

FCC MAIL SECTION

Federal Communications Commission

FCC 97-305

SEP 18 10 39 AM '97

DISPATCHED BY

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

In the Matter of)	
)	
Amendment of Part 90 of the)	PR Docket No. 93-61
Commission's Rules to Adopt)	
Regulations for Automatic Vehicle)	
Monitoring Systems)	

**MEMORANDUM OPINION AND ORDER
AND FURTHER NOTICE OF PROPOSED RULE MAKING**

Adopted: August 28, 1997

Released: September 16, 1997

Comments Due: November 5, 1997

Reply Comments Due: November 20, 1997

By the Commission:

TABLE OF CONTENTS

	<u>Paragraph</u>
I. INTRODUCTION	1
II. ELIGIBILITY AND PERMISSIBLE USES	7
III. OTHER ISSUES RAISED ON RECONSIDERATION	
A. Definition and Licensing of Non-Multilateration Systems	
1. Antenna Heights and Power Limitations	18
2. Licensing Issues	24
B. Accommodation of Secondary Users in the 902-928 MHz Band	28
1. Parameters of Safe Harbor	30
2. Safe Harbor and Non-Multilateration Systems	39
3. Administrative Procedure Act	41
C. Spectrum Allocation Plan	43
D. Geographic Areas for Exclusive Licenses	51
E. Multilateration System Operations -- Wideband Forward Links	56

F. Petitions for Reconsideration of <i>Order on Reconsideration</i>	65
IV. COMPETITIVE BIDDING FOR MULTILATERATION LMS LICENSEES	72
V. CONCLUSION	79
VI. ADMINISTRATIVE MATTERS	80
VII. ORDERING CLAUSES	83
Appendix A -- Pleadings	
Appendix B -- Initial Regulatory Flexibility Analysis (<i>Further Notice of Proposed Rule Making</i>)	
Appendix C -- Final Regulatory Flexibility Analysis (<i>Report and Order</i>)	
Appendix D -- Rule Changes	

I. INTRODUCTION

1. In this *Memorandum Opinion and Order and Further Notice of Proposed Rule Making*, we address the remaining issues raised by petitioners for reconsideration of our *Report and Order* in PR Docket No. 93-61, which established rules governing the licensing of the Location and Monitoring Service (LMS) in the 902-928 MHz band.¹ We resolved other issues raised by petitioners in an *Order on Reconsideration* in this docket.² This item clarifies interconnection limitations for multilateration LMS, as well as other issues raised on reconsideration, such as operational parameters for non-multilateration systems, treatment of other users of the 902-928 MHz band, the structure of the spectrum allocation plan, the geographic service area for licensing multilateration LMS, and the licensing of wideband forward links.³

2. As we have discussed previously in this Docket, LMS refers to advanced radio technologies designed to support the nation's transportation infrastructure and to facilitate the growth of Intelligent Transportation Systems.⁴ In the *LMS Report and Order*, we created a new Subpart M in

¹Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Report and Order*, PR Docket No. 93-61, 10 FCC Rcd 4695 (1995) (*LMS Report and Order*).

²See Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Order on Reconsideration*, PR Docket No. 93-61, 11 FCC Rcd 16905 (1996) (*LMS Order on Reconsideration*). Specifically, the *Order on Reconsideration* resolved issues regarding incumbent LMS licensees that were being afforded grandfathered status. These issues involved interference testing, accommodation of secondary uses in the 902-928 MHz band, emission masks, frequency tolerance, type acceptance and site relocation with respect to grandfathered licensees, as well as extension of the construction deadline applicable to grandfathered licensees.

³A list of parties filing Petitions for Reconsideration and associated pleadings in this proceeding is attached as Appendix A.

⁴The term "Intelligent Transportation System," or "Intelligent Vehicle Highway System," refers to the collection of advanced radio technologies that, among other things, is intended to improve the efficiency and safety of our nation's highways. *LMS Report and Order* at 4698 n.9.

Part 90 of the Commission's Rules for Transportation Infrastructure Radio Services (TIRS). LMS, which encompasses the 20-year-old Automatic Vehicle Monitoring Service as well as developing transportation-related services, was deemed to be the first service included within the TIRS category. In this regard, the Intelligent Transportation Society of America filed a petition for reconsideration of the *LMS Report and Order* requesting that we redesignate TIRS as ITSRS, or "Intelligent Transportation Systems Radio Service." This request was supported by the American Association of State Highway and Transportation Officials and by the Land Mobile Communications Council. These parties contend that the term "Intelligent Transportation System" has become widely accepted by other government agencies and in the private sector, and would be more descriptive of the types of services contemplated for Subpart M of Part 90. We are persuaded that it would be appropriate to refer to LMS and like services as Intelligent Transportation Systems Radio Services, and we will change our rules accordingly.

3. In the *LMS Report and Order*, the Commission defined two types of LMS systems -- multilateration and non-multilateration. Multilateration LMS systems are designed to locate vehicles or other objects by measuring the difference of time of arrival, or difference in phase, of signals transmitted from a unit to a number of fixed points, or from a number of fixed points to the unit to be located. Such systems generally use spread-spectrum technology to locate vehicles throughout a wide geographic area. Multilateration technology is used, for example, by trucking companies to track individual vehicles, by municipalities to pinpoint the location of their buses, and by private entrepreneurs developing subscriber-based services for recovery of stolen vehicles.⁵ The Commission defined non-multilateration systems as LMS systems that employ any technology other than multilateration technology. The Commission noted that unlike a multilateration system, which determines the location of a vehicle or object over a wide area, a typical non-multilateration system uses narrowband technology whereby an electronic device placed in a vehicle transfers information to and/or from that vehicle when the vehicle passes near one of the system's stations. Examples of non-multilateration LMS systems include automated toll collection devices and systems used by railway companies to monitor the location of railroad cars.⁶

4. LMS operates in the 902-928 MHz frequency band.⁷ The band is allocated for primary use by Federal Government radiolocation systems. Next in order of priority are Industrial, Scientific and Medical (ISM) devices. Federal Government fixed and mobile and LMS systems are secondary to both of these uses. The remaining uses of the 902-928 MHz band include licensed amateur radio operations and unlicensed Part 15 equipment, both of which are secondary to all other uses of the band. Part 15 low power devices include, but are not limited to, those used for automatic meter reading, inventory control, package tracking and shipping control, alarm services, local area networks, internet access and cordless telephones. The amateur radio service is used by technically inclined private citizens to engage in self-training, information exchange and radio experimentation. In the *LMS Report and Order*, the Commission recognized the important contribution to the public provided

⁵*LMS Report and Order* at 4697-98, 4703.

⁶*Id.*

⁷The definition of LMS also includes existing Automatic Vehicle Monitoring operations below 512 MHz. Unlike other LMS operations, LMS systems below 512 MHz may neither offer service to the public nor provide service on a commercial basis. See *LMS Report and Order* at 4738.

by Part 15 technologies and amateur radio operators and sought to develop a band plan that would maximize the ability of these services to coexist with LMS systems.⁸

5. The Commission adopted the *LMS Report and Order* with an eye toward minimizing potential interference within and among the various users of the 902-928 MHz band. The Commission's band plan accordingly permits secondary operations across the entire band by users of unlicensed Part 15 devices and amateur licensees. At the same time, the band plan separates non-multilateration from multilateration LMS systems in all but one subband so as to avert interference. The *LMS Report and Order* also established limitations on LMS systems' interconnection with the public switched network and set forth a number of technical requirements intended to ensure successful coexistence of all the services authorized to operate in the band.

6. This *Memorandum Opinion and Order* for the most part affirms decisions made by the Commission in the *LMS Report and Order* as an appropriate balancing of the interests of the different uses authorized in the band. Where appropriate, we clarify particular aspects of those decisions. First, we review petitioners' objections to our interconnection restrictions and clarify that the regulatory classification of LMS operators will be determined on a case-by-case basis. Next, we address petitioners' concerns regarding the definition and scope of the non-multilateration LMS service. We then discuss issues raised by petitioners regarding the "safe harbor" within which Part 15 devices and amateur operators will be deemed not to cause interference to multilateration LMS providers. We next address petitioners' suggested changes to the band plan adopted in the *LMS Report and Order*, as well as our decision to license multilateration LMS systems on a major trading area (MTA) basis. We further consider the propriety of allowing multilateration wideband forward links to operate in the 902-928 MHz band. Finally, in a *Further Notice of Proposed Rule Making* included as part of this item, we propose rules and procedures governing competitive bidding for multilateration LMS frequencies.

II. ELIGIBILITY AND PERMISSIBLE USES

7. *Background.* In the *LMS Report and Order*, we recognized that multilateration systems may have some need for interconnection with the public switched telephone network (PSTN). At the same time, however, we recognized that unlimited interconnection by multilateration operators would be incompatible with the unique technical environment created by different types of services sharing the 902-928 MHz band. We were concerned that such activity would not only increase the potential for harmful interference to other users of the band, but also detract from the location and monitoring purposes of the LMS allocation. Accordingly, we adopted operational restrictions on multilateration LMS operators to minimize interference to all users of the spectrum. These restrictions include limitations on messaging services and interconnection with the PSTN, and a prohibition against message and data transmissions to fixed units and units for which location and monitoring is not being provided.⁹

8. *Pleadings.* Of the restrictions listed above, the most discussed by petitioners are the Commission's limitations on interconnection. Specifically, the Commission in the *LMS Report and*

⁸See *LMS Report and Order* at 4714.

⁹*LMS Report and Order* at 4708.

Order permitted "store and forward" interconnection where either (1) transmissions from a vehicle or object being monitored are stored by the multilateration LMS provider for later transmission over the PSTN, or (2) transmissions received by the multilateration LMS provider from the PSTN are stored for later transmission to the vehicle or object being monitored. The rules adopted in the *LMS Report and Order* do not permit "real-time" interconnection between vehicles and the PSTN except for emergency communications related to a vehicle or a passenger in a vehicle.¹⁰

9. MobileVision is the only petitioner that supports unrestricted interconnection. It believes that interconnection with the PSTN must be provided on an unrestricted basis if multilateration LMS systems are to be viable and the goals of the Intelligent Vehicle Highway System are to be attained. In the alternative, MobileVision proposes that multilateration systems' interconnection capabilities only be restricted by requiring store and forward interconnection to the mobile unit from the PSTN, but permit unrestricted (*i.e.*, real time) communication to the PSTN from the mobile unit. MobileVision submits that this is the minimum degree of interconnection necessary to serve the needs of the public and the Intelligent Vehicle Highway System and to provide the necessary foundation for a successful spectrum auction.¹¹

10. Unlike MobileVision, the majority of parties addressing the issue support at least some restriction on LMS interconnection. For example, Pinpoint submits that allowing unlimited voice communications would be inappropriate because such traffic would increase interference levels throughout the band and would complicate sharing in the band. Pinpoint thus supports limiting interconnection to data store and forward messages.¹² Similarly, Metricom/SCE, CellNet and the Part 15 Coalition argue that voice messaging is not an important component of LMS and that permitting it will eliminate the possibility of Part 15 devices coexisting with LMS operators in the 902-928 MHz band.¹³ Ad Hoc Gas and the Part 15 Coalition oppose use of LMS for interconnected voice messaging, even on a limited, store-and-forward basis.¹⁴ The Part 15 Coalition suggests that if the Commission nevertheless decides to retain this exception, a minimum time delay of transmission should be imposed such that a two-way, person-to-person conversation would be impossible (*e.g.*, one minute).¹⁵

11. Further, some petitioners that oppose permitting any multilateration LMS interconnection to the PSTN submit that the restrictions adopted by the Commission present substantial enforcement

¹⁰*LMS Report and Order* at 4710.

¹¹MobileVision Petition at 5-6.

¹²Pinpoint Opposition at 21-22.

¹³Metricom/SCE Opposition at 3; CellNet Opposition at 9; Part 15 Coalition Petition at 7-8. AT&T, UTC and the Connectivity for Learning Coalition also oppose interconnection for voice communications. AT&T Reply at 3; UTC Petition at 2; Connectivity for Learning Coalition Petition at 11-12.

¹⁴Ad Hoc Gas Petition at 16; Part 15 Coalition Petition at 7.

¹⁵Part 15 Coalition Petition at 12, *contra* AirTouch/Teletrac Opposition at 15.

problems.¹⁶ They argue that by limiting transmission of messages to emergency communications related to the location and monitoring functions of the system, the Commission will place multilateration LMS operators in the position of having to become substantially involved with the content of their customers' communications. Further, UTC contends that carrier enforcement of this restriction could violate Section 705 of the Communications Act, which prohibits carriers from divulging the contents of their customers' communications.¹⁷ UTC additionally argues that a rule requiring multilateration LMS providers to monitor, disclose and/or prevent customers from transmitting certain types of communications could be construed as a form of censorship in violation of Section 326 of the Communications Act.¹⁸ Similarly, Ad Hoc Gas submits that allowing interconnection for only limited purposes could be considered a content-based speech restriction in violation of the First Amendment.¹⁹

12. Nonetheless, some parties, even those that generally oppose interconnection, recognize that some interconnected service is needed in the event of an emergency. For example, CellNet contends that the use of any interconnected services should be limited to those of an emergency nature, whether it is a real-time or a store and forward communication.²⁰ AirTouch/Teletrac and SBMS believe that it would be in the public interest to allow voice communications for emergency

¹⁶See, e.g., Ad Hoc Gas Petition at 15-16; Metricom/SCE Petition at 14-15; Connectivity for Learning Coalition Petition at 13; UTC Petition at 9; Symbol Technologies Comments at 11.

¹⁷UTC Petition at 7. Section 705 of the Communications Act reads, in pertinent part, as follows:

Except as authorized by chapter 119, title 18 . . . no person receiving, assisting in receiving, transmitting, or assisting in transmitting, any interstate or foreign communication by wire or radio shall divulge or publish the existence, contents, substance, purport, effect, or meaning thereof, except through authorized channels of transmission or reception, (1) to any person other than the addressee, his agent, or attorney, (2) to a person employed or authorized to forward such communication to its destination, (3) to proper accounting or distributing officers of the various communicating centers over which the communication may be passed, (4) to the master of a ship under whom he is serving, (5) in response to a subpoena issued by a court of competent jurisdiction, or (6) on demand of other lawful authority

47 U.S.C. § 705(a).

¹⁸UTC Petition at 8. Section 326 of the Communications Act reads as follows:

Nothing in this chapter shall be understood or construed to give the Commission the power of censorship over the radio communications or signals transmitted by any radio station, and no regulation or condition shall be promulgated or fixed by the Commission which shall interfere with the right of free speech by means of radio communications.

47 U.S.C. § 326.

¹⁹Ad Hoc Gas Petition at 16-17.

²⁰CellNet Petition at 12.

situations.²¹ On the other hand, Symbol Technologies would prohibit all interconnected voice messaging, even for emergency purposes, due to questions regarding the legality of monitoring message content.²² The Part 15 Coalition contends that there is no justification for emergency voice communications to be interconnected to the PSTN because other technologies are available for emergencies, such as emergency radio beacons.²³ AirTouch/Teletrac responds that voice messages may be necessary to explain certain complex situations and could be time and life saving.²⁴ In any event, a number of petitioners request that the definitions of store and forward messaging and emergency voice communications be clarified.²⁵

13. *Discussion.* As noted above, the *LMS Report and Order* specifically permitted "store and forward" interconnection, where either (1) transmissions from a vehicle or object being monitored are stored by the LMS provider for later transmission over the PSTN, or (2) transmissions received by the LMS provider from the PSTN are stored for later transmission to the vehicle or object being monitored.²⁶ Real-time interconnection between vehicles or objects being monitored and the PSTN was limited to emergency communications related to a vehicle or passenger in a vehicle. The *LMS Report and Order* also stated that emergency communications may include information about a medical condition that requires immediate attention or the mechanical breakdown or failure of an automobile.²⁷

14. After revisiting this issue and considering petitioners' concerns, we continue to believe that our decision regarding limitations on multilateration LMS interconnection reflects a necessary balancing of the interests of LMS providers and other users of the 902-928 MHz band. Relaxing restrictions on interconnection could increase the potential for interference in the band by allowing for additional message traffic. We believe that requiring messages to be sent on a store-and-forward basis will reduce message traffic in the band by making it difficult to conduct a real-time conversation using LMS spectrum. We therefore reject MobileVision's recommendation that multilateration LMS users be permitted unrestricted interconnection to the PSTN. We note that other services, such as personal communications services (PCS) and cellular telephone, are available for that type of use. At the same time, however, we conclude that real-time interconnection is necessary and appropriate in emergency situations. We therefore also reject the arguments of commenters asking that we forbid real-time interconnection in emergency situations. We believe that to do otherwise could impede the development of LMS, to the detriment of Intelligent Transportation Systems and, more importantly,

²¹AirTouch/Teletrac Opposition at 13-14; SBMS Opposition at 16. TIA also supports permitting interconnection for emergency purposes. TIA Comments at 11.

²²Symbol Technologies Comments at 11.

²³Part 15 Coalition Petition at 9.

²⁴Teletrac Reply at 6.

²⁵See, e.g., CellNet Petition at 12; Connectivity for Learning Petition at 13; Part 15 Coalition Petition at 8-12.

²⁶*LMS Report and Order* at 4710.

²⁷*Id.* at n.61.

would raise significant public safety concerns.

15. We clarify that "store and forward" communications as described in the *LMS Report and Order* refers to a storage of voice or data messages for subsequent delivery to the recipient. We decline to adopt a specific minimum delay, as requested by some petitioners. As a guideline, however, we adopt a "safe harbor" approach whereby a particular message will be considered an acceptable store-and-forward message pursuant to our rules if the LMS service provider incorporates at least a thirty-second delay between the time a message is stored and the time that message is forwarded. This is not to say that a delay of less than 30 seconds will be unacceptable in all cases, but use of a 30-second delay will ensure that the communication will be deemed to fit within the definition of a store and forward message with respect to LMS. While we considered using a one-minute delay, as suggested by the Part 15 Coalition, we believe that a thirty-second delay is sufficient to ensure that two-way conversation is impractical and will thereby discourage use of multilateration LMS for general messaging. We also clarify that emergency communications, for which real-time interconnection may be utilized, is equivalent to a 911 or 311 call. Such communication must have a direct relation to the immediate safety of life or for communications to render assistance to a motorist.²⁸ If no immediate action is necessary, it is not an emergency. All other communications should use "store and forward" technology.

16. We recognize petitioners' concerns that limiting interconnection based on the character of the message would be difficult to enforce and therefore raises the possibility of abuse. We believe, however, that setting forth specific examples of what is or is not an emergency would serve no useful purpose. While it may be desirable to have a fully descriptive definition of an emergency communication in the rules, such a rule could be unduly restrictive. The Commission does not intend to monitor the content of messages but expects that multilateration operators will be able to demonstrate compliance with the interconnection limitations if requested. Compliance may be accomplished by equipment that will permit voice calls in real time only to 311, 911, and an automobile road service provider. Of course, compliance might also be accomplished by multilateration LMS operators monitoring transmissions over their facilities and providing information regarding their transmissions to the Commission if requested. We believe that this type of monitoring will not violate Section 705 of the Communications Act as alleged by UTC, because it fits within the exception for providing information regarding a transmission "on demand of other lawful authority." We also note that the Commission will, on a case-by-case basis, consider requests for confidential treatment of such information. Moreover, the interconnection limitations are not tantamount to a restriction on free speech, as alleged by UTC and Ad Hoc Gas. Rather, the interconnection limitations are necessary to define the parameters of multilateration LMS service pursuant to the Commission's authority under the Communications Act to prescribe the type of service to be offered by a particular class of radio stations.²⁹

17. The interconnection issues raised by petitioners lead to the question of whether multilateration LMS is a Commercial Mobile Radio Service (CMRS). Pursuant to Section 332(d) of

²⁸A similar definition of "emergency communications" is used in the context of citizens band radio (CB) service. See In the Matter of Amendment of Section 95.41(d) of the Commission's Rules to Reserve a Citizen's Radio Frequency for Emergency Communications, Docket No. 18705, 22 FCC 2d 635 (1970).

²⁹See 47 U.S.C. § 303(b).

the Communications Act, a service is classified as CMRS if it is (1) provided for profit, (2) interconnected with the PSTN, and (3) available to the public or effectively available to a substantial portion of the public. In the *CMRS Second Report and Order*, we classified LMS as a Private Mobile Radio Service (PMRS). We indicated, however, that should LMS systems offer interconnected service in the future, they would be subject to reclassification as a presumptively Commercial Mobile Radio Service (CMRS).³⁰ At this juncture, it is unclear to what extent multilateration LMS providers will offer any interconnected service, notwithstanding their ability to offer some limited interconnection capabilities as discussed above. To accommodate the specific service offerings anticipated by each multilateration LMS provider, we will use a case-by-case approach in determining whether a particular service offering is CMRS or PMRS.

III. OTHER ISSUES RAISED ON RECONSIDERATION

A. Definition and Licensing of Non-Multilateration Systems

1. Antenna Height and Power Limitations

18. *Background.* In the *LMS Report and Order*, we limited the peak effective radiated power (ERP) of non-multilateration systems to 30 watts over the licensee's authorized bandwidth. The Commission also limited the antenna height above ground of these systems to 15 meters.³¹

19. *Pleadings.* The Part 15 Coalition proposes that the Commission make the height and power restrictions more strict, while Amtech suggests that they be relaxed in certain circumstances. The Part 15 Coalition contends that the Commission's definition of non-multilateration systems includes virtually any vehicular communications technology, including cellular and PCS. Further, it asserts that true "tag-reader" technologies require at most a few watts of power. The Part 15 Coalition submits that such high-power operations might not pose a significant threat of interference to Part 15 technologies if confined to highway toll plazas and railroad sidings, but that high-power systems with no geographic limits will overwhelm Part 15 operations in their vicinity. The Part 15 Coalition therefore requests that the Commission either (1) reduce the applicable power limitation for non-multilateration LMS systems to one watt, or (2) require that all such systems be operated within 50 meters of a highway toll plaza or rail siding.³²

20. Most parties addressing the issue believe that the Part 15 Coalition's proposal would unduly restrict non-multilateration operators.³³ For example, Pinpoint and Texas Instruments argue

³⁰ See Implementation of Sections 3(n) and 332 of the Communications Act, Regulatory Treatment of Mobile Services, *Second Report and Order*, GN Docket No. 93-252, 9 FCC Rcd 1411, 1453 (1994) (*CMRS Second Report and Order*).

³¹ *LMS Report and Order* at 4742.

³² Part 15 Coalition Petition at 17-18.

³³ See, e.g., AAR Opposition at 4; Hughes Opposition at 5-7; Pinpoint Opposition at 4-6; SBMS Opposition at 22-23; TI Opposition at 3-5.

that granting the Part 15 Coalition's proposal would foreclose operation of non-multilateration systems that are not tag readers, such as might be used in parking facilities to monitor permissible incoming and outgoing vehicles.³⁴ Hughes submits that the Part 15 Coalition's modification would limit non-multilateration operators' ability to maintain current services and develop and implement new ones.³⁵

21. Unlike the Part 15 Coalition, Amtech contends that the height and power limits adopted in the *LMS Report and Order* are too restrictive. For example, with respect to the height restriction, Amtech submits that readers used by airport authorities to monitor taxis and ground commercial transportation services sometimes are placed at locations less than 15 meters above the applicable arrival or departure ramp, but more than 15 meters above the ground. With respect to the power limitation, Amtech asserts that a railway company would need unconventional antennas in order to monitor rail cars in high speed multiple track situations.³⁶ Amtech therefore suggests that antenna heights greater than 15 meters should be permitted if the ERP is limited to 30 watts, and if the energy radiated toward the horizon is reduced such that the resultant radiated electric field is no more than 90 dBuV/m at a distance of one mile from the site at a height of six feet. Amtech also suggests that a system be permitted to exceed 30 watts ERP if the resultant radiated electric field is no more than 90 dBuV/m at a distance of one mile from the site and at a height of six feet (or 96 dBuV/m at one kilometer and a receive height of two meters).³⁷

22. A number of parties oppose Amtech's suggestion. They contend that allowing non-multilateration operators to exceed the height or power restrictions could significantly increase the potential for interference to Part 15 users.³⁸ The Ad Hoc Gas Distribution Utilities Coalition agrees with Amtech that allowing non-multilateration systems flexibility to exceed the height limitations may be acceptable with appropriate safeguards, but would not permit non-multilateration systems to exceed the power limits. Indeed, Ad Hoc Gas believes that 30 watts is too high a power limitation for a band designed to be shared and suggests that emissions from LMS base station and mobile transmitters operating from 903-927.25 MHz be limited to 10 watts ERP, except where highly directional antenna are employed.³⁹

23. *Discussion.* The *LMS Report and Order* concluded that the power and antenna height restrictions will allow non-multilateration systems to share spectrum more easily with other non-multilateration systems and with Part 15 users. It also concluded that the power and antenna height

³⁴Pinpoint Opposition at 2-4; TI Opposition at 4.

³⁵Hughes Opposition at 5-7.

³⁶Amtech Petition at 9-11.

³⁷*Id.* at 11-13.

³⁸*See, e.g.*, Itron Opposition at 2; Metricom/SCE Opposition at 17-18; SBMS Opposition at 22; TIA Comments at 13; UTC Comments at 12.

³⁹Ad Hoc Gas Petition at 7-8; Ad Hoc Gas Comments at 6-7.

limitations will permit greater frequency reuse.⁴⁰ We continue to believe that the definition and technical specifications of non-multilateration LMS systems adopted in the *LMS Report and Order* reflect a reasoned balancing of the interests of the various users of the 902-928 MHz band, and no new information has been introduced into the record of this proceeding to persuade us otherwise. The restrictions advocated by the Part 15 Coalition and others would unduly limit non-multilateration operations, jeopardizing future technological developments that could be crucial to the advancement of Intelligent Transportation Systems. On the other hand, the higher limitations suggested by Amtech could increase the potential for interference within the band. We believe that our requirements are most conducive to continued sharing of this band, and thus we decline to modify the power and antenna height restrictions we adopted in the *LMS Report and Order*. We believe that the antenna height and transmitting power limits in the current rule accommodate most of the common non-multilateration applications that would be appropriate for operation in this shared spectrum. However, in the event that unique practical considerations of a particular installation necessitate a higher antenna mounting height, such as the airport example cited by Amtech, we would consider waiving the rule on a case-by-case basis to allow the higher antenna height (but not higher power), provided that other comparable technical trade-offs, such as reduced power or confined antenna radiation patterns, are employed to limit the interference potential.

2. Licensing Issues

24. *Background.* In the *LMS Report and Order*, we decided to license non-multilateration LMS systems on a shared basis because these systems generally cover relatively short distances, and because of our belief that licensing based on a fixed mileage separation would limit re-use of spectrum and thereby limit the potential uses of non-multilateration systems. The Commission declined to adopt a blanket licensing scheme for non-multilateration systems whereby, for example, a licensee would be permitted to locate transmitter sites anywhere within a given geographic area. The Commission instead decided to require non-multilateration systems to acquire licenses for each site, concluding that a blanket licensing approach would make it difficult for the Commission and the public to ascertain the exact location of LMS transmitters.⁴¹

25. The Interagency Group reiterates its request that the Commission devise a blanket authorization procedure for non-multilateration systems used in large scale public service projects (*i.e.*, publicly-funded public service non-multilateration systems with multiple sites and multiple readers at individual sites). It notes that the *LMS Report and Order* declined to do this, reasoning that applicants and co-users need to know exactly where systems are located in order to avoid interference. The Interagency Group submits that it does not advocate blanket licensing for all non-multilateration systems, but only those used in large-scale public service projects. Moreover, the Interagency Group argues, it is not seeking to obtain licensing for unidentified sites but seeks a streamlined, single application procedure for obtaining all licenses required to operate all necessary sites on a system-wide basis after such sites have been identified. In other words, instead of separately considering the applications of each member of the Interagency Group, which consists of eight different public transportation authorities, the Commission would receive and consider joint applications for purposes of deploying a single, region-wide toll collection system. The Interagency Group submits that this

⁴⁰*LMS Report and Order* at 4742.

⁴¹*LMS Report and Order* at 4730-31.

would facilitate planning, promote administrative efficiency and ensure that necessary frequencies will be available during a lengthy build-out period.⁴² Amtech and Hughes support the Interagency Group's suggestion.⁴³

26. In addition, Ad Hoc Gas urges the Commission to revise its rules to make clear that non-multilateration systems are to limit their transmissions to a confined area and will not be licensed to provide communications over an extended area.⁴⁴ In opposition, Texas Instruments (TI) submits that not all non-multilateration systems operate over a limited contiguous area, and argues that the future of the intelligent highway system requires that vehicles be able to interact with transponders that do not emit over one contiguous area. For example, TI posits that a commuter of the future on a typical trip home at the end of a workday may, via non-multilateration LMS technology, enter his or her car without keys, exit a parking garage without stopping at the gate, pass through toll plazas uninterrupted and refuel without stopping to pay. TI asserts that this is only possible because the commuter's vehicle has interacted at various times with different transponders that do not emit over one contiguous area.⁴⁵

27. *Discussion.* We are persuaded by the Interagency Group that it would be administratively expedient to establish a mechanism by which public agencies and other entities can file joint applications for non-multilateration systems for purposes of deploying a single, region-wide system with multiple sites and multiple readers at individual sites. While we anticipate that this mechanism will be used primarily by municipalities and government agencies, we also believe that other entities seeking to establish multiple-site systems should also be able to use a streamlined application procedure. We will thus permit applicants to file a single application for a non-multilateration license covering multiple sites within a given U.S. Department of Commerce Bureau of Economic Analysis Economic Area (EA). Such an application may also be filed jointly by multiple users of a single system. In order to avoid uncertainty for other users of the band, the application must identify all planned sites and, after receiving the license, the licensee must notify the Commission if sites are deleted or if new sites are added before those sites become operational. We will revise our rules accordingly. We decline, however, to revise our rules as requested by Ad Hoc Gas to specify that the transmissions of non-multilateration systems are limited to a confined area. We believe that this could unnecessarily limit such systems' flexibility to configure their facilities for particular uses.

B. Accommodation of Secondary Users in the 902-928 MHz Band

28. *Background.* To accommodate the concerns of Part 15 interests regarding their secondary status *vis-a-vis* LMS, the *LMS Report and Order* adopted a "safe harbor" within which Part 15 devices may operate without fear of being deemed to cause interference to LMS operators. Specifically, a Part 15 device will, by definition, not be considered to be causing interference to a multilateration LMS system if it is otherwise operating in accordance with the provisions of Part 15

⁴²Interagency Group Petition at 2-3.

⁴³Amtech Opposition at 22-23; Hughes Reply at 5.

⁴⁴Ad Hoc Gas Petition at 8 n.11.

⁴⁵TI Opposition at 5-7.

and meets at least one of the following conditions:

(a) it is a Part 15 field disturbance sensor operating in compliance with Section 15.245 of the rules and it is not operating in the 904-909.750 or 919.750-928.000 MHz sub-bands; or

(b) it does not employ an outdoor antenna; or,

(c) if it does employ an outdoor antenna, then if

(1) the directional gain of the antenna does not exceed 6 dBi, or if the directional gain of the antenna exceeds 6 dBi, it reduces its transmitter output power below 1 watt by the proportional amount that the directional gain of the antenna exceeds 6 dBi; and,

(2) either

(A) the antenna is 5 meters or less in height above ground; or,

(B) the antenna is more than 5 meters in height above ground but less than or equal to 15 meters in height above ground and either:

(i) adjusts its transmitter output power below 1 watt by $20 \log (h/5)$ dB, where h is the height above ground of the antenna in meters; or,

(ii) is providing the final link for communications of entities eligible under Subparts B or C of Part 90 of the rules.⁴⁶

29. In its *Order on Reconsideration* in this proceeding, the Commission denied requests by petitioners that the Part 15 safe harbor instead be treated as a rebuttable presumption, *i.e.*, that LMS licensees be permitted to file complaints of interference regarding Part 15 devices operating within the safe harbor if the LMS licensees believe those Part 15 devices are causing harmful interference. The Commission concluded that the safe harbor approach represented an appropriate balancing of the interests of the various parties sharing the 902-928 MHz band.⁴⁷ In this *Memorandum Opinion and Order*, we address petitioners' other contentions regarding the safe harbor. Specifically, petitioners also challenged the technical parameters of the safe harbor and argued that the Commission acted in violation of the Administrative Procedure Act (APA), 5 U.S.C. § 551, *et seq.* In addition, some petitioners ask that the safe harbor apply to non-multilateration LMS operators as well as multilateration operators.

1. Parameters of Safe Harbor

30. *Pleadings.* A number of parties who support the concept of a safe harbor oppose the

⁴⁶LMS Report and Order at 4715-16.

⁴⁷Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Order on Reconsideration*, PR Docket No. 93-61, 11 FCC Rcd 16905 (1996) (*LMS Order on Reconsideration*).

height and power restrictions adopted by the Commission. Some of them contend that the height limit should be eliminated, or at least raised to accommodate schools, libraries and other users that might locate their antennas on top of buildings or street light poles.⁴⁸ If the Commission does not eliminate or relax the height/power requirements, some parties suggest that it add educational users to the exemption of Section 90.361(c)(2)(ii)(B), which now permits public safety and special emergency users to employ full power with antennas up to 15 meters.⁴⁹ Similarly, UTC suggests revising the rule so that entities listed in Section 90.63 of the Commission's Rules (*i.e.*, Power Radio Service entities such as utilities) will not be subject to the height/power restriction.⁵⁰ Metricom submits that the safe harbor limits should not apply to mobile and portable Part 15 devices. It posits that a cordless phone being operated off a 50th floor balcony as part of a wireless network should not be subject to complaints of interference from LMS providers.⁵¹ In addition, some parties contend that the height and power restrictions are arbitrary in that they would not necessarily achieve their intended purpose of minimizing interference to LMS operators. For example, the Part 15 Coalition argues that an antenna operation five meters above ground on a mountaintop could cause more interference than an antenna 50 feet above ground located on average terrain.⁵²

31. Other parties, most of whom oppose the idea of a Part 15 safe harbor, urge the Commission not to relax the height and power restrictions.⁵³ Indeed, some of these parties would tighten the parameters of the safe harbor. For example, Uniplex believes that the safe harbor should not include Part 15 devices that are within a given distance of LMS operations, and would apply that distance variable to indoor antennas.⁵⁴ Pinpoint would limit the application of the safe harbor to Part 15 operations with antenna heights of five meters or less. Pinpoint contends that the height/power attenuation rule has the undesirable effect of allowing more powerful systems at 15 meters antenna height than at 5 meters to be insulated from interference complaints.⁵⁵ Further, Pinpoint argues that any interference tolerance standard should be measured at the base station site (*i.e.*, the receiver of

⁴⁸*See, e.g.*, Council of Chief State School Officers Petition at 2,4; Connectivity for Learning Reply at 2; Metricom/SCE Petition at 2, 5-6; Metricom/SCE Opposition at 7; Part 15 Coalition Petition at 14; Part 15 Coalition Reply at 6; Symbol Technologies Comments at 11; UTC Petition at 14; UTC Comments at 10-12; Wireless Transactions Corp. Petition at 2.

⁴⁹Council of Chief State School Officers Petition at 3-4; Connectivity for Learning Reply at 4.

⁵⁰UTC Petition at 16-17; UTC Comments at 12.

⁵¹Metricom Petition at 6; Metricom Reply at 5-6.

⁵²Part 15 Coalition Petition at 13.

⁵³*See, e.g.*, SBMS Opposition at 14-15; SBMS Reply at 4; Uniplex Opposition at 2.

⁵⁴Uniplex Petition at 8; *accord* Pinpoint Opposition at 13; *contra* EIA Reply at 3; ATA Opposition at 7-8.

⁵⁵Pinpoint Petition at 22-23; Pinpoint Opposition at 5-7, 11; *contra* TIA Comments at 3-5. MobileVision submits that TIA's response to Pinpoint misused the Hata model, an urban model, in a city environment. MobileVision Reply at 8.

interference) and not based on height and power of Part 15 devices.⁵⁶ The American Radio Relay League contends that the safe harbor effectively places a power limit on amateur operators that does not exist in other bands and that the power limit is so severe that it precludes amateur operation in any segment of the 902-928 MHz band used for multilateration LMS. It further contends that the safe harbor was designed with Part 15 devices in mind rather than amateur radio operators.⁵⁷

32. *Discussion.* We believe that the safe harbor rule, which was adopted after careful study of the extensive record in this proceeding, appropriately balances the interests of the various parties operating in the 902-928 MHz band so as to limit the potential for harmful interference. In the *LMS Report and Order*, the Commission affirmed that unlicensed Part 15 devices in the band, as in any other band, may not cause harmful interference to and must accept interference from all other operations in the band.⁵⁸ It also reiterated that unlicensed Part 15 operations have no vested or recognizable right to continued use of any given frequency.⁵⁹ Nonetheless, the Commission recognized the concerns of Part 15 and amateur interests with respect to their secondary status. Accordingly, in order to alleviate such concerns and to provide all operators in the band with a greater degree of certainty in configuring their systems, thereby promoting competitive use of the band, the Commission adopted the safe harbor definition of non-interference.

33. The safe harbor rule is intended to identify Part 15 and amateur operations that will, in all cases, be deemed not to cause harmful interference to LMS operators. The Commission emphasized in the *LMS Report and Order* that Part 15 and amateur operations are not restricted from operating beyond the parameters of the safe harbor. Rather, the safe harbor specifications provide a threshold beyond which Part 15 and amateur operators will not be insulated from LMS operators' claims of harmful interference.⁶⁰ We therefore do not believe it necessary to add exemptions to the safe harbor as urged by some petitioners.

34. Moreover, the technical specifications of the rule were clearly explained in the *LMS Report and Order*. In general, amateur operators or Part 15 devices using outdoor antennas that are between five and 15 meters above the ground must reduce their output power concomitant with the height of their antennas in order to fit within the safe harbor. The Commission observed that an antenna less than five meters in height driven by a transmitter with one watt or less of output power (the general power limitation for Part 15 devices) will only affect LMS operations that are geographically close. A higher antenna, however, has the potential to affect a larger number of LMS operations. The Commission concluded that the power adjustment assures that between 5 and 15 meters, an outdoor antenna has the equivalent effect on multilateration LMS operations of an antenna

⁵⁶Pinpoint Reply at 4.

⁵⁷American Radio Relay League Petition at 6-10.

⁵⁸*LMS Report and Order* at 4714 (citing 47 C.F.R. § 15.5(b)).

⁵⁹*Id.* (citing 47 C.F.R. § 15.5(a)).

⁶⁰*Id.* at 4716.

five meters high using no more than 1 watt transmitter output power.⁶¹ We continue to believe that these specifications appropriately balance the interests of all the parties in minimizing interference.

35. We do not believe, as Metricom suggests, that the term "final link" in Section 90.361(c)(2)(ii)(B) of the Commission's rules requires clarification.⁶² Metricom asserts that the meaning of "final link" is open to interpretation because the Commission does not define the term. Metricom proposes that it be read as encompassing the entire complement of Part 15 devices that carries, or is available to carry, communications ultimately intended for entities eligible under Subparts B or C of Part 90 of the Rules. However, what Metricom proposes would in fact expand the definition of "final link" beyond its intended scope. The term "final link" is that link in a communications system which terminates with the Part 15 device used by or within the control of the Subpart B or C eligible entity. The term does not apply to other links in the system used to support such communications, e.g., intermediate links or links used by non-Subpart B or C entities. Therefore, we decline to expand the list of operations included under "final link" as proposed by Metricom.

36. We are persuaded by petitioners, however, that we should expand Section 90.361(c)(2)(ii)(B) of the Commission's Rules to include schools, libraries and rural health care providers within the safe harbor, permitting them to employ full power with antennas up to 15 meters. It is apparent from the record that many such institutions, particularly schools, may wish to use Part 15 devices that operate in this band, as well as similar devices that operate in the 5 GHz National Information Infrastructure (NII) band,⁶³ to connect to the Internet and other on-line resources. In addition to being invaluable research tools, such resources enhance the ability of students, teachers and parents to communicate with one another, as pointed out by the Connectivity for Higher Learning Coalition. We believe that inexpensive access to the national information infrastructure by our nation's educational institutions is of sufficiently significant benefit to the public to warrant special protection for this limited class of Part 15 devices. Further, the universal service provisions of Section 254 of the Communications Act, as amended by the Telecommunications Act of 1996, single out schools, libraries and public or nonprofit health care providers serving residents of rural areas as deserving of special attention so as to enable them to satisfy their communications needs.⁶⁴ Accordingly, we will include within the safe harbor elementary and secondary schools, libraries and health care providers for rural areas as defined by Section 254.

37. Further, we recognize that unlike Part 15 devices, the vast majority of which could operate within the safe harbor, amateur radio operations typically would not fit within the safe harbor provisions. Nevertheless, to the extent that amateur operators wish to employ the 902-928 MHz band and to operate within the safe harbor provisions, they should have the same protection as Part 15 devices. Further, we reiterate that failure to fit within the safe harbor provisions does not prevent

⁶¹*Id.*

⁶²Metricom Petition at 10-12.

⁶³Amendment of the Commission's Rules to Provide for Operation of Unlicensed NII Devices in the 5 GHz Frequency Range, *Report & Order*, ET Docket No. 96-102, 12 FCC Rcd 1576 (1997).

⁶⁴47 U.S.C. § 254. Rules implementing the new universal service provisions of the Act were adopted in Federal-State Joint Board on Universal Service, *Report and Order*, CC Docket No. 96-45, 62 Fed. Reg. 32,862 (1997).

operations; such operations may continue exactly as before, but are not protected from LMS operators' claims of interference.⁶⁵

38. In addition, AirTouch/Teletrac asks that the Commission clarify whether video links are included in the category of "unprotected" Part 15 devices for purposes of determining eligibility for the safe harbor.⁶⁶ They are not. The *LMS Report and Order* specifically provided that long-range video links will not be permitted to take advantage of the safe harbor. We stated that "because multilateration entities concur that most Part 15 interference to multilateration LMS systems is likely to be from field disturbance sensors and long range video links, we will not make any presumption of interference-free operations for these devices when they operate in the exclusive-use bands."⁶⁷

2. Extend Safe Harbor to Non-Multilateration

39. *Pleadings.* Metricom suggests that the safe harbor should apply with respect to non-multilateration operators as well as multilateration operators. It is concerned that non-multilateration operators will have the same problems sharing the band as multilateration operators, and argues that it is illogical to create a rule whereby Part 15 devices are protected from claims of interference by multilateration LMS systems but may be deemed to cause interference to non-multilateration LMS systems.⁶⁸ Other parties disagree, arguing that non-multilateration LMS systems and Part 15 devices do not have interference conflicts similar to those of multilateration LMS systems and Part 15 devices.⁶⁹

40. *Discussion.* The safe harbor was intended as a way to reduce interference conflicts between multilateration LMS operators and Part 15 devices and amateur operators in the 902-928 MHz band. Specifically, it was designed to provide parameters within which a Part 15 device or amateur operator could operate without being subject to a claim that it was interfering with the signal of a multilateration LMS operator. Because non-multilateration systems generally employ narrowband technology and operate at lower power levels, it is less likely that Part 15 devices and amateur operators will interfere with them, as compared with multilateration LMS systems, which use wider bandwidth emissions and operate at higher power levels. Because the range of non-multilateration devices is relatively small, there is less chance of Part 15 and amateur radio devices being located within their area of operation. Moreover, the record does not reveal actual or potential interference between non-multilateration and Part 15 devices. To the contrary, there appears to be substantial evidence that there is little likelihood of interference. For these reasons, we do not believe that it is either necessary or appropriate to extend the definition of the safe harbor so as to insulate Part 15 and amateur operators from claims of interference by non-multilateration systems.

⁶⁵*LMS Report and Order* at 4717 (footnote omitted).

⁶⁶AirTouch/Teletrac Petition at 8.

⁶⁷*LMS Report and Order* at 4717 (footnote omitted).

⁶⁸Metricom Petition at 17-18.

⁶⁹Amtech Reply at 5; AAR Opposition at 5-7; Hughes Opposition at 2-5; TI Opposition at 10.

3. Administrative Procedure Act

41. *Pleadings.* Some petitioners contend that the Commission's adoption of a safe harbor was a violation of the Administrative Procedure Act (APA), because it was not proposed in the *Notice* in this proceeding and was therefore adopted without the required notice and opportunity for public comment.⁷⁰ Other parties disagree, contending that the safe harbor was a logical outgrowth of the issues raised in the *Notice*.⁷¹

42. *Discussion.* We do not agree that the safe harbor setting forth conditions that will not be considered harmful interference from amateurs and Part 15 devices violated the APA. The APA requires an agency to provide the public with "either the terms or the substance of a proposed rule or a description of the subject and issues involved."⁷² The APA, however, "does not require an agency to publish in advance every precise proposal which it may ultimately adopt as a rule."⁷³ Rather, the notice is sufficient if the final rule is a "logical outgrowth" of the underlying proposal.⁷⁴ We believe that the safe harbor was a logical outgrowth of the *Notice of Proposed Rule Making* in this proceeding, which sought comment on ways to accommodate the various users of the 902-928 MHz band and identified specifically the problems surrounding coexistence of Part 15 and licensed users of the band.⁷⁵ Moreover, the suggestion of a Part 15 safe harbor was discussed in publicly-filed *ex parte* submissions.⁷⁶

C. Spectrum Allocation Plan

43. *Background.* The *LMS Report and Order* allocated the entire 902-928 MHz frequency band for LMS systems, generally separating multilateration and non-multilateration operations, as follows:

⁷⁰See, e.g., MobileVision Petition at 2; Pinpoint Petition at 22-23; Pinpoint Reply at 7; AirTouch/Teletrac Reply at 4.

⁷¹Ad Hoc Gas Reply at 4-5; EIA Reply at 4; Symbol Technologies Comments at 3; UTC Comments at 8-9.

⁷²5 U.S.C. § 553(B)(3).

⁷³*California Citizens Band Association v. United States*, 375 F.2d 43, 48 (9th Cir.1967); see also *Spartan Radiocasting Co. v. FCC*, 619 F.2d 314 (4th Cir.1980).

⁷⁴*United Steelworkers v. Marshall*, 647 F.2d 1189, 1221 (D.C. Cir.1980).

⁷⁵Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Notice of Proposed Rule Making*, PR Docket No. 93-61, 8 FCC Rcd 2502, 2507 (1993).

⁷⁶See, e.g., Letter from Kathleen Q. Abernathy (AirTouch Communications), David E. Hilliard (Pinpoint Communications, Inc.), Max Bryan (Uniplex) and John J. McDonnell (MobileVision, L.P.) to Ralph Haller, Chief, Private Radio Bureau, FCC, dated June 23, 1994 (proposes that "[t]he FCC would adopt a threshold interference level below which wideband AVM systems cannot complain about 'harmful interference' from Part 15 devices"); Letter of Nancy Bukar (Wireless Information Networks Forum, Inc.) to William F. Caton, Acting Secretary, FCC, dated August 15, 1994 (summarizes safe harbor proposal that had been verbally presented to industry).

A:	902.000 - 904.000	Non-Multilateration
B:	904.000 - 909.750	Multilateration
C:	909.750 - 919.750	Non-Multilateration
D:	919.750 - 921.750	Multilateration and Non-Multilateration
E:	921.750 - 927.250	Multilateration
F:	927.250 - 927.500	Narrow band associated with sub-band E
G:	927.500 - 927.750	Narrow band associated with sub-band D
H:	927.750 - 928.000	Narrow band associated with sub-band B

Thus, we concluded that bands B and E will be assigned to multilateration systems. Bands A and C will be assigned to non-multilateration systems. Band D will be subject to both multilateration and non-multilateration use. Licensees of bands B, D and E will be assigned narrow bands H, G and F, respectively. Operators requiring additional spectrum will be permitted to aggregate bands to obtain up to eight MHz in a given region through the aggregation of bands D and G and bands E and F. We concluded that licensees may not otherwise be authorized to operate on more than one of the multilateration bands in a given geographic area.⁷⁷

44. *Pleadings*. SBMS contends that the designation of Band D for sharing between multilateration and non-multilateration systems is unworkable and will increase interference. It submits that the *Notice* in this proceeding proposed separate allocations for multilateration and non-multilateration systems and that designating Band D for sharing was in response to Amtech's argument that additional contiguous spectrum was necessary for its non-multilateration operations.⁷⁸ SBMS reiterates its call for an allocation plan that offers reverse link spectrum in discrete two MHz increments, grants auction winners free alienability of bandwidth, and allows participants to acquire multiple two MHz blocks in any particular market. It asserts that an allocation plan with these characteristics will deter warehousing, promote competition, reward providers that employ spectrum-saving technologies, and result in lower costs to consumers.⁷⁹ Further, SBMS posits that auctioning of smaller spectrum blocks would likely encourage participation by smaller entities.⁸⁰

45. Amtech urges the Commission to reject the SBMS approach.⁸¹ It also requests that the Commission modify its spectrum allocation plan to allow non-multilateration systems an additional 2 MHz of contiguous spectrum by permitting them to operate in subband E on a shared basis with multilateration systems.⁸² Amtech contends that the 12 MHz of contiguous spectrum available to non-multilateration operators under the band plan is the absolute minimum amount of spectrum required

⁷⁷LMS Report and Order at 4722-23.

⁷⁸SBMS Petition at 4 & n.11; SBMS Opposition at 3.

⁷⁹SBMS Petition at 5-6.

⁸⁰SBMS Opposition at 8.

⁸¹Amtech Opposition at 5. AT&T and Texas Instruments also disagree with the SBMS plan. AT&T Comments at 3; TI Reply at 9.

⁸²Amtech Petition at 17-19; Amtech Opposition at 4.

for new high-rate data applications. It submits that non-multilateration operators need more flexibility to facilitate resolution of interference.⁸³

46. In addition, Pinpoint and Uniplex propose that the Commission designate a sub-band for multilateration LMS systems that are willing to share spectrum that would not be subject to competitive bidding. Uniplex contends that this would preserve and encourage small entrepreneurial companies in this service and increase the value of the spectrum available for bidding. Pinpoint details its own time sharing experiment with Uniplex to illustrate that sharing among multilateration operators is feasible.⁸⁴ A number of parties disagree with the Pinpoint/Uniplex proposal.⁸⁵ For example, MobileVision contends that time sharing among multilateration LMS systems would not work because there is no common ground for arriving at a set of specifications, essential emergency voice communications would be rendered unusable, and an LMS system's reliability, capacity and integrity would be compromised.⁸⁶

47. Another change to the band plan supported by some parties is the reclassification of Part 15 devices as co-primary in parts of the band. These parties contend that this will eliminate their interference concerns and will promote the development of valuable Part 15 technology.⁸⁷ Similarly, Safetran is concerned that the adopted frequency allocation will result in congestion and interference that will render ineffective direct sequence modulation spread spectrum radio, which is a Part 15 type of radio service used by railway companies. It suggests that certain portions of the band be allocated for this type of low power emission.⁸⁸

48. *Discussion.* As we stated in the *LMS Report and Order*, we believe that both multilateration and non-multilateration LMS systems will play an important role in achieving a nationwide intelligent highway infrastructure.⁸⁹ We accordingly devised a band plan that, for the most part, creates separate allocations for the two types of LMS systems and takes into consideration the interference concerns of non-LMS users of the 902-928 MHz band. Upon review of parties' responses to our *Notice of Proposed Rule Making* in this proceeding, however, we decided to allocate the 2 MHz of subband D to be shared by multilateration and non-multilateration users so as to provide non-

⁸³Amtech Petition at 18.

⁸⁴Uniplex Petition at 9; Uniplex Opposition at 3; Pinpoint Petition at 7-10 & Appendix 1.

⁸⁵See, e.g., AirTouch/Teletrac Opposition at 18; AT&T Comments at 3; Metricom Opposition at 22-24; MobileVision Opposition at 6-7; SBMS Opposition at 5.

⁸⁶MobileVision Opposition at 7.

⁸⁷See, e.g., CellNet Petition at 3-4; EIA/CEG Comments at 8; *contra* SBMS Reply at 2; TI Reply at 7.

⁸⁸Safetran Petition at 4.

⁸⁹*LMS Report and Order* at 4721.

multilateration users with the possibility of obtaining additional contiguous spectrum.⁹⁰

49. We do not agree with SMBS that our band plan was illogical or that sharing between multilateration and non-multilateration operators is not feasible. Because we agree that it is preferable that multilateration and non-multilateration facilities do not operate in the same spectrum, we adopted a band plan that, for the most part, allocated separate blocks of spectrum for multilateration and non-multilateration systems. Our modification to the proposed band plan represented an effort to respond to the concern that some non-multilateration systems might need additional spectrum, without taking any spectrum away from multilateration users. We concluded that it would be appropriate to permit those few multilateration users the opportunity to obtain additional spectrum by permitting them to share the 2 MHz of subband D. We considered the SBMS band plan earlier in this proceeding and declined to adopt it. SMBS has raised no new issues or arguments that persuade us that their plan is superior to the plan we adopted in the *LMS Report and Order*.

50. In addition, we decline to adopt Amtech's suggestion that we allocate an additional 2 MHz of contiguous spectrum for non-multilateration providers. We believe that the band plan adopted in the *LMS Report and Order* appropriately balances the needs and interests of multilateration and non-multilateration operators, as well as Part 15 and amateur users of the band. For this reason, we also decline to adopt exclusive subbands for parties willing to time-share, or for Part 15 users. Doing so would upset the equilibrium among users of the band. Such an allocation would also ignore the secondary status of Part 15 providers in that it would afford unlicensed devices co-primary status *vis-a-vis* licensed operators.⁹¹

D. Geographic Areas for Exclusive Licenses

51. *Background.* Rand McNally organizes the 50 states and the District of Columbia into 47 Major Trading Areas (MTAs) and 487 Basic Trading Areas (BTAs). In the *LMS Report and Order*, the Commission concluded that MTAs and four additional MTA-like service areas provide a more suitable regulatory construct for multilateration licensing than the smaller BTAs. The Commission determined that use of MTAs, as defined in the Rand McNally Commercial Atlas and Marketing Guide, will give systems greater capacity to accommodate large number of prospective users which, in turn, will promote competition and encourage advancement of new technologies. The rules adopted in the *LMS Report and Order* provide for one exclusive multilateration system license in each MTA in each of the sub-bands identified for exclusive assignments (B and H, D and G, E and F).⁹²

52. *Pleadings:* Rand McNally submits that it is the copyright owner of the MTA/BTA Listings and the Commercial Atlas and Marketing Guide and that it has not licensed use of its

⁹⁰The band plan adopted in the *LMS Report and Order* permits non-multilateration operators a total of 14 MHz of spectrum. Twelve MHz is contiguous; the 10 MHz of subband C is available exclusively for non-multilateration operators and the 2 MHz of subband D is available on a shared basis with multilateration operators. An additional, non-contiguous 2 MHz of spectrum (subband A) is also available exclusively for non-multilateration operators.

⁹¹We clarify, as requested by Amtech, that multilateration and non-multilateration systems operating in the shared subband will share in accordance Section 90.173(b) of the Commission's Rules. See Amtech Petition at 22.

⁹²*LMS Report and Order* at 4724.

MTA/BTA listings in connection with LMS. It asserts that the Commission should encourage prospective LMS licensees to contact Rand McNally to arrange licensing, and should explicitly acknowledge that the use of MTAs requires Rand McNally's consent, as it did in the 900 MHz SMR proceeding.⁹³

53. In addition, SBMS notes that the rules require construction of a substantial portion of at least one BTA per MTA within 12 months after initial authorization. SBMS is concerned that licensing on an MTA basis will encourage warehousing in light of this BTA-based build-out requirement. It contends that an LMS operator could meet this minimum standard by constructing and testing in a low-demand rural BTA, and could warehouse the rest of the MTA.⁹⁴

54. *Discussion.* After a thorough review of the record in this proceeding and upon further reflection regarding this issue, we conclude that the relevant geographic areas for multilateration LMS licenses should be based on U.S. Department of Commerce Bureau of Economic Analysis Economic Areas (EAs). There are 172 EAs covering the continental United States.

55. Because EAs have not been established for the five U.S. possessions (Guam, Northern Mariana Islands, Puerto Rico, U.S. Virgin Islands, American Samoa), we will create additional licensing regions for systems operating in these territories as well as for the Gulf of Mexico. Specifically, we will designate the following additional licensing regions: (1) Guam and the Northern Mariana Islands (to be licensed as a single area); (2) Puerto Rico and the U.S. Virgin Islands (to be licensed as a single area); and (3) American Samoa. In addition, Alaska will be licensed as a single area.⁹⁵ We believe that EAs are large enough to give systems sufficient capacity to accommodate large numbers of prospective users, which will promote competition, encourage new technologies and result in superior service to the public. At the same time, EAs are small enough to alleviate the BTA/MTA warehousing concerns posited by SMBS. Further, use of smaller geographic units could result in a more diverse group of prospective licensees because EA-based licenses may be more affordable for small and medium-sized businesses than would MTA-based licenses. We conclude that such an outcome not only is desirable but furthers the public interest and one of the goals enunciated in Section 309(j) of the Communications Act.⁹⁶ Moreover, EAs are better suited than MTAs to a service aimed at improving the nation's transportation infrastructure because EAs are based on urban,

⁹³Rand McNally Petition at 2-5.

⁹⁴SBMS Petition at 11-12.

⁹⁵ The EA Listings and the EA map are available for public inspection at the Wireless Telecommunications Bureau's Public Reference Room, 2025 M Street, N.W., Room 5608, Washington, DC, 20554, and the Bureau's Office of Operations, Gettysburg Reference Room, 1270 Fairfield Road, Gettysburg, Pennsylvania, 17325-7245. EA maps are also available on the FCC's Internet website at <http://www.fcc.gov/wtb/auctions/maps/maps.html>.

⁹⁶47 U.S.C. § 309(j). We adopted EAs for licensing areas in both the Wireless Communications Service and 800 MHz SMR service for similar reasons. See *Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service ("WCS")*, Report and Order, GN Docket No. 96-228, FCC 97-50, ¶¶ 53-60, (released February 19, 1997); *Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band*, Second Report and Order, PR Docket No. 93-144, FCC 97-223, ¶¶ 13-15, (released July 10, 1997).

suburban and rural traffic patterns. Further, use of EAs solves the copyright problem raised by Rand McNally, because EAs are published by the U.S. Department of Commerce.

E. Multilateration System Operations -- Wideband Forward Links

56. *Background.* In the *LMS Report and Order* we allowed LMS multilateration systems to use wideband forward links. A forward link refers to the signal path from the LMS system's fixed base site to its mobile units. The Commission noted that unlike a narrowband forward link, a wideband forward link can operate over a multilateration system's entire authorized sub-band. This concerned Part 15 interests, who, the Commission pointed out, opposed authorization of wideband forward links because they believed that wideband forward links are likely to cause interference to Part 15 devices. The Commission emphasized that grant of multilateration licenses will be conditioned on the applicant's ability to demonstrate through field testing that its system does not cause unacceptable levels of interference to Part 15 devices.⁹⁷ It also limited the maximum power of wideband forward links to 30 watts ERP.⁹⁸

57. *Pleadings.* A number of parties reiterate the concern that wideband forward links will cause harmful interference to Part 15 devices and should therefore not be authorized.⁹⁹ They submit that multilateration LMS providers have not shown a compelling need for the links sufficient to counterbalance the potentially severe detriment to Part 15 devices. In the alternative, the Part 15 Coalition calls for antenna height and duty cycle restrictions on such links.¹⁰⁰

58. Pinpoint and Uniplex, the original proponents of wideband forward links, continue to believe that authorization of such links is appropriate. Pinpoint submits that wideband forward links confer substantial cost and efficiency benefits for high capacity multilateration LMS systems and facilitate the sharing of spectrum by multilateration systems. It asserts, however, that the 30 watt ERP limit and the testing requirement will make the use of such links very difficult. It further contends that there is no evidence that wideband forward links cause the significant levels of interference claimed.¹⁰¹ Uniplex enumerates a number of advantages to use of wideband forward links rather than narrowband forward links. For example, it submits that a narrowband system attempting to track a person (e.g., a prisoner or an Alzheimer's Disease patient) would have to periodically transmit a fairly high-powered signal from that person, which would require battery capacity beyond that which could

⁹⁷*LMS Report and Order* at 4734-35, 4736-37. In the *Order on Reconsideration*, the Commission described the testing requirement as a way to ensure "that LMS systems are not operated in such a manner as to degrade, obstruct or interrupt Part 15 devices to such an extent that Part 15 operations will be negatively affected." *Order on Reconsideration* at para. 15.

⁹⁸*Id.* at 4742.

⁹⁹*See, e.g.,* Ad Hoc Gas Petition at 14; CellNet Petition at 4; Metricom/SCE Petition at 7-8; Part 15 Coalition Petition at 3-7; Symbol Technologies Comments at 12; TIA Comments at 5-6; UTC Comments at 3; Wireless Transaction Corp. Petition at 2.

¹⁰⁰Part 15 Coalition Petition at 7.

¹⁰¹Pinpoint Opposition at 17-18; *contra* Ad Hoc Gas Comments at 10-11.

be worn by a person, as a practical matter. In contrast, it asserts, a wideband system would only transmit on request so that battery size is manageable.¹⁰²

59. Another difference highlighted by Uniplex is that narrowband forward links must constantly query mobiles and store their locations in a central database, while wideband systems allow for intelligence to be stored in the mobile itself. It asserts that this permits less use of airtime in some applications. For example, Uniplex posits a metropolitan transportation system with 500 buses that has a requirement that central dispatch be alerted if a bus is running two or more minutes off schedule. It submits that while a system with narrowband forward links would have to query all 500 buses every two minutes, wideband forward links would permit each bus to have its own on-board computer with its stored schedule and buses would only report back to dispatch when behind schedule.¹⁰³ For similar reasons, Uniplex submits that a wideband prisoner tracking system could accurately monitor the location of a prisoner, while narrowband links can only report when that prisoner has gone out of permissible range.¹⁰⁴

60. Uniplex asserts that by adopting a stricter power limitation than was proposed in the *Notice* in this proceeding, in combination with restrictions on grandfathered systems, the Commission has adopted a policy strongly favoring narrowband forward link technology. It argues that this will limit the potential for the emergence of diverse technologies in the band.¹⁰⁵ Accordingly, Uniplex requests that the Commission adopt a 300-watt power limitation with a duty cycle limitation in lieu of the 30-watt power limitation adopted in the *LMS Report and Order*.¹⁰⁶ It also urges the Commission to permit grandfathered systems to deploy additional sites within a 30-mile radius of the primary site; it contends that this would enable a grandfathered system using a wideband forward link to offer service in an area similar to that of a typical grandfathered narrowband forward link licensee, whose service area would be bound by the range of its outermost 300-watt narrowband forward link sites.¹⁰⁷

61. *Discussion.* We believe that elimination of wideband forward links would preclude certain LMS technology options from being developed, to the detriment of consumers. At the same time, we continue to believe that the power limitation of 30 watts ERP is necessary and appropriate to minimize interference to other operators sharing the 902-928 MHz band. As we noted in the *LMS Report and Order*, limiting base and mobile stations' power levels will lessen the potential for interference between co-channel multilateration systems and will reduce the likelihood of interference to other operations in the 902-928 MHz band.¹⁰⁸ Further, pre-authorization testing will be a condition

¹⁰²Uniplex Petition at 2-3.

¹⁰³*Id.* at 3-4.

¹⁰⁴*Id.* at 4.

¹⁰⁵*Id.* at 1.

¹⁰⁶*Id.* at 6; *contra* Ad Hoc Gas Comments at 10.

¹⁰⁷Uniplex Petition at 5-6.

¹⁰⁸*LMS Report and Order* at 4742.

on the license of multilateration LMS operators seeking to employ wideband forward links.¹⁰⁹ We do not agree with Uniplex that adoption of a duty cycle limitation would allow increased power for wideband forward links without increasing the interference potential. With wideband forward link technology, each vehicular unit to be located must be able to receive transmissions from at least four different forward link transmitters. These transmitters operate sequentially, passing a "token" packet. Consequently, although a duty cycle limitation could be applied to each individual forward link transmitter, considered collectively, there would almost always be at least one transmitter transmitting in an area at any given time. Taking into consideration the greater range of a base transmitter, as compared to a mobile transmitter, and the amount of spectrum occupied by the wideband forward link, we believe allowing higher power for wideband forward links would unacceptably increase band congestion.

62. Also, we decline to permit grandfathered systems to deploy additional transmitters on the basis of a 30-mile radius. Uniplex's reason for asking for this is essentially to allow comparable coverage for its particular technology as compared to technologies using narrowband forward links. We have found that, in the 902-928 MHz band, it is necessary to have a common set of technical limits in order to facilitate co-occupancy among the various band users. Each different technology operating within these limits, however, will likely have advantages and disadvantages as compared to the others, including the matter of coverage. We do not have sufficient experience with operating LMS systems to craft a rule that would be appropriate for all potential LMS technologies. To the extent that grandfathered systems seek to add fill-in sites that do not increase their coverage footprint, we believe such requests should be handled on a case-by-case basis.

63. Some of the examples posed by Uniplex raise the issue of whether LMS technology may be used to track individuals as well as vehicles. CellNet requests us to clarify that only vehicles or inanimate objects, and not individuals, may be monitored and located via LMS. CellNet is concerned that without this restriction, the possibility increases that paging and messaging services will become the primary offerings on LMS channels. It also suggests that the Commission impose a limit on the number of receivers a company uses for non-vehicular monitoring, rather than defining vehicular location as a company's "primary" business.¹¹⁰

64. The rules adopted in the *LMS Report and Order* permit a multilateration LMS system to provide non-vehicular location services as long as the system's primary operations involve the provision of vehicle location services.¹¹¹ We do not share CellNet's concern that LMS will become a paging service. The rule clearly provides that such non-vehicular location functions may not be an LMS operation's primary function. To afford multilateration LMS operators maximum flexibility in

¹⁰⁹In addition, UTC requests that height and power limits be imposed on narrowband forward links operating in the 927.250-928.000 band in order to afford protection to multiple address systems operating in the adjacent 928-929 band. UTC Petition at 17-18. Multiple address systems are licensed systems and are fairly powerful. Given the nature of narrowband forward links, we do not believe that interference problems are likely and we accordingly deny UTC's request. In the event isolated interference problems do arise, voluntary coordination between these services may be necessary.

¹¹⁰CellNet Petition at 10-11.

¹¹¹47 C.F.R. § 90.353(a)(7).