Before the FEDERAL COMMUNICATIONS COMMISSION Washington, DC 20554

In the Matter of)
Promoting the Development of Positioning,)
Navigation, and Timing Technologies and)
Solutions)
)

WT Docket No. 25-110

COMMENTS OF NEXTNAV INC.

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I. INTRODUCTION AND SUMMARY

NextNav Inc. ("NextNav") fully supports the Federal Communications Commission's ("Commission") goal of building a record on specific actions the Commission can take to incentivize and support industry efforts to develop resilient and secure Positioning, Navigation, and Timing ("PNT") technologies and solutions.¹ NextNav also fully supports the Commission's intention to focus its efforts on utilizing its authority over non-Federal use of spectrum to rapidly support PNT solutions that could serve as complements or backups to the Global Positioning System ("GPS").²

In this proceeding, the Commission should thoroughly consider how it might facilitate the development of multiple terrestrial and space-based solutions as part of a system-of-systems approach to PNT resiliency. As part of that consideration, it is critical for the Commission to enable at least one future-proof solution that relies on market forces to deliver a terrestrial, widescale PNT solution that is broadly available to critical infrastructure, public safety, and consumers, and has a

¹ See In re Promoting the Development of Positioning, Navigation, and Timing Technologies and Solutions, Notice of Inquiry, WT Docket No. 25-110, FCC 25-20 ¶ 3 (rel. Mar. 28, 2025) ("NOI").

 $^{^{2}}$ *Id.* ¶¶ 3, 4, 16. The NOI seeks comment on both "complementary" and "alternative" systems to GPS. In this response NextNav uses the term "backup" instead of "alternative" to avoid any suggestion that any new PNT solutions would displace the central role of GPS in the U.S. PNT ecosystem.

clear path to incorporation in end-user devices. To that end, NextNav urges the Commission to promptly issue a Notice of Proposed Rulemaking ("NPRM") to enable terrestrial-based PNT in the Lower 900 MHz band, based on the extensive record that has been developed over the past year in NextNav's separate, parallel Petition for Rulemaking proceeding.³

Virginia-based NextNav has a proven track record of providing accurate, reliable location information to support first responders. Building on that legacy, NextNav's next-generation 5G-based 3D PNT solution, "NextGen," will help meet the urgent national security and public safety need for a complement and backup to GPS. NextNav is prepared to meet this need by leveraging preexisting 5G networks and network capabilities, as well as the established and vibrant 5G device ecosystem, to enable a broadly available, widescale terrestrial complement and backup to GPS utilizing market forces and not taxpayer funding. NextNav brings not only its expertise in PNT technology, but also its low-band spectrum holdings to address the critical need for resilient PNT.⁴ Having previously acquired extensive spectrum licenses in the Lower 900 MHz band at auction and in the secondary market, NextNav is the nation's largest license holder in the only spectrum band expressly designated for terrestrial positioning services.

While proudly articulating and standing behind the value of its solution, NextNav also reemphasizes its support for a system-of-systems approach to PNT resiliency.⁵ Only multiple

³ Petition for Rulemaking of NextNav Inc., WT Docket No. 24-240 (Apr. 16, 2024) ("NextNav PFR").

⁴ Throughout these comments, NextNav uses the term "resilient PNT" consistent with the definition in the NOI: "a combination of PNT technologies or solutions that will ensure PNT for users and protect against the threats to and vulnerabilities of GPS." NOI ¶ 3 n.3.

⁵ See, e.g., Letter from Robert Lantz, General Counsel of NextNav Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 24-240, RM-11989, Attach. at 2 (Dec. 9, 2024); Letter from Robert Lantz, General Counsel of NextNav Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 24-240, RM-11989, Attach. at 2 (Nov. 15, 2024); Letter from Robert Lantz, General Counsel of NextNav Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 24-240, RM-11989, Attach. at 2 (Nov. 15, 2024); Letter from Robert Lantz, General Counsel of NextNav Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 24-240, RM-11989, Attach. at 8 (Oct. 21, 2024); Reply Comments of NextNav Inc., WT Docket No. 24-240, at 12, 22 (Sept. 20, 2024) ("NextNav Reply Comments"); see also Elisabeth Jeffs, NextNav Statement on FCC Adoption of PNT Notice of Inquiry, NextNav (Mar. 27, 2025), https://nextnav.com/statement-on-fcc-adoption-of-pnt-noi/.

terrestrial and space-based systems—together with a whole-of-government approach—can solve this national security challenge. NextNav therefore also supports the Commission's exploration of other terrestrial and space-based technologies, including, but not limited to, the terrestrial Broadcast Positioning System ("BPS"), eLoran, and Mobile Broadband Systems, and PNTfocused space-based solutions, including Iridium's Satellite Time and Location ("STL") service, TrustPoint's and Xona's developing services, and Navsys's PNT as a Service ("PNTaaS").⁶

II. THE UNITED STATES NEEDS A SYSTEM-OF-SYSTEMS APPROACH TO RESILIENT PNT.

A. The Commission and the Public Recognize the Importance of GPS.

PNT data provided by GPS is foundational to national security, public safety, and economic stability.⁷ GPS today helps first responders to act with speed and accuracy in the face of disaster, proves essential to critical infrastructure, and supports wide swaths of the American economy. Importantly, efforts to develop GPS complements and backups will not diminish the role of GPS, which remains vital to national and economic security.⁸

The public understands the importance of resilient PNT. A recent national Public Policy Polling survey found that, by a margin of ten-to-one, voters across gender, political party, and age groups support the creation of a ground-based complement and backup to GPS.⁹ A majority of voters view a terrestrial complement and backup to GPS as vital to safeguarding public safety, keeping pace with foreign rivals, protecting U.S. national security, and preserving a strong

⁶ NOI ¶¶ 25-28, 30, 23; *Resilient, Redundant, Accurate*, NAVSYS Corp., https://www.pntaas.com/ (last visited Apr. 16, 2025).

⁷ NOI ¶¶ 1, 5.

⁸ See Comments of GPS Innovation Alliance, WT Docket No. 24-240 (Sept. 5, 2024).

⁹ Memorandum from Jim Williams, Public Policy Polling, to Interested Parties, Subject: *By a Ten-to-One Margin – Voters Across the United States Support a Ground-Based Backup to GPS* (Jan. 30, 2025), https://nextnav.com/wp-content/uploads/2025/03/NN-PPP-Memo-National-Poll.pdf; *National Survey Results*, Public Policy Polling (Jan. 24-25, 2025), https://nextnav.com/wp-content/uploads/2025/03/NationalResults.pdf.

economy. Additionally, nearly seven out of ten of voters (68%) agree that creating a backup to GPS represents an urgent national security need for the United States.

B. Different Types of PNT Solutions Bring Different Strengths; Multiple Terrestrial and Space-Based Solutions Are Required for Resilient PNT.

Positioning, navigation, and timing functions are often grouped together, but represent distinct capabilities. As the Department of Transportation has shown through its testing of individual components of PNT, not all systems provide all three functions, and many PNT offerings excel at one function while offering more limited support for the others.¹⁰ For instance, timing solutions may lack accurate location capabilities, while navigation functions may depend on underlying positioning inputs.¹¹ Solutions also differ in their abilities to provide coverage across a range of geographies and use cases. NextNav's NextGen solution is designed to deliver both positioning and timing, as well as vertical location. Because different technologies and deployment models bring different strengths—and different weaknesses—truly resilient PNT requires multiple terrestrial-based and multiple space-based solutions. There is no single solution.

III. THE COMMISSION PLAYS A VITAL ROLE IN ADVANCING A WHOLE-OF-GOVERNMENT APPROACH TO RESILIENT PNT.

A. National PNT Resilience Demands Integrated Federal Efforts.

Only a whole-of-government approach can fulfill President Trump's 2020 call for "approaches to integrate and use multiple PNT services to enhance the resilience of critical infrastructure."¹² Addressing this critical national security need will require the expertise of

¹⁰ See Andrew Hansen et al., U.S. Dep't of Transp., Complementary PNT and GPS Backup Technologies Demonstration Report: Sections 1 through 10, https://tinyurl.com/y57jd7vz ("2021 DOT Report"). The DOT acknowledged potential disparities in capabilities by describing the central objective of its PNT demonstration as having "each complementary PNT technology demonstrated and verified in its best light." Id. at 10.

¹¹ *Id.* at 185 (depicting a chart of the DOT's findings on the varying capabilities of the tested PNT technologies); *see also* NextNav PFR at 13.

¹² See Exec. Order No. 13905 § 4(h), 85 Fed. Reg. 9359 (Feb. 12, 2020) ("2020 Executive Order on PNT Resiliency").

multiple federal agencies, as described in the NOI.¹³ NextNav has been an active participant in a whole-of-government approach to resilient PNT.¹⁴ This experience not only validates NextNav's expertise in providing PNT, but also underpins NextNav's understanding of the requirements and concerns of federal agencies.

In 2019, the Department of Homeland Security ("DHS") awarded NextNav funding for a study of cybersecurity resiliency. In 2021, NextNav completed *The Study of Cybersecurity and Improved Timing Resilience of NextNav's Metropolitan Beacon System (MBS) Network*, illustrating that NextNav's present-generation TerraPoiNT solution successfully demonstrated a functional, stable, and high-precision timing distribution system that is both independent of GPS and reliable in a real-world environment.¹⁵ During the 72-hour GPS outage simulation, TerraPoiNT delivered timing accuracy better than 50 nanoseconds in urban and semi-urban environments, based on alternative absolute timing sources such as LEO satellite-based timing and a holdover atomic clock such as a Cesium clock at select sites.¹⁶

Later in 2021, the Department of Transportation ("DOT") published a report about the scope of PNT features required to offer backup capability in the event of disruption to GPS, identifying 14 metrics to assess the effectiveness of a PNT system.¹⁷ The 2021 DOT Report ranked

¹³ NOI ¶¶ 13-15.

¹⁴ See Comments of NextNav Inc. at 8-9, WT Docket No. 24-240 (Sept. 5, 2024) ("NextNav Comments"); Elisabeth Jeffs, *Mobile World Congress Las Vegas 2024: Critical Conversations on National Security*, NextNav (Oct. 16, 2024), https://nextnav.com/mobile-world-congress-las-vegas-2024-post-event-recap/.

¹⁵ See Presentation by Sameet Deshpande, Principal Engineer of NextNav Inc., *Terrestrial Timing System*, Workshop on Synchronization and Timing Systems (2022), https://wsts.atis.org/wp-content/uploads/2022/05/08-Sameet-Deshpande.Terrestrial-Timing-System.pdf ("Terrestrial Timing System Presentation"); Press Release, NextNav, *NextNav Demonstrates World's First GPS-Free PNT Network in Department of Homeland Security Trial*, NextNav (Aug. 16, 2021), https://nextnav.com/nextnav-demonstrates-worlds-first-gps-free-pnt-network-in-department-of-homeland-security-trial/; *see also* NOI ¶ 29 n.88.

¹⁶ See Terrestrial Timing System Presentation.

¹⁷ 2021 DOT Report, at 149-79.

TerraPoiNT as best in class under a variety of scoring methods.¹⁸ After evaluating 11 different PNT technologies, DOT concluded that while all "demonstrated some PNT performance of value[]... only one vendor, NextNav, demonstrated [PNT performance] in all applicable use case scenarios."¹⁹

In September 2023, DOT released a Complementary PNT ("CPNT") Action Plan, describing several proposed steps and benchmarks to achieve increased CPNT usage.²⁰ As part of the action plan, DOT in March 2024 requested proposals for CPNT technologies for instrumentation, testing, and evaluation at field test ranges in conjunction with critical infrastructure owners and operators, with the goal of expediting adoption of the technologies into federal systems that require improved PNT resiliency.²¹ In June 2024, after receiving 29 proposals, the DOT selected nine technologies, including NextNav's, to participate in the field testing.²² Technologies that meet DOT standards will join a federal clearinghouse of potential technology options for GPS backups or complements that federal agencies can begin to procure.

B. The Commission Has a Key Role to Play in Rapidly Supporting Resilient PNT.

The Commission can play a key role in rapidly supporting resilient PNT by exercising its authority to regulate non-Federal use of spectrum, including its authority to modify spectrum

¹⁸ See id. at 180-93.

¹⁹ See id. at 194.

²⁰ U.S. Dep't of Transp., *Complementary PNT Action Plan: DOT Actions to Drive CPNT Adoption* (Sept. 2023), https://www.transportation.gov/sites/dot.gov/files/2023-09/DOT%20Complementary%20PNT%20Action%20Plan_Final.pdf ("CPNT Action Plan").

²¹ U.S. Dep't of Transp., *Complementary PNT Action Plan: DOT Actions to Drive CPNT Adoption* (Updated Mar. 2024), https://www.transportation.gov/pnt/complementary-pnt-action-plan.

²² U.S. Dep't of Transp., *Department of Transportation Awards* \$7 *Million for Complementary Positioning, Navigation and Timing Technologies* (July 3, 2024), https://www.transportation.gov/briefing-room/department-transportation-awards-7-million-complementary-positioning-navigation-and.

allocation and service rules, and modify existing licenses.²³ The Commission should embrace a near-term opportunity to do just that by promptly issuing an NPRM based on the robust record developed in response to the NextNav PFR.²⁴ Issuing an NPRM that proposes to enable PNT in the Lower 900 MHz band would be consistent with the NOI's call for identifying existing rules impeding PNT development and deployment.²⁵ In NextNav's case, decades-old command-and-control Multilateration Location and Monitoring Service ("M-LMS") service rules in the Lower 900 MHz band stand in the way of 5G-powered 3D PNT.

IV. TERRESTRIAL PNT SOLUTIONS OFFER DISTINCT CAPABILITIES AND BENEFITS.

A. Terrestrial PNT Solutions Address Current Space-Based Limitations and Strengthen PNT Resilience.

Terrestrial PNT can compensate for limitations inherent in space-based PNT and provide coverage where space-based PNT is currently constrained or unavailable. Therefore, while space-based systems are vital components of a system of systems, resilient PNT must also include terrestrial technologies. As the Commission describes in the NOI, terrestrial, radiofrequency-based PNT technologies: (i) operate at stronger received signal strengths due to shorter distances between transmitters and receivers and therefore experience less propagation loss than satellite-based PNT systems; (ii) function in locations where satellite signals are too weak or too obstructed to be received, such as indoors and in urban canyons; and (iii) prove more resilient to intentional interference because signal strength is considerably higher than satellite-based systems.²⁶ In

²³ NOI ¶¶ 4, 54, 58; *see also* NOI ¶ 16 ("Given its importance to national security and the vital role GPS plays in ensuring the safety of everyday citizens and the continued flow of goods and services, we intend to focus our efforts to rapidly support new and complementary or alternative PNT solutions that will maintain U.S. global leadership in this area and mitigate harmful GPS disruptions caused by foreign adversaries.").

²⁴ See infra Sec. VI.

²⁵ NOI ¶¶ 54, 58.

²⁶ *Id.* \P 24.

addition, localized transmitter infrastructure can be used to improve terrestrial system performance.²⁷

Terrestrial PNT systems offer more than just stronger relative received signal strength; physically-diverse network infrastructure offers additional benefits.²⁸ *First*, given greater link redundancy, terrestrial PNT is less vulnerable to intentional interference and hacking.²⁹ Intentional jamming of terrestrial signals would also require significantly more power than jamming space-based signals, creating a significantly higher barrier to disruption. *Second*, the geographic distribution of some terrestrial systems also provides a further form of resilience due to the diversity of signal sources.³⁰ *Third*, the presence of even one terrestrial PNT system can help deter potential attacks on space-based PNT systems by signaling to potential adversaries the futility of a space-based attack given the existence of physically redundant PNT infrastructure.³¹ In sum, terrestrial PNT solutions not only overcome the limitations of attenuated space-based PNT signals, but also enhance resilience in their own right through link redundancy, link diversity, and the simple existence of a complement to space-based PNT.

²⁷ See NextNav PFR at 9-10, 12; Communications Security, Reliability, and Interoperability Council V, CSRIC V Working Group 4: Communications Infrastructure Resiliency Subgroup B: Network Timing Single Source Risk Reduction Final Report, at 3-4 (Dec. 2016), https://tinyurl.com/22jeo7qc ("CSRIC V Working Group 4 Final Report").

²⁸ Peake Advisors, *The Race to Resilience: A Review of the Existing Literature Regarding GPS Vulnerabilities and Complementary Approaches to Positioning, Navigation, and Timing* at 10-11, WTB Docket No. 24-240 (Feb. 21, 2025) (explaining how U.S. adversaries have prioritized deployment of terrestrial-based PNT systems to improve the resilience of space-based PNT systems).

²⁹ NOI ¶ 24 & n.72.

³⁰ NextNav Reply Comments at 12.

³¹ John Plumb, *PNT Resilience for an Era of Great Power Competition*, Ctr. for Strategic & Int'l Stud. (Oct. 31, 2024), https://www.csis.org/analysis/pnt-resilience-era-great-power-competition, ("The United States needs a more resilient national PNT architecture in order to strengthen deterrence against both China and Russia."); *see also* David Simpson, Rear Admiral (ret.), *A Day Without Space and a Call for Greater Positioning, Navigation, and Timing Resiliency in the United States*, Wireless @ Virginia Tech, at 1, 3, 30 (Sept. 3, 2024) ("A Day Without Space").

B. Terrestrial PNT Solutions Offer Strengths Including Scalability, Reliance on Market Forces, and Mass-Market End-User Adoption.

The Commission should recognize the criticality of at least one future-proof solution as part of a system of systems that relies on market forces to deliver a terrestrial, widescale PNT solution that is broadly available to critical infrastructure, public safety, and consumers, and has a clear path to incorporation in end-user devices. As described in this submission, NextNav has the knowledge, experience, and technical expertise to offer one such solution.³² By leveraging the power and scale of existing 5G infrastructure, private-market funding, and consumer device availability via standard smartphone upgrade cycles, NextNav's market-based NextGen solution will deliver widescale PNT without the need for taxpayer funding, a costly and time-consuming greenfield network build, or the costly development of bespoke consumer end-user devices. Similar to how GPS capabilities are already embedded in end-user devices like smartphones today, this approach will put terrestrial-based PNT directly into the hands of U.S. consumers, as well as serve enterprise and government users, including critical infrastructure and public safety users, that rely on the power of the consumer device ecosystem to enable more cost-effective tailored equipment.

Scalability. The need for resilient PNT is nationwide, and at least one technology solution in a system of systems should be widescale as well.³³ Scalability encompasses both broad geographic coverage and relative ease of adoption by end users, including government, enterprise, and consumer users. Standardized integration of terrestrial PNT as a component of a larger preexisting ecosystem, such as 5G, will help reduce costs and facilitate adoption, including for critical infrastructure and public safety uses, thus advancing national security and resilience.

³² See infra Sec. III.A, Sec. V.

³³ *See* NOI ¶ 3.

As the Commission hypothesized, a new PNT technology is more likely to be widely deployed if it can function on top of an existing network infrastructure, such as 5G NR networks.³⁴ The ubiquity of 5G networks and associated network infrastructure provides one widescale deployment model underpinning NextNav's intention to partner with one or more Mobile Network Operators ("MNOs") to deliver its NextGen solution.³⁵ This model will leverage the preexisting vibrant ecosystem of infrastructure, semiconductors, devices, applications, and mobile support services that 5G NR offers, combined with a widescale 5G broadband network deployment.³⁶ Relying on existing and evolving 5G NR network infrastructure and standards in the Lower 900 MHz band means that a widescale, future-proof PNT solution can be delivered without the need for a costly greenfield network buildout, accelerating deployment.³⁷ The propagation characteristics of Lower 900 MHz spectrum will also enhance both urban and rural coverage.³⁸

Private-Market Funding. While DOD currently develops, acquires, operates, sustains, and secures GPS,³⁹ resilient PNT also demands at least one market-based solution that does not require taxpayer funding. ⁴⁰ As discussed above, deploying a PNT solution utilizing 5G network infrastructure will eliminate the need for network construction or maintenance at taxpayer expense. Advancing competitive, market-based solutions also aligns with a recent Executive Order that

 ³⁴ NOI ¶ 46; *see* Comments of NextNav Inc. at 6, 20, WT Docket No. 24-240 (Sept. 5, 2024) ("NextNav Comments").
³⁵ NextNav Comments at 11.

³⁶ *Id.* at 6.

³⁷ *Id.* at 5-6.

³⁸ See id.

³⁹ NOI ¶ 6.

⁴⁰ Others agree about the value of a non-taxpayer funded solution. *See, e.g.*, Gil Biran, *Counting the Cost of GPS Vulnerability: Why the US Needs a Terrestrial Backup*, Adtran Blog (Jan. 8, 2025), https://www.blog.adtran.com/en/ counting-the-cost-of-gps-vulnerability-why-the-us-needs-a-terrestrial-backup.

states that "Federal regulations should not predetermine economic winners and losers."⁴¹ Under NextNav's proposal, one or more MNOs will have market-based incentives to commercially deploy 5G services in the Lower 900 MHz band and simultaneously deliver 5G data and applications in addition to PNT.⁴² While conversations with potential partners are still ongoing, NextNav envisions that network partners will integrate Lower 900 MHz band spectrum into their 5G networks, and NextNav will implement, operate, and manage the PNT solution.⁴³ This market-based model will enable widescale PNT availability, without requiring taxpayer funding.⁴⁴

End-User Devices. For both economic and national security reasons, at least one terrestrial PNT technology should be broadly available in consumer end-user devices, *e.g.*, smartphones.⁴⁵ Integration of an additional PNT technology into the 5G end-user device ecosystem will not only benefit consumers and critical infrastructure and public safety personnel who utilize smartphones, but also promote the development of PNT equipment tailored for enterprise and government use, including by critical infrastructure and public safety. Both enterprise and government applications will be able to take advantage of the economies of scale that a robust consumer device ecosystem offers. In addition, just as consumer access to GPS in smartphones boosted enterprise efficiency in logistics, tracking, and safety, consumer access to an additional, terrestrial-based PNT technology in end-user devices and connected products will similarly benefit the critical infrastructure community.⁴⁶

⁴¹ *Reducing Anti-Competitive Regulatory Barriers*, Exec. Order No. 14267, 90 Fed. Reg. 15629 (Apr. 9, 2025), https://www.whitehouse.gov/presidential-actions/2025/04/reducing-anti-competitive-regulatory-barriers/#:~:text =Federal%20regulations%20should%20not%20predetermine,American%20consumers%20%E2%80%94%20shoul d%20be%20eliminated.

⁴² NextNav Comments at 3.

⁴³ NextNav PFR at 22.

⁴⁴ Id.

⁴⁵ See generally, NextNav Comments at 20-21; see also NOI ¶ 33.

⁴⁶ See infra Sec. V.D, n.77.

As the Commission notes, "[t]oday, virtually all Americans with cell phones have access to GPS, and individuals use GPS-based applications for essential everyday functions, such as directions, location-based transactions, and tracking the safety of family members."⁴⁷ Consumer use of GPS in cell phones also enables the app economy, with app-based rideshare and delivery apps alone contributing more than \$212 billion annually to the U.S. economy.⁴⁸ The most efficient path to widespread adoption of resilient PNT runs through those same devices people already carry and regularly upgrade—smartphones.⁴⁹ Embedding complementary and backup PNT capabilities into the existing 5G ecosystem will enable consumers to access those capabilities without having to purchase specialized receivers or additional standalone hardware. NextNav's NextGen solution will support various 5G user equipment ("UE") platforms, including smartphones and IoT devices, making broad device compatibility both technically and commercially feasible.

V. NEXTNAV'S PROVEN PNT SOLUTIONS DEMONSTRATE THE PROMISE OF TERRESTRIAL PNT.

A. NextNav Is a Leader in Delivering Highly Specialized, Accurate Positioning Technologies to Support First Responders.

NextNav is a pioneer in using terrestrial systems to deliver accurate, reliable location services, including indoors and in dense urban settings. NextNav led the industry in the development of accurate vertical positioning (z-axis) technology, which is critical for applications such as first responder navigation in multi-story buildings, urban mobility, and smart infrastructure. Members of the public safety community, including FirstNet, currently use NextNav's z-axis

⁴⁷ NOI ¶ 7.

⁴⁸ See Flex Association, Comments on NextNav Petition for Rulemaking at 1, WT Docket No. 24-240, RM-11989 (Oct. 31, 2024) ("Flex Ass'n Comments").

⁴⁹ Federica Laricchia, Average Lifespan (Replacement Cycle Length) of Smartphones in the United States from 2013 to 2027, Statista (Aug. 31, 2023), https://www.statista.com/statistics/619788/average-smartphone-life/.

solution to pinpoint the location of 911 callers in multi-story buildings and track first responders as they address emergency situations.⁵⁰

In its NextGen solution, NextNav will combine 5G Positioning Reference Signals ("PRS") to enable accurate x-y positioning with a barometric pressure-based system for z-axis estimation to provide a full 3D positioning service.⁵¹ Both space-based and terrestrial PNT technologies are generally limited with respect to estimating the height of end-user devices.⁵² To overcome these challenges, NextNav developed a barometric pressure sensor-based z-axis solution, "Pinnacle," that utilizes barometric pressure calibration and advanced data processing to deliver vertical positioning to within 1.8 meters of accuracy 80% of the time, as demonstrated in independent testing by CTIA and JRC, exceeding the FCC's z-axis accuracy threshold of three meters for 80% of the time.⁵³

B. NextNav's Proposed PNT Solution Will Leverage Resilient 5G Networks.

NextNav's NextGen solution will leverage the robust network resilience that MNOs have spent decades developing. The Commission's existing network resilience requirements for mobile network operators create an ideal foundation for delivering resilient PNT.⁵⁴ MNOs must comply with Commission regulations aimed at ensuring network resilience, including sufficient backup

⁵⁰ Gillian Smith, *FirstNet, Built with AT&T, Selects NextNav's Pinnacle Service to Provide Critical Vertical Location Capabilities for First Responders,* NextNav (Feb. 8, 2021), https://nextnav.com/firstnet-vertical-location/; *see also* Gillian Smith, *NextNav Rolls Out Vertical Location Services to 4,400 Cities Across the US, Exceeding FCC's Z-Axis Coverage Requirements Ahead of Schedule*, NextNav (Mar. 26, 2021), https://tinyurl.com/28s3zvrl.

⁵¹ NextNav PFR at A-3 and A-4.

⁵² *Id.* Terrestrial systems cannot accurately estimate the height of UE using multilateration because the transmitters operate from roughly the same plane.

⁵³ See 47 C.F.R. § 9.10(i)(2)(ii)(H); NextNav Comments on Z-Axis Test Bed Results/Recommendations at 65, Table 9.1, Addendum to 911 Location Test Bed, LLC: Report on Stage Z (2018), https://api.ctia.org/wp-content/uploads/2018/08/911-Location-Test-Bed-Stage-Z-Report-Final.pdf ("NextNav Comments on Z-Axis Test Bed Results/Recommendations"); see also L. Bonenberg et al., JRC Science for Policy Report: Assessing Alternative Positioning, Navigation, and Timing Technologies for Potential Deployment in the EU, JRC132737, at 72 (2023), https://publications.jrc.ec.europa.eu/repository/handle/JRC132737 ("JRC Science for Policy Report") (reporting 1.6m accuracy 95% of the time for indoor static readings).

⁵⁴ NOI ¶¶ 53-58 (seeking comment on how to enhance PNT resilience).

power, continuous service availability, rapid recovery, and infrastructure hardening to guard against natural disasters, emergencies, and cyber threats.⁵⁵ The Commission's 2016 Network Resiliency Principles further emphasize the importance of maintaining backup generators and battery systems at base station transmitter locations, particularly for disaster-prone areas.⁵⁶ In addition, section 9.19 of the Commission's rules establishes certain baseline power and redundancy requirements to ensure the continuity of 911 services.⁵⁷ Moreover, wireless networks also have the option of relying on more than one physical backhaul connection, such as multiple fiber connections or fixed microwave links, to help prevent single points of failure.⁵⁸

NextNav's NextGen solution will leverage underlying 5G network resiliency and further build on advantages of terrestrial systems generally in the following four ways.⁵⁹ *First*, the NextGen solution will reduce susceptibility to PNT errors caused by space weather and space-based attacks, as it will be largely unaffected by geomagnetic storms.⁶⁰ High-altitude electromagnetic pulse ("EMP") attacks or targeted anti-satellite operations will be unlikely to inhibit a ground-based PNT network. *Second*, NextGen will rely on stronger signal strength and propagation characteristics as compared to space-based systems, making it more resilient to jamming and interference, including in urban environments and indoor settings.⁶¹ *Third*, 5G's

⁵⁵ See, e.g., 47 C.F.R. §§ 4.9, 4.17, 4.18. The Commission approved new rules in 2022 to further improve the resilience of mobile wireless networks. See In re Resilient Networks, Report and Order and Further Notice of Proposed Rulemaking, 37 FCC Rcd 8059 (2022).

⁵⁶ CSRIC V Working Group 4 Final Report, at 3-4.

⁵⁷ 47 C.F.R. § 9.19.

⁵⁸ *Id.*; see also 47 C.F.R. § 4.18.

⁵⁹ See infra Sec. IV.

⁶⁰ See NextNav PFR at 12; CSRIC V Working Group 4 Final Report at 3-4 (describing NextNav's earlier version of TerraPoiNT as "insensitive to space weather phenomena"); see also NOI ¶ 24.

⁶¹ NextNav Comments, Appendix A, at 18 ("With a backup centralized infrastructure and stronger signal strength, terrestrial PNT solutions, like NextNav's NextGen solution can be more resilient against certain types of disruptions, such as intentional jamming or spoofing attacks targeting GPS signals."); *see also Resilient PNT for Critical Infrastructure*, DHS (Mar. 2020), https://tinyurl.com/26md7g8w.

cybersecurity schemes help validate the authenticity of base stations and can detect spoofers within the network.⁶² These standard 5G authentication schemes help protect against unauthorized access to PNT systems.⁶³ The NextGen solution's PNT receiver will perform integrity monitoring of PNT measurements by validating these measurements against the network configuration assistance provided through the NextGen cloud server. *Fourth*, NextGen's 5G-based terrestrial PNT network will have a physically-distributed architecture with multiple base stations to provide both failover and physical diversity.⁶⁴ The redundancy of multiple base stations will ensure network resilience, as remaining infrastructure will maintain functionality if individual stations fail or become compromised.⁶⁵

C. 5G PRS Is a 3GPP-Standardized Feature Designed to Enable Positioning, and Providing a PNT Solution Requires More Than Simply Transmitting PRS.

NextNav's NextGen solution will leverage the global 5G NR standard, including the 5G NR PRS, to deliver widescale, accurate PNT.⁶⁶ However, offering an accurate PNT solution involves many factors beyond simply transmitting PRS as a positioning reference. To address these complexities, NextNav brings its low-band spectrum licenses with the capacity required to carry the PRS signal,⁶⁷ PNT-related intellectual property, technical expertise, and years of operational experience, including its z-axis capabilities, to enable 3D PNT.

⁶² Prajwol Kumar Nakarmi & Karl Norman, *Detecting False Base Stations in Mobile Networks*, Ericsson (June 15, 2018), https://www.ericsson.com/en/blog/2018/6/detecting-false-base-stations-in-mobile-networks.

⁶³ See generally Mohamed Amine Ferrag et al., Security for 4G and 5G Cellular Networks: A Survey of Existing Authentication and Privacy-Preserving Schemes (Aug. 14, 2017), https://arxiv.org/pdf/1708.04027.

⁶⁴ CSRIC V Working Group 4 Final Report at 3-4.

⁶⁵ *Id.* at 19 ("The high-power TBS signals are more difficult to jam than GPS, and multiple beacon overlap provides geographic redundancy mitigating a single beacon being jammed.").

⁶⁶ See generally NextNav PFR, Appendix A.

⁶⁷ Because 5G PRS uses only a small part of the 5G network's capacity, at least 95 percent of spectrum capacity will remain available for non-PNT 5G services. *See also* NextNav PFR at 27.

Release 16 was the first 3GPP 5G NR Release to include the PRS feature that enables PNT functionality.⁶⁸ This standards-based foundation offers the flexibility and evolutionary path for NextNav to future proof its solution by integrating future 3GPP-specified PNT enhancements into 5G and beyond. PRS enables accurate PNT by using resource elements spread across available 5G NR downlink bandwidth and then transmitting PRS over multiple symbols that can be aggregated to assemble a more accurate measurement.⁶⁹ Using resource elements spread across a wide bandwidth enables better multipath resolution, which improves range accuracy. But leveraging PRS to provide PNT requires careful network design and integration. Each base station must be configured with precise PRS sequences, comb patterns, and muting strategies to mitigate interference and ensure the reception of high-quality PRS signals across the coverage area.⁷⁰ And only the most exacting system architecture and PRS configurations enable the reception of a sufficient number of high-quality PRS signals to achieve the targeted PNT accuracy within the coverage area.

NextNav draws on its experiences developing its PNT beacon system, TerraPoiNT, to inform the network design of its PRS-based NextGen solution. The goal of PRS optimization closely resembles the transmit parameter selection methods used in TerraPoiNT. To optimize that system, NextNav developed advanced network design techniques for the selection of transmit parameters that minimize interference and deliver best-in-class PNT performance.⁷¹ These same network design techniques apply to 5G PRS-based systems as well. In addition to its network

⁶⁸ See generally, European Telecomms. Standards Inst., 5*G*; *NG Radio Access Network (NG-RAN); Stage 2 Functional Specification of User Equipment (UE) Positioning in NG-RAN, (3GPP TS 38.305 version 16.4.0 Release 16)*, ETSI TS 138 305 (2021), https://www.etsi.org/deliver/etsi_ts/138300_138399/138305/16.04.00_60/ts_138305v1604 00p.pdf.

⁶⁹ See id.; NextNav Comments at 16.

⁷⁰ NextNav PFR at A-3; NextNav Comments at 16-17.

⁷¹ NextNav PFR at A-3; NextNav Comments at 16-17.

design expertise, NextNav developed sophisticated receiver algorithms such as high-resolution multipath mitigation algorithms for range determination, as well as specialized techniques for positioning and navigation in a terrestrial network, which are distinct from techniques that might be used for a satellite signal network. These algorithms improve the performance of the positioning and timing system.⁷²

Through these combined innovations—design techniques and signal processing— NextNav has consistently demonstrated superior PNT performance in both controlled trials and real-world demonstrations. ⁷³ NextNav also recently validated the potential of 5G-based approaches by successfully completing demonstrations of its NextGen solution using 5G waveforms, demonstrating precise timing synchronization and robust positioning capabilities.⁷⁴

As 5G NR standards evolve, a 3GPP-based foundation will help ensure that NextNav's PNT solution is future-proof: remaining adaptable and aligned with advancing standards designed not only for current 5G needs, but also to support a smooth migration to more advanced capabilities in 5G and beyond. These strategic design choices leave NextNav well-positioned to support the integration of next-generation PNT functionality as technology and 3GPP standards continue to advance.⁷⁵

⁷² See NextNav PFR at A-8.

⁷³ See NextNav PFR at A-3; 2021 DOT Report; JRC Science for Policy Report; *TerraPoiNT: Terrestrial Navigation System*, Institute of Navigation ("ION") Int'l Tech. Meeting, (2022); *A Novel Method to Transfer Time Using the Terrestrial Timing System*, ION Precise Time and Time Interval Systems and Applications Meeting (2022).

⁷⁴ See generally A-7 to A-10; see also Press Release, NextNav, NextNav Inc. Reports Fourth Quarter and Full Year 2024 Results (Mar. 12, 2025), https://www.globenewswire.com/news-release/2025/03/12/3041754/0/en/NextNav-Inc-Reports-Fourth-Quarter-and-Full-Year-2024-Results.html.

⁷⁵ NextNav PFR at 21 & n.75.

D. NextNav's NextGen Solution Will Deliver Significant Benefits for Critical Infrastructure and Public Safety.

Executive Order 13905 requires that "the Federal Government must foster the responsible use of PNT services by critical infrastructure owners and operators."⁷⁶ The NextGen solution will enable an important backup capability for sectors defined as "critical infrastructure" by the Cybersecurity and Infrastructure Agency ("CISA"), including Public Safety as part of the Emergency Services Sector.⁷⁷ For instance, the NextGen solution will be capable of providing positioning consistent with the needs for asset tracking of regulated and often hazardous materials in the chemical, nuclear, energy, healthcare, and critical manufacturing sectors. This includes the potential to monitor positioning through the domestic supply chain, which would require a mobile solution with a widescale service footprint. Integration into consumer end-user devices like smartphones would also support the safety and security needs of individuals working in critical infrastructure sectors. ⁷⁸ The NextGen solution will also be capable of providing timing functionalities to the financial services, energy, and information technology sectors needed to ensure synchronization within these critical networks.

Building on its history of providing location services for first responders, NextNav is particularly well suited to help fill an important gap in public safety in the U.S.⁷⁹ The integration of PNT that will be enabled by NextNav's NextGen solution promises to help overcome the

⁷⁶ 2020 Executive Order on PNT Resiliency § 1.

⁷⁷ Critical Infrastructure Sectors, CISA, https://www.cisa.gov/topics/critical-infrastructure-security-and-resilience/ critical-infrastructure-sectors (last visited Apr. 16, 2025).

⁷⁸ See, e.g., Home Care Safety Risks, Katana Safety, https://katanasafety.com/health-social-care/ (last visited Apr. 22, 2025); Stacey Manclark, *The Lone Worker App That Improves Workforce Safety and Monitoring*, OK Alone (Jan. 21, 2025), https://www.okaloneworker.com/lone-worker-app/; *Protect Your People and Assets in the Oil & Gas Sector*, Vismo, https://www.vismo.com/us/sectors/oil-gas/ (last visited Apr. 22, 2025).

⁷⁹ See NOI ¶¶ 33, 35, 37-39.

limitations of current GPS systems in public safety.⁸⁰ More reliable location accuracy will not only help ensure continuity of service to end users, but also enable heightened situational awareness for first responders. The capacity of an incident commander to know a team's location as well as the ability of every first responder to know the way into—and out of—hazardous conditions can mean the difference between life and death.⁸¹

NextNav's NextGen solution will significantly boost emergency services through enhanced horizontal (x- and y-axis) and vertical (z-axis) location accuracy, enabling first responders to better identify locations of emergencies within multi-story buildings. The NextGen solution will exceed the Commission's horizontal and vertical location requirements for 911 calls.⁸² Height Above Terrain (also known as Height Above Ground Level or HAGL) provides more actionable location data, compared to Height Above Ellipsoid, but also requires an accurate estimate of ground level above the ellipsoid.⁸³ The NextGen solution will provide x/y location accuracy such that terrain estimate errors caused by horizontal x/y errors no longer limit the accuracy of Height Above Ground Level.⁸⁴ NextGen will also offer enhanced indoor coverage. These features, in turn, will enable improved location-based routing and situational awareness, better equipping first responders to rapidly and accurately address emergency responses, ultimately enhancing the effectiveness of public safety operations.⁸⁵

⁸⁰ See also NextNav Comments, Appendix A, at 17 ("The combination of all the characteristics of a terrestrial PNT solution...is an important step in enabling the public safety ecosystem, providing the PSAP, agencies, and first responders with the tools needed for complementary and backup system for Emergency Services.").

⁸¹ See NextNav Comments at 5.

⁸² See 47 C.F.R. § 9.10(i)(2)(i)(A), (i)(2)(ii)(H); NOI ¶ 29; NextNav PFR at 26-28.

⁸³ See NextNav Comments, Appendix A, at 16. In that pleading, NextNav used the term "Height Above Terrain" rather than "Height Above Ground Level."

⁸⁴ Id.

⁸⁵As NextNav determined in its prior simulation included in its PFR, NextNav's NextGen solution can provide x/y location accuracy down to 10 meters or less, along with z-axis down to +/- 3 meters and promises more accurate location readings and, by extension, more timely emergency responses. *See* NextNav PFR at A-9; *see also* NextNav

Public safety users,⁸⁶ along with other companies providing services to first responders,⁸⁷ agree about the value of NextNav's solution. NextGen will directly address critical considerations by improving emergency response times, enhancing location accuracy, increasing critical situational awareness, and bettering 911 dispatch systems generally—all needs articulated by public safety agencies themselves. For example, the California Fire Chiefs Association explained how NextNav's solution could improve the availability and accuracy of indoor geolocation, which

Comments, Appendix A, at 10 (explaining that "PSAPs today are just now beginning to use z-axis as it is delivered via Height Above Ellipsoid (HAE) but must employ translation tools to make this location coordinate 'actionable'"). Table 1 of this Technical Appendix also summarized the simulated positioning and timing results for the urban and rural macro indoor scenarios at a 95% confidence level. Based on prior testing, NextNav believes that its next-generation system will be able to achieve +/- 1.8 meters on the z-axis, 80% of the time. *See* NextNav Comments on Z-Axis Test Bed Results/Recommendations at 126-29; *see also* JRC Science for Policy Report (reporting 1.6m accuracy 95% of the time for indoor static readings).

⁸⁶ See, e.g., City of Springfield, Ohio Fire Rescue Division, Comment on NextNav Petition for Rulemaking, WT Docket No. 24-240, RM-11989 (Feb. 19, 2025) ("City of Springfield Comments") ("The proposed use of the 900 MHz spectrum presents a vital opportunity to improve these capabilities. Enhanced location accuracy will not only assist in reducing response times but also ensure that our personnel are operating as safely and efficiently as possible, especially during high-profile events that bring an influx of visitors to our city."); Nevada Division of Emergency Management, Comment on NextNav Petition for Rulemaking, WT Docket No. 24-240, RM-11989 (Jan. 31, 2025) (writing "to express our support for the Commission's continued exploration of technologies that enhance location accuracy for emergency response [because] [a]ccurate and reliable location information is foundational to public safety operations... [and] [a]ccurate situational awareness and navigation are critical for [first responders'] safety and effectiveness. An enhanced system, as envisioned in the NextNav petition, could enable real-time tracking of responders within structures, reducing the risks of disorientation and improving personnel accountability."); Fairfax County Department of Public Safety Communications, Comment on NextNav Petition for Rulemaking, WT Docket No. 24-240, RM-11989 (Sept. 18, 2024) ("Not only would a terrestrial solution provide a significant improvement for indoor location from current options available today through current GPS technology, but it would also improve navigation in urban canyons created by high rise structures in urban environments today, thereby ensuring the routes are accurate and most expeditious for responders."); Fire Chiefs' Association of Massachusetts, Inc., Comments on NextNav Petition for Rulemaking, WT Docket No. 24-240, RM-11989 (Sept. 5, 2024) ("I would like to encourage the Commission to proceed forward on this matter as the potential benefits to Public Safety are important to our agency and stakeholders."); San Bernardino County Fire Protection District, Comment on NextNav Petition for Rulemaking, WT Docket No. 24-240, RM-11989 (Sept. 5, 2024) (same); Arlington County Fire Department, Comment on Notice of Inquiry, WTB Docket No. 25-110 (Apr. 22, 2025) ("By leveraging the 900 MHz spectrum and 5G deployments, there are present solutions that enhance x- and y-axis location accuracy and provides vertical location, helping to direct responders to the floor and position of an emergency--something that is currently a major gap in urban environments and indoor operations with limited GPS signal.").

⁸⁷ See, e.g., Convey911, Comment on NextNav Petition for Rulemaking, WT Docket No. 24-240 (Jan. 28, 2025) ("Convey911 Comments") ("By enabling a terrestrial alternative to GPS, NextNav's proposed network will provide the enhanced location accuracy public safety agencies need to save lives and improve response efficiency. … NextNav's system is not just a standalone solution-it is a foundational component of the broader ecosystem of public safety software that our customers depend on daily. The advanced location services provided by this network will enhance the effectiveness of 911 dispatch systems, GIS platforms, and responder tracking solutions, directly impacting response times and operational efficiency."); 3AM Innovations, Inc., Comment on NextNav Petition for Rulemaking, WT Docket No. 24-240 (Dec. 20, 2024) (same)

would be a "gamechanger" for firefighting.⁸⁸ Similarly, Fairfax County in Virginia emphasized that NextNav's solution will "improve navigation in urban canyons created by high rise structures in urban environments today, thereby ensuring the routes are accurate and most expeditious for responders."⁸⁹ The Texas 9-1-1 Alliance also noted how an enhanced system for accurate situational awareness and navigation improves public safety answering points ("PSAPs") and benefits public safety agencies by "[p]rovid[ing] dispatchable locations…essential for multistory buildings," "[e]nhance[ing] personnel tracking…during complex operations," and "[r]educ[ing] call-processing time at PSAPs by delivering more precise location data."⁹⁰

VI. TARGETED ADJUSTMENTS TO THE COMMISSION'S RULES WILL ENABLE A WIDESCALE, TERRESTRIAL COMPLEMENT AND BACKUP TO GPS WHILE CONTINUING TO ACCOMMODATE CURRENT USES OF THE LOWER 900 MHZ BAND.

The Commission explicitly acknowledges that the proceeding exploring NextNav's PFR is

ongoing and independent of this inquiry.⁹¹ NextNav references aspects of its proposal in greater

detail here to respond to specific questions raised in this NOI. The NextNav PFR proposed that the

FCC:

- Update the 902-928 MHz band plan to support a 15-megahertz spectrum block with a 5megahertz uplink in the 902-907 MHz band and 10-megahertz downlink in the 918-928 MHz band;
- Revise the outdated rules for Multilateration Location and Monitoring Service to permit flexible use at traditional macro-cell macro power limits, allowing the band to support both PNT and mobile broadband applications;
- Arrange a spectrum swap to convert NextNav's current licensed spectrum holdings into a single nationwide license; and
- Ensure protection for incumbent licensees and federal operations.⁹²

⁸⁸ Comments of California Fire Chiefs Association, WT Docket No. 24-240, RM-11989 (Sept. 13, 2024).

⁸⁹ Comments of Fairfax County Department of Public Safety Communications, WT Docket No. 24-240, RM-11989 (Sept. 18, 2024).

⁹⁰ Comments of the Texas 9-1-1 Alliance, WT Docket No. 24-240, RM 11989, at 2-3 (Feb. 11, 2025).

⁹¹ NOI ¶ 29 n.87.

⁹² NextNav PFR at iv.

Adoption of these targeted adjustments will enable a terrestrial PNT solution capable of complementing and backing up GPS across the United States.

A. The Commission Has a Long History of Embracing Innovation and Updating Outdated Service Rules to Support Flexible Use.

The Commission's prompt action to issue an NPRM based on the already-robust record in the NextNav PFR proceeding would be consistent with the Commission's authority to modify spectrum allocation and service rules and modify existing licenses, as well as with its history of updating its rules to support flexible use.⁹³ The Lower 900 MHz band also presents the nearestterm opportunity for the Commission to take swift, decisive action "to rapidly support new and complementary or alternative PNT solutions that will maintain U.S. global leadership in this area and mitigate harmful GPS disruptions caused by foreign adversaries."⁹⁴ NextNav is focused on "addressing [the] problem … [of] finding … complement[s] to GPS to achieve resilient PNT,"⁹⁵ and suggests that parties that present only objections to NextNav's proposal, while not presenting detailed technical analyses to support their objections or meaningfully seeking to address potential concerns, are in conflict with the Commission's stated objective in this proceeding.

B. NextNav Is Working with Other Incumbent Licensees to Explore Win-Win Solutions.

NextNav has repeatedly affirmed its commitment to work with non-M-LMS licensees operating systems in the Lower 900 MHz band to develop coexistence solutions. To the extent that

⁹³ See, e.g., NOI ¶¶ 4, 54, 58; In re Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, Report and Order and Further Notice of Proposed Rulemaking, 19 FCC Rcd 14165, 14180-81 ¶ 30 (2004); In re Review of the Commission's Rules Governing the 896-901/935-940 MHz Band, Report and Order, Order of Proposed Modification, and Orders, 35 FCC Rcd 5183, 5203-04 ¶ 44 (2020); In re Improving Public Safety Communications in the 800 MHz Band, Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order, 19 FCC Rcd 14969, 15010-13 ¶¶ 63-68 (2004).

⁹⁴ NOI ¶ 16.

⁹⁵ *Id.* ¶ 17 n.52.

coexistence requires retuning and other equipment-related costs, NextNav is committed to accommodations, including financial and technical support, that contribute to a smooth transition to a new band plan.⁹⁶

Over the past year, NextNav has engaged in extensive outreach to Lower 900 MHz LMS licensees, including the railroad and tolling industry, in pursuit of technical and business solutions. This outreach has included NextNav's taking financial responsibility for coexistence testing. NextNav suggests that prompt issuance of an NPRM with concrete proposals for the Lower 900 MHz band, building on the technical record in response to the NextNav PFR, will focus all parties on accelerating business and technical discussions to reach win-win solutions to mitigate any potential interference.⁹⁷

C. Replacing Authorized M-LMS Operations with 5G Is Unlikely to Cause Unacceptable Interference to Unlicensed Operations.

NextNav recently submitted a comprehensive engineering study, titled 5G NR and Unlicensed Part 15 Technologies in the Lower 900 MHz Band, concluding that 5G operations will not cause unacceptable levels of interference to unlicensed Part 15 devices in the 902-928 MHz band.⁹⁸ The study examined whether replacing authorized M-LMS operations with 5G would be

⁹⁶ See NextNav PFR at 30-32; NextNav Comments at 22; NextNav Reply Comments at 50, 52-53; Dr. John Kim et al., 5G NR and Unlicensed Part 15 Technologies in the Lower 900 MHz Band, NextNav (Feb. 27, 2025) ("NextNav Technical Study"), attached to Letter from Renee Gregory, NextNav Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 24-240 (Feb. 27, 2025); see also Press Release, NextNav, NextNav Lays Out New Vision for Complement and Backup to GPS with Additional Spectrum for Broadband Services (Apr. 16, 2024), https://nextnav.com/lays-out-new-vision/; Press Release, NextNav, FCC Takes Important Step Towards New Band Plan and Creation of Complement and Backup to GPS (Aug. 6, 2024), https://nextnav.com/fcc-public-notice-august-2024/; Letter from Renee Gregory, Vice President of Regulatory Affairs, NextNav Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket 24-240 (Mar. 28, 2025), https://www.fcc.gov/ecfs/document/103282758003889/1.

⁹⁷ NOI ¶ 34 ("Does the proposed PNT technology pose interference implications for other spectrum users? If so, how could the impact of any such interference be mitigated?").

⁹⁸ See generally NextNav Technical Study.

likely to cause unacceptable interference to unlicensed operations that already thrive in crowded environments—and concluded that it would not.⁹⁹

The study first explored some of the features intrinsic to 5G that promote coexistence with unlicensed operations and analyzed scenarios involving 5G, M-LMS, and Part 15 devices.¹⁰⁰ The 902-928 MHz band is a complex environment, with high levels of pre-existing emissions from unlicensed Part 15 devices, as well as licensed M-LMS and non-M-LMS operations, amateur radio, and ISM applications.¹⁰¹ The study found that the introduction of 5G operations would not materially alter this emissions landscape. Any additional emissions 5G deployments might generate would be marginal in comparison to the emissions already present and, based on the operational parameters of the San Francisco M-LMS deployment, would have no greater effect on unlicensed users than authorized, licensed M-LMS operations.¹⁰² Finally, the features and operations of unlicensed technologies, such as the five examined in the report, namely LoRaWAN, RAIN RFID, Wi-Fi HaLow, Wi-SUN, and Z-Wave, include capabilities such as frequency agility, dynamic channel selection, and robust receiver sensitivities that enable coexistence with licensed and unlicensed operations.¹⁰³

NextNav will carefully review and consider any detailed technical information and analyses related to unlicensed operations in the band, and similarly suggests that an NPRM will focus all parties on addressing any outstanding interference questions. If any parties provide technical analyses based on sound underlying assumptions demonstrating unacceptable

⁹⁹ See NextNav Technical Study at 12-13.

¹⁰⁰ *Id.* at 9-10.

¹⁰¹ *Id.* at 58 n.121 ("From the underlying interference condition perspective, these Part 15 devices are not only subjected to interference from one another, but also from other non-Part 15 systems in the band such as non-M LMS, amateur radio, and ISM devices.").

¹⁰² See id. at 12-18.

¹⁰³ See id. at 22-49.

interference to unlicensed operations as a result of replacing authorized M-LMS operations with 5G and suggest a mitigation solution, NextNav will work with them to validate concerns and further explore solutions.¹⁰⁴

VII. CONCLUSION

A system-of-systems approach to resilient PNT integrating multiple space-based and terrestrial-based technologies is essential. The Commission's focus and prompt action as part of a whole-of-government approach is indeed "necessary to ensur[ing] that the [United States'] use of PNT systems supports our national and economic security."¹⁰⁵ NextNav is prepared to do its part. NextNav's 5G-powered NextGen solution will offer powerful scalability, availability for critical infrastructure, public safety, and consumers, and enhanced PNT resilience—at no cost to taxpayers. The Commission's long-standing embrace of market forces and flexible use spectrum, paired with a sound, fact-based, and engineering-driven approach to spectrum policy, positions it to realize the full value of this opportunity.

Respectfully submitted,

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April 28, 2025

 $^{^{104}}$ NOI ¶ 34 ("Does the proposed PNT technology pose interference implications for other spectrum users? If so, how could the impact of any such interference be mitigated?").

¹⁰⁵ *Id.* \P 4.