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Mission Summary

By this application, K2 Space Corporation ("K2 Space") seeks Federal Communications Commission ("FCC") authorization to conduct a space research mission ("Government Experiments 2" or "GE2") 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 medium Earth orbit ("MEO"), and proliferated geostationary Earth orbit ("GEO") applications.[1] The GE2 mission is K2 Space's second satellite demonstration and is in part funded by the U.S. Department of Defense, including the Space Systems Command and National Reconnaissance Organization.[2] The mission will also fly select novel technologies to demonstrate the company's ability to deliver desired capabilities.

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 GE2 mission is a space research mission, consisting of one Mega Class satellite (the "Spacecraft") that serves as a means of testing K2 Space's ability to operate its satellite in both LEO and MEO environments while acting as a host platform to demonstrate technological development across several space experiments. Radio frequency transmissions from the vehicle will be used for telemetry, tracking, and command ("TT&C"), hosted payload telemetry downlink purposes, and for payload transmit demonstrations.

The FCC granted K2 Space's Gravitas mission an experimental license in Q3 2025.[3] The GE2 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 TT&C will use the same transmitter the FCC authorized for Gravitas with similar power, frequency, and emission characteristics.[4] 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 space research service ("SRS") designation applies to spacecraft that engage in "scientific or technological research purposes."[5] The Spacecraft will, as is described above, collect technological

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[1] K2 Space has begun construction of the Spacecraft at its own risk. 47 C.F.R. § 5.64(a).

[2] Sandra Erwin, *K2 Space lands $30 million military contract for "Mega" satellite mission* (Dec. 19, 2024), https://spacenews.com/k2-space-lands-30-million-military-contract-for-mega-satellite-mission/.

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

[4] *See id.*

[5] 47 C.F.R. § 2.1(c).

research data from prototype hardware with the goal of advancing state-of-the-art in spacecraft communications. Accordingly, GE2 should be treated as a space research mission.

Mission Phases

We highlight that the GE2 mission timeline mirrors the Gravitas mission timeline that the FCC previously granted an experimental license for.

GE2's notional total mission life will be ~156 weeks (~3 years), consisting of insertion into LEO, orbit raising, and operations in MEO.

Out of an abundance of caution, K2 Space requests authorization for three years. K2 Space understands that the GE2 mission's duration exceeds the standard experimental license duration of two years.[3] The additional time is warranted because of the time (~28 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.

Orbit Insertion

The Spacecraft is scheduled to be launched on a contracted SpaceX Falcon 9 launch vehicle no earlier than May 2027 with three other satellites from K2 Space (the "Trinity[6] launch"). 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 Spacecraft TT&C frequencies, specifically UHF, S-band, and X-band for downlink, and S-band for uplink (all as is further defined in the "Operational Spacecraft Communications System" section below). Once commissioning is completed, the Spacecraft will perform payload experiments for both the Department of Defense and commercial customers 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 MEO to perform further payload experiments. This orbit raise will pause at various altitudes in MEO to collect experimental data, and will continue to a final altitude of 7800 km. The Spacecraft will remain at its final altitude until the end of the GE2 mission. During the orbit raise phase, nominal space-to-ground communications will be maintained via the Operational TT&C communication system over S-Band and X-Band. Ground-to-space communications will be maintained via the Operational TT&C communication system over S-Band.

Disposal

The Spacecraft will be located in an operational orbit that is defined by the NASA Guidelines and Assessment Procedures for Limiting Orbital Debris[7] as semi-synchronous, and that is defined by FCC

[6] 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.
[7] NSS 1740.14 Section 6.

guidelines as those that are not LEO or GEO.[8] The Spacecraft will spend its final ~128 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: 7800 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 GE2 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 orbital inclination for GE2 – 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, as well as the K2 Space Gravitas mission.

To reiterate, the selected orbit is very stable and will not decay to the LEO orbit range, nor will it approach GSO, and 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 7800 km in altitude for at least 100 years.

Spacecraft Subsystems

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

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, three global navigation satellite system ("GNSS") receivers, and six sun sensors. The reaction wheels and torque rods are designed by K2 Space and have successful flight heritage on the Gravitas mission. All third-party other 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

[8] *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).

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 GE2 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.

Payload Experiments

The Spacecraft will host both U.S. government and other commercial experimental payloads, such as the following:

- Optical communication terminals to demonstrate communications capabilities with other spacecraft and optical ground stations;[9]
- Space weather sensors to characterize the environment of the Spacecraft during its operations in LEO and MEO;[10]
- A radiation detector experiment to characterize radiation environments and assess their impact on detection systems; and
- Technological research and development on various satellite equipment to assess performance capabilities in different space and radiation environments.

The Space Research Service designation applies to spacecraft that engage in "scientific or technological research purposes."[11] The Spacecraft will, as is described above, collect scientific and technological

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[9] Laser operations will be held to industry best practices, including submission to the U.S. laser clearinghouse. K2 Space is in the process of determining the partners with which K2 Space will test this capability.

[10] K2 Space understands that the data from the space weather sensors will be provided to NASA, which will analyze and publish its research findings.

[11] *See* 47 C.F.R. § 2.1(c).

research data, such as radiation and space weather data, and test equipment, as it traverses from LEO to MEO. Accordingly, GE2 should be treated as a space research mission.

Operational Spacecraft Communications System (TT&C)

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. The analyses in this section are similar to those provided for the Gravitas mission, with updates to account for GE2'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 the GE2 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.[12]

	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

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

Table 2. Uplink frequency RF specifications.

	S-Band Uplink
Center Frequency (MHz)	2040
Bandwidths (MHz)	0.1 to 2
Modulation Scheme	QPSK
Polarization	RHCP

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 analyzes their potential for causing interference to authorized radio operations. Beam patterns and power flux density ("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.[13] 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,

[13] 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* 47 C.F.R. § 2.106.

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.[14] K2 Space will manually turn off the beacon as soon as it is able to obtain accurate tracking information, which could be as soon as one day after launch. The beacon does not automatically re-activate after it has been shut off.[15]

The GE2 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.[16] 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.[17] Nonetheless, to the extent necessary, K2 Space requests a waiver of any applicable processing round requirement (and/or associated cut-off deadline).[18]

<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

[14] *Id.* §§ 5.84, 5.308.

[15] 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.

[16] *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*").

[17] *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).

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

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 -130.9 dBW/m^2, showing compliance with the -125 dBW/m^2 limit.

S-Band Uplink[19]

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.[20] The GE2 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.[21] The Spacecraft will transmit on these frequencies only to non-U.S. ground stations. The GE2 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.
- $-154 + 0.5 * (\delta - 5)$ dBW/m^2 in any 4 kHz band for angles of arrival, δ (in degrees), between 5 and 25 degrees above the horizontal plane.

[19] 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.
[20] *See* 47 C.F.R. § 2.106 n.US347. The 2025 – 2110 MHz (Earth-to-space) band is also allocated to space operations internationally.
[21] *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.

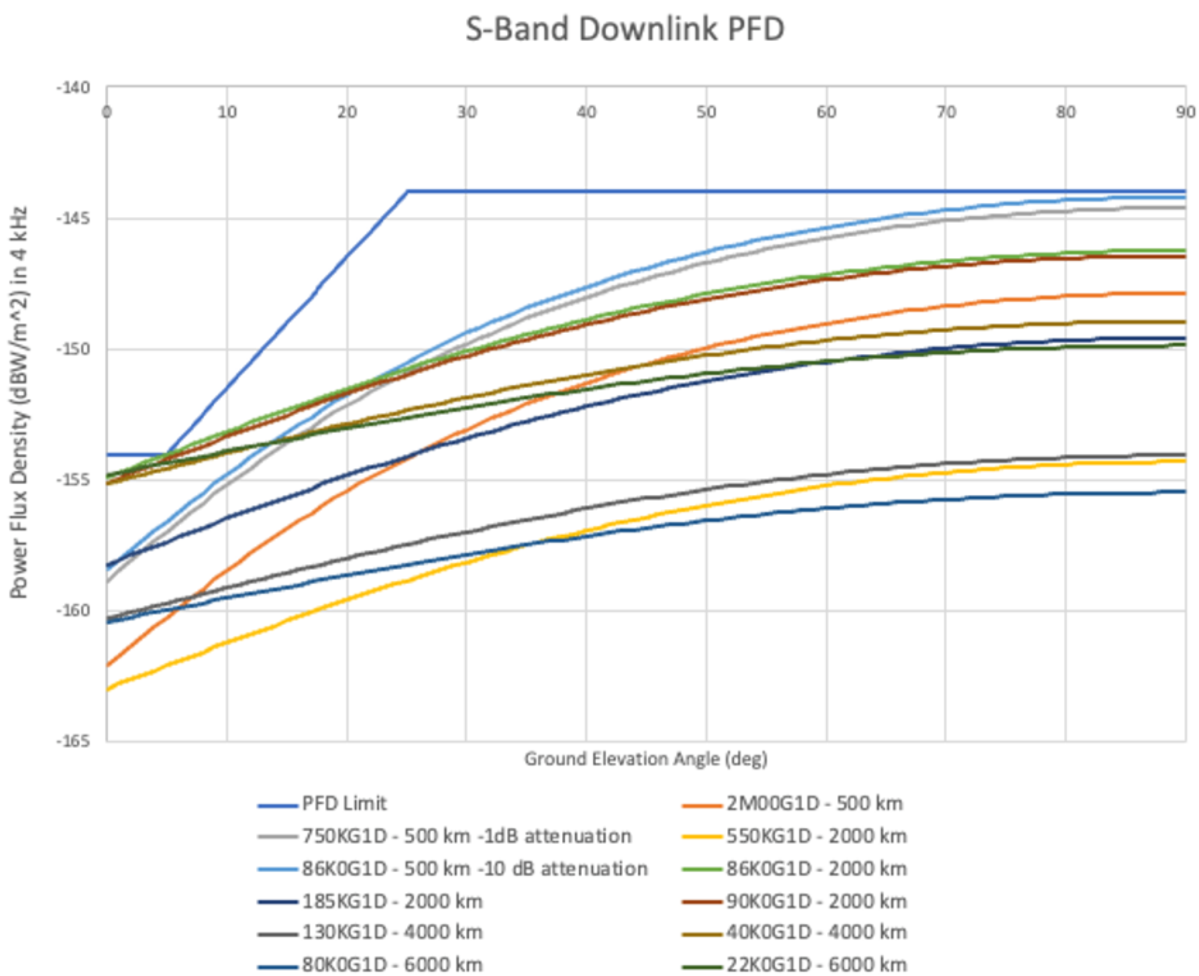

Figure 1. S-Band Power Flux Density at the surface of the Earth.

Power Spectral Flux Density in the band 2290 – 2300 MHz

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.[22] 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.

PFD at the Surface of the Earth in the band 8450 – 8500 MHz

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.

[22] *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.

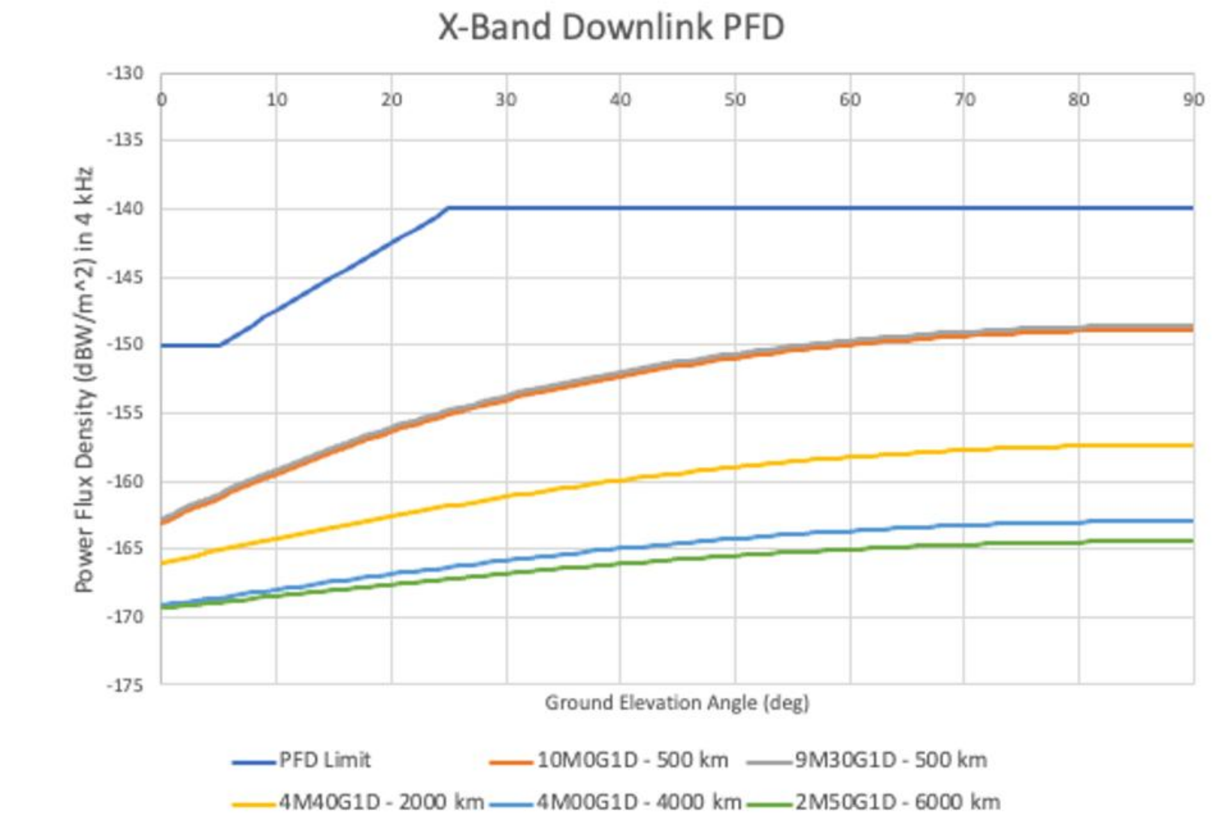

Figure 2. X-Band Power Flux Density at the surface of the Earth.

<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 – 7800 km = 27986 km for the highest possible Spacecraft orbit of 7800 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 arc in the 8450 – 8500 MHz band of -177.8 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 -222.8 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. K2 Space is additionally analyzing a design change to introduce additional RF filtering to ensure compliance with ITU-R Recommendation SA.1157.

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/m2/Hz, giving the Spacecraft a 1.1 dB margin in compliance with ITU-R Recommendation SA.1157.