Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20544

In the Matter of	)	
	)	
Wireless Telecommunications Bureau and	)	WT Docket No. 24-240
Office of Engineering and Technology Seek	)	
Comment on NextNav Petition for	)	RM-11989
Rulemaking	)	
	)	

OPPOSITION OF THE INTERNATIONAL BRIDGE, TUNNEL & TURNPIKE ASSOCIATION

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September 5, 2024

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INTRODUCTION AND SUMMARY

The International Bridge, Tunnel & Turnpike Association ("IBTTA")[1] respectfully responds to the August 6, 2024 *Public Notice* seeking comment on NextNav Inc.'s ("NextNav") 902–928 MHz band ("Lower 900 MHz Band") Petition for Rulemaking.[2] The Lower 900 MHz Band is a vital, workhorse spectrum band for consumers, government, and industry. The band has been a success because the Commission's rules "facilitate sharing . . . by multiple licensed services as well as unlicensed devices."[3] This framework establishes sharing of the Lower 900 MHz Band between multilateration Location and Monitoring Service ("M-LMS") and non-multilateration Location and Monitoring Service ("non-M-LMS"), the latter being used by IBTTA's members to operate electronic tolling systems that deliver significant benefits nationwide.

NextNav's proposal would dramatically alter the Lower 900 MHz Band by permitting NextNav to deploy a high-power 5G and terrestrial positioning, navigation, and timing ("PNT")

[1] IBTTA is the worldwide association for the owners and operators of toll facilities and the businesses that serve them. Founded in 1932, IBTTA has members in more than 20 countries on six continents. Through advocacy, thought leadership and education, members are implementing state-of-the-art, innovative user-based transportation financing solutions to address the critical infrastructure challenges of the 21st Century.

[2] *Wireless Telecommunications Bureau and Office of Engineering and Technology Seek Comment on NextNav Petition for Rulemaking*, Public Notice, DA 24-776, WT Docket No. 24-240, RM-11989 (rel. Aug. 6, 2024) ("*Public Notice*"); *see* NextNav Petition for Rulemaking, Enabling Next-Generation Terrestrial Positioning, Navigation, and Timing and 5G: A Plan for the Lower 900 MHz Band (902-928 MHz) (filed Apr. 16, 2024) ("NextNav Petition").

[3] *Amendment of the Commission's Part 90 Rules in the 904-909.75 and 919.75-928 MHz Bands*, Order, 29 FCC Rcd. 6361, 6361 ¶ 1 (2014) ("NPRM Termination Order") (concluding that prior proposals to significantly change the Lower 900 MHz Band rules, including from NextNav's license-holding subsidiary, "do not merit further consideration at this time").

network. Because this proposal would substantially disrupt the current ecosystem of diverse operations in the band, the Commission should deny this Petition.

NextNav's Petition is flawed for three fundamental reasons. *First*, NextNav incorrectly assumes that the band is "largely underused" by incumbents, such as non-M-LMS.[4] In reality, non-M-LMS operations have flourished in the Lower 900 MHz Band, enabling a wide range of applications, such as electronic tolls; automated commercial vehicle clearance; vehicle access and traffic management; railway car monitoring; monitoring and controlling equipment in warehouses; as well as access control at parking lots, airports, and residential communities. These technologies operate alongside unlicensed Part 15 devices in the band, which have also proliferated in recent years to create a vibrant and varied network of applications—from baby monitors to utility meter monitors, wireless speakers to wireless security systems, and a plethora of Internet of Things ("IoT") devices supporting consumers, industry, health, military, and government.

North American electronic tolling operations rely exclusively on the Lower 900 MHz Band to deliver nationwide transportation benefits to consumers, provide vital public revenue for transportation infrastructure investment and operations, and empower roadway operators to advance their environmental goals. Lower 900 MHz Band tolling systems facilitate efficient transportation, reduce congestion, ensure travel time reliability, cut daily commute times, allow state and local governments to fund transportation infrastructure, and greatly reduce pollution and fuel consumption.

Second, NextNav's proposed high-power operations pose a substantial risk of harmful interference to licensed electronic tolling systems, undermining their operations. The proposed

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[4] NextNav Petition at 20.

changes would also significantly constrain future electronic tolling deployments, blocking planned expansions by state and local authorities. Many of these risks cannot be mitigated, including by in-band retuning or relocation to other spectrum bands. Nonetheless, the NextNav Petition does not acknowledge these harms, does not include a feasible plan to address them, and does not include the testing and technical analysis needed to justify the proposal.

Finally, NextNav's proposal is counter to sound spectrum policy. The core premise of NextNav's proposal is that because it is uneconomical for NextNav to operate its existing standalone terrestrial PNT network in the Lower 900 MHz Band, the Commission should displace all other users to authorize a high-power 5G network with the goal of subsidizing NextNav's PNT operations. IBTTA's members take no position on whether the public interest requires a terrestrial PNT network, or whether an entity—NextNav or another company—could ever operate a terrestrial PNT network economically. But if the public interest does require the operation of a non-economic PNT service, NextNav should make its case to Congress for a direct subsidy rather than asking the Commission to use spectrum policy to create an indirect subsidy, particularly when that indirect subsidy would disrupt vital public incumbent operations and preclude other beneficial band uses.

I. ELECTRONIC TOLLING OPERATIONS USE THE LOWER 900 MHZ BAND INTENSIVELY TO PROVIDE SIGNIFICANT BENEFITS TO AMERICANS.

NextNav's Petition assumes that current Lower 900 MHz Band operations are not extensive or important enough to protect from the harmful interference and disruption a new high-powered network would inflict. NextNav recognizes that the Lower 900 MHz Band hosts non-M-LMS operations, which "support[] electronic highway tolling, railroad car tracking, and vehicle access to restricted areas,"[5] but fails to account for both the full magnitude of these critical non-M-LMS operations and the need to accommodate future deployments in additional locations in urban and rural areas. Tens of millions of Americans use electronic tolling systems every day, providing substantial benefits to consumers, state and local governments, and the environment.

Toll operators rely on the Lower 900 MHz Band for short-range radio communications that are integral to electronic tolling operations. Specifically, electronic tolling facilities communicate with transponders, or tags, mounted in vehicles, enabling quick and accurate identification as vehicles pass through toll points. These systems thereby facilitate the seamless automation of toll collection, allowing drivers to pay tolls by simply driving through toll plazas and other toll collection points without stopping. This automation fast-tracks the otherwise manual payment process.

Automated electronic tolling systems using licensed non-M-LMS spectrum have proliferated in the U.S. in the past three decades. IBTTA members employ about 120 million electronic tolling tags today in the U.S. that are read at tens of thousands of tolling points on American roads. In 2023, U.S. electronic tolling processed more than 5 billion transactions. E-ZPass—the largest interoperable electronic toll system in the world, with operations in the Eastern, Midwestern, and Southern portions of the United States—reports that over 59 million E-ZPass devices are in circulation today.[6] The Central United States Interoperability Hub encompasses ten toll agencies in four states (Texas, Oklahoma, Kansas, and Colorado), with more than 23 million transponders.

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5 *Id.*

6 E-ZPASS GRP., https://www.e-zpassiag.com/ (last visited Aug. 21, 2024).

The fast expansion of electronic tolling operations has generated enormous benefits to consumers, state and local governments, and the environment.

Consumer Benefits. The expansion of electronic tolling operations has had a profound, positive impact on Americans' daily lives. The most recognizable benefit for motorists is reduced traffic congestion, which results in quicker trips and more reliable driving times. By removing cash transactions and enabling vehicles to pass through toll plazas and similar facilities without coming to a complete stop, electronic tolling enhances both convenience and efficiency during travel. In Open Road Tolling systems—in which electronic toll transactions are processed without toll booths—motorists can pass under equipment mounted overhead at highway speeds without needing to slow down. This results in significant efficiencies in traffic flow. For example, a typical manual payment toll lane at a tollbooth can only handle 350 vehicles per hour.[7] By comparison, an electronic tolling system located in that same lane in a traditional plaza configuration with tollbooths can handle 1,200 vehicles per hour, and an Open Road Tolling configuration with free-flow traffic can handle 1,800 vehicles per hour.[8] In addition, electronic tolling systems can also promote interoperable standards for toll operations across states, creating a smoother interstate experience for drivers. The outcome is a uniform travel experience for motorists travelling state-to-state as well as increased business efficiencies for commercial fleets and road operators that benefit from common data exchange standards and business rules.

Drivers have already benefited from the significant efficiencies of electronic tolling systems. In New Jersey, for example, the implementation of electronic tolling reduced delay for all vehicles passing through toll plazas by approximately 85 percent, for a savings of 2.1 million

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7 *Electronic Toll Collection Systems*, TEX. A&M TRANSP. INST., https://policy.tti.tamu.edu/strategy/electronic-toll-collection-systems/ (last visited Aug. 21, 2024).

8 *Id.*

vehicle-hours per year.[9] In addition, by eliminating long lines for cash transactions, these benefits are realized by *all* drivers—not just electronic tolling users. In Florida, the implementation of Open Road Tolling decreased delays by 50 percent for cash customers and 55 percent for automatic coin machine customers, while also boosting speeds in the express lanes by 57 percent.[10]

Finally, and perhaps most importantly, electronic tolling systems greatly increase the overall safety of tolling plazas and other facilities. By reducing or eliminating the need to stop-and-go, and merge into different toll lanes, electronic tolling significantly reduces the likelihood of rear-end and side-swipe collisions.[11] The safety benefits of electronic tolling also reduce the likelihood of secondary crashes. Not only do these benefits protect motorists from injuries and property damage, but they also reduce the traffic delays caused by incident response and clearance.

State and Local Government Benefits. Toll roads generate a vital source of revenue for state and local governments, allowing them to invest in maintaining, modernizing, and

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[9] *Implementation of the E-ZPass Electronic Toll Collection System on the New Jersey Turnpike Reduced Delay for All Vehicles by 85 Percent Saving Approximately 2.1 Million Hours Per Year*, INTELLIGENT TRANSP. SYS., U.S. DEPT. OF TRANSP. (Sept. 7, 2001), https://www.itskrs.its.dot.gov/2007-b00421.

[10] *In Florida, the Addition of Open Road Tolling (ORT) to an Existing Electronic Toll Collection (ETC) Mainline Toll Plaza Decreased Delay by 50 Percent for Manual Cash Customers and by 55 Percent for Automatic Coin Machine Customers, and Increased Speed by 57 Percent in the Express Lanes*, INTELLIGENT TRANSP. SYS., U.S. DEPT. OF TRANSP. (May 30, 2008), https://www.itskrs.its.dot.gov/2008-b00553.

[11] *See generally* Muamer Abuzwidah & Mohamed Abdel-Aty, *Safety Assessment of the Conversion of Toll Plazas to All-Electronic Toll Collection System*, 80 ACCIDENT ANALYSIS & PREVENTION 153 (2015), https://pubmed.ncbi.nlm.nih.gov/25909391 (finding that the conversion from a manual payment tolling plaza to a ETC system resulted in a 76 percent reduction in total crashes, a 75 percent reduction in fatal-and-injury crashes, and a 68 percent reduction in property-damage-only crashes in Florida).

improving transportation infrastructure. IBTTA reports 2023 toll revenue of more than $23 billion on American roads in 33 states, which supports transportation infrastructure investment and operations. E-ZPass reports that its electronic tolling efforts have resulted in over $13.8 billion dollars in electronic toll revenues across 20 states.[12] And Illinois Tollway reports that its electronic tolling system alone collects $1.6 billion each year. Implementing electronic tolling systems increases state and local resources for infrastructure investment through user fees that augment a variety of federal and state taxes used for transportation. In addition, electronic tolling systems are generally more cost effective than staffed toll booths with cash collection, making toll revenue collection efficient. By minimizing the need for physical infrastructure and personnel dedicated to toll collection—as well as eliminating the costs of handling and protecting cash on a daily basis—electronic tolling reduces the transaction processing costs for public agencies, reducing government expenditures on these services. In addition, electronic tolling systems can facilitate variable and dynamic pricing solutions, which can optimize increasingly scarce road capacity with sophisticated demand management tools rooted in economic incentives. The outcome of dynamic pricing is revenue for state and local governments based on real-time demand as well as more efficient and reliable travel across the entire transportation system. Importantly, electronic tolling has provided a highly reliable way to collect revenue, allowing repayment of bonds and roadway transportation infrastructure expansion to meet new demand.

Environmental Benefits. Electronic toll collection also produces enormous environmental benefits. By eliminating stop-and-go driving associated with manual toll

[12] *About Us*, E-ZPASS GRP., https://www.e-zpassiag.com/about-us/overview (last visited Aug. 27, 2024).

payments and reducing traffic congestion, electronic tolling significantly reduces fuel consumption and consumers' dependence on harmful fossil fuels. Not only does this save Americans money at the pump, but it also reduces emissions and lowers air pollution. This is especially crucial for urban toll facilities serving large commuter populations.

The act of accelerating from a complete stop to highway speeds results in significantly higher levels of vehicle emissions than the resulting exhaust released at today's constant highway speeds through Open Road Tolling points. Transportation is the number one source of greenhouse gas emissions in the United States,[13] but the move of many tolling facilities to cashless free-flow operations has contributed to global climate decarbonization improvements. The benefits are evident everywhere but are particularly important in heavily trafficked urban areas, where air quality from vehicular traffic has caused elevated cases of asthma and other respiratory disease.

These environmental benefits are significant and quantifiable. For instance, the shift to electronic tolling systems in Baltimore, Maryland reduced hydrocarbons and carbon monoxide *by half* and reduced nitrogen oxide by approximately 16 percent.[14] Similarly, a study of Boston,

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[13] *See Overview of Greenhouse Gases: Carbon Dioxide Emissions*, EPA (last updated Apr. 11, 2024), https://www.epa.gov/ghgemissions/overview-greenhouse-gases.

[14] Anthony A. Saka & Dennis K. Agboh, *Assessment of the Impact of Electronic Toll Collection on Mobile Emissions in the Baltimore Metropolitan Area* (81st Transp. Rsch. Bd. Ann. Mtg., 2002), available at https://rosap.ntl.bts.gov/view/dot/60711; *see also Electronic Toll Collection Can Reduce Black Carbon Emissions by up to 50 Percent Compared to Manual Toll Collection*, INTELLIGENT TRANSP. SYS., U.S. DEPT. OF TRANSP. (Aug. 24, 2022), https://www.itskrs.its.dot.gov/2022-b01669 (finding that ETC systems can reduce black carbon emissions by up to 50 percent); *see also The Implementation of an Electronic Toll Collection (ETC) System Reduced Harmful Emissions of Airborne Particulate Matter And Associated Cancer Risk by 49.3 Percent*, INTELLIGENT TRANSP. SYS., U.S. DEPT. OF TRANSP. (Mar. 30, 2021), https://www.itskrs.its.dot.gov/2021-b01545 (finding that particulate matter and associated cancer risk was reduced by nearly 50 percent at ETC systems in Taiwan).

Massachusetts' tolling plazas found that Open Road Tolling reduced particulate matter by up to 61 percent and reduced energy consumption by up to 28 percent.[15]

All in all, electronic tolling systems provide a faster, greener, and more economical way to navigate toll roads and serve a strong public need. The Commission's spectrum policies should ensure that Americans continue to benefit from electronic tolling system deployments.

II. NEXTNAV'S PROPOSAL WOULD SUBSTANTIALLY DEGRADE ELECTRONIC TOLLING OPERATIONS.

The Lower 900 MHz Band rules authorize non-M-LMS licensees, such as tolling authorities, to use 14-megahertz of spectrum, including two-megahertz shared on a co-equal basis with M-LMS operators such as NextNav, whose downlink operations may not exceed 30 watts.[16] But NextNav's proposal would (1) reduce the total amount of spectrum available for all non-M-LMS operations from 14-megahertz to 11-megahertz; and (2) confine the remaining non-M-LMS spectrum to the duplex gap of a new service entitled to operate at the "full macro power limits and standard out-of-band emissions limits" of a high-power wide area network.[17]

The *Public Notice* appropriately questions "whether any incumbents could continue to operate in [this] proposed 11 MHz segment of the band," as well as the "potential effects" of proposed NextNav mitigation measures.[18] NextNav's proposal would significantly degrade electronic tolling operations, including harms that could not be mitigated by compensation, retuning, or relocation.

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[15] *Study of Electronic Open Road Tolling Application near Boston Finds Reductions of Vehicle' Particulate Matter by up to 61 Percent and Energy Consumption by up to 28 Percent*, INTELLIGENT TRANSP. SYS., U.S. DEPT. OF TRANSP. (May 26, 2023), https://www.itskrs.its.dot.gov/2023-b01750.

[16] 47 C.F.R. § 90.357(a).

[17] *Public Notice* at 5–6 (citing NextNav Petition at 29).

[18] *Id.* at 4.

IBTTA has had detailed discussions with its membership's tolling technology and engineering staff who are the national experts in tolling systems. These experts universally agree that NextNav's proposal presents significant risks to electronic tolling operations that will be virtually impossible to mitigate without significant performance degradation. Even if a retuning or relocation solution were identified, it would generate massive and widespread disruption involving replacement of electronic tolling systems—including roadside equipment, application software to integrate subsystems, and transponders in vehicles—as well as enormous customer challenges in managing a transition. But nothing that NextNav has shared about the details of its proposal has provided evidence that a workable coexistence solution is feasible.

A. The Proposed High-Power Service Would Dramatically Alter the Lower 900 MHz Band, Posing a Significant Risk to Electronic Tolling Systems.

As described above, electronic toll collection using non-M-LMS spectrum works by deploying antenna systems at facilities to communicate with transponders, or tags, mounted in vehicles (e.g., in the interior windshield of a car).[19] Modern electronic tolling systems are Part 90 licensed uses of frequencies throughout the Lower 900 MHz Band sub-bands that the Commission allotted for non-M-LMS, and toll operators use this spectrum to support several important functions.

Tolling systems support communications using a variety of signal protocols, the most popular of which are the time division multiplexing ("TDM") standard for tolling, the International Organization for Standardization 18000-63 ("6C"), and Super eGo®. Tolling systems also significantly use the Title 21 and ATA ("American Trucking Association") protocols in the U.S. and the American Society for Testing and Materials ASTMv6 protocol in

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[19] *See supra* Section I.

Canada. The ASTMv6 protocol is also used for commercial vehicle credentialing and clearance on U.S. highways. The effectiveness of these protocols across North America has driven high adoption of in-vehicle toll transponders (i.e., tags), which help ensure highly accurate and reliable high-speed transactions. The evolution of multi-protocol roadside readers also eliminates the need for consumers to use multiple transponders, consistent with Congress's goal of nationwide interoperability for electronic tolling.[20]

In addition, Open Road Tolling deployments use overhead antenna arrays with multiple antennas deployed at close intervals—typically, every six feet—to allow two antennas to cover each 12-foot-wide road lane. Antennas in an array employ multiple different frequencies, enabling interrogation of vehicle transponders in many lanes traveling at prevailing highway speeds to accommodate numerous transactions simultaneously. Tolling systems also must operate with an extremely high degree of reliability and accuracy, as typical contractual performance standards require positive transponder detection and vehicle association at least 99.95 percent of the time. Systems must satisfy these requirements at highway speeds of up to 100 mph using a detection window of approximately 80 milliseconds.

State and local governments, public toll authorities, private toll operator concessions, and the companies that support them designed their electronic tolling systems using the co-existence framework in the Commission's current rules, which contemplates relative parity of operations rather than a single high-power incumbent.[21] Thus, introducing a new substantially higher source

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[20] *See, e.g.*, Moving Ahead for Progress in the 21st Century Act, Pub. L. No. 112-141, Div. A, Title I, § 1512(b), 126 Stat. 405, 572 (2012) (contemplating that tolling systems on Federal-aid highways "implement technologies or business practices that provide for the interoperability of electronic toll collection programs").

[21] *See, e.g.*, 47 C.F.R. § 90.353(d) (describing the co-equal sharing between M-LMS and non-M-LMS operations).

of energy from nearby wide-area network transmissions in directly adjacent sub-bands would be highly disruptive to the non-M-LMS services that currently have equal status with the existing M-LMS services.

First, NextNav's proposed higher downlink power limits pose a serious risk of harmful interference. NextNav has proposed base station power limits of up to one thousand watts/megahertz (and two thousand watts/megahertz in rural areas) effective radiated power ("ERP") for operations in the contemplated 918–928 MHz downlink band.[22] This would permit up to 20,000 watts ERP in the proposed ten-megahertz channel—*over 600 times the existing 30-watt limit for NextNav's current operations*—directly abutting tolling operations in the 907–918 MHz sub-band.

Second, NextNav's proposed band reconfiguration for the new high-power service introduces additional risk of harmful interference. NextNav has assumed that "frequency agile" incumbent non-M-LMS equipment could accommodate this frequency shift. But this is not the case for many licensed non-M-LMS devices and toll systems. For example, the TDM and ASTMv6 protocols have fixed frequency specifications, and the transponders used with these protocols have fixed hardware filtering.

Third, NextNav's proposed uplink band in 902–907 MHz would also be a significant source of harmful interference. NextNav contemplates that uplink operations transmit at up to three watts ERP in this band.[23] Even for handheld devices, such as smartphones, uplink transmissions could be up to +23 dBm or 200 mW. Because consumers routinely use

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[22] *See* Letter from Robert Lantz, General Counsel, NextNav, Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 24-240, at A-10 (filed June 7, 2024) ("NextNav Proposed Rule Addition") (Proposed § 90.1408(a)-(b)).

[23] *See* NextNav Proposed Rule Addition at A-10 (Proposed § 90.1408(c)).

smartphones and other mobile devices in vehicles, this new source of interference would often be *less than a meter* away from tolling transponders operating in the proposed 907–918 MHz sub-band when those transponders are mounted in vehicles. At such close distances, devices operating at these higher power levels threaten to overwhelm existing tolling devices.

Finally, the proposed NextNav expansion to include mobile, portable, and point-to-point 5G transmitters will result in the out-of-band emissions of these transmitters to be located close to toll points, creating significantly more unwanted energy directly in the pass-band of frequencies used for licensed electronic tolling services and exacerbating the risk of harmful interference.

These significant new, higher-power/closer-proximity sources of undesired emissions would present several challenges for electronic tolling operations. The millions of transponder tags in Americans' vehicles today are well-engineered consumer devices, but they are not hardened equipment engineered to withstand blocking (i.e., overload) interference from high-power signals that were simply not contemplated by the longstanding Lower 900 MHz Band rules. Similarly, since these transponder tags are designed to be widely distributed consumer devices, they do not aggressively filter out-of-band signals from other Lower 900 MHz Band operations. Indeed, passive protocol tags, such as those used by the 6C standard, leverage designs used by a wide range of industries in the Lower 900 MHz Band ecosystem that are intended for operations—including Part 15 operations—throughout the band. And even in cases where out-of-band and blocking interference to tolling system receivers might not be an issue, tolling systems would face an increase in co-channel energy, which cannot be filtered out.

Receiver overload and/or interference from out-of-band and in-band emissions would decrease system performance, resulting in missed transponder reads and failed transactions—

particularly for toll system deployments designed to accommodate numerous simultaneous transactions and/or support multiple protocols. These sources of interference would appear to the electronic tolling system as toll violations, potentially triggering unwarranted fines for consumers and eroding their confidence and trust in the system.

Moreover, interference could result in associating a transaction with the wrong vehicle and improper billing. This is because tolling systems use an algorithm to associate successful reads from the reader antenna with the closest transponder tag. If some toll system reader antennas receive interference, however, other antennas in the system (e.g., those above an adjacent lane) could associate the tag with the incorrect vehicle. In these cases, the missed reads would need to be reconciled using a labor-intensive, less-accurate tolling method, such as video license plate identification,[24] which then can require human review, paper invoicing, and lower overall successful revenue collection rates. Thus, the likely interference to toll antennas and readers would affect system performance and toll collection accuracy, increasing missed transponder reads and resulting in more expensive transaction processing, billing errors, diminished consumer confidence, and lost public revenue for state and local governments.

Even in cases where transactions could be successfully completed in the presence of a high-power system, degraded system performance would have significant impacts. For example, battery-powered active vehicle transponders are designed to operate in a power-efficient state to enable a long-term battery life of approximately ten years, "waking up" only when there is

[24] Video license plate identification is far less reliable and economical than Lower 900 MHz solutions. For example, Illinois Tollway estimates that its operating costs would likely increase by over $150 million per year if it relied entirely on video license plate identification. Video license plate identification is also impacted by inclement weather and blocked or otherwise unreadable license plates, which could jeopardize up to ten percent of Illinois Tollway's revenue each year.

energy in the band. High signal strengths in nearby adjacent spectrum would significantly increase undesired transponder activations, thus reducing the battery life of consumers' transponders. Depleted batteries would, in turn, cause more frequent tag-read failures at unpredictable intervals. They would also require more frequent tag replacements at a substantial cost to both the public and toll facility operators, rather than the current practice of proactive periodic replacement of battery-operated tags to ensure reliable operations.

Initial assessments from IBTTA members based on path loss calculations using ERP limits and equipment sensitivities indicate that the transmissions from the proposed adjacent high-power network transmitters could present co-existence issues even when those transmitters are located multiple kilometers away. Significantly, the impact of NextNav's *current* system requires careful co-existence management with tolling systems to enable those systems to operate effectively. For example, more than ten years ago, E-ZPass, Kapsch, and NextNav's subsidiary Progeny performed co-existence evaluations to determine the minimum separation distances below which the Progeny system interference would be a concern to E-ZPass operations. These evaluations involved the PNT system currently being deployed by NextNav, consisting of downlink-only transmissions from base stations within the existing 921.75–927.5 MHz M-LMS sub-band and M-LMS 30-watt ERP limits. Also at that time, the E-ZPass system only utilized the single TDM protocol, centered in the current 909.75–921.75 MHz sub-band. Even under these conditions, testing determined that interference from the Progeny system degraded the toll system, and site-specific co-existence analysis/testing was necessary if the Progeny transmitters were located less than 1.07 miles (1.72 km) from a toll site for one mode of Progeny transmission and 0.34 miles (0.54 km) for an alternative mode of Progeny transmission.

The proposed changes in the current NextNav petition contemplate much higher-power base station transmitters than those in use today as well as the likelihood of handset transmitters in vehicles, which present a completely new interference risk. As such, required co-existence separation distances would be substantially larger than those evaluated over ten years ago. These separation distance concerns are consistent with the grant conditions that the Office of Engineering and Technology places on experimental authorizations in the Lower 900 MHz Band, which require coordination with LMS licensees over significant distances.[25]

In short, signal interference and degraded system performance caused by a nearby high-power system deployment in the Lower 900 MHz Band would result in failed toll collections, increased customer service issues involving billing and equipment, and erosion of customer confidence and trust in public revenue systems' ability to perform accurately and correctly—jeopardizing support for both existing and future electronic tolling solutions.

B. Many Harms to Electronic Tolling Caused by High-Power Systems Could Not Be Mitigated.

The *Public Notice* seeks comment on the status of outreach by NextNav regarding impact mitigation.[26] IBTTA members have had multiple discussions with NextNav, including sharing details about toll system operating characteristics and performance requirements. However, these discussions not only have failed to alleviate concerns about mitigating impacts to electronic tolling operations but have underscored members' assessment that interference to both roadside readers and in-vehicle transponders will be pervasive, disruptive, and costly. Furthermore, any

[25] *See, e.g.*, Experimental Special Temporary Authorization, Call Sign WX9XAV, Special Condition 6 ("Prior to commencing any operations in 902-928 MHz band, the applicant must obtain consent from licensees in Location & Monitoring Service (902-928 MHz) within 100 miles of the contours of the testing area.").

[26] *Public Notice* at 4.

effective mitigation solution must accommodate not only existing electronic tolling deployments, but also preserve tolling authorities' ability to deploy new facilities to advance new transportation finance options and address traffic congestion. There is no evidence that the mitigations described by NextNav would permit this investment and growth without the risk of harmful interference.

1. High-Power Operations Would Dramatically Constrain Electronic Tolling Deployments, Including Urban Congestion Relief.

At the core of NextNav's proposal is its presumption that non-M-LMS deployments are limited, "should not particularly require protection," and could be accommodated instead by a rule "generally requiring interference protection."[27] This assumption is incorrect with respect to electronic tolling deployments, which are widespread, require specific interference protection, and would be degraded with access to less spectrum.[28] Moreover, even if a high-power network operator were able to protect existing tolling deployments by creating exclusion zones with a radius demonstrated to protect existing electronic tolling facilities, the proposed high-power network operations, once active, could foreclose important future electronic tolling deployments. Additionally, the growth of future base stations for a high-power network and the number of users over time would require continual testing and retuning of toll equipment that would represent significant expense and disruption to ongoing toll operations.

Importantly, motor fuel taxes are projected to decline and become unsustainable as a contribution to transportation investment and operations in light of growing vehicle fuel efficiency and use of alternative fuels. Electronic tolling is an important option for state and local governments to overcome revenue shortfalls in transportation revenue. As such, tolling sites and

[27] *Id.* (citing NextNav Proposed Rule Addition at A-11 (Proposed § 90.1410)).

[28] *See supra* Section I.

locations are expected to grow as governments seek new and diversified revenue sources to maintain and enhance the nation's transportation system. Transportation infrastructure is a foundational element of national economic strength and competitiveness, is essential for functional supply chains and goods movement, and enables basic mobility for all people, which is fundamental to quality of life. By constraining the flexibility for siting and expanding future electronic tolling applications, interfering high-power networks represent a risk to the funding and financing of vital infrastructure that supports these national and regional interests.

In addition to traditional toll revenue finance, a key application of the next generation of tolling applications is the deployment of systems designed for vehicle access management and congestion-relief that will be widely deployed throughout urban cores, not just on highways—which would require excluding such a high-powered service from urban areas across the country.

One example is the popularity of priced managed lanes in urban areas. Managed lanes are highway lanes for which vehicle access is based on factors such as time of day, occupancy, or vehicle type. For example, a system could provide managed lanes for high-occupancy vehicles ("HOV") lanes or dedicated bus operations. Priced managed lanes allow access to vehicles that would otherwise be restricted from using the lane.

Local and regional authorities increasingly use pricing to balance demand for a particular lane with the benefits of improved travel times and reliability, facilitating motorist choice and often supporting transit services in the corridors served. These priced managed lanes reduce congestion on urban highways and guarantee levels of service for users by employing dynamic and variable pricing that adjusts with changing conditions, and rely on electronic tolling using the Lower 900 MHz Band for their successful operation.

In another urban example, New York City has deployed a congestion pricing zone system covering Manhattan's central business district below 60th street.[29] This project has made a substantial investment in electronic tolling infrastructure using the Lower 900 MHz Band. While this project is currently paused as policymakers weigh questions about toll pricing,[30] it is an early indication of what will likely be deployed in many major American urban areas in the future.

Systems such as priced managed lanes and congestion pricing would be incompatible with a spectrally adjacent and physically proximate high-power network—including device operations in the same vehicle—for the reasons described above.[31] If the Commission were to authorize a high-power network in this band, it would need to ensure that metropolitan areas are free to deploy congestion-relief systems without fear of harmful interference. NextNav's proposed deployment would block such systems, and its Petition does not explain how the company would protect such operations once they commence if NextNav has already deployed in the relevant geographic area.

2. In-Band Retuning Will Not Enable Co-existence with High-Power Operations.

The *Public Notice* seeks comment on NextNav's proposal to "pay[] . . . for retuning" incumbent devices.[32] To the extent this refers to in-band retuning, this proposal would not address the co-existence challenges posed by a nearby high-power network.

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[29] *Congestion Relief Zone*, MTA, https://congestionreliefzone.mta.info/tolling (last visited Aug. 21, 2024).

[30] *See* Carl Campanile, *Hochul Mulls Lower-Cost NYC Congestion Toll – With City Workers Exempt – But Will Wait Until After Election: Sources*, N.Y. POST (Aug. 18, 2024), https://nypost.com/2024/08/18/us-news/hochul-mulls-lower-cost-nyc-congestion-toll-with-city-workers-exempt-but-will-wait-until-after-election-sources/.

[31] *See supra* Section II.A.

[32] *Public Notice* at 4.

As noted above, the Commission's rules enable non-M-LMS operations in 14-megahertz of Lower 900 MHz Band spectrum. These include two non-M-LMS bands at 902–904 MHz and 909.75–919.75 MHz, along with the 919.75–921.75 MHz band, which is shared on a co-equal basis with M-LMS.[33] Even if NextNav were to pay to retune or otherwise relocate existing non-M-LMS operations below 907 MHz and above 918 MHz into the 907–918 MHz duplex gap of its proposed high-power service (which would be the only remaining spectrum in the Lower 900 MHz Band), this would be insufficient to ensure co-existence with nearby high-power network operations.

First, toll operators already intensively use the entire existing non-M-LMS spectrum at electronic tolling facilities. As described above, electronic tolling systems use multiple frequencies to facilitate interoperability among protocols and accommodate multiple simultaneous tolling transactions—increasingly in deployments that require rapid transaction processing at high rates of speed.[34] At prevailing highway speeds, Open Road Tolling systems have little margin for error to cycle through multiple supported protocols and successfully read a transponder tag. Using the existing non-M-LMS spectrum allotment available today, Open Road Tolling systems can complete a single read using the various protocols in approximately 25 milliseconds, meaning that each protocol has only two-to-three attempts even in ideal communications conditions to successfully complete the tolling transaction before the vehicle is out of range. Because the transponders are on vehicles in a high multi-path environment, however, the number of successful attempts is often less than the ideal. Reducing the available

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[33] 47 C.F.R. § 90.353(h).

[34] *See supra* Section II.A.

spectrum inhibits a tolling system's ability to quickly use multiple protocols to query vehicle transponders, which will result in missed reads.

In addition, availability of non-M-LMS spectrum helps operators effectively address other sources of potential interference in the band. For example, as the National Telecommunications and Information Administration's ("NTIA") spectrum compendium for the Lower 900 MHz Band indicates, band uses include the operation of Wind Profile Radar ("WPR") by multiple federal agencies.[35] With an effective sensitivity of -165 dBm, these extremely sensitive WPR operations have required state tolling authorities to commit to refraining on operations in certain non-M-LMS frequencies, including channels in the 914–916 MHz portion of the band.[36]

Because electronic tolling systems already use the entire existing non-M-LMS spectrum allotment to effectively enable services and manage local sources of interference, NextNav's proposal to reduce available frequencies by 20 percent would, by itself, provide a new major constraint and challenge. And this is even before taking into account the spectrum that would be unavailable because of proximity to high-power network transmissions. In other words, in-band retuning is infeasible because there is no spectrum in the Lower 900 MHz Band that is available to serve as an effective *de facto* guard band for the high-power service.

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[35] NTIA, *902-928 MHz*, at 5–6 (2015), https://www.ntia.gov/files/ntia/publications/compendium/0902.00-0928.00_01DEC15.pdf.

[36] *See, e.g.*, Application for Waiver of Section 90.137b for Permanent Locations, *Interference Resolution Analysis* at 2, ULS File No. 0004904280 (filed June 7, 2012) (describing resolution of interference concerns regarding North Carolina Turnpike Authority operations at 914.75, 915.75, and 916.75 MHz to nearby WPR deployment).

3. Relocating Electronic Tolling Out of the Lower 900 MHz Band Is Infeasible.

The *Public Notice* seeks comment on the feasibility of incumbent relocation.[37] As the *Public Notice* observes, however, NextNav has not "indicate[d] how relocation would be accomplished."[38] NextNav has not identified any alternative spectrum bands that would effectively accommodate electronic tolling operations. This is unsurprising given the fact that no other readily available spectrum options exist.

Non-M-LMS operations, such as electronic tolling, are part of the Intelligent Transportation Systems ("ITS") Radio Service.[39] But there are no other available frequencies for electronic tolling in this service beyond the Lower 900 MHz Band. For example, LMS authorizations below 512 MHz have constraints including bandwidth limitations of no more than 25-kilohertz in each of the three allotted sub-bands.[40] And with respect to the 5.9 GHz ITS band, the Commission recently reaffirmed its decision to reserve the 30-megahertz of spectrum now available in that band for "vehicle safety-related applications."[41]

In addition, there are some applications important to toll and other highway operators that simply could not be effectively deployed using spectrum with inferior propagation characteristics. These include Automatic Vehicle Identification deployments at weigh station

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[37] *Public Notice* at 4.

[38] *Id.*

[39] *See generally* 47 C.F.R. pt. 90 subpt. M.

[40] *See id.* § 90.355.

[41] *Use of the 5.850-5.925 GHz Band*, Order on Reconsideration, FCC 24-32, ET Docket No. 19-138, ¶ 3 (rel. Mar. 18, 2024).

sites specifically intended to accommodate multiple semi-trailer truck operations traveling at highway truck speeds.[42]

By way of illustration, the ASTMv6 protocol used for tolling in Canada is also used for commercial vehicle credentialing and clearance on U.S. highways. Specifically, the Commercial Vehicle Information Systems and Networks ("CVISN") architecture, which sets forth the information systems and communications networks owned and operated by governments, motor carriers, and other stakeholders, relies on ASTMv6. CVISN supports commercial vehicle operations with safety and motor-carrier productivity applications designed to reduce regulatory and administrative costs for public- and private-sector stakeholders through improved data sharing, electronic credentialing, and targeted automated screenings and enforcement of commercial vehicles at the roadside. The relatively long communication zone required for commercial vehicle credentialing and clearance compared to tolling requires the ASTMv6 transponders to be nearly two orders of magnitude more sensitive than non-ASTMv6 transponders, making them much more sensitive to interference. With multiple vehicles in these communication zones, a mobile or portable interferer in one vehicle in the zone will have an impact on communications with multiple tags and readers throughout the zone.

Even if there were a readily available alternative band for electronic tolling, the Lower 900 MHz Band provides unique benefits. Higher frequencies do not have as favorable propagation characteristics as the Lower 900 MHz Band for electronic tolling, because the Lower 900 MHz Band has the benefit of low path loss and cable loss. Thus, the Lower 900 MHz

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[42] *See, e.g.*, *Weigh Station e-Screening Technology*, WASH. STATE DEPT. OF TRANSP., https://wsdot.wa.gov/travel/commercial-vehicles/transponder-weigh-station-e-screening/weigh-station-e-screening-technology (last visited Aug. 22, 2024) (employing 915 MHz transponders to enable Automatic Vehicle Identification).

Band’s signal propagation is better under adverse weather conditions (e.g., rain, snow, fog) than the propagation of higher frequencies under similar conditions. Electronic tolling operations also realize economies of scale from the robust Lower 900 MHz Band ecosystem to deploy equipment in an efficient and cost-effective manner. For example, the transponder tag technology widely available in the Lower 900 MHz Band significantly reduces the costs of designing, developing, and deploying tolling transponders to millions of vehicles. Electronic tolling has also been able to take advantage of innovations developed for devices in the Lower 900 MHz Band ecosystem, such as reduced size, improved battery life, and multi-protocol operations promoting federally mandated interoperability of electronic tolling operations. Finally, any relocation efforts would be so substantial, costly, time-consuming, and disruptive to consumers, businesses, and public and private toll operators that they would be practically impossible. With 120 million transponders and tens of thousands of reader installations, reissuing new equipment for each user and toll plaza would require billions of dollars. In addition to equipment replacement, the increased cost of software and hardware development and testing as well as the modified installation processes for a new first-generation solution will likely be passed down to toll agencies and consumers. The process of issuing an entirely new transponder system equipment to consumers also risks damaging the high adoption that has been achieved over more than three decades, as well as undermining consumer confidence in the system. Some drivers would inevitably attempt to use outdated tags and subsequently receive unexpected bills when transactions fail. Furthermore, electronic tolling companies would need to manage the responsible disposal of millions of tags with lithium batteries all at once, rather than the normal gradual replacement process.

Simply put, the answer to the *Public Notice*'s question on whether incumbents could continue operations under NextNav's proposed reconfiguration is "no." Current electronic tolling operations depend on the full use of allotted sub-bands of the Lower 900 MHz Band. Even if tolling operations could be condensed into the duplex gap, NextNav's operations would generate significant emissions that cost-effective, mass-market consumer transponders could not filter out. Furthermore, retuning is infeasible due to the lack of spectrum in the Lower 900 MHz Band that can serve as a guard band for NextNav's high-power service, and relocating is infeasible because there are no suitable alternative frequencies available for electronic tolling. Given these constraints, the Commission should maintain the existing framework and protect critical non-M-LMS services.

III. NEXTNAV'S PROPOSAL RUNS COUNTER TO SOUND SPECTRUM POLICY.

NextNav's proposal is also inconsistent with sound spectrum policy. NextNav's Petition effectively asks the Commission to adopt new rules based on the claim that without a major change to the Lower 900 MHz Band it will not be economically viable for the company to continue to provide a standalone PNT service. In other words, unless the company receives an implicit subsidy in the form of Commission rules that make its licenses substantially more valuable, it will not be profitable enough to justify continued PNT operations. But the Commission does not and should not use spectrum policy to create such implicit subsidies, especially when doing so would create enormous collateral damage to other incumbent licensees, and other existing licensed bands can effectively provide low-band 5G services and PNT without disrupting critical incumbent operations.

A. NextNav's Inability to Provide Profitable PNT Service Does Not Justify Degrading Other Lower 900 MHz Band Operations.

NextNav's primary justification for its new band plan hinges on the fact that it cannot operate an economically viable standalone terrestrial PNT service in the Lower 900 MHz Band.[43] Specifically, NextNav asserts that it is uneconomical for it to build a nationwide terrestrial PNT network because (1) there is limited incentive for equipment and software developers to integrate PNT protocols into user devices when GPS is readily available at no cost;[44] and (2) the infrastructure and operating expenditures necessary for such a widescale network is cost-prohibitive.[45] However, the argument that a terrestrial PNT network is not economically viable is not a sufficient justification to decrease the utility of the Lower 900 MHz Band and lease more than half of the total spectrum in this band to mobile carriers.

First, there is no technical impediment to NextNav offering a standalone PNT service that would justify the sweeping changes to the rules that NextNav contemplates. As the Commission recognized almost two decades ago, a vibrant and valuable ecosystem is already present in the Lower 900 MHz Band. In a 2006 Notice of Proposed Rulemaking ("NPRM") to address potential changes to this band, the Commission observed that "[non-M-LMS] systems have flourished since 1995 with the Commission licensing more than 2,000 sites to state and local governments, railroads, and other entities in recent years"[46] The Commission further recognized that there was "[a]n increasing number of medical devices (blood pressure and heart rate monitors, medical telemetry systems, fetal monitoring systems, etc.) [as well as] . . . an

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[43] NextNav Petition at ii–iii, 22.

[44] *Id.* at ii.

[45] *Id.* at 22.

[46] *Amendment of the Commission's Part 90 Rules in the 904-909.75 and 919.75-928 MHz Bands*, Notice of Proposed Rulemaking, 21 FCC Rcd. 2809, 2814 ¶ 11 (2006).

increased variety of 902–928 MHz consumer electronic devices such as wireless speakers, intercom devices, wireless keypads and mouse controllers, baby monitors, and video cameras."[47] Notably, this NPRM arose in response to a Petition for Rulemaking filed by Progeny LMS, LLC, an operating subsidiary of NextNav.[48] The Commission terminated the proceeding, finding that "the wholesale changes to [the] existing M-LMS framework . . . are not warranted and . . . are not necessary to provide sufficient flexibility to M-LMS licensees to provide their location services."[49] Consistent with this prior determination, the Commission should decline to act on requests to make similar "wholesale changes" that would undermine the vibrant ecosystem of federal incumbents, non-M-LMS licensees, and Part 15 users currently thriving in the Lower 900 MHz Band.

Second, NextNav's proposal to lease more than half of the Lower 900 MHz Band to mobile carriers as a means to subsidize a terrestrial PNT network is inherently inefficient and would result in an unwarranted windfall to NextNav. The *Public Notice* recognizes this potential outcome, as it seeks comment on "the windfall that NextNav might receive as a result of its proposed spectrum swap for a new nationwide license."[50] NextNav's proposed spectrum swap would result in NextNav holding exclusive, nationwide broadband spectrum rights that NextNav could then lease at a premium, resulting in an outsized financial gain and undermining the principles of fairness, efficiency, and public benefit that guide spectrum management. NextNav's CEO Mariam Sorond even acknowledged that as little as two percent of NextNav's spectrum

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[47] *Id.* ¶ 16.

[48] Petition for Rulemaking of Progeny LMS, LLC (filed Mar. 5, 2002).

[49] NPRM Termination Order ¶ 8.

[50] *Public Notice* at 6.

under this new band plan would be used for a terrestrial PNT system while the other 98 percent would carry 5G broadband services.[51]

Third, if policymakers determine that having a private company operate a terrestrial PNT network at a financial loss is in the public interest, then the U.S. should do so through direct subsidization rather than relying on the inefficient and roundabout mechanism of degrading other existing operations in the Lower 900 MHz Band. NextNav states that "there appears to be no path to congressional appropriation" for a terrestrial PNT system but does not explain any further.[52] If NextNav has tried and failed to convince elected representatives of the benefits of funding a terrestrial PNT system, however, this only underscores why the Commission should not entertain a request to indirectly subsidize this network using spectrum policy.

B. NextNav Fails to Acknowledge the Other Low Band Spectrum Available for a Combined PNT and Mobile Broadband Service.

NextNav asserts that mobile carriers can use Lower 900 MHz Band spectrum as part of a comprehensive 5G network that uses "a combination of low-band, mid-band, and millimeter-wave spectrum."[53] Specifically, NextNav explains that "[l]ow-band spectrum is a fundamental building block in a mobile carrier's inventory because of its superior building penetration and propagation characteristics, which offer greater indoor and wide-area coverage."[54] NextNav also states that sub-1 GHz spectrum is valuable for sufficient coverage in rural areas as well as indoor

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[51] Mike Dano, *NextNav's CEO Explains Her 5G Network Buildout Plan*, LIGHT READING (May 3, 2024), https://www.lightreading.com/5g/nextnav-s-ceo-explains-her-5g-network-buildout-plan.

[52] NextNav Petition at 22.

[53] *Id.* at 39.

[54] *Id.*

coverage.[55] However, NextNav does not address the fact that there is already other low-band spectrum readily available for mobile broadband. For example, NextNav asserts that the downlinks require 10-megahertz in the Lower 900 MHz Band to achieve better positional accuracy,[56] but does not address the fact that several other low-band spectrum services already authorized for 5G broadband communications have ten or more megahertz of downlink spectrum available.

NextNav does not provide any reason why mobile carriers cannot simply use the existing lower frequencies already available under Part 22 or 27, and why terrestrial PNT cannot be provided using those networks.[57] For instance, the 600 MHz band is used by T-Mobile (Band 71) for its 5G offerings; the 700 MHz band is used by Verizon (Band 13), AT&T (Bands 12/17/29), and T-Mobile (Band 12); and the 850 MHz band is used by AT&T and Verizon (Band 5).[58] At even lower frequencies than the Lower 900 MHz Band, these bands all offer broad coverage and better building penetration without disrupting important existing operations. And unlike the Lower 900 MHz Band, these numerous existing bands have already been standardized for 5G operations. Because NextNav's proposed location service would utilize 5G networks to provide PNT capabilities, the cost to deploy a PNT service using these existing bands should be much lower than deploying a new system in the Lower 900 MHz Band because the infrastructure already exists for these 5G bands.

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[55] *Id.* at 39–40.

[56] *See id.* at 26, 29.

[57] *See Public Notice* at 3 (seeking comment on whether "wireless carriers [would] be able to use a standards-based solution to provide PNT using their networks in commercial bands other than the Lower 900 MHz Band").

[58] *A Guide to Cellular Frequency Bands Used by US Carriers*, KAJEET, https://www.kajeet.com/en/blog/a-guide-to-cellular-frequency-bands-used-by-us-carriers (last visited Aug. 21, 2024).

CONCLUSION

For the reasons stated above, IBTTA respectfully requests that the Commission deny NextNav's Petition for Rulemaking in the Lower 900 MHz Band. The Commission should maintain the status quo in order to enable the federal incumbents, non-M-LMS, and unlicensed operations that use the Lower 900 MHz Band to continue to provide significant benefits to consumers, government, and businesses.

Respectfully submitted,

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September 5, 2024