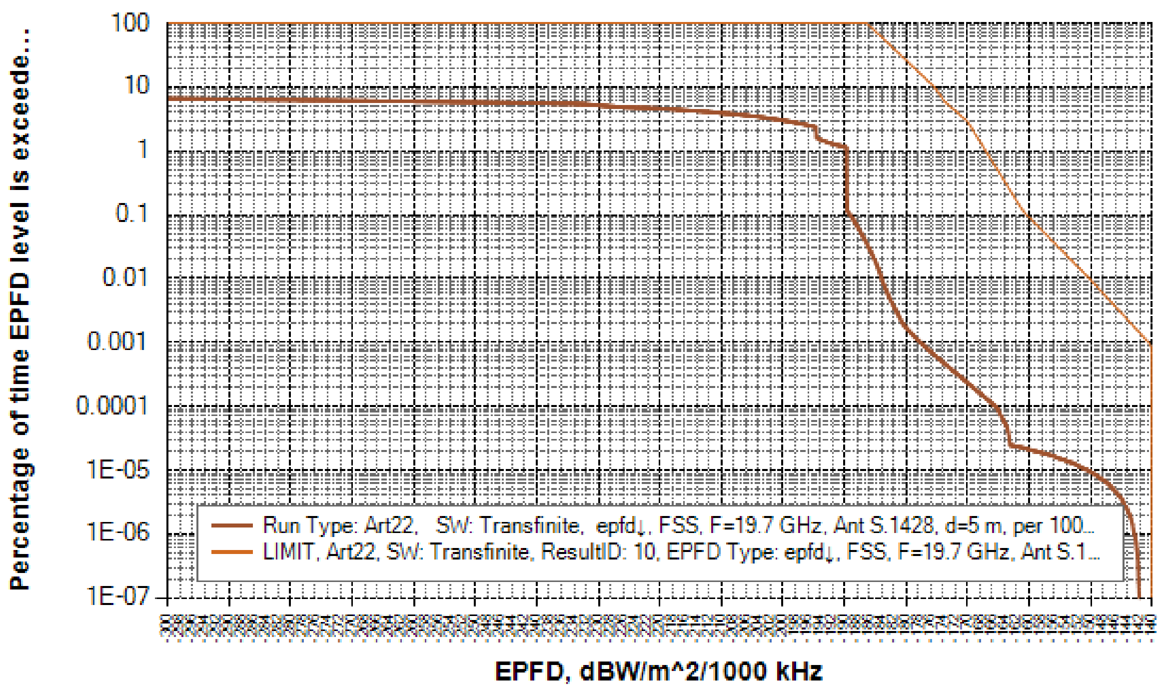


Figure 10: LEO Operations, Downlink EPFD in the 19.7-20.2 GHz Band for the 5.0m Victim GEO Earth Station.

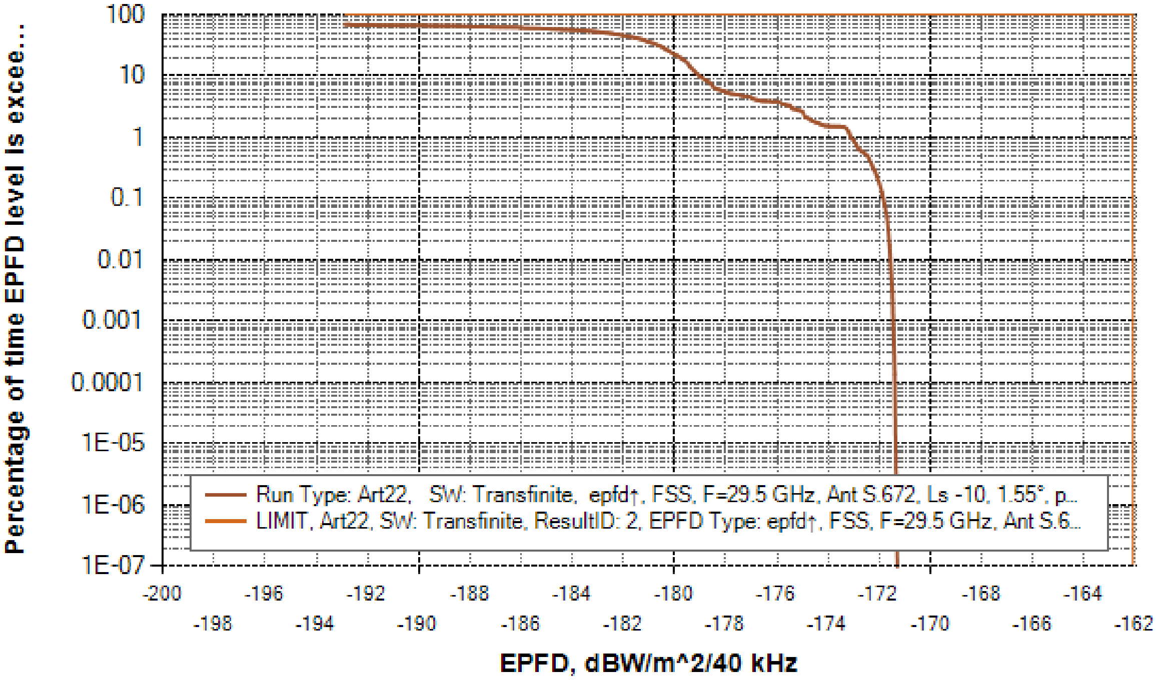


Figure 11: LEO Operations, Uplink EPFD in the 29.5-30.0GHz Band.

<u>EPFD at MEO (6000 km)</u>

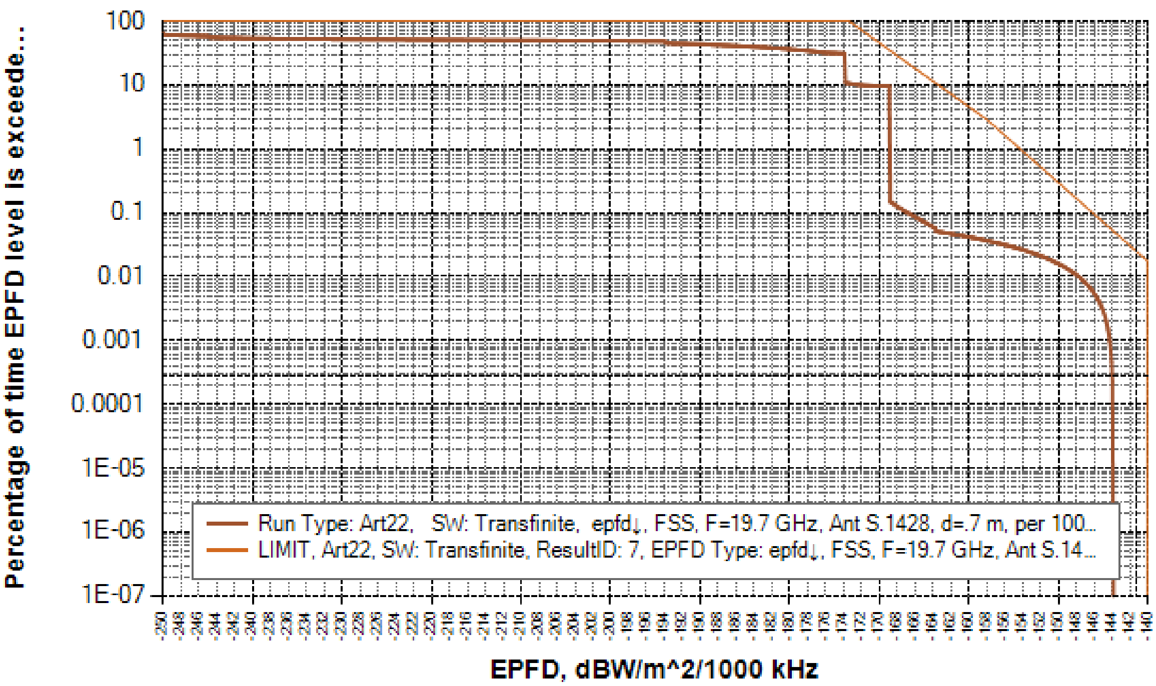


Figure 12: MEO Operations, Downlink EPFD in the 19.7-20.2 GHz Band for the 0.7m Victim GEO Earth Station.

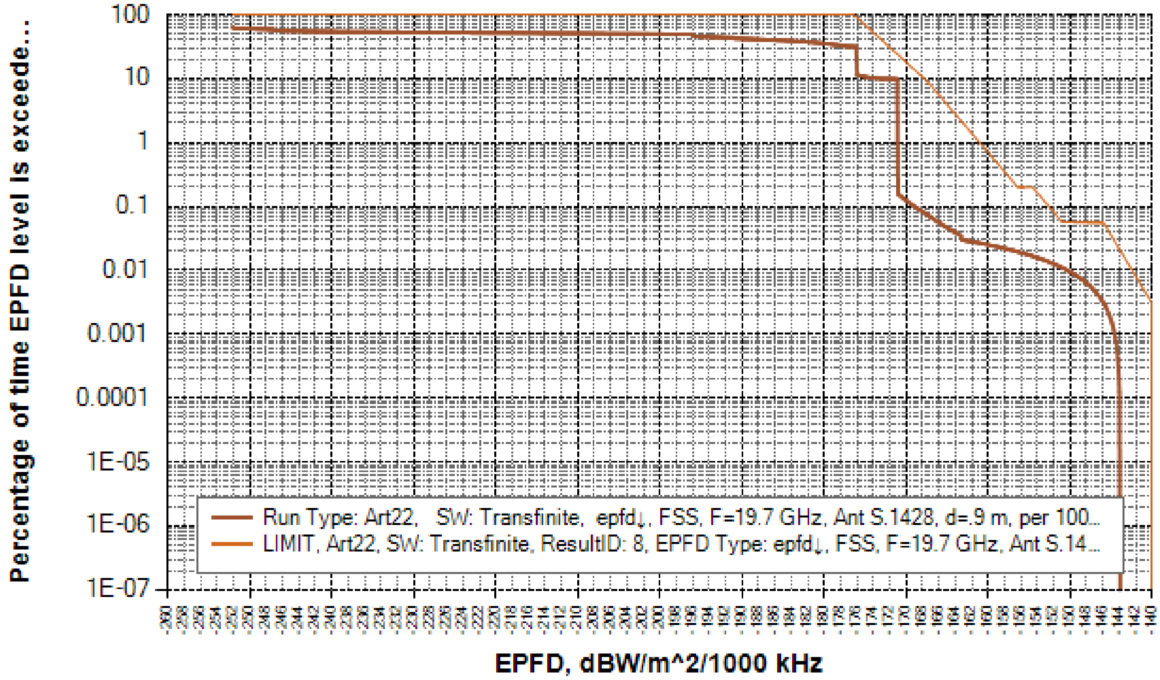


Figure 13: MEO Operations, Downlink EPFD in the 19.7-20.2 GHz Band for the 0.9m Victim GEO Earth Station.

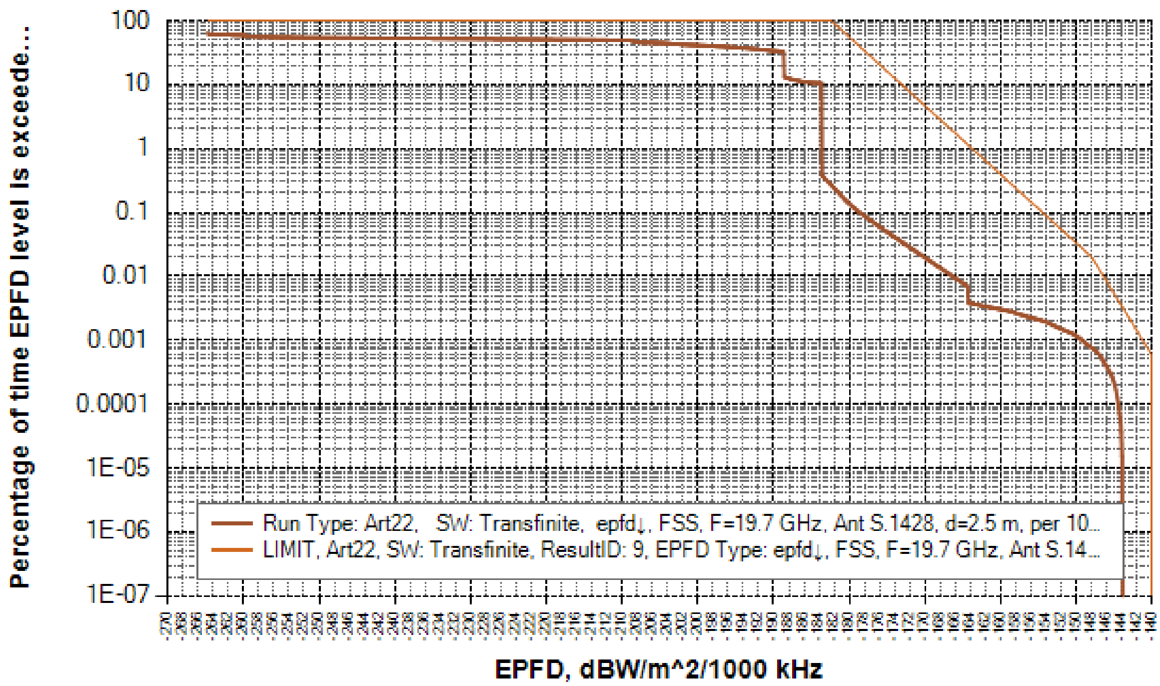


Figure 14: MEO Operations, Downlink EPFD in the 19.7-20.2 GHz Band for the 2.5m Victim GEO Earth Station.

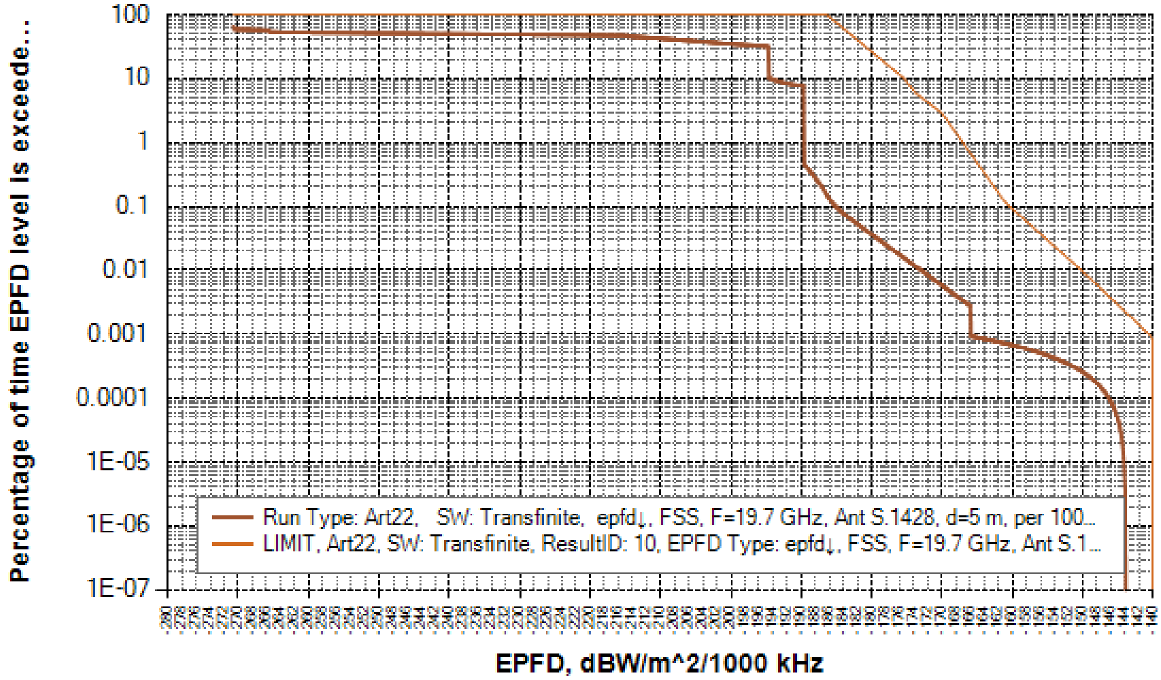


Figure 15: MEO Operations, Downlink EPFD in the 19.7-20.2 GHz Band for the 5.0m Victim GEO Earth Station.

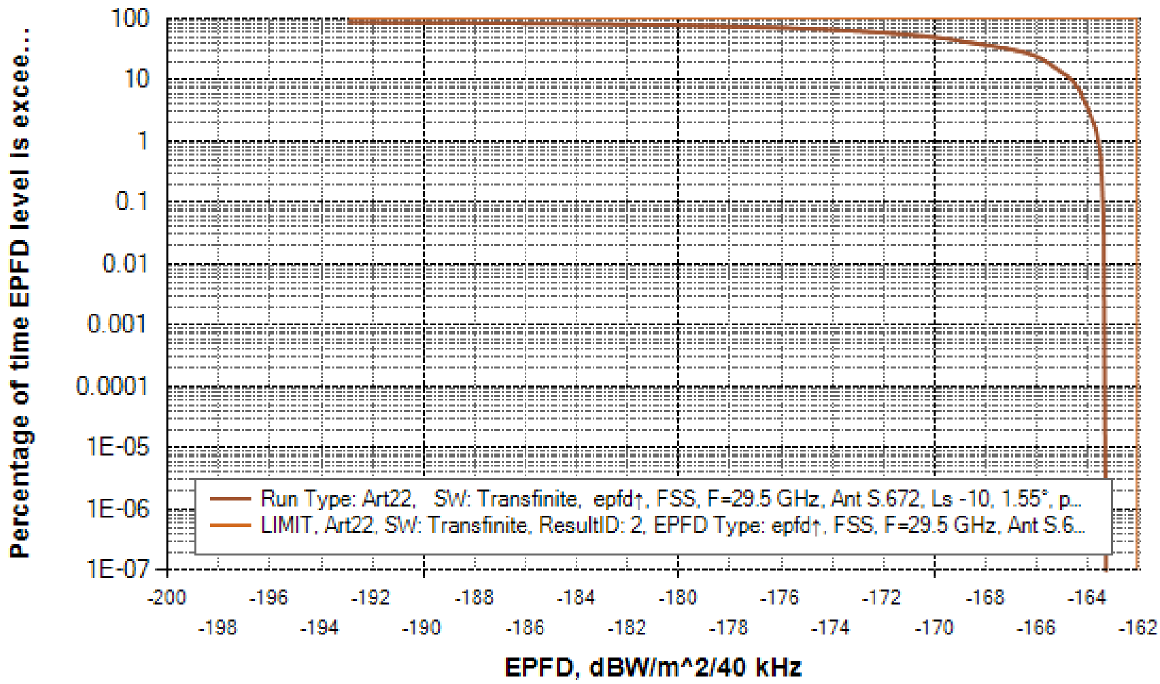


Figure 16: MEO Operations, Uplink EPFD in the 29.5-30.0 GHz Band.

Interference Protection for Co-Frequency NGSO Systems

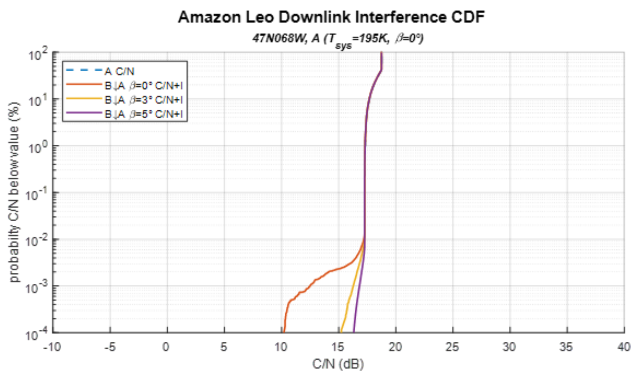
Since there are no power limits or service rules for SRS in the Ka-band in the Commission's rules or ITU Radio Regulations, K2 Space has performed a conservative degraded-throughput analysis in accordance with section 25.261(d) of the Commission's rules, which sets out the protection criteria later entrants must demonstrate vis-à-vis earlier-authorized and operational NGSO FSS systems.[27] As demonstrated below, the proposed operations are orders of magnitude below the established protection criteria threshold, and thus probabilistically unlikely to cause harmful interference into authorized and operational co-frequency systems.

The Screech 1 experiment was designed to ensure that the actual probability of harmful interference into an authorized system is unlikely. With only a single spacecraft and limited transmission windows (only when in view of a gateway), the likelihood of geometrical alignment with another co-frequency spacecraft at the time of transmission is low and, where necessary, can be coordinated with nearby earth station operators. Using the section 25.261(d) methodology, the following analysis demonstrates the effectively insignificant impact such transmissions are expected to have on two authorized and operational NGSO FSS networks (SpaceX Starlink and Amazon Leo), without factoring in potential coordination or mitigation measures.

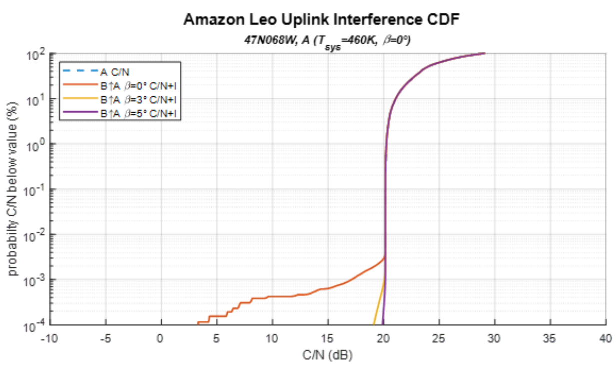
[27] See 47 C.F.R. § 25.261(d).

Amazon Leo – Maine (500 km Orbit Altitude)

The following diagrams illustrate the potential impact of K2 Space LEO operations at Loring, Maine on the Amazon Leo network. The calculations illustrate how (without any inline interference event avoidance) the impact is less than 1% of the protection criteria. That is, the 0.01% impact to throughput is less than 1% of the 3% time-weighted average criterion and the 0.0002% impact to link availability is less than 1% of the 0.4% criterion.[28] Further, the C/N curves illustrate how much further the impact of K2 Space operations would be reduced with a 3 or 5 degree inline interference event avoidance angle.



Unavailability Change		
fade	3.5778E-03	%
fade+intf	3.5778E-03	%
DIFF	**2.5430E-09**	%
Capacity Change		
fade	4.15	bps/Hz
fade+intf	4.15	bps/Hz
RELCHNG	**0.01**	%

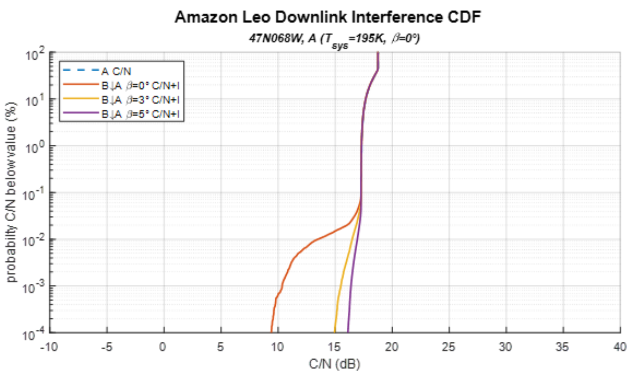


Unavailability Change		
fade	1.2941E-02	%
fade+intf	1.3149E-02	%
DIFF	**2.0855E-04**	%
Capacity Change		
fade	5.48	bps/Hz
fade+intf	5.48	bps/Hz
RELCHNG	**0.01**	%

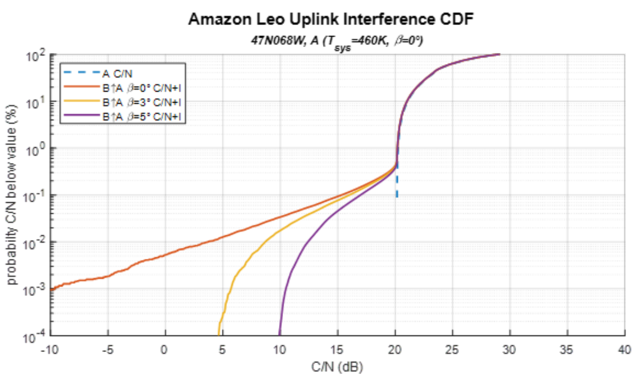
[28] See *id*.

Amazon Leo – Maine (6000 km Orbit Altitude)

The following diagrams illustrate the potential impact of K2 Space MEO operations at Loring, Maine on the Amazon Leo network. The calculations illustrate how (without any inline interference event avoidance) the impact is less than 8% of the protection criteria. Further, the C/N curves illustrate how much further the impact of K2 Space operations would be reduced with a 3 or 5 degree inline interference event avoidance angle.



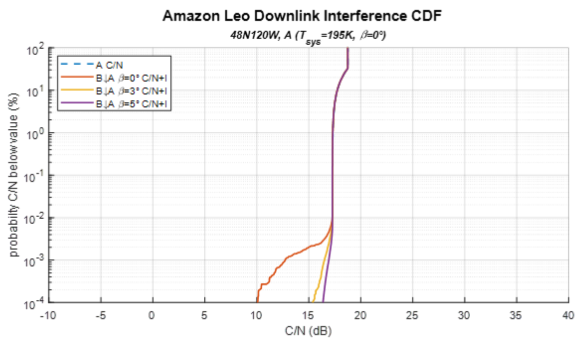
Unavailability Change		
fade	8.1263E-02	%
fade+intf	8.1403E-02	%
DIFF	**1.4040E-04**	%
Capacity Change		
fade	5.37	bps/Hz
fade+intf	5.37	bps/Hz
RELCHNG	**0.01**	%



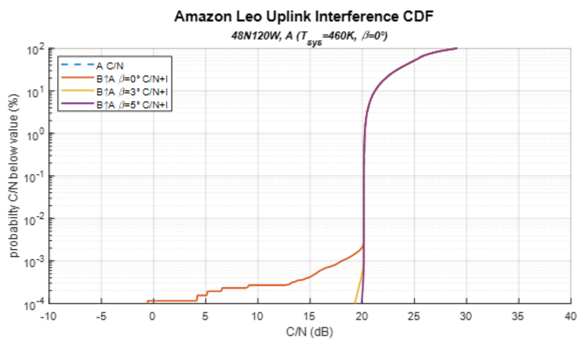
Unavailability Change		
fade	1.2931E-02	%
fade+intf	1.7528E-02	%
DIFF	**4.5969E-03**	%
Capacity Change		
fade	5.48	bps/Hz
fade+intf	5.47	bps/Hz
RELCHNG	**0.22**	%

Amazon Leo – Washington (500 km Orbit Altitude)

The following diagrams illustrate the potential impact of K2 Space LEO operations at Brewster, Washington on the Amazon Leo network. The calculations illustrate how (without any inline interference event avoidance) the impact is less than 2% of the protection criteria. Further, the C/N curves illustrate how much further the impact of K2 Space operations would be reduced with a 3 or 5 degree inline interference event avoidance angle.



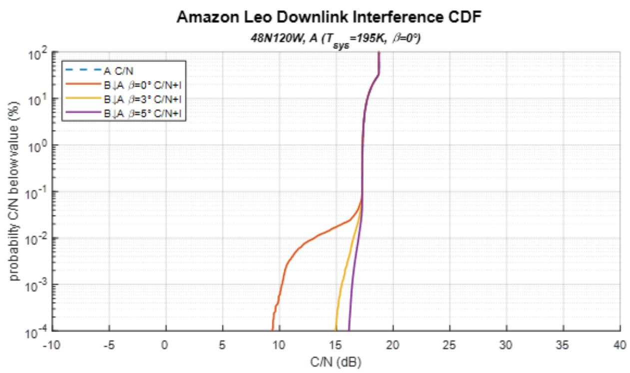
Unavailability Change		
fade	0.0000E+00	%
fade+intf	0.0000E+00	%
DIFF	**0.0000E+00**	%
Capacity Change		
fade	4.18	bps/Hz
fade+intf	4.18	bps/Hz
RELCHNG	**0.05**	%



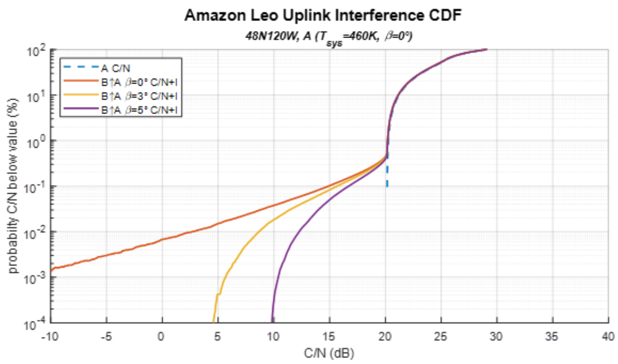
Unavailability Change		
fade	1.6839E-03	%
fade+intf	1.8793E-03	%
DIFF	**1.9548E-04**	%
Capacity Change		
fade	5.60	bps/Hz
fade+intf	5.60	bps/Hz
RELCHNG	**0.02**	%

Amazon Leo – Washington (6000 km Orbit Altitude)

The following diagrams illustrate the potential impact of K2 Space MEO operations at Brewster, Washington on the Amazon Leo network. The calculations illustrate how (without any inline interference event avoidance) the impact is less than 9% of the protection criteria. Further, the C/N curves illustrate how much further the impact of K2 Space operations would be reduced with a 3 or 5 degree inline interference event avoidance angle.



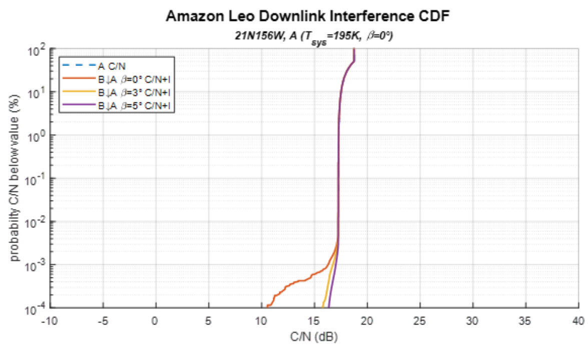
Unavailability Change		
fade	0.0000E+00	%
fade+intf	0.0000E+00	%
DIFF	**0.0000E+00**	%
Capacity Change		
fade	4.18	bps/Hz
fade+intf	4.18	bps/Hz
RELCHNG	**0.03**	%



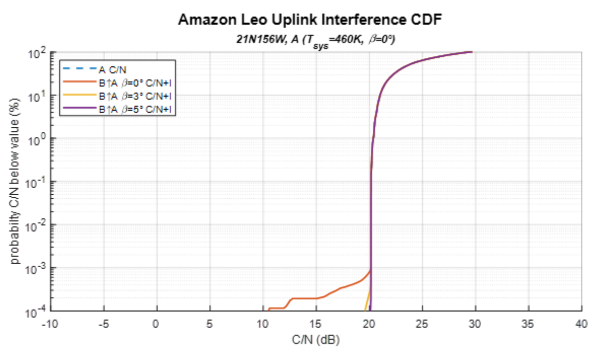
Unavailability Change		
fade	1.6801E-03	%
fade+intf	7.5901E-03	%
DIFF	**5.9100E-03**	%
Capacity Change		
fade	5.60	bps/Hz
fade+intf	5.58	bps/Hz
RELCHNG	**0.25**	%

Amazon Leo – Hawaii (500 km Orbit Altitude)

The following diagrams illustrate the potential impact of K2 Space LEO operations at Hawaii on the Amazon Leo network. The calculations illustrate how (without any inline interference event avoidance) the impact is less than 1% of the protection criteria. Further, the C/N curves illustrate how much further the impact of K2 Space operations would be reduced with a 3 or 5 degree inline interference event avoidance angle.



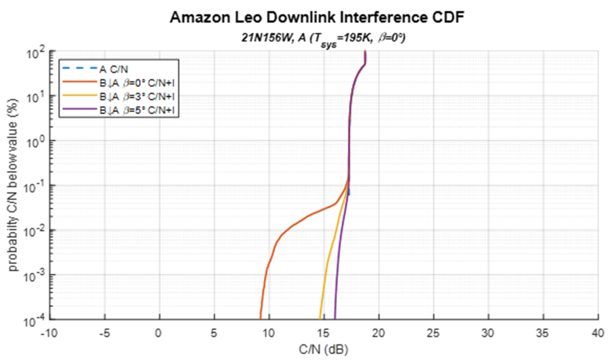
Unavailability Change		
fade	2.3784E-02	%
fade+intf	2.3784E-02	%
DIFF	**9.0150E-09**	%
Capacity Change		
fade	4.09	bps/Hz
fade+intf	4.09	bps/Hz
RELCHNG	**0.01**	%



Unavailability Change		
fade	8.1263E-02	%
fade+intf	8.1403E-02	%
DIFF	**1.4040E-04**	%
Capacity Change		
fade	5.37	bps/Hz
fade+intf	5.37	bps/Hz
RELCHNG	**0.01**	%

Amazon Leo – Hawaii (6000 km Orbit Altitude)

The following diagrams illustrate the potential impact of K2 Space MEO operations at Hawaii on the Amazon Leo network. The calculations illustrate how (without any inline interference event avoidance) the impact is less than 11% of the protection criteria. Further, the C/N curves illustrate how much further the impact of K2 Space operations would be reduced with a 3 or 5 degree inline interference event avoidance angle.

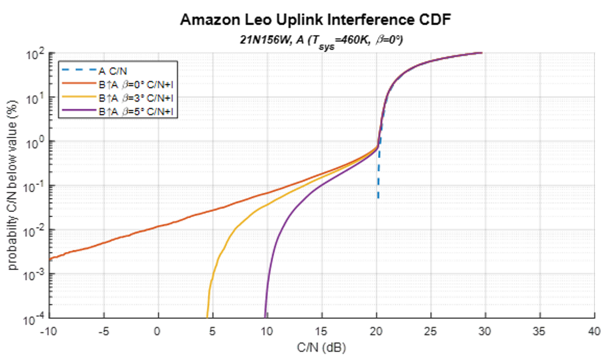


Unavailability Change

fade	2.3779E-02	%
fade+intf	2.3779E-02	%
DIFF	**4.0291E-07**	%

Capacity Change

fade	4.09	bps/Hz
fade+intf	4.09	bps/Hz
RELCHNG	**0.04**	%



Unavailability Change

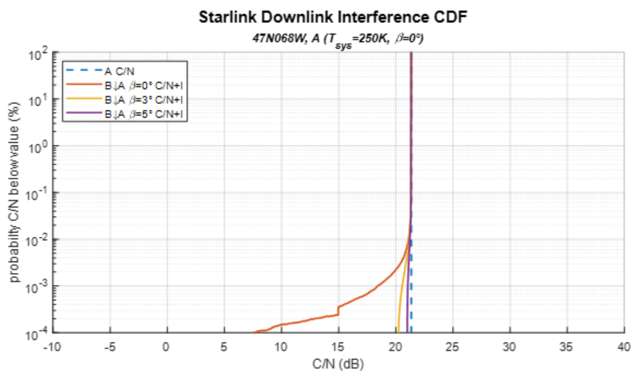
fade	8.1181E-02	%
fade+intf	9.0590E-02	%
DIFF	**9.4088E-03**	%

Capacity Change

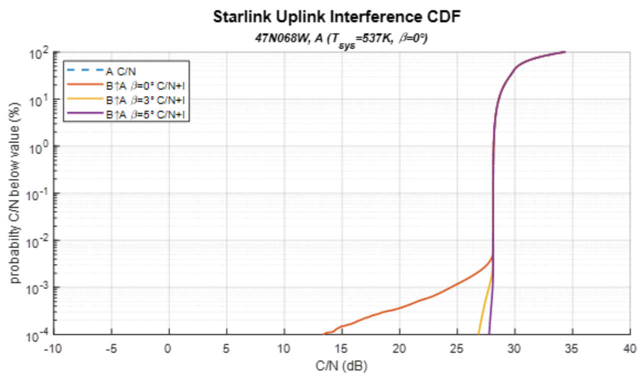
fade	5.37	bps/Hz
fade+intf	5.36	bps/Hz
RELCHNG	**0.32**	%

SpaceX Starlink – Maine (500 km Orbit Altitude)

The following diagrams illustrate the potential impact of K2 Space LEO operations at Loring, Maine on the Starlink network. The calculations illustrate how (without any inline interference event avoidance) the impact is less than 2% of the protection criteria. Further, the C/N curves illustrate how much further the impact of K2 Space operations would be reduced with a 3 or 5 degree inline interference event avoidance angle.



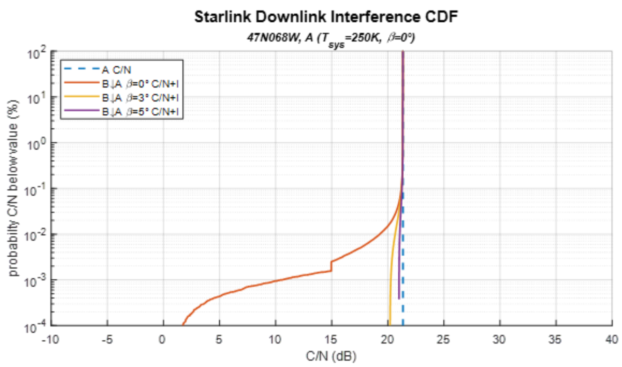
Unavailability Change		
fade	2.2158E-03	%
fade+intf	2.2158E-03	%
DIFF	**2.0130E-09**	%
Capacity Change		
fade	4.90	bps/Hz
fade+intf	4.89	bps/Hz
RELCHNG	**0.06**	%



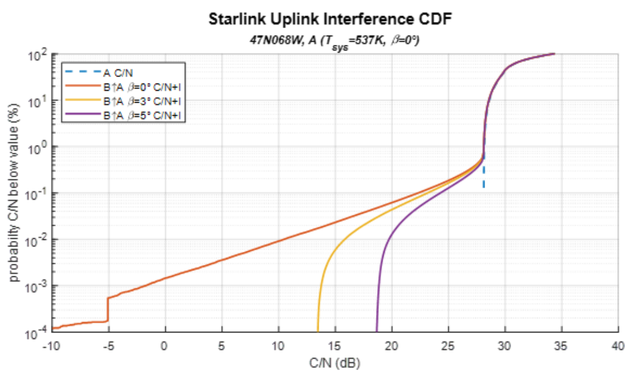
Unavailability Change		
fade	6.4251E-03	%
fade+intf	6.4468E-03	%
DIFF	**2.1701E-05**	%
Capacity Change		
fade	5.94	bps/Hz
fade+intf	5.94	bps/Hz
RELCHNG	**0.00**	%

SpaceX Starlink – Maine (6000 km Orbit Altitude)

The following diagrams illustrate the potential impact of K2 Space MEO operations at Loring, Maine on the Starlink network. The calculations illustrate how (without any inline interference event avoidance) the impact is less than 2% of the protection criteria. Further, the C/N curves illustrate how much further the impact of K2 Space operations would be reduced with a 3 or 5 degree inline interference event avoidance angle.



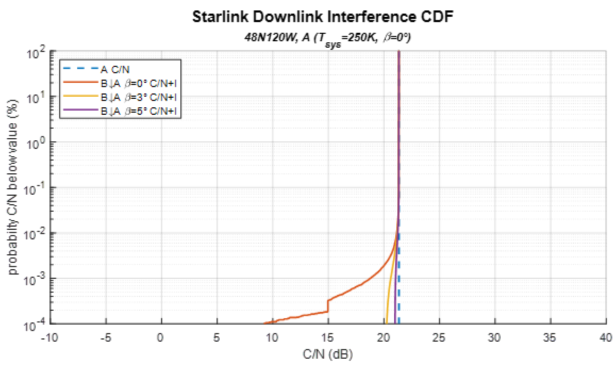
Unavailability Change		
fade	2.2158E-03	%
fade+intf	2.2158E-03	%
DIFF	**1.3723E-08**	%
Capacity Change		
fade	4.90	bps/Hz
fade+intf	4.89	bps/Hz
RELCHNG	**0.04**	%



Unavailability Change		
fade	6.4254E-03	%
fade+intf	7.8959E-03	%
DIFF	**1.4706E-03**	%
Capacity Change		
fade	5.94	bps/Hz
fade+intf	5.94	bps/Hz
RELCHNG	**0.04**	%

SpaceX Starlink – Washington (500 km Orbit Altitude)

The following diagrams illustrate the potential impact of K2 Space LEO operations at Brewster, Washington on the Starlink network. The calculations illustrate how (without any inline interference event avoidance) the impact is less than 1% of the protection criteria. Further, the C/N curves illustrate how much further the impact of K2 Space operations would be reduced with a 3 or 5 degree inline interference event avoidance angle.

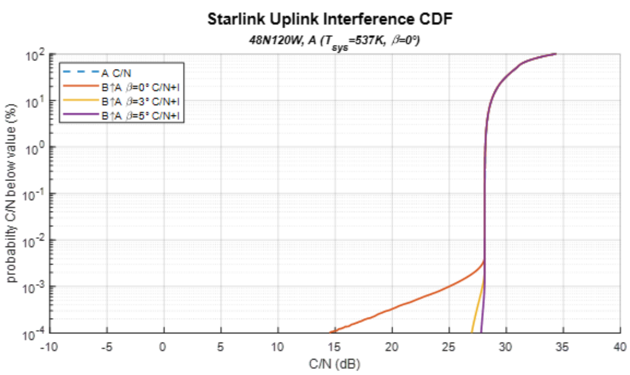


Unavailability Change

fade	0.0000E+00	%
fade+intf	2.9000E-11	%
DIFF	**2.9000E-11**	%

Capacity Change

fade	4.91	bps/Hz
fade+intf	4.91	bps/Hz
RELCHNG	**0.03**	%



Unavailability Change

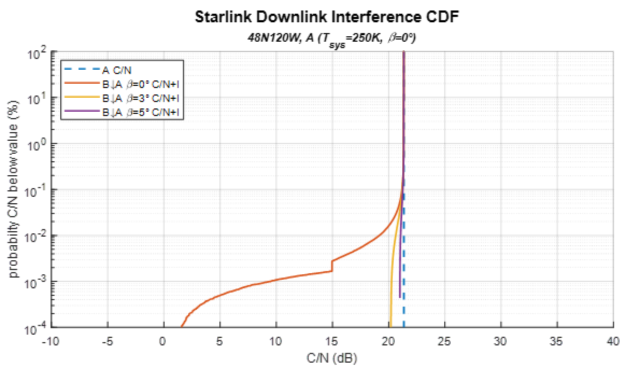
fade	0.0000E+00	%
fade+intf	1.2057E-05	%
DIFF	**1.2057E-05**	%

Capacity Change

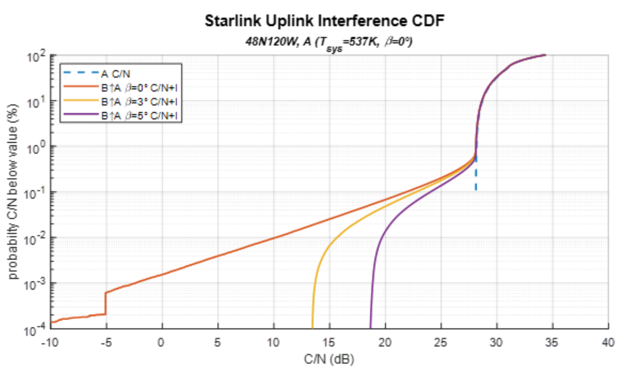
fade	5.94	bps/Hz
fade+intf	5.94	bps/Hz
RELCHNG	**0.00**	%

SpaceX Starlink – Washington (6000 km Orbit Altitude)

The following diagrams illustrate the potential impact of K2 Space MEO operations at Brewster, Washington on the Starlink network. The calculations illustrate how (without any inline interference event avoidance) the impact is less than 2% of the protection criteria. Further, the C/N curves illustrate how much further the impact of K2 Space operations would be reduced with a 3 or 5 degree inline interference event avoidance angle.



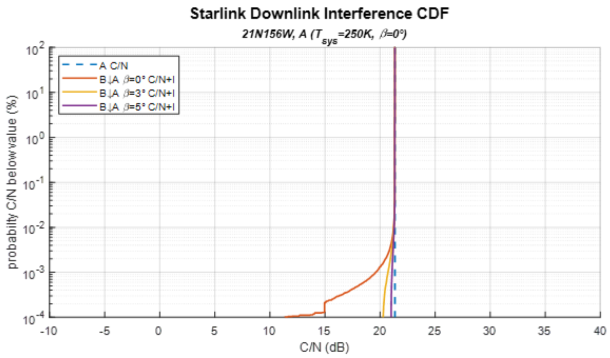
Unavailability Change		
fade	0.0000E+00	%
fade+intf	3.4400E-10	%
DIFF	**3.4400E-10**	%
Capacity Change		
fade	4.91	bps/Hz
fade+intf	4.91	bps/Hz
RELCHNG	**0.03**	%



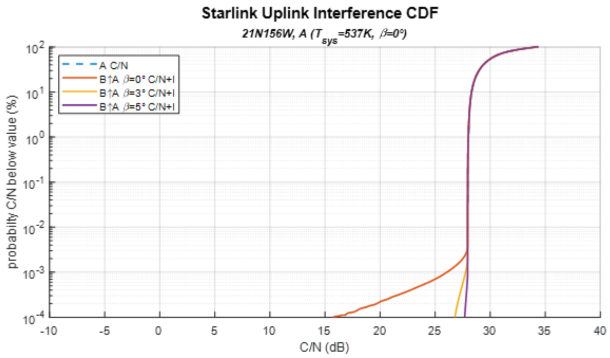
Unavailability Change		
fade	0.0000E+00	%
fade+intf	1.5360E-03	%
DIFF	**1.5360E-03**	%
Capacity Change		
fade	5.94	bps/Hz
fade+intf	5.94	bps/Hz
RELCHNG	**0.04**	%

SpaceX Starlink – Hawaii (500 km Orbit Altitude)

The following diagrams illustrate the potential impact of K2 Space LEO operations at Hawaii on the Starlink network. The calculations illustrate how (without any inline interference event avoidance) the impact is less than 2% of the protection criteria. Further, the C/N curves illustrate how much further the impact of K2 Space operations would be reduced with a 3 or 5 degree inline interference event avoidance angle.



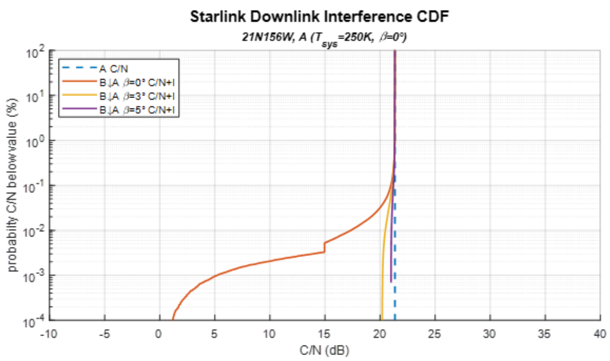
Unavailability Change		
fade	1.5432E-02	%
fade+intf	1.5432E-02	%
DIFF	**6.8500E-09**	%
Capacity Change		
fade	4.86	bps/Hz
fade+intf	4.86	bps/Hz
RELCHNG	**0.05**	%



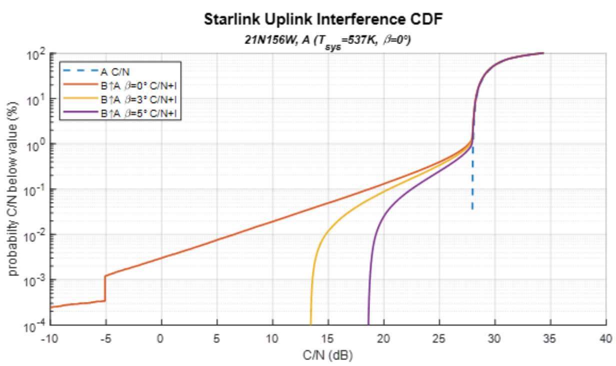
Unavailability Change		
fade	4.5429E-02	%
fade+intf	4.5431E-02	%
DIFF	**2.4309E-06**	%
Capacity Change		
fade	5.93	bps/Hz
fade+intf	5.93	bps/Hz
RELCHNG	**0.00**	%

SpaceX Starlink – Hawaii (6000 km Orbit Altitude)

The following diagrams illustrate the potential impact of K2 Space MEO operations at Hawaii on the Starlink network. The calculations illustrate how (without any inline interference event avoidance) the impact is less than 3% of the protection criteria. Further, the C/N curves illustrate how much further the impact of K2 Space operations would be reduced with a 3 or 5 degree inline interference event avoidance angle.



Unavailability Change		
fade	1.5432E-02	%
fade+intf	1.5433E-02	%
DIFF	**1.7742E-07**	%
Capacity Change		
fade	4.86	bps/Hz
fade+intf	4.86	bps/Hz
RELCHNG	**0.03**	%



Unavailability Change		
fade	4.5438E-02	%
fade+intf	4.8451E-02	%
DIFF	**3.0129E-03**	%
Capacity Change		
fade	5.93	bps/Hz
fade+intf	5.92	bps/Hz
RELCHNG	**0.08**	%

Additional Measures for Protection of Co-Frequency NGSO Systems

Prior to commencing operations K2 Space will contact the authorized and operational co-frequency operators around its test sites in Maine, Washington, and Hawaii to make available the relevant technical information regarding the experiment, including the frequencies and technical parameters to be used, earth station location, anticipated operating windows, maximum EIRP and EIRP density, antenna pointing constraints, and the contact information for the 24/7 interference-resolution point of contact. In the unlikely event that K2 Space receives notification of interference, the company will take immediate steps to resolve the interference, including pausing transmissions until relevant parties can coordinate to mitigate future risk of interference.

Together, these measures demonstrate that the proposed experiment can be conducted without causing harmful interference to authorized co-frequency systems. K2 Space's technical showing, operator communications, limited operating windows, and immediate cessation commitment provide multiple independent safeguards while preserving the limited, experimental, non-interference, no-protection character of the requested authority.