

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

Application of

SPACE EXPLORATION HOLDINGS, LLC

For Modification of Authorization for the
SpaceX Gen2 NGSO Satellite System to Add a
Direct-to-Cellular System

IBFS File No. SAT-MOD-_____

Call Sign S3069

**APPLICATION FOR MODIFICATION OF AUTHORIZATION
FOR THE SPACEX GEN2 NGSO SATELLITE SYSTEM TO
ADD A DIRECT-TO-CELLULAR SYSTEM**

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SUMMARY

Carriers have made significant strides in bringing wireless coverage to much of the country. But some areas remain far from a terrestrial base station, or shrouded by terrain, limiting their ability to receive reliable signal coverage. SpaceX wants to reduce or eliminate this problem with its satellite direct-to-cellular system. This system will, in cooperation with terrestrial carriers, allow wireless subscribers to switch to satellite service when terrestrial networks are unavailable, connecting the unconnected without requiring them to buy a new device or do anything more than sign up for the service.

To that end and with this application, SpaceX requests modification of the authorization for its second-generation non-geostationary orbit Fixed-Satellite Service system (“Gen2 system”) to authorize deployment and operation of a direct-to-cellular Mobile-Satellite Service (“MSS”) payload in the United States using the 1910-1915 MHz and 1990-1995 MHz bands (the “PCS G Block”) to connect terrestrial mobile devices operating under 3rd Generation Partnership Project (“3GPP”) Long-Term Evolution (“LTE”) standards. SpaceX intends to provide similar direct-to-cellular operations outside of the United States, subject to cooperation with local terrestrial mobile service providers who are authorized to provide service within a specified frequency band and consistent with authorization within each country to reuse that spectrum accordingly. SpaceX’s operations will be consistent with its ITU filings, as described herein; and SpaceX will provide notice to the Commission of authorizations and operations in other countries, consistent with the Commission’s prior orders related to satellite-to-cellular connectivity outside of the United States.

In the United States, SpaceX has partnered with T-Mobile to offer service using the PCS G Block, which is licensed in its entirety and in virtually every part of the United States to T-Mobile. SpaceX and T-Mobile have carefully coordinated to ensure that the system can coexist

with T-Mobile’s terrestrial operations and have executed a spectrum manager lease permitting SpaceX’s use of the frequencies. SpaceX’s direct-to-cellular operations will meet and comply with the out-of-band emissions, field strength, and other relevant technical limits established for the broadband PCS service, and thus will be indistinguishable from terrestrial PCS G Block operations from an interference perspective. The system will merely put already assigned spectrum to more intensive use by allowing it to be received in locations where it cannot be received today, in full coordination with the sole incumbent licensee.

Importantly, the direct-to-cellular system will not consume any new orbital resources and has been designed with affordability in mind. SpaceX will fly the direct-to-cellular payload on the satellites currently authorized to deploy as part of SpaceX’s Gen2 system and the payload will not affect the risk profile of that system. In addition to promoting space safety, this highly resource-efficient approach will reduce economic barriers to achieving truly ubiquitous mobile connectivity, especially when combined with the payload’s ability to communicate with off-the-shelf user devices. This, in turn, will ensure that more Americans can communicate from wherever life takes them, including during emergencies, while creating new possibilities for Internet-of-Things (“IoT”) applications.

SpaceX and T-Mobile stand ready to provide direct-to-cellular capabilities to tens of millions of U.S. wireless subscribers. The companies have agreements in place today, and SpaceX will be able to launch enough satellites to support the service quickly by leveraging its rapid deployment capabilities and the system’s modular payload architecture. Accordingly, SpaceX urges the Commission to process the application as soon as possible so that T-Mobile subscribers can benefit from these services without delay.

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INTRODUCTION

Space Exploration Holdings, LLC (“SpaceX”)¹ requests modification of the authorization for its second-generation non-geostationary orbit (“NGSO”) Fixed-Satellite Service (“FSS”) license² to authorize deployment and operation of a direct-to-cellular Mobile-Satellite Service (“MSS”) payload in the United States using the 1910-1915 MHz and 1990-1995 MHz bands (the “PCS G Block”). The SpaceX direct-to-cellular system will connect terrestrial mobile devices operating under 3rd Generation Partnership Project (“3GPP”) Long-Term Evolution (“LTE”) standards in cooperation with T-Mobile USA, Inc. and its subsidiaries (collectively, “T-Mobile”). SpaceX intends to provide similar direct-to-cellular operations outside of the United States, subject to cooperation with local terrestrial mobile service providers who are authorized to provide service within a specified frequency band and consistent with authorization within each country to reuse

¹ Space Exploration Holdings, LLC is a wholly owned subsidiary of Space Exploration Technologies Corp.

² See *Space Exploration Holdings, LLC*, FCC 22-91 (rel. Dec. 1, 2022) (“*Gen2 Authorization*”).

that spectrum accordingly. SpaceX’s operations will be consistent with its ITU filings, as described herein; and SpaceX will provide notice to the Commission of authorizations and operations in other countries, consistent with the Commission’s prior orders related to satellite-to-cellular connectivity outside of the United States.³

This application identifies all changes that SpaceX requests for its Gen2 system. SpaceX is also filing an FCC Form 312, Schedule S, requests for waiver, and updated technical showings to account for the changes proposed. SpaceX certifies that all other information provided in its Gen2 applications remains unchanged.⁴

I. SPACEX’S DIRECT-TO-CELLULAR SYSTEM WILL BRING UBIQUITOUS CONNECTIVITY TO WIRELESS CONSUMERS

A. SpaceX Background

SpaceX is a private company revolutionizing space technologies, with the ultimate goal of enabling humanity to become a multi-planetary species. The company designs, manufactures, and launches advanced rockets and spacecraft. It has over 9,500 employees based in the United States at the company’s headquarters in Hawthorne, California and facilities located across the country.

Since its founding in 2002, SpaceX has achieved a series of historic milestones. In December 2010, SpaceX became the first private company ever to successfully launch and return a spacecraft (Dragon) from low-Earth orbit. In May 2012, the company again made history when Dragon berthed with the International Space Station (“ISS”), delivered cargo, and returned safely to Earth—a technically challenging feat previously accomplished only by governments. In

³ See *Lynk Global, Inc.*, DA 22-969, ¶ 34 (IB 2022) (“*Lynk*”) (authorizing operations in frequency bands for satellite-to-cellular connectivity outside the United States).

⁴ See 47 C.F.R. § 25.117(c); see also Application for Approval of Orbital Deployment and Operating Authority for the SpaceX Gen2 NGSO Satellite System, IBFS File No. SAT-LOA-20200526-00055 (May 26, 2020) (“Gen2 Application”); Amendment, IBFS File No. SAT-AMD-20210818-00105 (Aug. 18, 2021) (collectively, “Previous Applications”); see also Letter from William M. Wiltshire to Karl A. Kensinger, IBFS File Nos. SAT-LOA-20200526-00055 and SAT-AMD-20210818-00105 (Jan. 7, 2022).

December 2015, SpaceX successfully returned a first-stage rocket booster to land after carrying a payload to space. SpaceX has since landed a first-stage booster more than 165 times and has re-flown over 135 boosters, including up to 16 re-flights of a single booster. In May 2020, SpaceX used its Crew Dragon capsule, the only U.S. human-rated orbital transport spacecraft, to become the first and only commercial operator to deliver astronauts to the ISS. And by leveraging the reusability of its rockets, SpaceX has launched over 3,700 of its Starlink satellites, which will be used to provide high-speed broadband across the country and around the world.

SpaceX's current and planned space-based activities underscore its commitment to space safety. SpaceX is proud that NASA has entrusted the company to safely carry American astronauts to and from the ISS, a more than \$100 billion multinational facility with human beings onboard. Nothing is more important to SpaceX than safely and successfully accomplishing this mission. The company is highly experienced with space-based operations and debris mitigation practices.⁵ SpaceX maintains deep ties with the domestic and international institutions tasked with ensuring the continued safety of space operations, which facilitates aggressive and effective space-debris mitigation practices. SpaceX brings this commitment and experience to all aspects of its space-based operations. The modular architecture of MSS payload embodies this commitment, as it will permit SpaceX to introduce important new capabilities without launching a single additional satellite.

As the Un-carrier, T-Mobile has demonstrated its commitment to solving customer pain points through market-changing innovations that have boosted competition and improved services for all Americans. This includes a dedication to keeping customers connected wherever they are

⁵ See *SpaceX's Approach to Space Sustainability and Safety*, SPACEX (Feb. 22, 2022), <https://www.spacex.com/updates/>.

through efforts like T-Mobile’s Coverage Beyond Un-carrier move, providing “free high-speed data in 210+ countries and destinations [and] free in-flight connectivity.”⁶ This focus on customers and changing industry norms creates a strong partnership between innovators that are well positioned to collaborate on how to finally provide true nationwide connectivity.

B. SpaceX’s Direct-to-Cellular System Will Extend Mobile Connectivity for Americans

i. SpaceX’s direct-to-cellular service

SpaceX has designed its direct-to-cellular system with the capability to operate over a wide range of spectrum bands that have been identified by 3GPP for use by terrestrial mobile LTE devices. SpaceX intends to seek out carrier partners around the world that have the desire and ability to share their authorized spectrum with a new satellite-delivered capability. T-Mobile is SpaceX’s first carrier partner in this endeavor, and the arrangement between the parties illustrates the type of framework under which SpaceX will offer direct-to-cellular services.

Through its partnership with T-Mobile, SpaceX will leverage existing spectral and orbital resources to enable new mobile connectivity for millions of Americans where that connectivity may not be available today. Operating essentially as cellular base stations in space, direct-to-cellular payloads will give T-Mobile a means of reaching mobile devices provisioned for its own and partner networks when terrestrial base stations are out of reach or unavailable. Leveraging the ubiquitous coverage NGSO systems can provide—and T-Mobile’s nationwide PCS G Block spectrum holdings—SpaceX will support this capability throughout the entire contiguous United States, Hawaii, Puerto Rico, and some of the most remote corridors of Alaska.⁷ Because no new

⁶ See *T-Mobile Expands Coverage Above and Beyond Its Own Maps*, T-MOBILE (June 16, 2022), <https://www.t-mobile.com/news/un-carrier/coveragebeyond>.

⁷ See Technical Attachment at Figure A.6-1.

hardware, software, or device modifications will be needed for subscribers to access the payloads, the direct-to-cellular system will be able to extend service to unserved or underserved areas, connecting potentially millions of Americans across the country as soon as it is deployed.

The system will support delivery of voice, messaging (“SMS” and “MMS”), and basic web browsing to T-Mobile customers using 3GPP LTE concepts. For everyday wireless consumers, the system will provide the convenience of being able to continue communicating when they travel out of range of a terrestrial tower. It also will provide new connectivity that otherwise would not exist for subscribers that lack coverage at home, work, school, or at off-grid facilities that they frequent. For all consumers, the service will provide peace-of-mind in situations where real-time communications are critical, even lifesaving. Hikers experiencing an emergency in a remote area would be able to call or text for help using the service. Likewise, firefighters battling dangerous and unpredictable forest fires would be able to maintain situational awareness even in areas not covered by terrestrial base stations. Perhaps most importantly, they would be able to access these capabilities using the same mobile handset that virtually every American keeps in their pocket today, as well as with tablets and other off-the-shelf cellular-enabled mobile devices. Furthermore, the direct-to-cellular system will meet requirements for MSS emergency 911 services under Section 9.18 of the Commission’s rules.⁸

The direct-to-cellular system also presents significant opportunities for Internet-of-Things (“IoT”) applications. With enhanced space-based coverage, users will be able to deploy off-the-shelf, low-cost, commercially available IoT devices equipped with a T-Mobile SIM card to monitor critical infrastructure, track vehicles, deploy smart agriculture solutions, and detect wildfire activity in remote locations, to provide just a few examples.

⁸ See 47 C.F.R. § 9.18.

ii. The PCS G Block is well-suited for such a system in the United States

Consistent with its goals of promoting efficient spectrum use and ubiquitous access to advanced communications, the Commission has long believed that satellite systems operating in the same frequencies as terrestrial systems could “provide communications in areas where it is difficult or impossible to provide communications coverage via terrestrial base stations.”⁹

Spectrum licensed in the Personal Communications Service (“PCS”) is no exception. From the very beginning, the Commission understood PCS to encompass a “wide range” of “mobile services and technologies” that one day might include satellite services.¹⁰ The International Telecommunication Union (“ITU”) likewise has called for the deployment of international mobile telecommunications (“IMT”) systems that blend terrestrial and satellite components throughout the S- and L-bands, recognizing that “the satellite component is an integral part of IMT” and that satellite networks operating “simultaneously with the terrestrial component of IMT . . . would improve the overall use of IMT.”¹¹ With respect to the PCS G Block in particular, the U.S. licensing regime makes it an ideal candidate for direct-to-cellular satellite services that complement a terrestrial system. The Commission assigned the PCS G Block as replacement spectrum to T-Mobile’s predecessor in interest, Nextel, in every market in the country, in exchange for the billions spent by Nextel and its successor Sprint on the seventeen-year 800 MHz re-

⁹ *Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands*, 27 FCC Rcd. 16102, ¶ 6 (2012) (“AWS-4 Order”) (citing *Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands*, 16 FCC Rcd. 15532, ¶ 1 (2001)).

¹⁰ *Amendment of the Commission’s Rules to Establish New Personal Communications Services*, 8 FCC Rcd. 7700, ¶ 22 (1993) (“1993 PCS Order”). In fact, to “allow PCS providers the maximum degree of flexibility” in deploying these technologies, the Commission adopted a very broad definition of permissible communications in PCS spectrum. *Id.* ¶ 23. Pursuant to that definition, PCS spectrum may be used to provide “any mobile communications service,” with the sole exception of “[b]roadcasting.” See 47 C.F.R. § 24.3.

¹¹ ITU, Resolution 212 (WRC-19) at 1 (2019), available at https://www.itu.int/dms_pub/itu-r/oth/0C/0A/R0C0A00000F0068PDFE.pdf.

banding.¹² As a result, SpaceX would only need to coordinate the proposed system with one terrestrial system in the United States, facilitating the prompt deployment of direct-to-cellular capabilities in the U.S. and eliminating concerns about coordinating spectrum use with multiple licensees across different geographic areas.

iii. SpaceX and T-Mobile have agreed to SpaceX's use of the spectrum

T-Mobile is the sole licensee of the PCS G Block in the United States and SpaceX negotiated with T-Mobile for the right to operate in these frequencies. SpaceX is pleased to report that the companies have reached mutually beneficial commercial and technical arrangements that will allow both direct-to-cellular satellite services and T-Mobile's terrestrial network to thrive. In fact, both companies have concluded that the direct-to-cellular system will not just coexist with but enhance the T-Mobile network by bringing space-based connectivity to T-Mobile's wireless subscribers. As part of these arrangements, the two parties executed a spectrum manager lease pursuant to which T-Mobile granted SpaceX the right to use the PCS G Block as described in this application. T-Mobile has filed FCC Form 608 notifying the Commission of the arrangement.

iv. SpaceX intends to develop similar arrangements with carriers in other countries

Because the direct-to-cellular payload is capable of operating on a range of frequencies, SpaceX will be able to offer similar arrangements to terrestrial mobile operators in other countries that have appropriate spectrum holdings. In each case, SpaceX anticipates that it would enter into a commercial arrangement with the terrestrial carrier under which the direct-to-cellular system and the terrestrial carrier's system could operate cooperatively and harmoniously to extend coverage to areas not served by terrestrial cell towers. Working with its carrier partner, SpaceX would also

¹² See *Improving Public Safety Communications in the 800 MHz Band*, 19 FCC Rcd. 14969, ¶ 217 (2004); see also *Improving Public Safety Communications in the 800 MHz Band*, 36 FCC Rcd. 7690 (2021).

comply with the regulatory requirements applicable to such an arrangement in the country or countries where the service is provided, and notify the Commission when such a service has been authorized.

C. Description of Direct-to-Cellular System Architecture

The SpaceX direct-to-cellular system will consist of a constellation of low Earth orbit satellites that will leverage SpaceX's existing ground equipment as well as add new equipment that aims to optimize performance for consumers. It will operate under network filings made on behalf of SpaceX at the ITU by Germany.

i. Space segment

The proposed SpaceX direct-to-cellular system will consist of a payload on the satellites currently authorized to deploy as part of SpaceX's Gen2 system, and subject to the conditions set forth in the *Gen2 Authorization* initially granting SpaceX authority to launch and operate 7,500 satellites.¹³ At full deployment, this payload will enable SpaceX to provide complete and continuous coverage within $\pm 58^\circ$ latitude. This will enable direct-to-cellular service across the entirety of the contiguous United States, Hawaii, Puerto Rico, and the majority of Southeast Alaska, Kodiak, and the Aleutian Islands.¹⁴

The direct-to-cellular payload will operate in the United States in the 1910-1915 MHz and 1990-1995 MHz bands in the uplink (Earth-to-space) and downlink (space-to-Earth) directions, respectively.¹⁵ Specifically, the payload will be able to support text messaging, voice, and basic

¹³ See *Gen2 Authorization* ¶¶ 6-8.

¹⁴ See Technical Attachment at 7-8.

¹⁵ SpaceX anticipates that the system will also employ optical inter-satellite links for communications directly between satellites. These links may support direct-to-cellular operations. As the Commission has previously found, "[b]ecause optical ISLs do not involve wire or radio frequency transmissions, the Commission does not have jurisdiction over the use of optical ISLs." *Teledesic LLC*, 14 FCC Rcd. 2261, ¶ 14 (IB 1999). Moreover, to the extent that the use of optical ISLs alleviates congestion in radio frequency bands, it is to be encouraged. *Id.*

web browsing over three or four 1.4 MHz bandwidth channels or one 5 MHz channel on the downlink (space-to-Earth) and three or four 1.4 MHz channels or one 5 MHz channel on the uplink (Earth-to-space). A more precise description of the frequency and channelization plan for the direct-to-cellular NGSO system in the PCS G Block is included in the Schedule S and the Technical Attachment accompanying this application. As discussed below, the direct-to-cellular system will operate without causing harmful interference to or requiring protection from any other Commission licensee in the United States.

ii. Ground segment

SpaceX's direct-to-cellular NGSO system will communicate in the United States with commercial, off-the-shelf mobile devices that are intended to communicate with terrestrial networks and are authorized to transmit in the 1910-1915 MHz bands pursuant to the Commission's equipment authorization rules. Consumers will not need to purchase separate devices to ensure compatibility with the direct-to-cellular system, nor will they need to modify their existing mobile device, install new hardware, or in any way alter the device's RF emission characteristics. For backhaul from the direct-to-cellular payload, SpaceX will use gateway frequencies of the Gen2 Fixed Satellite Service ("FSS") constellation. Likewise, for Telemetry, Tracking and Command ("TT&C"), SpaceX will use the dedicated TT&C subsystem on the Gen2 system for communications with the spacecraft during pre-launch, transfer orbit, and on-station operations, as well as during spacecraft emergencies.

II. AUTHORIZING THE DIRECT-TO-CELLULAR SYSTEM WILL SERVE THE PUBLIC INTEREST BY PROMOTING COMPETITION AND MAKING MORE EXPANSIVE USE OF VALUABLE SPECTRUM ASSETS WITHOUT COMPROMISING THE RIGHTS OF OTHER SPECTRUM LICENSEES

Authorizing SpaceX's direct-to-cellular NGSO system would serve the public interest in a variety of ways. By delivering an immediate and significant enhancement in mobile service

coverage using already licensed frequencies, the system will promote competition for mobile voice, data, and text services without affecting other Commission licensees and while conserving scarce spectral resources. Importantly, by using a hosted payload architecture, the system also will conserve orbital resources and will pose no discernable space safety risks of any kind.

A. The Direct-to-Cellular System Will Promote Competition in the United States

Grant of this application will significantly enhance connectivity capabilities in the United States in the near term while setting the stage for similar benefits in other countries in the future. From its very inception, SpaceX has been a frequent disrupter of the communications marketplace. With its direct-to-cellular system, SpaceX will continue this trend, leveraging the Gen2 NGSO constellation to usher in a new era of more ubiquitous connectivity for U.S. wireless consumers. As explained, the direct-to-cellular system will offer millions (and potentially tens of millions) of U.S. subscribers cellular connectivity where none previously existed or where terrestrial systems have been damaged, destroyed, overloaded, or made otherwise unavailable. Furthermore, since the direct-to-cellular system will work with existing devices provisioned to operate on the T-Mobile network rather than purpose-built, and often expensive, satellite phones, it will offer a seamless solution to the disparate connectivity needs of residential, commercial, and governmental users. With these capabilities, the system will enhance service availability and increase competitive pressure in the marketplace for mobile services of all kinds: space-based, terrestrial, or some combination of both.

Complementing SpaceX's recent acquisition of Swarm Technologies, Inc. ("Swarm"), the system also will enhance the availability of IoT services. Swarm already offers services to customers in the agriculture, maritime, energy, environmental, and transportation sectors (among others) in need of global satellite data connectivity. Connectivity solutions that combine T-

Mobile-provisioned devices with Swarm IoT products would cover a broad range of data rates throughout the United States, including in some of its most remote locations, while also leveraging Swarm’s global coverage. U.S. companies in the maritime, aviation, trucking, energy, and mining industries will also benefit from this new and compelling alternative, as will U.S. government customers that depend on global satellite connectivity.

B. The Direct-to-Cellular System Will Make Use of Available Spectrum While Protecting Commission Licensees

By enhancing the utilization of T-Mobile’s spectrum while protecting all Commission licensees, the proposed system would advance public interest factors relating to spectrum availability in the United States.

i. In-band licensees

SpaceX has long recognized that bringing new technologies and services to market requires a coordinated effort and prides itself on its partnerships with other entities motivated to rapidly deploy innovative connectivity-driven services. In this spirit of collaboration, SpaceX has negotiated a lease agreement with T-Mobile—which is the only licensee in the PCS G Block in the United States.¹⁶

Pursuant to that agreement, T-Mobile will allow SpaceX’s direct-to-cellular system to utilize the 1910-1915 MHz and 1990-1995 MHz bands as described in this application.¹⁷ SpaceX, in turn, will agree to operate a system that not only coexists effectively with T-Mobile’s terrestrial network but also elevates the connectivity received by T-Mobile subscribers. By enhancing the

¹⁶ The 1910-1915 MHz and 1990-1995 MHz bands are allocated to non-federal deployments in the Fixed Service and Mobile Service. *See* 47 C.F.R. § 2.106.

¹⁷ SpaceX’s system would use the 1910-1915 MHz band for uplinks and the 1990-1995 MHz band for downlinks, consistent with the terrestrial pairing arrangement adopted by the Commission. *See Improving Public Safety Communications in the 800 MHz Band*, 19 FCC Rcd. 14969, ¶ 217 (2004); *see also Improving Public Safety Communications in the 800 MHz Band*, 36 FCC Rcd. 7690 (2021).

utilization of T-Mobile’s spectrum in this manner, the direct-to-cellular system will enable transformative improvements in mobile connectivity while conserving scarce spectral resources.¹⁸ It therefore would enhance the Commission’s objective of promoting more intensive spectrum use in the United States.

ii. Other licensees

In addition to working with—and enhancing—the operations of the sole in-band licensee, SpaceX would operate on an unprotected, non-harmful interference basis with respect to all other Commission licensees. To do so, SpaceX would observe the same out-of-band emissions (“OOBE”) limits that apply to T-Mobile’s terrestrial deployments.¹⁹ SpaceX recognizes that the PCS service rules apply more stringent OOBE limits for terrestrial broadband users than the limit that typically governs satellite operations.²⁰ SpaceX has ensured that the direct-to-cellular system’s sophisticated phased array antennas will enable all downlink transmissions to comply with the stricter $43 + 10\log(P)$ dB OOBE limit specified in Section 24.238(a).²¹

iii. User uplinks

Mobile devices authorized to transmit in the 1910-1915 MHz bands would not need to be modified to access direct-to-cellular payloads. As a result, uplink operations pose no new interference concerns.

¹⁸ SpaceX also will comply with the boundary field strength limit specified in the PCS rules. 47 C.F.R. § 24.236 (establishing an in-band boundary field strength limit for PCS licensees). As explained in the Technical Attachment, this field strength limit can be converted into an equivalent PFD limit to verify that space-to-Earth emissions will not create the potential for harmful interference outside T-Mobile’s service area (i.e., at the border). Specifically, SpaceX will ensure that its downlink operations outside of T-Mobile’s service area do not exceed -100.3 dBW/m²/MHz, the PFD equivalent of the 47 dBμV/m maximum field strength specified in Section 24.236. See Technical Attachment at 9-10.

¹⁹ See 47 C.F.R. § 24.238(a).

²⁰ See 47 C.F.R. § 25.202(f).

²¹ Given that the 1910-1915 and 1990-1995 MHz bands are licensed exclusively to T-Mobile nationwide and allocated exclusively for non-federal use, SpaceX does not anticipate any federal coordination issues.

C. The Direct-to-Cellular System Will Support a Wide Variety of Communications Needs, Including Critical Emergency Services

The direct-to-cellular system will offer typical mobile service users expanded options for meeting their everyday communications needs. But it will also meet more critical needs by offering seamless connectivity in unserved and underserved areas and in the wake of disasters and other events that disrupt terrestrial connectivity. First responders, law enforcement officials, and military personnel are just a few examples of the end users who routinely work and train in the type of remote environments and scenarios that the direct-to-cellular system is specially designed to serve.

III. ELIGIBILITY AND OPERATIONAL REQUIREMENTS

To the extent necessary, SpaceX confirms that (1) it will post a surety bond as required under Section 25.165 of the Commission's rules; (2) it will comply with the Commission's milestone requirements; and (3) it does not have any other application for an NGSO-like satellite system license on file with the Commission, or any licensed-but-unbuilt NGSO-like system, in any frequency band involved in this application. In addition, SpaceX has provided the technical information required under Section 25.114 of the Commission's rules, as detailed in the accompanying Schedule S and Technical Attachment.

With respect to the shared orbital environment, SpaceX takes seriously its responsibility to minimize the generation of orbital debris. To meet that responsibility, SpaceX will deploy its direct-to-cellular payload on the same spacecraft already authorized for the Gen2 system. By doing so, SpaceX will avoid the need to launch additional satellites while also leveraging the built-in advantages of operating at low altitudes and applying its unique iterative and integrated approach to minimize the effect its constellation will have on other operating spacecraft and other orbital resources. The Gen2 system has been designed so that normal operations should not

generate any debris, but in the unlikely event that any does result, atmospheric drag will ensure that such debris will quickly disintegrate in the atmosphere and pose no further danger to space operations or life on the ground. Moreover, its satellites will have sufficient maneuverability to avoid other satellites and orbital debris throughout their mission lifetime and through the deorbit process. Thus, these spacecraft will enable SpaceX to provide a broad array of services to consumers throughout the country without increasing risk to safety in space. To the extent necessary, SpaceX incorporates by reference the orbital debris mitigation assessment submitted in the Gen2 application, as amended.²²

CONCLUSION

For the foregoing reasons, and for the reasons set forth in the accompanying materials, SpaceX requests that the Commission find that modifying SpaceX's *Gen2 Authorization* to include a direct-to-cellular system, specifically including operation in the 1910-1915 MHz and 1990-1995 MHz bands in the United States, will serve the public interest, and issue such a grant expeditiously.

²² See Previous Applications; see also Letter from David Goldman to Marlene H. Dortch, IBFS File Nos. SAT-LOA-20200526-00055 and SAT-AMD-20210818-00105, at 1-5 (Aug. 19, 2022).

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