EXHIBIT A – TECHNICAL ANNEX

TECHNICAL ANNEX

Pursuant to 47 C.F.R. § 25.114 and other relevant provisions of the Commission's Rules, this Technical Annex provides an overall system description of the facilities, operations, and services of Blue Origin's proposed non-geostationary satellite orbit ("NGSO") fixed-satellite service ("FSS") system, TeraWave, using Q/V-, E-, S-, and Ka bands. It also addresses compatibility with co-frequency terrestrial fixed services ("FS"), geostationary satellite orbit ("GSO"), and other NGSO fixed-satellite service FSS operations.

I. OVERALL SYSTEM DESCRIPTION

A. Constellation Design

Blue Origin's TeraWave system consists of 5,408 satellites operating in Low Earth Orbit ("LEO") and Medium Earth Orbit ("MEO"). The LEO portion consists of three different shells with altitudes at 520 km, 530 km, and 540 km, respectively. The MEO portion consists of five different shells with altitudes at 8,000 km, 8,100 km, and 24,200 km. **Table 2** details the TeraWave constellation design distributed across LEO and MEO regimes. Consistent with the ITU Radio Regulations, Resolution 8, Blue Origin requests authority to operate TeraWave within an altitude tolerance of ± 100 km and within an inclination tolerance of ± 3 degrees.[1] Blue Origin requests this flexibility to maintain safe space operations and maintain a low natural decay timeline.

[1] *See* ITU Radio Regs., Resolution 8 (WRC-23).

Table 2. TeraWave Constellation Design

Altitude (km)	Inclination (deg)	# of Planes	# of Satellites per Plane	# of Satellites
LEO SEGMENT				
520	82.5	12	60	720
530	58	52	60	3,120
540	36	24	60	1,440
			LEO Total	**5,280**
MEO SEGMENT				
8000	55	10	8	80
8100	0	1	8	8
8100	80	2	8	16
24200	0	1	8	8
24200	90	2	8	16
			MEO Total	**128**
			TeraWave Total	**5,408**

Orbital control tolerances are defined with LEO and MEO-specific limits, once spacecraft are on orbit. For LEO based satellites, apogee and perigee are maintained within ±5 km of the nominal altitude, and inclination tolerances are limited to less than 1 degree. The MEO satellites will maintain apogee and perigee within ±100 km, and inclination tolerances less than 2 degrees. For each orbital shell, the right accension of the ascending node will span the full range of 0-360 degrees. The TeraWave system will abide by the spaceflight safety principals by establishing continuous communication with other operators.

B. Ground Segment

The Ground Segment for Blue Origin's TeraWave system consists of Operations Centers ("OC"), gateway Earth stations, user terminals, and optical ground terminals.

1. Operations Center (OC)

The OC will orchestrate the global connections between users and gateways. The OC maintains a continuous connection with individual spacecraft, intaking positional and traffic loading data to determine which spacecraft are in view of and available to serve the various terminals at any given time. The OC employs scheduled or persistent connections for user terminals across the system, optimizing a user's connection based on latency, bandwidth needs, and any other defined parameters. The OC also enables communications between the system's operations centers for telemetry, tracking, and control ("TT&C") purposes. This will be used during launch and early orbit phase ("LEOP"), spacecraft contingencies, collision avoidance, and other system state-of-health activities. Finally, the OC ensures the proper applicable encryption is applied to the data transported.

The OC heavily leverages cloud hosting as the means to virtualize the network control function and provide operational resiliency. For contingency purposes, the OC function can also be executed from alternate continuity of operations locations virtually.

2. Gateway Earth Stations

The gateway Earth stations will be larger, parabolic antennas capable of transmit and receive functions. The gateways are connected to the internet and will offer enterprise grade network access supporting multi-gigabit data rates.

3. *User Terminals*

User terminals will be phased array antennas capable of both transmit and receive functions. These user terminals are intended to be deployed at customer facilities where traditional terrestrial network access is difficult to install or is unavailable. User terminals are anticipated to offer multi-gigabit data rates.

C. Frequency and Polarization Plan

Blue Origin seeks authority to operate its TeraWave system in the Q/V-, E-, S-, and Ka-bands. TeraWave communicates with user terminals in the 37.5-42 GHz (downlink) and 47.2-50.2 and 50.4-51.4 GHz (uplink) bands. Both transmit and receive phased arrays are highly reconfigurable digital antennas capable of synthesizing multiple spot beams and taking advantage of frequency reuse to offer connectivity across large geographic areas. Within each user beam, the antennas are also capable of channelizing the spectrum to accommodate a diverse mixture of user data rate needs, variable channel widths, ranging between 125 MHz and three or four GHz (depending on frequency band and user traffic direction) supported by up to five GHz channels on gateway beams. In the Schedule S, Blue Origin provides two exemplar channels for user beams recognizing that more channel variations are possible.

TeraWave will operate gateway links through steerable parabolic antennas in the 71-76 GHz (downlink) and 81-86 GHz (uplink) bands. Gateway beams aggregate forward capacity in variable bandwidths, up to a maximum of five gigahertz, necessary to support user data demands. Likewise, the gateway return beams aggregate user return traffic in variable bandwidths up to a maximum of five gigahertz. In Schedule S, Blue Origin provides two exemplar channels for gateway beams, recognizing that many more channel variations are possible.

The TeraWave LEO satellites will utilize E-band spectrum for all TT&C operations, with Ka-band serving as the back-up. The TeraWave MEO satellites will nominally utilize the Ka-band for TT&C operations and the S-band for contingency and LEOPs. **Table 3** summarizes the TeraWave system's frequency use.

Table 3. Frequency Bands Used by the TeraWave System

Type of Link	**Transmission Direction**	**Frequency Band**	**Frequency Ranges**	**Polarization**
User Downlink	Space to Earth	Q/V-band	37.5-42.0 GHz	RHCP/LHCP
User Uplink	Earth to Space	Q/V-band	47.2-50.2 GHz[2] 50.4-51.4 GHz[2]	RHCP/LHCP
Gateway Downlink	Space to Earth	E-band	71-76 GHz	RHCP/LHCP
Gateway Uplink	Earth to Space	E-band	81-86 GHz	RHCP/LHCP
TT&C(1)	Space to Earth	E-band	71-76 GHz	RHCP/LHCP
TT&C(1)	Earth to Space	E-band	81-86 GHz	RHCP/LHCP
TT&C(1)(2)	Space to Earth	Ka-band	18.8-19.3 GHz	RHCP/LHCP
TT&C(1)(2)	Earth to Space	Ka-band	28.6-29.1 GHz	RHCP/LHCP
TT&C(2)	Space to Earth	S-band	2200-2290 MHz	RHCP/LHCP
TT&C(2)	Earth to Space	S-band	2025-2110 MHz	RHCP/LHCP
(1) E-band will serve as the primary, long-term TT&C band for LEO satellites. Ka-band will serve as contingency and LEOP for LEO satellites. (2) Ka-band will serve as the primary, long-term TT&C band for MEO satellites. S-band will serve as contingency and LEOP for MEO satellites.				

[2] Blue Origin intends to seek access to the currently unallocated 42-42.5 MHz and 51.4-52.4 MHz bands, if and once allocated for FSS use. Blue Origin will follow any subsequent rules imposed upon these bands once allocated.

TeraWave will use right- and left-hand circular polarization ("RHCP/LHCP"), depending on the scenario either simultaneously or individually, while transmitting and receiving to further take advantage of frequency reuse and increase data capacity.

D. Cessation of Emissions

Pursuant to 47 C.F.R. § 25.207, each TeraWave satellite will have the ability to cease radio emissions via ground command.

E. Space Station Beam Contours and Information

Representative antenna gain contours for both transmit and receive beams, for both user and gateway beams, are shown below in *Figure 1* through *Figure 8*. Additional beam projections can be provided to the Commission upon request. Due to the use of wide-angle antennas, antenna gain contours for TT&C beams do not intersect the Earth's surface, and are therefore not shown.

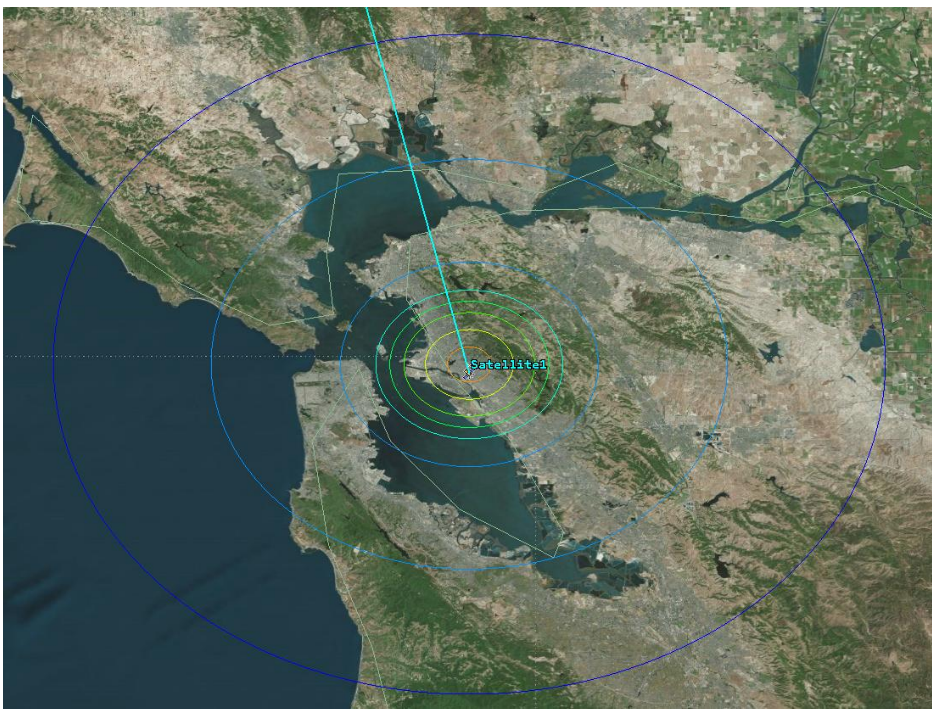

Figure 1. TeraWave Uplink Q/V-Band Nadir Beam Contour

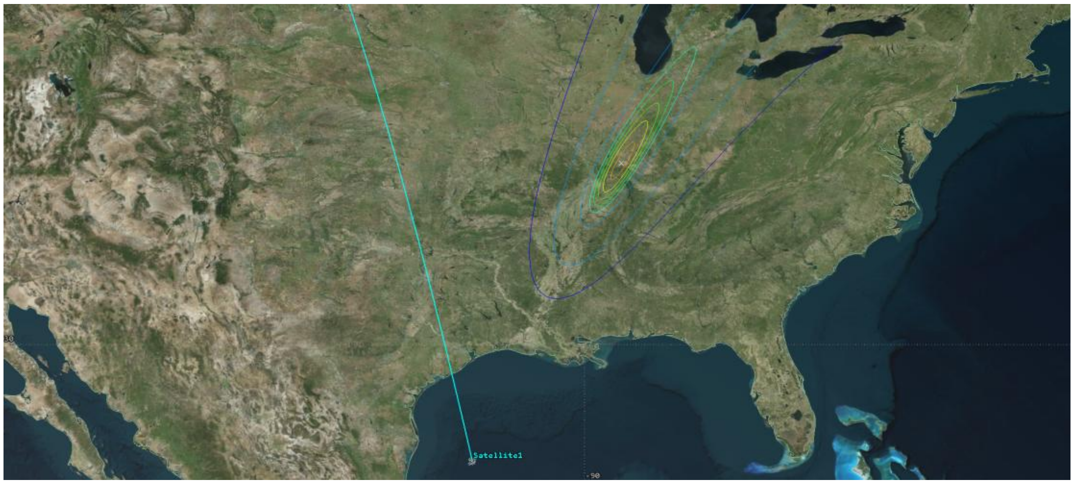

Figure 2. TeraWave Uplink Q/V-Band Max Scan Beam Contour

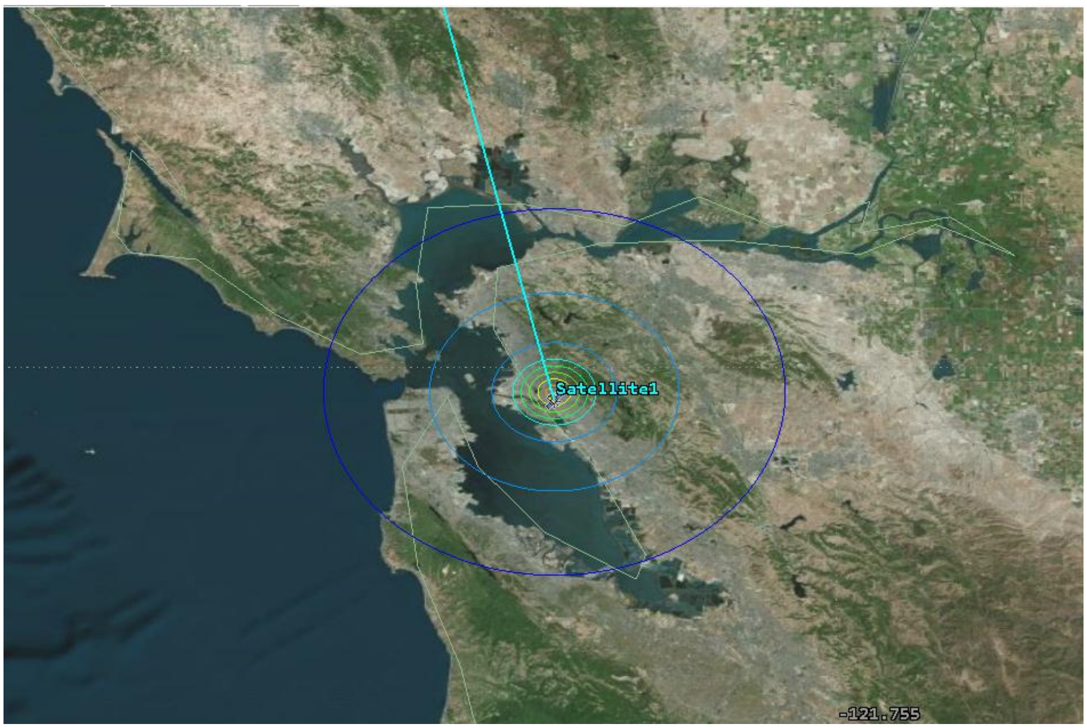

Figure 3. TeraWave Uplink E-Band Nadir Beam Contour

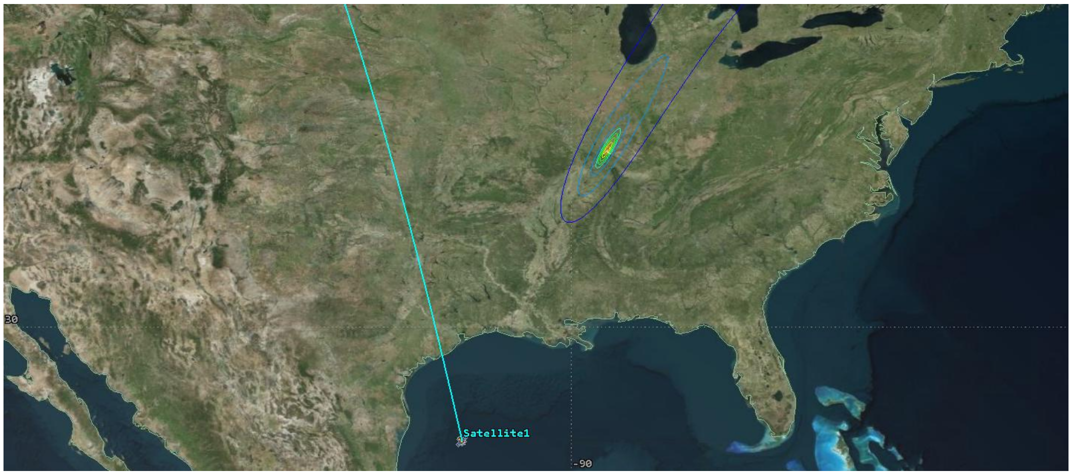

Figure 4. TeraWave Uplink E-Band Max Scan Beam Contour

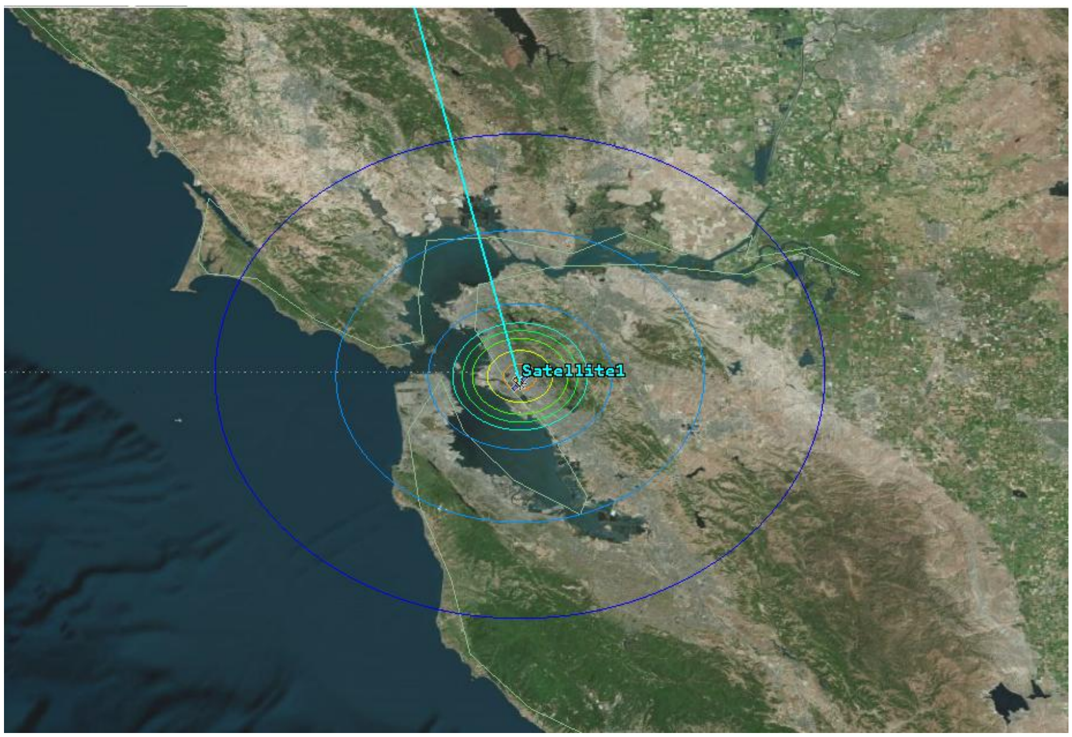

Figure 5. TeraWave Downlink Q/V-Band Nadir Beam Contour

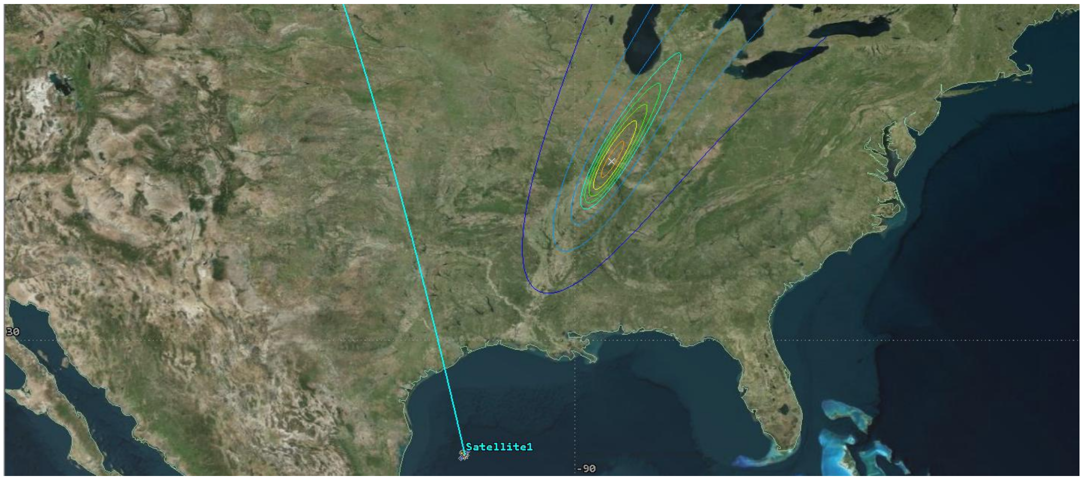

Figure 6. TeraWave Downlink Q/V-Band Max Scan Beam Contour

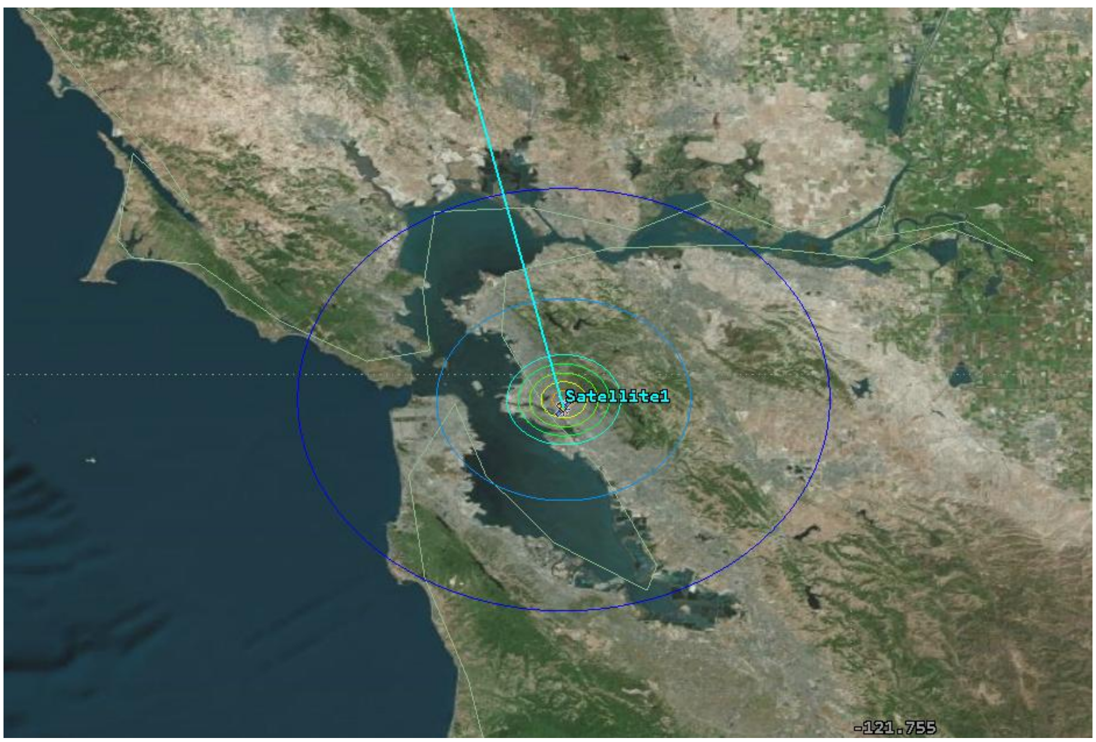

Figure 7. TeraWave Downlink E-Band Nadir Beam Contour

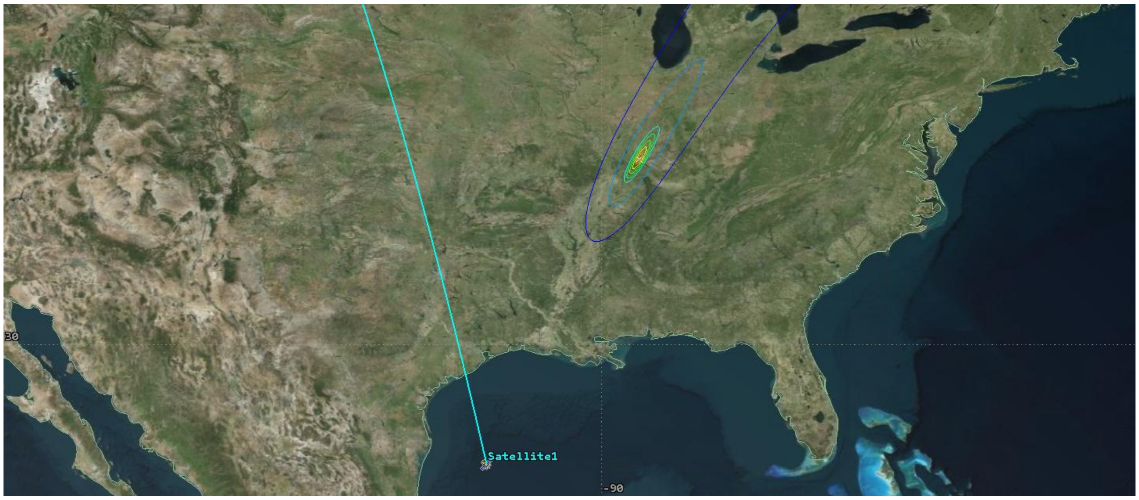

Figure 8. TeraWave Downlink E-Band Max Scan Beam Contour

All communications links within TeraWave are designed to support a minimum elevation angle of 25 degrees, corresponding with a maximum steering angle of 56.9 degrees from nadir. A summary of the receive and transmit beams used within the TeraWave are shown below:

Table 4. TeraWave Receive Beams

Link Type	**Minimum Elevation Angle (deg)**	**Maximum Steering Angle Space Station Nadir (deg)**	**Peak Gain (dBi)**
User	25	57	42.5
Gateway	25	57	47.7
TT&C (E-band)	20	0	2
TT&C (Ka-band)	20	0	2
TT&C (S-Band)	20	0	4

Table 5. TeraWave Transmit Beams

Link Type	Minimum Elevation Angle (deg)	Maximum Steering Angle Space Station Nadir (deg)	Peak Gain (dBi)
User	25	57	42.5
Feeder	25	57	46.6
TT&C (E-band)	20	0	2
TT&C (E-band)	20	0	2
TT&C (S-Band)	20	0	4

Note that the maximum steering angle referenced in **Table 4** and **Table 5** are associated with the minimum altitude shell of the constellation, 520 km. Additionally, peak gains listed are associated with a maximum gain of the unscanned space station beam.

1. Q/V-Band Beams

The TeraWave Q/V-band beams will transmit with a directivity ranging from 42.5 to 39.5 dBi at peak of beam. This range of directivity corresponds with the change in effective antenna area between nadir (0 degrees) and the maximum steering angle to point to a user with an elevation angle of 25 degrees (56.9 degrees). To maintain a constant power flux density ("PFD") on the ground at different scan angles, the RF output power is adjusted to compensate for variations in antenna directivity and range loss. Beyond the maximum steering angle, the beam is shut off. *Figure 9* illustrates the effective isotropic radiated power ("EIRP") density variation as a function of scan angle. An altitude of 520 km was used in generating the EIRP density over scan angle.

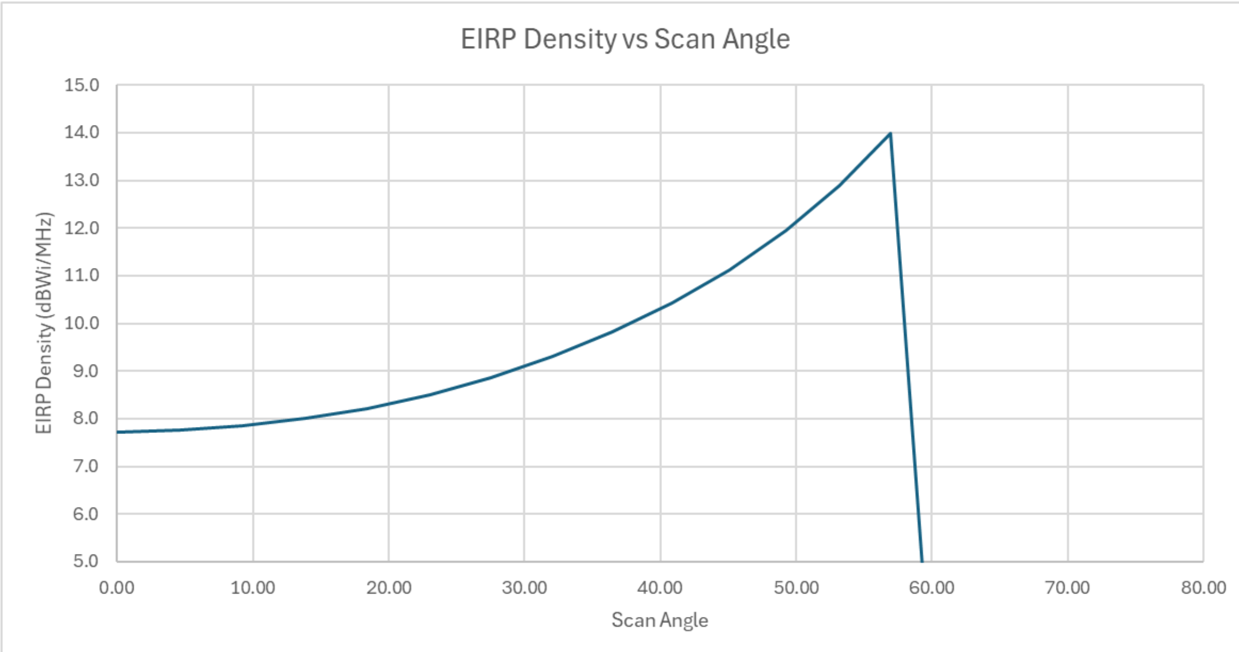

Figure 9. Q/V-Band Beam EIRP Density Over Scan Angle

2. *E-Band Beams*

Unlike the phased array-based Q/V-band beams, the E-band beam uses a parabolic antenna to communicate with gateway Earth stations on the ground. As such, the directivity of the antenna does not vary across scan angle. EIRP is still adjusted to compensate for slant range variation. *Figure 10* below shows the variation in EIRP density as a function of scan angle. Like the Q/V-band beams, E-band gateway links are established down to an elevation angle of 25 degrees after which the link is shut off.

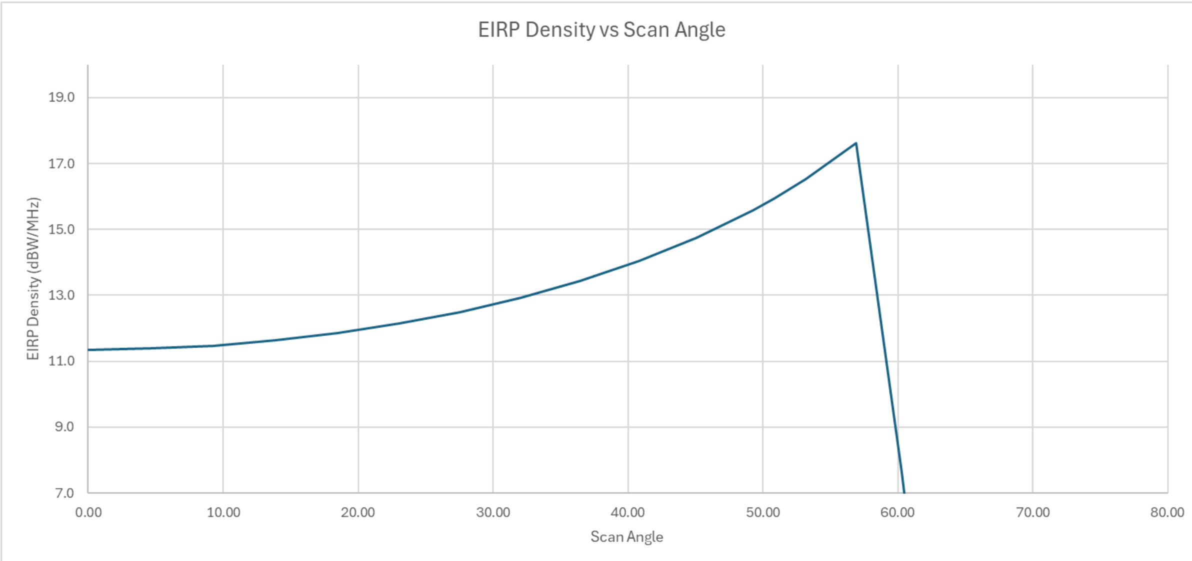

Figure 10. E-Band Beam EIRP Density Over Scan Angle

TeraWave will also use E-band for TT&C. For reliability and design simplicity, the TT&C subsystem will use an omnidirectional antenna. TT&C links are designed to operate to a minimum elevation angle of 20 degrees. Given the directionality of the antenna, no scan or elevation angle dependent EIRP compensations will be applied. Because the antenna gain contours do not intersect the Earth's surface, no antenna patterns are provided for the TT&C beams.

3. *Ka-Band Beams*

Ka-band will serve two uses in the TeraWave constellation. For satellites in the LEO shells of the TeraWave constellation, Ka-band will be used for TT&C contingency and LEOP activities only, with E-band serving as the primary TT&C communications frequencies. For satellites in the MEO shells, Ka-band will serve as the primary band for TT&C, with S-band contingency. Like the E-band TT&C, Ka-band will use an omnidirectional antenna. Because the antenna gain contours do not intersect the Earth's surface, no antenna patterns are provided for the TT&C beams.

4. S-Band Beams

For satellites in the MEO shells, S-band will be used for TT&C contingency and LEOP. Like the E- and Ka-band TT&C, S-band will also use an omnidirectional antenna. Because the antenna gain contours do not intersect the Earth's surface, no antenna patterns are provided for the TT&C beams.

II. INTERFERENCE PROTECTION AND SPECTRUM SHARING

A. Sharing with Fixed and Mobile Services

Both the Commission and ITU have established PFD limits for Q/V-band and Ka-band to protect fixed services.[3] Pursuant to 47 C.F.R. § 25.208, the PFD limits in portions of the Q/V-band are established in both clear sky and rain fade conditions. TeraWave complies with the clear sky PFD limits as defined in 47 C.F.R. § 25.208, nominally operating with a PFD of -117.6 dBW/m^2/MHz constant across elevation angles above 25 degrees. Below 25 degrees the link will be shut off. PFDs received on the ground at elevation angles under 25 degrees is determined by the sidelobes of the antenna patterns and the associated off-axis gain. Under rain fade conditions, TeraWave will adjust EIRP to compensate for the additional loss. The PFD in the 37.5-40 GHz band is shown in *Figure 11*.

[3] ITU Article 21, Table 21-4 and FCC 47 C.F.R. § 25.208.

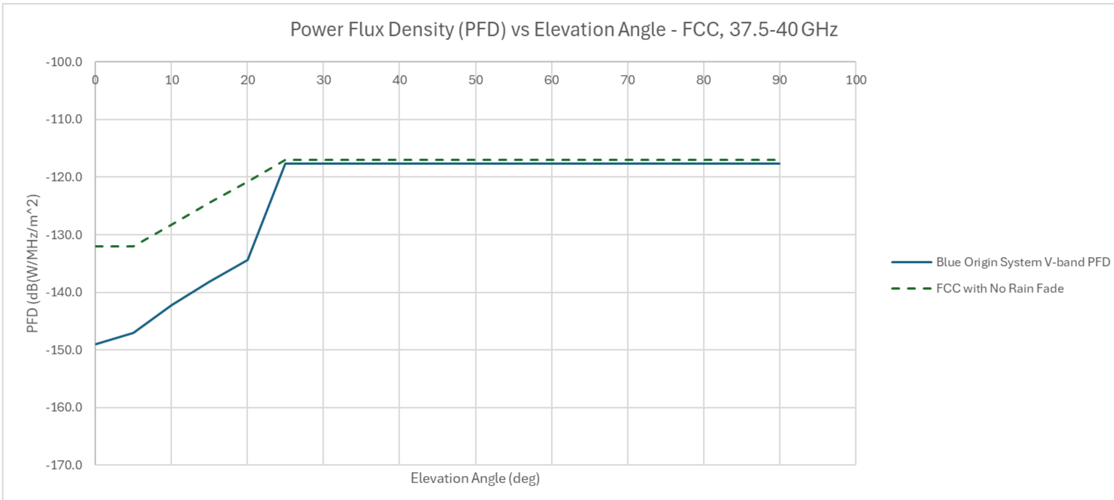

Figure 11. TeraWave Q/V-Band Downlink PFD– 37.5 to 40 GHz

In the presence of rain fade and other atmospheric conditions TeraWave will adjust output power to compensate for the additional loss. *Figure 12* demonstrates compliance with the PFD mask in the presence of rain fade.

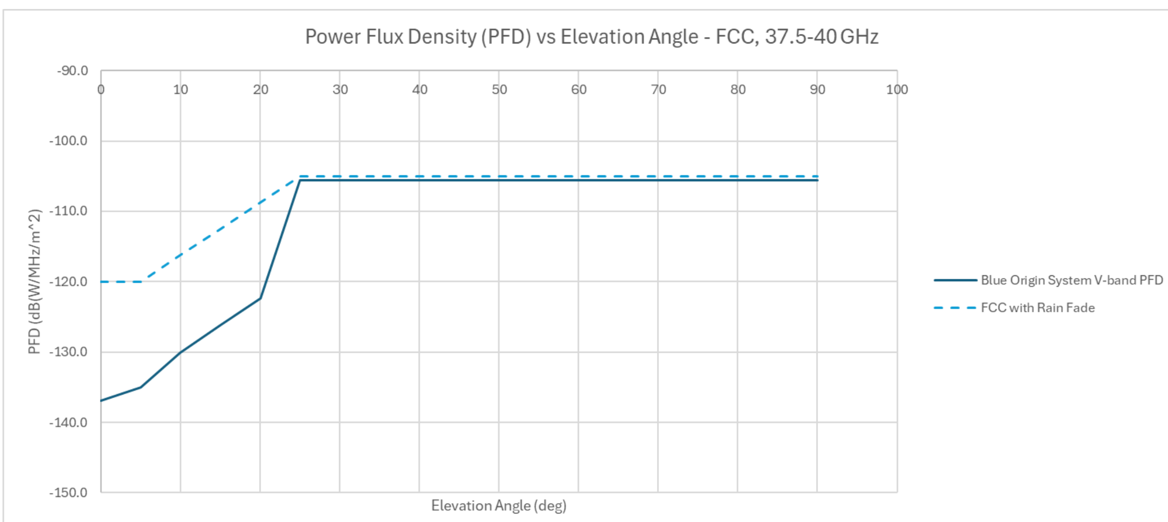

Figure 12. TeraWave Q/V-Band Downlink PFD with Rain Fade – 37.5 to 40 GHz

1. Q/V-Band: 40-42 GHz

47 C.F.R. § 25.208 also establishes PFD limits for 40-40.5 GHz and 40.5-42.5 GHz. Unlike the 37.5-40 GHz band, only one PFD mask is established. As demonstrated in *Figure 13*, TeraWave will comply with these PFD limits, nominally operating with a PFD of -105.6 dBW/m^2/MHz across elevation angles above 25 degrees. Similar to the 37.5 – 40 GHz band, the link will shut off below elevation of 25 degrees. PFD's received on the ground at elevation angles under 25 degrees is determined by the sidelobes of the antenna patterns and the associated off-axis gain.

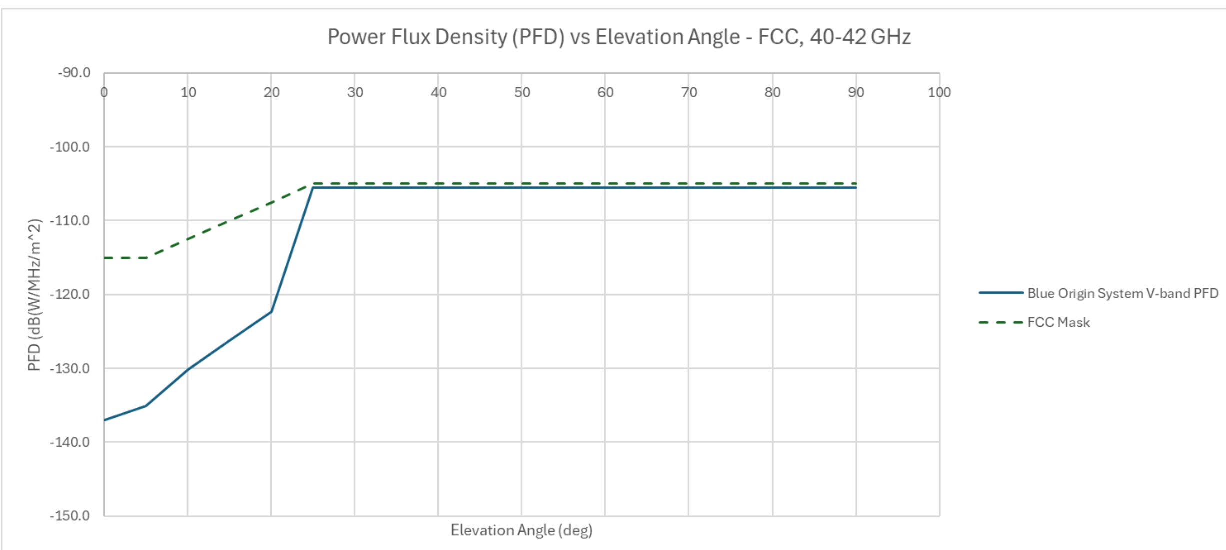

Figure 13. TeraWave Q/V-Band Downlink PFD – 40 to 42 GHz

2. E-Band: 71-76 GHz

No PFD limits have been established in the E-band through either the ITU's Radio Regulations or the Commission's rules. However, there are ongoing efforts at the ITU to develop

PFD limits in the 71-76 GHz band.[4] The E-band feeder link will operate at a fixed PFD of -114 dBW/m^2/MHz. Blue Origin submits the PFD in *Figure 14* for informational purposes only. Should the Commission adopt E-band PFD limits in the future, Blue Origin will bring its operations into conformity with such rules.

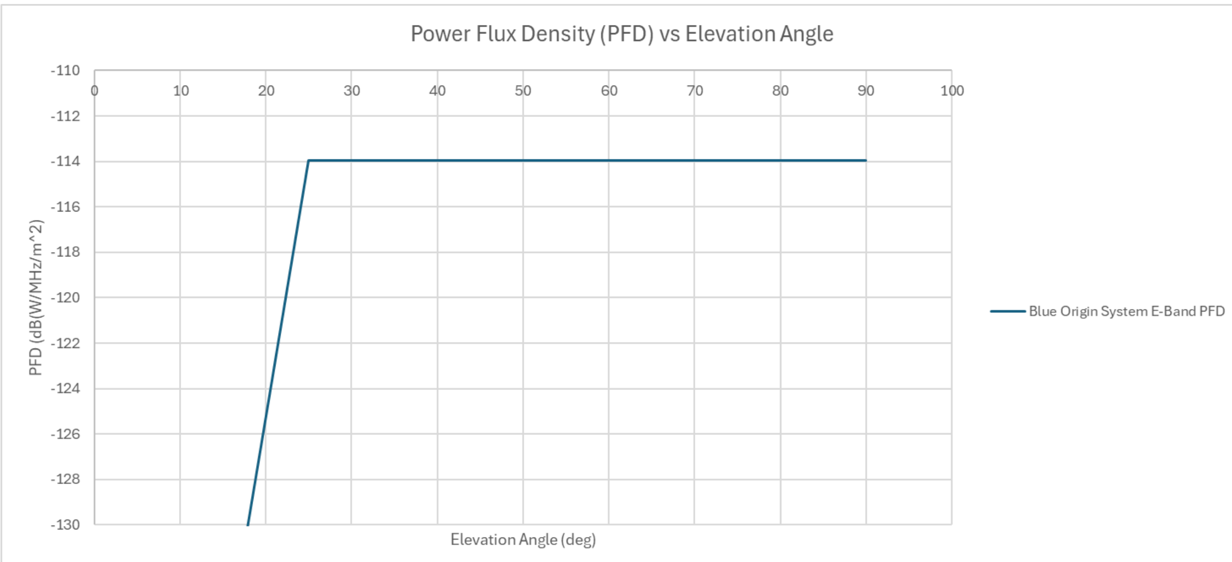

Figure 14. TeraWave E-Band Downlink PFD – 71-76 GHz

In addition to establishing gateway links, TeraWave will use the E-band for TT&C. Due to the omnidirectional nature of the subsystem, TeraWave's TT&C function will have a non-constant PFD at the ground, with maximum PFD occurring at 90-degree elevation and reducing as elevation angle decreases due to longer slant ranges. As there is no PFD limit established in the E-band, Blue Origin submits the PFD showing in *Figure 15* for informational purposes only.

[4] *See* Resolution 775 (Rev. WRC-23).

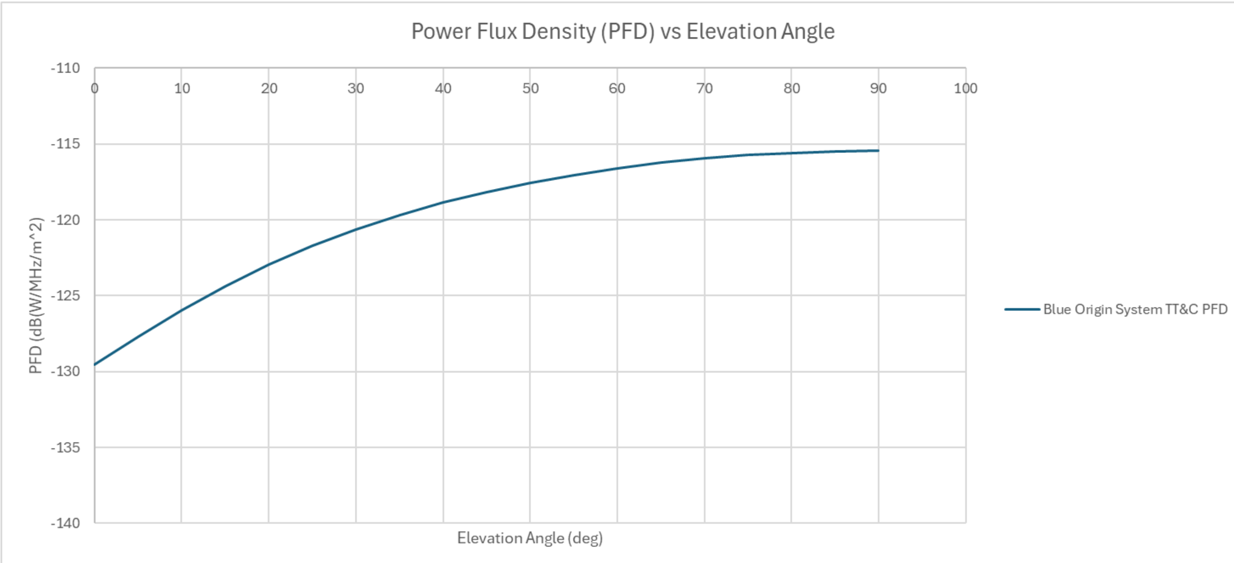

Figure 15. TeraWave LEO Segment E-Band TT&C PFD

3. *Ka-band: 18.8-19.3 GHz*

Ka-band will serve as the TT&C band across the TeraWave constellation. For satellites within the LEO segment, Ka-band TT&C beams will be used for contingency and LEOP operations only. For satellites within the MEO segment, Ka-band will serve as the nominal TT&C communications band. Regardless of orbit, all Ka-band TT&C subsystems will use omnidirectional antennas and will not compensate EIRP across different scan angles. PFD analysis for the 18.8-19.3 GHz band is shown below for both the LEO (520-540 km), low MEO (8000 km), and high MEO (24200 km) segments.

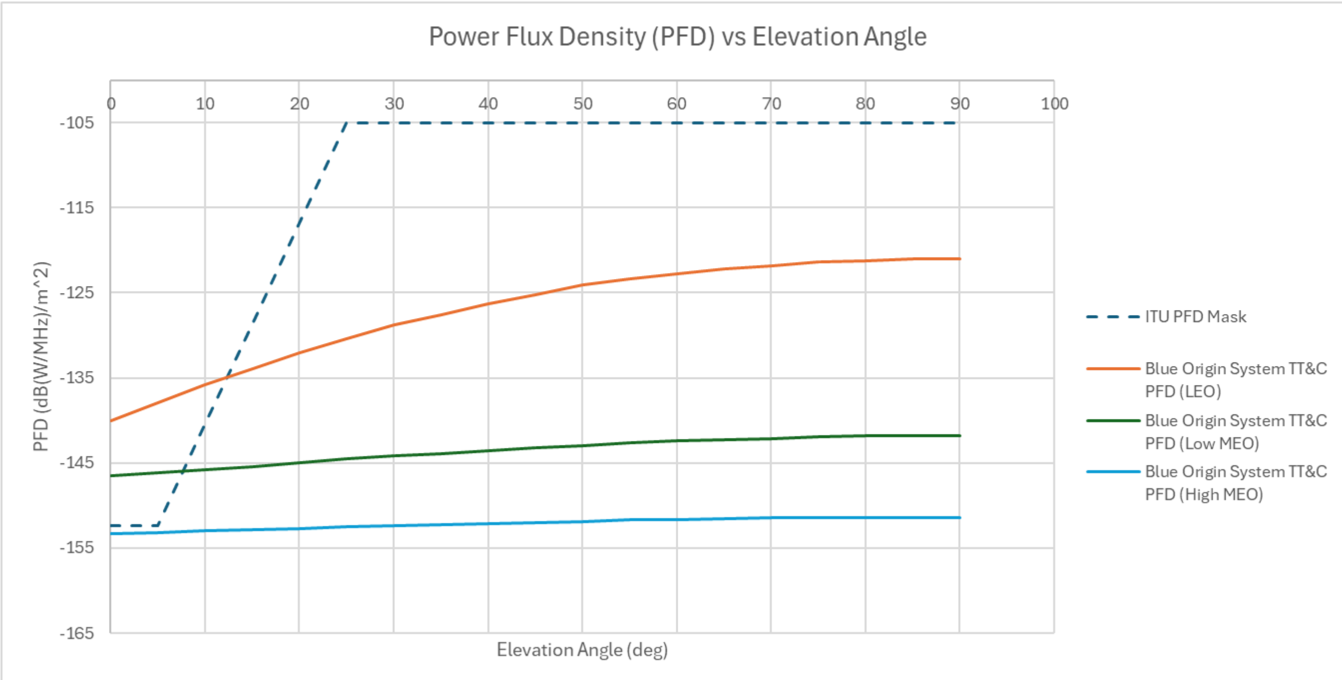

Figure 16. TeraWave Ka-Band TT&C PFD

The Ka-band TT&C service is projected to exceed the ITU PFD mask at low elevation angles (less than 15 degrees for LEO and less than 10 degrees for low MEO). As previously stated, Blue Origin seeks a waiver of the PFD limits applied to Ka-band operations owing to its narrowly tailored use of the band, coordination with existing users, and other operational interference-mitigation techniques.

4. S-Band: 2200-2290 MHz

As previously discussed, TeraWave MEO satellites will use the S-band for contingency and LEOP. Similar to the E-band TT&C design, the S-band TT&C subsystem will also use an omnidirectional antenna and will not compensate EIRP across different scan angles. Ground stations will operate and maintain connectivity to the TT&C system down to a minimum elevation angle of 20 degrees. Peak power occurs at an elevation angle of 90 degrees and reduces as elevation angle decreases. The PFD in the 2200-2290 MHz band is shown in *Figure 17*.

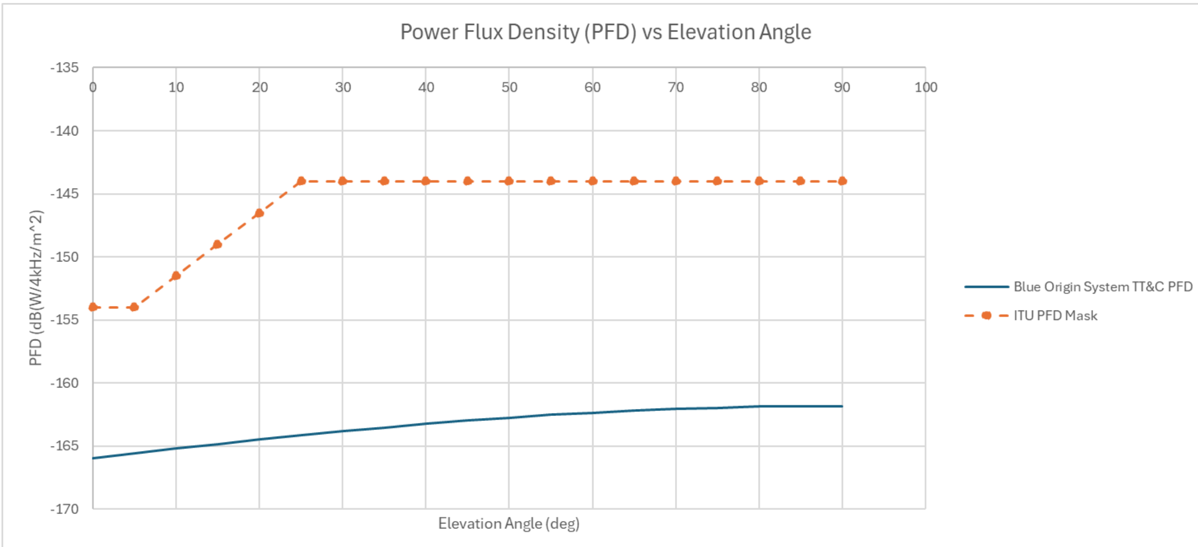

Figure 17. TeraWave MEO Segment S-Band TT&C PFD

B. Sharing with GSO FSS and BSS Systems

As discussed below, Blue Origin will take all necessary steps to ensure protection of GSO FSS and BSS systems. While the Commission has not established specific rules for protection of GSO systems in the Q/V-band spectrum, Blue Origin will comply with the limits established in Article 22 of the ITU Radio Regulations.

1. Q/V-band

Nos. 22.5L and 22.5M of Article 22 of the ITU Radio Regulations specifies the single entry and aggregate allowable interference levels for a Q/V-band NGSO system. These limits apply to the 37.5-42.5, 47.2-50.2, and 50.4-51.4 GHz bands. Blue Origin evaluated compliance of TeraWave against these limits and confirms that it will comply with stated limits. TeraWave will use transmit power control techniques and GSO arc-avoidance angles to prevent unacceptable interference into the GSO networks.

2. E-band

No EPFD levels are defined for an E-band NGSO system to protect GSO networks. Nonetheless, as with Q/V-band, Blue Origin will use GSO arc-avoidance angles and transmit power control techniques on both ground and space stations to protect GSO networks.

C. Sharing with NGSO Systems

47 C.F.R. § 25.261 provides guidelines for the sharing of spectrum between NGSO applicants in a processing round. Blue Origin will coordinate operate in good faith with other operators in accordance with the Commission’s rules, including protection of applicants in earlier processing rounds, using overlapping frequencies, and coverage areas.

In addition, Blue Origin has engineered its system with the technical flexibility that will facilitate the necessary coordination with other NGSO satellite systems and is committed to achieving mutually satisfactory agreements. TeraWave will utilize mechanisms such as beam steering, transmit power control, and satellite selectivity to facilitate successful sharing of the spectrum with other operators. In doing so, Blue Origin is confident that the TeraWave system will effectively share spectrum with other NGSO operators.

D. Sharing with Other Co-frequency and Adjacent Band Users

1. Radio Astronomy Service

Several radio astronomy service (“RAS”) bands reside within TeraWave’s proposed bands of operation. Specifically, overlapping RAS bands exist between 48.94-49.04 and 81-86 GHz.

Within these bands, TeraWave will coordinate with RAS users to facilitate compatible operations. As previously discussed, the TeraWave system has the flexibility to adjust interference power as necessary to deconflict with radio astronomy users.

2. *Earth Exploration Satellite Service (Passive)*

TeraWave will meet emissions limits as set forth in ITU Resolution 750 and footnotes US156 and US246 of the U.S. Table of Frequency Allocations.

III. ORBITAL DEBRIS MITIGATION

Blue Origin is committed to being a leader in the safe, sustainable use of space. Blue Origin is in the process of completing the TeraWave system design and will revise our orbital debris mitigation plan as our system and satellite design matures. However, Blue Origin nonetheless provides initial plans for the TeraWave design and operational strategies to be used to mitigate orbital debris, in compliance with the Commission's rules.

TeraWave satellites will be equipped with a propulsion system enabling collision risks to be actively mitigated throughout mission life cycle, including attaining service orbits from the insertion orbit, while on station, and during post-mission disposal.

A. Post Mission Disposal

Post-mission disposal for the LEO segment will be achieved through atmospheric reentry. Our spacecraft, mission concept and selected orbits are designed to ensure we achieve disposal in less than 5-years with a probability of success for any individual spacecraft above 0.9 (with an aim for >0.99). The mission operations are designed to execute powered descent from the station altitudes to an altitude which is both below manned stations and ensures atmospheric reentry will occur within one year of terminating the powered descent phase. TeraWave satellite designs, including hardware selection and propellant margins, will be selected with the intent to maintain collision-avoidance maneuverability to the lowest altitude where attitude control can be sustained, thereby seeking a minimum time to disposal after loss of maneuverability. In the case of off-nominal loss of maneuverability on-station, atmospheric drag will ensure natural decay to disposal from our nominal altitudes within 6.5 years or less depending on solar activity, as calculated using NASA DAS. Accordingly, we expect rapid disposal for TeraWave LEO segment satellites in both the nominal mission execution concept and in the result of off-nominal failures. Blue Origin's design strategies will also limit the probability that the space vehicles will become a source of debris by such collisions, in compliance with the Commission's rules.

Post-mission disposal for the MEO segment will be achieved by maneuvering of TeraWave satellites to disposal orbits which minimize time spent overlapping occupied orbits (including the 20,182 +/- 300 km range) and limit the risk of collision with large (>10 cm) objects and which are in compliance with U.S. Government Orbital Debris Mitigation Standard Practices[5] and NASA-STD-8719.14C.[6]

[5] U.S. Government Orbital Debris Mitigation Standard Practices, November 2019 Update, https://orbitaldebris.jsc.nasa.gov/library/usg_orbital_debris_mitigation_standard_practices_november_2019.pdf .

[6] NASA, Process for Limiting Orbital Debris, NASA-STD-8719.14C, Superseding NASA-STD-8719.14B (approved Nov. 5, 2021), https://standards.nasa.gov/sites/default/files/standards/NASA/C/0/nasa-std-871914c.pdf.

All TeraWave satellites will be designed to minimize the impacts of any portions of any individual spacecraft that survive atmospheric re-entry. Blue Origin will verify compliance with the Commission's Rules[7] using the NASA Debris Assessment Software ("DAS") and Blue Origin's internal analysis.

B. Collisions with Large Objects

Collisions with large objects, including other satellites, will be mitigated through a combination of automated collision avoidance systems and active inter-operator coordination. Blue Origin will implement an automated system to assess conjunction risks and execute mitigation maneuvers to reduce the collision risk when required. This system will ingest Conjunction Data Messages ("CDMs") from the 18th Space Control Squadron (or a successor entity) ("18th SCS"), assess the collision risk and command maneuvers as required to mitigate the risk. Further, this system will develop orbit raise and de-orbit trajectories which mitigate any potential risks. In addition to mitigating high-risk CDMs during all phases, maneuvers plans will be screened to verify they do not introduce additional collision risks.

Maneuverability will be retained throughout the active disposal phases detailed above. Upon design maturity, Blue Origin will perform a collision risk analysis using NASA DAS to verify that the probability of collision between any space vehicle of the system and any other large object is less than 1 in 1,000 during any periods without effective maneuverability.

[7] 47 C.F.R. 25.114(d)(14)(vii)(D)(*2*)(*ii*)

Blue Origin will actively coordinate with other operators and will track all satellites. Each TeraWave satellite will be registered with the 18th SCS. Blue Origin will regularly update ephemeris made available both through Space-track and publicly to all operators, including human inhabitable spacecraft. As part of Blue Origin's commitment to space safety, we will also provide operators with up-to-date information about the maneuverability status of our satellites via Space-Track (or a successor entity). Blue Origin will seek out and be receptive to inter-operator exchanges of our planned launch, transfer, and de-orbit operating concepts with other operators whenever practical to do so. Finally, while collision avoidance maneuvers will be predominantly automated, Blue Origin will maintain permanently staffed communication channels to ensure transparent communication with other operators if required to mitigate conjunction risks. Accordingly, Blue Origin certifies that upon receipt of a space situational awareness conjunction warning, Blue Origin will review and take all possible steps to assess the collision risk and will mitigate the collision risk if necessary.

C. Debris Generation

TeraWave satellite hardware and mission operating concepts will be designed to minimize the probability of debris generation. This will include analysis and design features, including shielding, which limit the probability of accidental explosion or release of liquids, including of either the propellant tank or battery. At end of life, when the terminal altitude prior to expected loss of maneuverability is expected to result in more than one month of natural decay prior to atmospheric reentry, the satellites will passivate the battery and propulsion system through depleting the batteries and opening propellant valves respectively. This approach reduces the risk of accidental explosion for any satellite experiencing prolonged non-maneuverable orbit decay while ensuring they can nominally maintain collision avoidance maneuverability to a minimum possible altitude. These satellites will not intentionally generate any debris, and design strategies will be made to ensure that debris generation will not result from the conversion of energy sources onboard the spacecraft into energy that fragments the spacecraft.