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

In the Matter of)
)
Request of PTC-220, LLC for Waivers of)
Sections 90.729(b) and 90.723(f) of the)
Commission's Rules) File No. _____

To: Chief, Wireless Telecommunications Bureau

REQUEST FOR WAIVER

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EXECUTIVE SUMMARY

PTC-220, LLC ("PTC-220") respectfully seeks a waiver of Sections 90.729(b) and 90.723(f) of the Commission's rules, which is necessary to facilitate PTC-220's ability to deploy robust, interoperable and efficient networks in the 220-222 MHz band for positive train control ("PTC"). As the Commission knows, PTC systems use wireless technologies to monitor train activity and reduce the risk of accidents caused by human error, such as train-to-train collisions, derailments caused by excessive speed, and unauthorized train movements. Pursuant to the Rail Safety Improvement Act of 2008, rail operators must install and operate functional PTC systems by December 31, 2015.

PTC-220, comprised of the nation's largest commercial freight railroads, was established to lead the deployment of PTC networks that will not only benefit its members, but the entire rail industry. To achieve this end, PTC-220 acquired licenses in the 220 MHz band and previously obtained waivers of various Part 90 rules to facilitate the deployment of PTC systems. At the time of its initial waiver request, PTC-220 did not know whether or how Sections 90.729(b) and 90.723(f) would adversely affect PTC deployment. Subsequent development work, however, has revealed that these rules will prevent PTC-220 from fully utilizing its spectrum for PTC, and will result in an inefficient use of the band. Given the shortage of spectrum for PTC in more congested areas, PTC-220 seeks to maximize the use of its current licenses for its members and other railroads that may need to lease PTC spectrum capacity.

Section 90.729(b) limits stations in the upper 221-222 MHz band to 50 watts ERP, with an antenna height of 7 meters HAAT. PTC networks will employ time division duplex (TDD) technology that utilizes both upper and lower bands for base and mobile transmissions. With the current limits, base station transmissions in the upper band would have a much smaller coverage footprint than those in the lower band, which would reduce network capacity, require the construction of many additional sites, and prevent the synergies of sharing existing 160 MHz railroad infrastructure. Waiver of Section 90.729(b) would increase capacity and allow more railroads to benefit from PTC-220's member networks, including commuter and short line railroads, who could therefore avoid the onerous cost of locating and acquiring additional spectrum for PTC purposes. Widespread access to this PTC network will be especially critical to accommodate railroad operations in congested areas (such as Chicago and other rail hubs).

In addition, waiver of Section 90.723(f) is necessary to avoid the extended deployment delays that would occur if PTC-220 is required to enter into coordination discussions with hundreds of Phase II licensees across the country. PTC-220's experience to date demonstrates that locating and engaging incumbent licensees in such discussions is a costly and time-consuming process. The rail industry cannot afford to have Congressionally-mandated PTC deployment held hostage by non-responsive licensees.

Granting these waivers would not frustrate the underlying purposes of Sections 90.729(b) or 90.723(f), which were both intended to address the possibility of interference to adjacent channel users. To reduce the likelihood of PTC operations creating a material risk of harmful interference to other licensees, PTC-220 proposes that the Commission extend to all licensees operating in the 221-222 MHz band the following protection criteria, which are largely based on

limits already contained in Sections 90.723(d)-(e) (which currently only protect a smaller subset of licensees):

Scenario	Requirement
To protect Phase I Licensees	
For Phase I licensee receivers within 25 kHz and 6 km of a proposed PTC transmitter	No PTC transmitter would be permitted without the concurrence of the Phase I licensee
For Phase I licensee receivers within 25-200 kHz and 6 km of a proposed PTC transmitter	Apply geographic separation/ERP limits in accordance with the table in Section 90.723(d) of the Commission's rules
To protect Phase II and nationwide Phase I Licensees	
For <i>existing</i> Phase II and nationwide Phase I receivers within 25 kHz and 6 km of a proposed PTC transmitter	No PTC transmitter would be permitted without the concurrence of the Phase II or nationwide Phase I licensee
For <i>existing</i> Phase II and nationwide Phase I receivers within 25-200 kHz and 6 km of a proposed PTC transmitter	Apply geographic separation/ERP limits in accordance with the table in Section 90.723(d) of the Commission's rules
For <i>existing</i> Phase II and nationwide Phase I receivers within 25 kHz and between 6 and 10 km of a proposed PTC transmitter	Notify the licensee of the proposed site. If requested, produce an engineering study showing that the degradation of the noise floor due to the PTC transmitter at the potential victim site will be 2 dB or less. (The study could be based on computer prediction, actual measurements, or both.) The parties could agree on relaxed criteria.
For <i>new</i> Phase II and nationwide Phase I receivers	Require coordination between the licensees

If the above framework is inadequate to prevent harmful interference in some circumstances, PTC-220 would remain willing and able to take the necessary precautions to prevent or correct interference to co-channel and adjacent channel receivers operating between 221-222 MHz.

Finally, PTC-220 proposes specific coordination procedures to be followed in situations where another licensee wishes to locate a new Phase II or nationwide Phase I station in proximity to a PTC station in the 221-222 MHz band. The proposed process aims to allow the other licensee to take advantage of its spectrum rights without being subject to harmful interference, while at the same ensuring that there is no sudden change or impairment in service in a PTC network that could undermine the public safety goals of PTC.

Waiver of these rules is warranted in light of the unique circumstances of this case, and application of Sections 90.729(b) and 90.723(f) would be inequitable and unduly burdensome. PTC-220 estimates that, absent a waiver, its members would be forced to incur tens of millions of dollars in additional costs to deploy PTC.

In view of the foregoing, the Commission should act promptly to grant this request and facilitate the railroad industry's continued efforts to meet the federally mandated PTC implementation deadline, in furtherance of the public interest.

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To: Chief, Wireless Telecommunications Bureau

REQUEST FOR WAIVER

PTC-220, LLC ("PTC-220"), by its undersigned counsel and pursuant to Sections 1.3 and 1.925 of the rules of the Federal Communications Commission ("FCC" or the "Commission"), hereby requests waiver of Sections 90.729(b) and 90.723(f) of the Commission's rules.¹ Waiver of these provisions is warranted to enable PTC-220 to fully and more efficiently deploy a robust nationwide, interoperable network for positive train control ("PTC"). Given the waiver conditions PTC-220 is proposing to ensure the protection of other licensees, the underlying purpose of these rules would not be undermined or frustrated by waiver in this case. In addition, granting the waiver would serve the public interest in a number of ways. First, it would further the development and timely deployment of PTC systems, a Congressionally mandated technology that is important to monitoring train activity, preventing collisions, and enhancing public safety. Second, it would provide increased spectrum capacity for PTC-220's member railroads, thereby resulting in more spectrum availability that can be leased to non-member railroads, particularly in congested areas. Finally, a waiver would promote the Commission's

¹ 47 C.F.R. §§ 90.729(b), 90.723(f).

general objective of ensuring the most efficient and flexible use of spectrum. Absent a waiver, approximately half of the 220 MHz spectrum acquired by PTC-220 will be of limited or no use for PTC operations.

I. BACKGROUND

A. PTC-220 and PTC Technology

PTC-220 is a joint venture among the seven Class I freight railroads in the United States² formed to oversee the development and deployment of interoperable PTC communications systems in compliance with the Rail Safety Improvement Act of 2008 (“RSIA”), which mandates that PTC systems be installed by December 31, 2015.³ PTC-220’s mission of leading the deployment of an interoperable PTC network will benefit not only the members of PTC-220, but the entire rail industry.⁴ To serve this purpose, PTC-220 acquired and now holds sixteen licenses in the 220 MHz band, including four nationwide licenses,⁵ six J Block licenses,⁶ and six E Block

² PTC-220 members include BNSF Railway (“BNSF”), Canadian National Railway (“CN”), Canadian Pacific Railway (“CP”), CSX Transportation (“CSX”), Kansas City Southern Railway (“KCS”), Norfolk Southern Railway (“NS”), and Union Pacific Railroad (“UP”).

³ Rail Safety Improvement Act of 2008, Pub. L. No. 110-432, § 104, 122 Stat. 4848, 4857 (2008) (“*Rail Safety Improvement Act*”). The Federal Railroad Administration has adopted regulations concerning the implementation and requirements of PTC systems, including an implementation deadline of December 31, 2015. See 49 C.F.R. § 236.1005(b).

⁴ Although PTC-220 holds a number of licenses to spectrum in the 220 MHz band that will be used to support the nationwide PTC operations, the successful deployment of a nationwide, interoperable PTC network may require additional spectrum, particularly in areas with a dense railroad environment. See Comments of PTC-220, LLC, Spectrum Needs for the Implementation of the Positive Train Control Provisions of the Rail Safety Improvement Act of 2008, WT Docket No. 11-79 (filed June 20, 2011). PTC-220 is currently engaged in negotiations to acquire additional spectrum in the Chicago area.

⁵ These licenses include two Phase I nationwide licenses (WPFR284 and WPPF444), one L Block nationwide license (WPOI701), and one M Block nationwide license (WPOJ271).

⁶ These licenses include call signs WPOI702, WPOI703, WPOI704, WPOI705, WPOI706, and WPOI708. Because these represent all six of the J Block licenses issued on the basis of the six U.S. Regional Economic Area Groupings (“REAGs”), these licenses “form a *de facto* nationwide license.” Request of PTC-220, LLC for Waivers of Certain 220 MHz Rules, *Memorandum Opinion and Order*, 24 FCC Rcd. 8537, 8544-45 ¶ 18 (2009) (“*2009 Waiver*”). The nationwide licenses listed in footnote 5, together with these J block licenses, will be referred to as the “nationwide licenses.”

licenses.⁷

PTC systems are “designed to monitor train activity and prevent train collisions by using onboard radio devices to automatically monitor a train’s speed, location, and related data within the train’s authorized travel area.”⁸ The PTC communications network must support wireless connectivity between trains, rail wayside devices, and “back office” applications, and must faithfully and reliably deliver messages between these three entities including, among other things, information about train movement authorities, speed restrictions, train position and speed, and the state of signal and switch devices.

PTC systems are intended to help prevent the occurrence of certain accidents caused by human error, such as train-to-train collisions, derailments caused by excessive speed, unauthorized incursions by trains onto sections of track where maintenance activities are present, and the movement of a train through a track switch that has been left in the wrong position. These systems require highly complex technologies, information processing capabilities, and communications facilities that are able to capture and interpret a massive number of variables that affect rail operations. Just to determine the amount of time to stop a train, for example, a PTC system must account for the terrain, weight, and length of the train, braking technology on the train, and other factors.

B. PTC System Development and Build-Out

1. Software Development

PTC-220 and the railroads are committed to meeting the deadline for rolling out PTC systems in the United States. PTC-220 has devoted substantial resources to a number of

⁷ These licenses include WPOJ279 (Rochester, MN-IA-WI), WPOJ280 (Minneapolis-St. Paul, MN-WI-IA), WPOJ281 (San Francisco-Oakland-San Jose, CA), WPOI774 (Memphis, TN-AR-MS-KY), WPOI800 (St. Louis, MO-IL), and WPVL860 (Los Angeles-Riverside-Orange County, CA-AZ).

⁸ 2009 Waiver at 8538 ¶ 3.

software development efforts to support PTC and its efficient use of spectrum. For example through its Engineering Services provider, Transportation Technology Center, Inc. (“TTCI”), PTC-220 continues to refine new software that will help coordinate frequency and time slot assignments for base station and wayside radios. Likewise, under a contract with Meteorcomm, new custom software extensions are being written for existing coverage prediction tools to make them more directly applicable to the unique PTC radio technology. Finally, PTC-220 has developed a hosted environment for the Mentum Planet RF prediction tool to facilitate coordination of frequencies and slot plans for the industry. This tool will allow RF engineers from each rail operator to plan their RF networks in conjunction with other users that are currently operating, or will be operating, in any geographic area of the continental U.S.

2. Hardware Development

A number of development efforts for new hardware devices are also ongoing. Notable among these are the Locomotive, Wayside, and Base radios being developed by Meteorcomm. Part 90 Equipment Certifications have been secured for these devices, and Meteorcomm has successfully demonstrated the functionality of its radio platforms in a closed-track environment in Pueblo, Colorado.⁹ As of November 1, 2012, two manufacturers are equipped to produce PTC radios, and production units have become available.¹⁰ Though radio hardware development is not directly under the control of PTC-220, many of its members are intimately involved in guiding the effort.

⁹ See Request of PTC-220, LLC for Waivers of Certain 220 MHz Rules, *Construction Progress Report*, WT Docket No. 08-256, 5 (filed Nov. 1, 2012) (“*Nov. 2012 Construction Progress Report*”).

¹⁰ *Id.*

3. Protocol Development

In addition to software and hardware development, new communications protocols designed specifically for PTC continue to be refined (though also not directly under the control of PTC-220). These protocols directly address PTC's unique requirements for message reliability, delivery latency, and efficient use of communications resources—particularly spectrum.

4. Site Preparation

PTC-220's members have made substantial progress in preparing and building out the sites that will host the PTC radio equipment, and have procured and begun to install PTC radios. The preparation work has included predicting coverage areas, selecting the sites, installing antenna systems, upgrading antenna structures and site power supplies, planning for backhaul needs, and clearing rack space for the PTC radios. Such work has been completed or substantially completed at 1,387 base station sites across 41 states.¹¹ Similar preparatory work has been performed for wayside sites. Radio installation has occurred at 295 base sites, with similar installation efforts taking place at various wayside sites.

5. Spectrum Coordination

Finally, PTC-220 has engaged in various spectrum coordination initiatives. Under its contract with PTC-220, TTCI is responsible for analyzing the propagation characteristics of PTC-220's spectrum, mitigating interference, determining the necessary transmitter characteristics, planning frequency reuse, coordinating frequency and slot assignments, issuing site authorizations to the railroads, and developing and maintaining a PTC-specific frequency/slot coordination database, among other duties.

¹¹ Nov. 2012 Construction Progress Report at 2-3.

II. REQUEST FOR WAIVER

Despite the substantial progress that PTC-220 and its members have made in deploying PTC technology, waiver of the following Commission rules is necessary to harness the full value of the 220-222 MHz spectrum that will be used to support the nationwide PTC network, and to help realize the important public interest benefits that will result from the proliferation of PTC systems in the United States:

Applicable Rule	Requirement
Section 90.729(b)	Prohibits licensees from operating fixed stations or paging base stations in the 221-222 MHz band at power levels greater than 50 watts Effective Radiated Power (“ERP”), and from using transmitting antennas higher than 7 meters Height above Average Terrain (“HAAT”). ¹²
Section 90.723(f)	Requires coordination among Phase II licensees with base stations transmitting on Sub-band B frequencies (between 220-221 MHz) and Phase II licensees with base stations receiving on Sub-band A frequencies (between 221-222 MHz), if such frequencies are 200 kHz or less removed from each other. ¹³

The Commission has already granted PTC-220 relief from various Part 90 rules to facilitate the deployment of PTC systems.¹⁴ At the time of its initial waiver request, PTC-220 did not know whether or how the rule provisions above would adversely affect PTC deployment. At that time, many of the operating parameters of the PTC radio system were not finalized and little had been done to model the propagation characteristics of the 220 MHz band in the rail environment. However, subsequent development work conducted by PTC-220 and its representatives has revealed that these additional rules will prevent PTC-220 from fully and

¹² 47 C.F.R. § 90.729(b). The rule permits transmission from antennas higher than 7 meters if the ERP is “...reduced below 50 watts ERP by $20 \log_{10}(h/7)$ dB, where h is the height above average terrain (HAAT) in meters.” *Id.*

¹³ *Id.* § 90.723(f).

¹⁴ See 2009 Waiver; Request of PTC-220, LLC for Waivers of Certain 220 MHz Rules, WT Docket No. 08-256, FCC File Nos. 0003634433-38, 0003634442-48, 0003634450, 0003634452-54, 0003634456, 0003634458, 0003634459, 0003634461, 0003634463, 0003634465, and 0003634466 (filed Oct. 31, 2008) (“2009 Waiver Request”).

efficiently using its 220 MHz spectrum for PTC, and result in an inefficient use of spectrum in the 221-222 MHz band.

A. Basis for Waiver Request

1. The Power and Antenna Height Limitations of Section 90.729(b)

Although the 220 MHz band was designed as a frequency division duplex (FDD) band (with the lower one megahertz designated as the base transmit band and the upper one megahertz designated as the mobile transmit band), PTC-220 previously obtained permission via waiver to deploy a time division duplex (TDD) system that utilizes both bands for base *and* mobile transmissions, given the asymmetric nature of PTC traffic.¹⁵ However, Section 90.729(b) continues to impose a 50 watt ERP and 7 meter HAAT limit on base station transmitters that would be operating in the upper band. With these limits, base station transmissions in the upper band would have a much smaller coverage footprint than transmissions in the lower band. As explained below, PTC network build-out must be predicated on achieving the coverage currently available based on the higher power and antenna height limits in the lower band, because this coverage more closely approximates the coverage of existing 160 MHz infrastructure.

The 160 MHz band was historically designated for use by the railroads, who continue to rely upon it throughout the United States for a variety of operational and safety-related functions, including dispatcher-to-train links, onboard communications, train-to-train communications, and

¹⁵ *2009 Waiver* ¶ 18 (granting waiver of Section 90.715(a)). PTC-220 explained that relief from this rule was necessary because the PTC system had to employ base and mobile stations that could transmit and receive signals on either the 220-221 MHz band or the 221-222 MHz band to accommodate PTC traffic patterns that are expected to be asymmetric (*i.e.*, inbound and outbound traffic loads will differ). *2009 Waiver Request* at 18. The FCC concluded that waiver of Section 90.715 was in the public interest and would “benefit PTCS in highly congested areas shared by multiple freight and commuter railroads.”

various traffic control systems.¹⁶ The railroad industry has invested many millions of dollars to deploy and maintain several thousand base stations and backhaul facilities that support the 160 MHz network, which covers nearly 100% of all rail track in the U.S. This network is operating at or near capacity in many congested areas. When the rail industry considered potential RF bands to support PTC operations, the 220 MHz spectrum was most attractive because its propagation characteristics are similar to those of the 160 MHz band,¹⁷ and has the necessary frequency separation to permit colocation with the existing 160 MHz base stations. These features enable the railroads to employ similar base station spacing in both spectrum bands, which has critical implications for PTC implementation: the extensive infrastructure that already exists to support the railroads' 160 MHz networks—including the real estate, access roads, buildings, towers, power plants, and backhaul facilities—can also support a nationwide PTC network using 220 MHz spectrum.

By leveraging the existing 160 MHz communications infrastructure, the U.S. rail industry can maximize the use and value of its 220 MHz spectrum holdings and avoid the significant delay and much higher capital costs that would otherwise be necessary to roll out an entirely new infrastructure for a nationwide PTC system. However, PTC-220 can only realize these synergies if the power and antenna height limitations applicable to all 220 MHz operations are at least comparable to those applicable to 160 MHz operations, such as the limits available in the 220-221 MHz band pursuant to Section 90.729(a).

Waiving these rules would further the public interest by allowing PTC-220 to deploy a more robust PTC network, utilizing technologies that serve a quasi-public safety purpose. As

¹⁶ These 160 MHz frequencies, located between 160.215 MHz and 161.610 MHz, are exclusively coordinated by the AAR and denoted with an "LR" in the Coordinator Column of the Industrial/Business Pool Frequency Table. *See* 47 C.F.R. §§ 90.35(b)(2)(iv), 90.35(b)(3).

¹⁷ *See* Comments of PTC-220, LLC, WT Docket No. 11-79 at 2 (filed June 20, 2011).

described further below, a waiver would effectively increase the capacity of the 220 MHz spectrum to serve more railroads, including commuter and short line railroads, particularly in congested areas (such as Chicago and other rail hubs). Fundamentally, a waiver would promote the most efficient and flexible use of licensed spectrum during a period of spectrum scarcity and limited public funding for transit authorities to purchase their own spectrum.¹⁸ Absent a waiver, PTC-220 would have limited use of approximately half of its 220 MHz spectrum – *i.e.*, the upper band – for PTC purposes. Accordingly, PTC-220 requests the ability to deploy and operate PTC base radios in the 221-222 MHz band at power levels consistent with the ERP and antenna height limits in Section 90.729(a) governing the 220-221 MHz band, but subject to the additional interference protection condition described below in Section III.A.1.b.

2. The Coordination Requirements of Section 90.723(f)

Waiver of Section 90.723(f) is equally necessary given the likelihood of significant deployment delays that will occur if PTC-220 is required to enter into “coordination” discussions about avoiding interference with hundreds of licensees across the country. In some instances, a single PTC base station could require coordination with multiple licensees. Based on its initial efforts, PTC-220 has experienced difficulties in locating and engaging representatives of incumbent licensees with decision-making authority in the coordination process.¹⁹ Although licensees have an obligation to cooperate in the coordination process, the Commission’s rules provide little in the way of procedures, timelines, or enforcement mechanisms. Section

¹⁸ See Comments of the American Public Transportation Association, Auction of 218-219 MHz Band and Phase II 220 MHz Service Licenses Scheduled for December 7, 2010; Comment Sought on Bidding Procedures for Auction 89, AU Docket No. 10-107, 2 (filed June 15, 2010).

¹⁹ For example, PTC-220 has attempted to contact a Phase II licensee in the Chicago area to determine where the licensee’s base stations are located. Despite various efforts to contact the licensee by phone and email, the licensee has yet to respond to PTC-220. Reaching another licensee in the Los Angeles area took months and, ultimately, the involvement of legal counsel.

90.173(b) simply states that if licensees are unable to reach agreements, “the Commission may impose restrictions including specifying the transmitter power, antenna height, or area or hours of operation of the stations concerned.”²⁰ Yet there is no guidance on how (or how quickly) to engage the Commission each time the ULS-listed contact for a licensee fails to respond to a coordination request in a timely manner. In light of the congressionally mandated deadline for PTC deployment, PTC-220 cannot afford to have the deployment of PTC held hostage to non-responsive licensees. In lieu of the coordination requirements, PTC-220 proposes that this rule waiver be conditioned with the same requirement—described below in Section III.A.1.b—as proposed to ensure that no interference results from the waiver of Section 90.729(b).²¹ This will provide for a more logical, consistent interference protection process across the entire 221-222 MHz band.

B. Legal Standard for Waiver

The Commission may waive the application of a rule if the party seeking such waiver establishes (i) that the “underlying purpose of the rule[] would not be served or would be frustrated by application to the instant case, and that grant of the waiver would be in the public interest;” or (ii) that, “[i]n view of the unique or unusual factual circumstances of the instant case, application of the rule[] would be inequitable, unduly burdensome or contrary to the public interest, or the applicant has no reasonable alternative.”²² Additionally, under Section 1.3 of the

²⁰ 47 C.F.R. § 90.173(b).

²¹ As discussed *infra* Section III.A.3, certain scenarios will still require coordination, and PTC-220 proposes a process for such coordination that will preserve the rights of the other licensee without endangering the functioning of PTC networks.

²² 47 C.F.R. § 1.925.

Commission's rules, the Commission may suspend, revoke, amend, or waive any rule for "good cause shown."²³

III. THE COMMISSION SHOULD WAIVE THE APPLICATION OF SECTIONS 90.729(B) AND 90.723(F) IN THIS CASE

A. A Waiver Would Not Undermine or Frustrate the Underlying Purpose of the Commission's Rules

1. Section 90.729(b)

The underlying purpose of Section 90.729(b) would not be frustrated if a waiver is granted in this case because PTC-220's operation at the greater power levels and antenna heights would not cause harmful interference to co-channel or adjacent channel licensees, based on the protection criteria PTC-220 is proposing below. The height and power limitations in Section 90.729 were established "to permit sufficient power levels for satisfactory operation while reducing the possibility of interference,"²⁴ and are primarily intended to protect "adjacent channel users."²⁵ However, the Commission typically grants waivers of its power and antenna height rules if the risk of interference to other parties is low. For example, in 2010, the Commission waived the power thresholds applicable to licensees operating in the 450-470 MHz band because the adjacent frequencies at issue were generally not in use, and there was "little risk of interference due to the requested increase in power."²⁶ Similarly, PTC-220's operation of

²³ *Id.* § 1.3.

²⁴ Application of County of Morgan, West Virginia to Operate a County-Wide Public Safety Radio System Utilizing 220 MHz Band Frequencies, *Order*, 21 FCC Rcd 5161, 5163 ¶ 7 (2006) ("*County of Morgan*"), citing Amendment of Part 90 of the Commission's Rules to Provide for the Use of the 220-222 MHz Band by the Private Land Mobile Radio Service, *Memorandum Opinion and Order on Reconsideration*, 13 FCC Rcd 14569, 14607 ¶ 80 (1998) ("*220 MHz MO&O*").

²⁵ *220 MHz MO&O* at 14608 ¶ 82.

²⁶ Requests for Waiver for End-of-Train Devices to Exceed Power Limit for Telemetry Operations in the 450-470 MHz Band, *Order*, 25 FCC Rcd 16986, 16988 ¶ 7 (2010) ("*EOT Order*"); see also State of Montana, *Order*, 25 FCC Rcd 12571, 12573 ¶ 9 (finding that operation at the higher power and antenna heights "will likely create no risk of harmful interference to incumbent operators") ("*Montana Order*"); MDS Operations, Inc., Request for Waiver of Certain Multichannel Video Distribution and Data Service Technical Rules for One Station in Sandia

its sites at the proposed power levels and antenna heights would not cause material interference to other co-channel or adjacent channel operations.

a) *Co-Channel Interference*

An increase in the power and antenna height limits for PTC-220's nationwide and *de facto* nationwide licenses will cause no co-channel user interference because there are no other co-channel users. With regard to PTC-220's regional E Block frequencies, where there are co-channel licensees in neighboring market areas, harmful interference to co-channel users is unlikely. The Commission has already found that potential interference to co-channel users in adjacent markets on the 220 MHz E Block will be minimal, "limited to areas along established rail lines – often rural, sparsely populated areas," and that "transmissions originating from train radios should be predictable given the regular scheduling of trains."²⁷ Moreover, as a condition of its current waivers, PTC-220 must notify all co-channel E Block licensees in adjacent markets 30 days prior to commencing operations.²⁸

Despite the higher power and antenna height limits being proposed, the Commission's rules already provide adequate protection criteria for co-channel licensees in adjacent markets. Section 90.771 prohibits a regional licensee's transmissions from exceeding a predicted 38 dBu field strength at the EA border.²⁹ Licensees may only exceed that field strength if all affected, co-channel regional licensees agree to the higher field strength.³⁰ Moreover, regional licensees

Park, New Mexico, *Order*, 25 FCC Rcd 7963, 7968-7969 ¶ 13 (2010) (granting waiver because operation at the increased power limits would not cause an increase in harmful interference) ("*MDS Waiver*").

²⁷ *2009 Waiver* at 8545 ¶ 19.

²⁸ *Id.*

²⁹ 47 C.F.R. § 90.771(a).

³⁰ *Id.* § 90.771(b).

must coordinate to minimize interference at or near the EA border, and must cooperate to resolve any instances of interference.³¹

PTC-220 notes that the text of Section 90.771 is drafted to apply the field strength limit to “transmissions from base station frequencies.” Because of its existing waiver, however, the base stations of PTC-220 users will be operating on all 220 MHz band frequencies. Thus, PTC-220 interprets the limit to apply to all PTC base station transmissions in the E Block. The Commission may wish to condition PTC-220’s requested waiver with such compliance, which should ensure adequate protection for co-channel E Block licensees.

b) Adjacent Channel Interference

Section 90.210(f), for which no waiver has been sought, already acts to mitigate potential adjacent channel interference. Because the 220 MHz band was originally channelized into narrow 5 kHz channels, the Commission adopted a steep emissions mask “F” to protect adjacent channels.³² This strict emissions mask will have an even greater effect of reducing the risk of interference from PTC operations, which will use 25 kHz channels. Under emissions mask F, PTC transmitter emissions will be below -25 dBm at the center of an adjacent 5 kHz channel (just 2.5 kHz away from the channel edge). Radios that are currently being developed for PTC have emission levels closer to -35 dBm at this point, rendering the risk of harmful interference to be even less likely.

However, to further reduce the likelihood that PTC operations, following a grant of this waiver, would create a material risk of harmful interference to adjacent channel licensees, PTC-220 proposes that its waiver be conditioned on extending to all licensees in the 221-222 MHz

³¹ *Id.* § 90.771(c).

³² 47 C.F.R. § 90.210(f).

band the same protection—contained in Section 90.723(d)-(e)—that already protects some licensee receivers in Sub-band A from spectrally adjacent base station transmitters in Sub-band B.³³ Because there is no guard band between the base and mobile transmit bands in the 220 MHz band, the Commission effectively confronted the same issue present here – how to protect receivers from high power adjacent transmitters. The solution the Commission developed was to establish geographic separation distances, variable depending on the radiated power employed, between base station transmitters and receivers operating within 200 kHz of the transmitter.³⁴ Upon granting this waiver request, the Commission can protect Phase I and Phase II receivers operating in the 220 MHz band by adopting frequency and geographic spacing requirements that align with those provisions (with some additional protection for stations located between 6 and 10 km), as follows in this matrix:

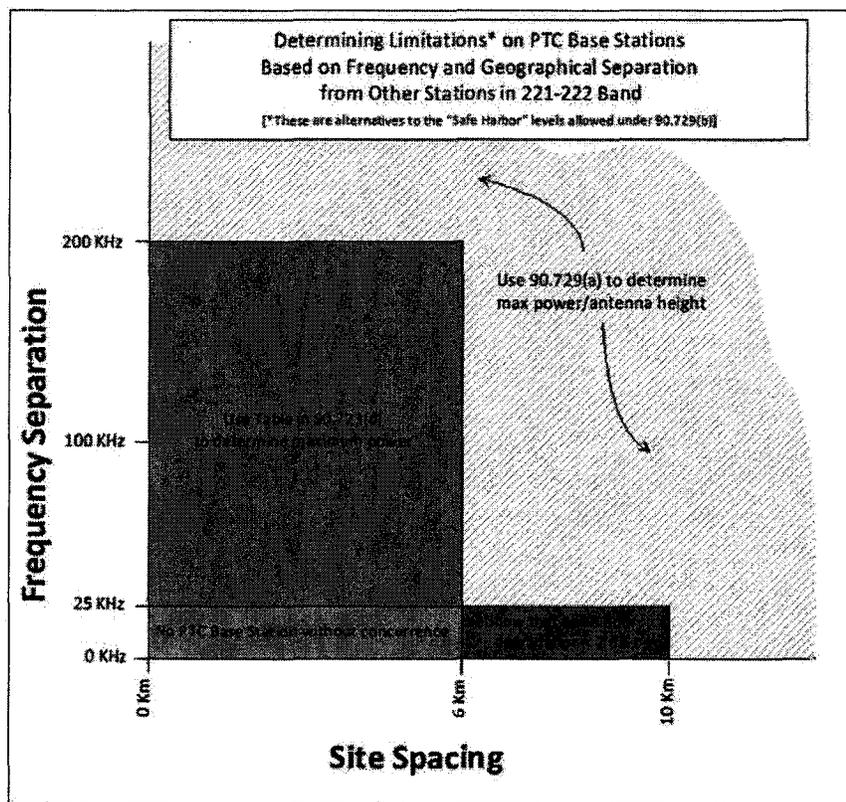
Scenario	Requirement
To protect Phase I Licensees	
For Phase I licensee receivers within 25 kHz and 6 km of a proposed PTC transmitter	No PTC transmitter would be permitted without the concurrence of the Phase I licensee
For Phase I licensee receivers within 25-200 kHz and 6 km of a proposed PTC transmitter	Apply geographic separation/ERP limits in accordance with the table in Section 90.723(d) of the Commission's rules
To protect Phase II and nationwide Phase I Licensees	
For <i>existing</i> Phase II and nationwide Phase I receivers within 25 kHz and 6 km of a proposed PTC transmitter	No PTC transmitter would be permitted without the concurrence of the Phase II or nationwide Phase I licensee
For <i>existing</i> Phase II and nationwide Phase I receivers within 25-200 kHz and 6 km of a proposed PTC transmitter	Apply geographic separation/ERP limits in accordance with the table in Section 90.723(d) of the Commission's rules

³³ See *id.* § 90.715(a). This rule establishes the lower 40 duplex channels of the 220-222 MHz band as Sub-band A, and the upper 40 duplex channels as Sub-band B. This effectively places the transmit frequencies of Sub-band B adjacent to the receive frequencies of Sub-band A.

³⁴ *Id.* § 90.723(e).

Scenario	Requirement
For <i>existing</i> Phase II and nationwide Phase I receivers within 25 kHz and between 6 and 10 km of a proposed PTC transmitter	Notify the licensee of the proposed site. If requested, produce an engineering study showing that the degradation of the noise floor due to the PTC transmitter at the potential victim site will be 2 dB or less. (The study could be based on computer prediction, actual measurements, or both.) The parties could agree on relaxed criteria.
For <i>new</i> Phase II and nationwide Phase I receivers	Require coordination between the licensees

A graphic representation of this protection matrix is shown below:



2. Section 90.723(f)

Likewise, a waiver would not frustrate the underlying purpose of Section 90.723(f). The Commission adopted this coordination requirement to ensure that “appropriate geographic separations are maintained” among Phase I and Phase II licensees authorized on Sub-bands A or

B.³⁵ However, by waiving those provisions and adopting the separation requirements that mirror those in Sections 90.723(d)-(e) (as above in Section III.A.1.b), the Commission would actually streamline the deployment of PTC systems, while preserving the underlying purpose of those coordination requirements.

3. Coordination Procedures

Although PTC-220 seeks a waiver of the specific coordination requirement contained in Section 90.723(f) as described above, coordination with other Phase II and nationwide Phase I licensees may still be necessary (as noted in the chart above in Section III.A.1.b) under PTC-220's proposal in one scenario—namely, when another licensee wishes to locate a new station to receive in the 221-222 MHz band near an existing PTC-220 station that is operating in the band pursuant to this waiver request. The coordination process for this scenario should allow the other licensee to take advantage of its spectrum rights without being subject to harmful interference, while at the same time ensuring that there is no sudden change or impairment in service in the PTC network that could undermine the public safety goals of PTC.

As noted above, the Commission has not established procedures by which Part 90 licensees must coordinate/cooperate. Therefore, PTC-220 proposes, and seeks confirmation, that the following procedures constitute an acceptable coordination process for situations where another 220 MHz licensee seeks to locate a station near an existing PTC-220 station:

- The licensee shall provide written notice to PTC-220 requesting coordination, describing its desired site location and operating parameters.
- The parties agree to enter into good faith discussions to assess and resolve any potential for harmful interference.

³⁵ See Amendment of Part 90 of the Commission's Rules to Provide for the Use of the 220-222 MHz Band by the Private Land Mobile Radio Service, *Memorandum Opinion and Order on Reconsideration*, 13 FCC Rcd 14569, 14617 ¶ 100 (1998).

- If, at the end of the 90 days, the parties cannot reach agreement on a solution to avoid interference, the licensee may, via written notice, direct PTC-220 to take ameliorative action. PTC-220, at its option, shall either: (i) modify its station to conform to the protection criteria proposed in this waiver request for existing stations (*i.e.*, see protection matrix above); (ii) provide an analysis or measurement demonstrating that PTC-220's interference level at the potential victim site would be at or below the level that would be received if PTC-220 were operating without the advantage of the instant waiver; or (iii) reduce its transmit power/antenna height at the affected site(s) to the levels permitted under the existing rules for fixed stations in the 221-222 MHz band.
- To allow sufficient time to engineer changes to the PTC network, PTC-220 would need up to 180 days to make any necessary modifications to its operating parameters or site location.

Obviously, should the other licensee be unsatisfied with PTC-220's mitigation efforts or with any phase of the process, it would retain the option of contacting the Commission for assistance as envisioned in Section 90.173(b).³⁶

4. PTC-220's Commitment to Correct Interference

Finally, if adoption of the framework proposed above is inadequate to prevent harmful interference in some circumstances, PTC-220 would remain willing and able to take measures necessary to prevent or correct such interference to co-channel and adjacent channel receivers operating between 221-222 MHz caused by PTC operations following the waiver. Each of PTC-220's member organizations has decades of experience designing, deploying, and maintaining large scale radio networks in some of the most congested areas in the United States. They routinely design systems to avoid and eliminate interference when and where it occurs. Moreover, as noted above, TTCI has been performing frequency coordination for the U.S. rail industry's 160 MHz spectrum for many years, and the FCC has designated its parent

³⁶ 47 C.F.R. § 90.173(b) ("Licensees of stations suffering or causing harmful interference are expected to cooperate and resolve this problem by mutually satisfactory arrangements. If the licensees are unable to do so, the Commission may impose restrictions including specifying the transmitter power, antenna height, or area or hours of operation of the stations concerned.").

organization, AAR, to be the exclusive frequency coordinator for the LR frequencies in the Industrial/Business Pool.³⁷

B. Granting a Waiver In This Case Would Further the Public Interest

Granting a waiver in this case would serve the public interest in three important ways:

1. Fostering a New Safety-Related Technology

A waiver would further the development and deployment of PTC, a new technology that has growing importance in monitoring rail activity, preventing collisions, and enhancing public safety. The Commission has long provided waiver relief when a licensee proposes to use spectrum for a new wireless service or technology, particularly for public safety purposes. In this case, the requested waiver would facilitate the creation of a reliable interconnected radio system intended and designed to “increase the safety of life and property for railroads and their employees, and for people in communities through which trains travel,”³⁸ without any significant risk of harmful interference to other co-channel or adjacent channel licensees. Additionally, because PTC-220 is willing and able to mitigate any interference that results from operating with increased power and antenna height limitations, a waiver would further the Commission’s objective of fostering the deployment of new technologies without undermining the protections that the Commission has afforded other operations.³⁹

³⁷ See *id.* § 90.35(b)(4); Replacement of Part 90 by Part 88 to Revise the Private Land Mobile Services and Modify the Policies Governing Them and Examination of Exclusivity and Frequency Assignment Policies of the Private Land Mobile Services, *Second Report and Order*, 12 FCC Rcd 14307, 14330 ¶ 42 (1997); *id.* at 14362, Appendix D; Frequency Coordination in the Private Land Mobile Radio Services, *Report & Order*, 103 FCC 2d 1093, 1139 ¶ 94 (1986); Replacement of Part 90 by Part 88 to Revise the Private Land Mobile Services and Modify the Policies Governing Them and Examination of Exclusivity and Frequency Assignment Policies of the Private Land Mobile Services, *Second Memorandum Opinion and Order*, 14 FCC Rcd 8642, 8646-47 ¶ 6 (1999).

³⁸ *EOT Order* at 16988 ¶ 8.

³⁹ Alvarion Ltd. Application for Equipment Certification for Transmitter in the 3650-3675 MHz Band under Subpart Z of Part 90 of the Commission’s Rules, *Order*, 25 FCC Rcd 3863, 3866 ¶ 11 (2010).

2. Increasing the Ability of 220 MHz PTC Networks to Serve More Railroads

Granting this waiver would also serve the public interest by allowing PTC-220 to increase the capacity of networks on its spectrum, thereby accommodating more railroads in more parts of the country, including areas of high railroad congestion. PTC-220 has consistently noted that PTC spectrum needs are most acute in areas of high population.⁴⁰ By waiving Sections 90.729(b) and 90.723(f), the Commission can help satisfy the heightened demand for spectrum among rail operators in major metropolitan areas.

The Commission has previously found that a licensee's need to expand its network coverage is an appropriate basis for waiving its power and antenna height restrictions.⁴¹ Likewise, the Commission has found a waiver to be in the public interest when necessary to ensure the provision of adequate coverage and service, and has specifically waived the power and antenna height restrictions of Section 90.729 where the petitioner demonstrated that a waiver was necessary "to provide adequate service" to a designated service area.⁴² In 2010, the Commission waived the power limits applicable to eight petitioning railroads after concluding that those limits were insufficient for the communications intended on the frequencies at issue.⁴³ Waiver in this case would similarly enable PTC-220 to ensure that the nationwide interoperable PTC networks can adequately and consistently offer PTC coverage to as many railroads as possible, regardless of the rail density of a particular area.

⁴⁰ See, e.g., *Nov. 2012 Construction Progress Report* at 6.

⁴¹ Application of University of Minnesota – Athletics Request for Waiver of Section 90.267 to Exceed Maximum Antenna Height, *Order*, 25 FCC Rcd 2612, 2612-2613 ¶ 4 (2010).

⁴² See *County of Morgan* at 5163 ¶ 7.

⁴³ See, e.g., *EOT Order* at 16987-16988 ¶ 7.

3. Promoting the Efficient and Flexible Use of Spectrum

The public interest would also be served because a waiver would encourage the efficient and flexible use of spectrum, and thereby align with the Commission's policy goals for 220 MHz spectrum.⁴⁴ Absent a waiver, approximately half of PTC-220's spectrum holdings will be of limited or no use for PTC operations, and PTC-220 would be forced to find and acquire additional spectrum, just to adequately support the statutorily mandated PTC operations for its seven member railroads. More importantly, PTC-220 will have substantially less spectrum capacity to make available through spectrum leases to smaller, non-member railroads who must also comply with the PTC mandate. Indeed, in congested areas, PTC-220 may be competing for spectrum against some of these railroads in the secondary markets.

C. A Waiver Is Warranted in View of the Unique Circumstances in This Case, and Application of Sections 90.729(b) and 90.723(f) Would be Inequitable and Unduly Burdensome

The unique and unusual circumstances facing PTC-220 in deploying its PTC network also justify waiver relief in this instance. *First*, the unfunded mandate that railroads (including PTC-220's members) implement adequate PTC systems by the end of 2015 constitutes a unique and unusual circumstance. Although the railroads are obligated to deploy functional PTC systems by December 31, 2015, no government or agency has allocated resources for PTC deployment. As such, denial of waiver relief would be inequitable, unduly burdensome, and contrary to the public interest because PTC-220 and its members would be forced to expend

⁴⁴ Amendment of Part 90 of the Commission's Rules to Provide for the Use of the 220-222 MHz Band by the Private Land Mobile Radio Services, *Second Memorandum Opinion and Order and Third Notice of Proposed Rulemaking*, 11 FCC Rcd 188, 193 (1995) (noting that the Commission's primary goal in addition to promoting efficient use of the 220 MHz spectrum "is to establish a flexible regulatory framework that will . . . eliminate unnecessary regulatory burdens on both existing and future licensees," and "ensure that licenses are granted to those who value the spectrum most highly and will maximize its use to provide the best quality and variety of service to consumers").

significant additional capital to acquire more spectrum and, where that is not an option, to build additional infrastructure to support sites with smaller coverage areas.

PTC-220 estimates that, without the waiver, it would need to construct, on average, nearly 2.4 stations to provide the same track coverage as could be provided from a single station operating under the requested waiver.⁴⁵ In a congested area where all PTC channels are needed, this could increase the number of required base stations by almost 70%. In an area like Chicago, for example, this could amount to 25 additional base stations along with their attendant infrastructure and backhaul requirements. In cases where appropriate existing facilities are not available, greenfield sites may have to be built. For the Chicago area alone, the incremental cost to complete a PTC network without the waiver could approach \$2 million. Expanding these calculations to consider all congested areas throughout the country would obviously result in multiple tens of millions of dollars in additional mandated costs.

Second, the nature of PTC-220's proposed PTC deployment is a unique circumstance that justifies waiver. Specifically, PTC-220 is uniquely situated in using its 220 MHz spectrum to oversee and coordinate the deployment of interoperable, nationwide PTC service for all Class I rail operators, which will enhance safety and efficiency in rail transportation on a nationwide basis by reducing and preventing train collisions throughout the United States. By employing a common radio protocol, 220 MHz PTC will permit multiple railroads to operate on the same track and achieve true nationwide interoperability. PTC-220 also plans to lease spectrum to, and

⁴⁵ Under 90.729(b), transmitters in the 221-222 MHz band are limited to 50 watts at a 7 meter HAAT antenna height, with the provision that higher antennas may be used if power is reduced by a factor of $10\log(h/7)$, where h is the antenna height in meters. The most consequential restriction here is the antenna height. In areas where ground level HAAT is positive, this can put antennas well within the clutter (e.g., buildings, trees and other vegetation or man-made structures rising above ground level), and even below the height of much rail equipment. By raising antennas to a useful height for base communication to mobiles – for example, 30 meters HAAT – the required power reduction puts ERP at approximately 12 watts. Using propagation models developed for PTC, this would translate into a nearly 60% reduction in computed range from a base station compared to stations operating at typical PTC levels.

support, non-member railroads that lack adequate spectrum for PTC purposes. This service will be of heightened value to smaller railroads in densely populated areas that would not otherwise be able to acquire its own spectrum to meet the PTC mandate.

Accordingly, granting this waiver request will facilitate the unique development of PTC-220's nationwide network and leasing/support services that will extend well-known benefits to the U.S. railroad industry and the general public. Moreover, a waiver would align with Congress' mandate in Section 151 that the Commission "promot[e] safety of life and property,"⁴⁶ as well as the Commission's prior findings concerning the value of wireless technologies in the railroad industry,⁴⁷ thereby furthering the public safety benefits of the PTC network.

Finally, PTC-220's need to rely on 220 MHz spectrum is a unique and unusual circumstance that justifies waiver in this case. Because (as noted above) the U.S. railroad industry heavily uses 160 MHz band spectrum for a variety of functions, PTC-220 had few realistic options in acquiring additional spectrum suitable for PTC operations. By procuring licenses in the 220 MHz band, PTC-220 took a meaningful step towards satisfying the federal PTC mandate. However, after conducting subsequent development work on its PTC network, PTC-220 discovered that, absent this waiver, it cannot fully harness the potential of the 220 MHz spectrum and its infrastructure within the current regulatory framework. Until the complex

⁴⁶ 47 U.S.C. § 151.

⁴⁷ Application for Consent to the Assignment of a Five-Channel 220 MHz Nationwide License (Call Sign WPWY753, formerly WPTC968) from Rush Network Corp. to the Association of American Railroads, Request by Rush Network Corp. for Waiver of the Ten-Year Construction Requirement, *Order*, 18 FCC Rcd 24711 ¶¶ 6-8 (2003) (granting AAR's request for waiver of the commercial use only restriction based on the conclusion that AAR served as licensee on behalf of its member railroads to coordinate portable locomotive control technology operations, the PLCT operations on narrowband channels provided for flexible use of the spectrum and would spur technological innovation, and promoted public safety by eliminating the use of the congested 450-460 MHz band); see also *FCC Staff Report on NTIA's Study for Current and Future Spectrum Use by the Energy, Water and Railroad Industries 5* (July 30, 2002) (stating that the railroad industry has been developing PTC systems to protect against train collisions and incursions into roadway worker locations and enforcing train speeds).

engineering studies were completed, PTC-220 could not have foreseen these circumstances, which are sufficiently unique and unusual to support a grant of this waiver request.

IV. CONCLUSION

For the foregoing reasons, PTC-220 respectfully requests that the Commission grant the waivers requested herein.

Respectfully submitted,

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