Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Progeny LMS, LLC	)	RM No. 10403
	)	
Amendment of Part 90 of the Commission's	)	
Rules Governing the Location and Monitoring	)	
Service to Provide Greater Flexibility	)	

To The Commission

Comments of
Warren C. Havens and Telesaurus Holdings GB, LLC

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Comments of
Warren C. Havens and Telesaurus Holdings GB, LLC

1. Introduction

Warren C. Havens ("Havens") and Telesaurus Holdings GB, LLC (in which Havens holds majority controlling interest) (together, "LMS Wireless," their DBA ["LMSW"]), hold the majority of the 'A'-block LMS Multilateration licenses in the nation.[1] Herein, LMSW, in Part I, comments on specific items in the Progeny petition captioned above (the "Progeny Petition"), then in Part II, submits a white paper of what LMSW believes would be a best use for LMS spectrum (the entire 902-928 MHz band), termed Advanced Technology Land Infrastructure Service ("ATLIS") and appropriate rule changes for such.[2]

LMSW plans to submit a rule making petition in regards to its ATLIS plan in the near future and does not submit this white paper to propose rule changes. LMSW submits this white paper here, first, because parts of it augment LMSW's comments in Part I to the specific proposals and underlying views in the Progeny Petition, and second, so that parties who participate in this rulemaking, including Progeny, may, if they so choose, comment on these ATLIS ideas in Reply Comments to the Progeny Petition and thereby advance a full and complete record on appropriate rule changes for the LMS band.

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[1] Havens also holds many FCC licenses in the VHF Public Coast, AMTS, and 220 MHz Services.

[2] To give a background, in March 2002, LMSW submitted Comments in FCC DA 02-361(regarding the NTIA study on spectrum needs of "critical infrastructure" entities) outlining this ATLIS plan and the rationale therefore.

Part I
Comments on the Progeny Petition

1. Summary

To avoid potential misunderstanding, LMSW notes that Progeny developed and presented the Progeny Petition independently of LMSW, and other than as noted herein, Progeny's views do not reflect the views of LMSW.[3]

LMSW agrees with Progeny that there is a need for rule changes for the Location and Monitoring Service ("LMS"), especially in (as Progeny means) the spectrum licensed for Multilateration LMS ("LMS-M"), for it be put to its best use in the marketplace, and that such change is warranted under FCC policy and precedent. LMSW agrees with some and disagrees with other of what Progeny (i) describes as the current rule requirements, allowances and restrictions,[4] and related current marketplace problems, and (ii) proposes as rule-change solutions.

Progeny notes that, in its view, location and monitoring service is a niche market, and proposes lessening FCC restrictions to encourage participation of equipment vendors and

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[3] The Progeny Petition in various places uses the phrase "LMS licensees" in setting forth its complaints and proposed remedies. Without the above note, this may be misconstrued to include Havens and Telesaurus ("LMSW"). Also, the Progeny Petition suggests that there is no development taking place in LMS ("multilateration") which is not the case with respect to LMSW and its licenses. LMSW has on a number of occasions offered to Progeny and FRC, Inc. (Bruce Fox), the two other principal LMS licensees, proposals to fund and work together on LMS development including useful FCC relief. The views and plans expressed herein, including in Part II, represent LMSW's initiative and development independent of other LMS licensees.

[4] Progeny does not deal much with the one LMS-M requirement: "multilateration" location service, in terms of what this requirement currently imposes and any need for change. LMSW comments on this requirement in Part II in the context of its ATLIS proposal, and in Part I discusses this in response to some rule interpretations in the Progeny Petition.

investors and to facilitate competitive LMS-M service.[5] In this regard, LMSW believes it would be useful for Progeny to describe its plan for LMS-M spectrum including technology, applications, and markets, if its proposal is accepted. (The LMSW plan is outlined in Part 2 below.)

In sum, the four categories of relief, and one new type of restriction, proposed by Progeny and LMSW responses thereto are:

1. Progeny: "[E]liminate the LMS "spectrum cap" and allow a single licensee to hold all of the LMS licenses in an EA." LMSW believes this is premature for reasons given in Part II below. Briefly, if LMS-M, or the entire LMS band, is to be developed as a special service providing for critical land transportation and other critical industries (as LMSW proposes: a natural extension of its historic and current purpose), then competition within the band may be appropriate.

2. Progeny: "[E]liminate the restriction on real-time interconnection with the public switched telephone network ("PSTN")." LMSW agrees.[6] Many core ITS (Intelligent Transportation System) services, and other location-and-monitoring- based services, cannot be fully provided without real-time interconnected service.

3. Progeny: "[E]liminate the restriction on the types of communications or services that may be provided." LMSW agrees with Progeny's goal in this regard and that a rule change

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[5] Given Progeny's views that without its proposed rule changes LMS-M will not be viable, LMSW does not understand the basis for Progeny's described endeavors to obtain participation of equipment vendors and investors in LMS-M spectrum development.

[6] But as noted below, LMSW disagrees with Progeny's interpretation of what is allowed and what is prohibited under §§ 90.353(b) and (c).

is appropriate.[7] However, LMSW does not agree with Progeny's apparent narrow interpretation of the content of voice and data communications permitted under § 90.353(b), and believes that Progeny misunderstands § 90.351's introductory sentence (it deals with the required "multilateration" location service, not with content of permitted voice and data communications).[8]

4. Progeny: "[M]odify or eliminate the 'safe harbor' provision that creates a presumption of non-interference for secondary users of the band." LMSW agrees and gives details below. LMSW disagrees regarding protection afforded Part 15 device and amateur radio operations under current rules.[9]

5. Progeny: "The Commission Should Substitute Technical Limits, as Necessary, for Current Service Limitations." LMSW strongly disagrees, and believes Progeny proposes this

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[7] As discussed further below, LMSW believes that under current rules, including §§ 90.353(b) and (c), any non-interconnected voice and data communication is permitted as long as the LMS-M system operator is providing the required location service to the end users. However, while a declaratory ruling under §1.2 could be sought in this regard, a rule change providing such language would be appropriate given the need at this time for an overall review of LMS-M rules and appropriate changes thereto.

[8] Progeny cites, in that sentence, "non-voice radio techniques to determine the location and status . . ." This refers to use of the LMS-M signals for the required rule-defined "multilateration" location determination (see § 90.7 and § 90.101 first sentence, and § 90.155(d) and (e)), and to reporting of the status of the mobile entity (the vehicle, persons in the vehicle, peripatetic persons, and other animate things). It does not refer to the content of permitted voice and data communications under § 90.353(b).

[9] Contrary to Progeny, there is no protection is afforded, other than in some cases, certain testing under §90.353(d)'s last sentence. See Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, PR Docket No. 93-61, *Memorandum Opinion and Order and Further Notice of Proposed Rule Making*, FCC 97-305 (released September 16, 1997), ¶ 69.

based on misunderstanding of the current rules (believing them to impose more restrictive than then the do, as discussed below).

2. Current Rule Requirements, Allowances, and Restrictions Discussed in the Progeny Petition

Rule Requirements: Progeny, in its references to location services described in § 90.353(b), and in its section II. C, references the principal requirement of LMS-M, which is to provide "multilateration" location service.[10] However, Progeny does not propose any rule change in this regard. (LMSW, *in the context of* its ATLIS plan and its importance to the nation's transportation and other critical infrastructur*e*, intends to propose that this requirement be dropped: see Part II below.)

LMSW generally agrees with Progeny that the location "market" has changed and is continuing to change dramatically since LMS-M rules were established, and that this contributes to the compelling case for re-examination of LMS-M rules. However, LMSW disagrees with Progeny suggestions that location services are a distinct market and that CMRS E911 is comparable to LMS-M required location service. In brief, LMS-M rules do not require[11] location service in emergency as under E911, but as the required service (which may be supplemented, with no limitation, by allowed voice and data under §§ 90.353(b) and (c)). There is a major difference in these two requirements, the technology and systems to implement them,

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[10] See § 90.7, § 90.101 first sentence, § 90.155(d) and (e), and § 90.351 first paragraph.

[11] Under § 90.353(c), real-time interconnected communications are permitted for emergency communications. Under § 90.353(b), certain voice and data communications are permitted which may include emergency communications. Neither requires emergency communication of the end-user location or other information.

and the end-user markets served.[12] LMSW agrees with Progeny that, thus far, location services (whether in emergency or for regular location determination) are "niche" in character (not well developed or widely used),[13] but does not believe as Progeny suggests that the main thrust of

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[12] For example, principal vendors of network-based E911 location technology (e.g., Allen Telecom and True Position) did not develop equipment for the CMRS operators seeking to comply with E911 requirements that provide for on-going location service (e.g., automatic vehicle and people location, asset tracking, and the like) since the CMRS operators did not request this, but only requested E911 compliance capability. For example, if such network-based location technology (which is all a type of "multilateration") is based on calculation of the difference in time, phase, or angle of arrival (among multiple paths to and from the end-user radio and the network base stations) of the voice channel when the user activates an E911 interconnected call, then it is not designed for on-going calculation of location via such technique, which requires constant or regular "multilateration" location fixes, via signals sent to or from the end-user at predetermined rate or as may be polled. Allen Telecom informed LMSW (in year 2001) that, despite the substantial talk in the industry about CMRS operators moving toward offering non-emergency locations services, it had not obtained any requests from such entities for technology to implement such, and it believed that its major competitors (including True Position) also had not.

[13] E.g., from *Wired Magazine* (on line), April 12, 2002: *GPS: Still Wandering in Space*:

> In 1996, . . . the Federal Communications Commission told the cell-phone industry it had to [implement] emergency . . . 911. [Notes GPS and other, i.e., network "multilateration" based, techniques.] [C]arriers haven't found compelling applications for GPS that will help them recoup the costs of meeting the FCC mandate. . . . GPS service providers attended the sixth annual GPS Wireless conference. . . this week. . . . "A year ago, the world was a very different place," said [the] conference chairman . . . . "Everyone thought that the e911 mandate was going to happen by now, and that's been delayed. We weren't looking at a recession and the Internet bubble hadn't burst completely. "Things are being stretched out, and the market projections (for GPS) probably won't be as aggressive as people thought a year or two ago." Another [non-e911] growing segment of the GPS market, he says, includes businesses such as police stations, trucking companies and fire departments that want to keep track of their vehicles. . . . The FCC mandates . . . 911 calls. The carriers, claiming it was technologically impossible and not economically feasible for them to offer the service, have gotten the deadline postponed. . . . Only 5 to 10 percent of the carriers will be able to track callers' location more precisely by the end of this year . . . . [T]he industry will most likely recoup the costs for implementing the service *in the form of a tax* on cell-phone bills, similar to the business model of home 911 service. . . . Beyond e911, market analysts don't see much of a demand for GPS among consumers. [Italics added.]

development of location services is a market. Rather, location service are seen and being planned by the major wireless operators worldwide as an essential component of the new wave of advanced wireless being planned for CMRS '3G' and beyond,[14] as well as new generations of mission critical communications.[15]

Since, as noted above, Progeny does not mention its plan for its LMS-M spectrum, and does not propose changes in the rule requirements for "multilateration" location service, we will not further discuss these requirements and the "market" for location-based services. LMSW intends to further discuss these when it submits in the near future its proposal for rule changes for LMS-M spectrum after it completes due diligence related to its ATLIS proposal outlined in Part II below.

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[14] E.g., (1) In a principal text on 3G, *WCDMA for UMTS* (H. Holma and A. Toskala of Nokia, John Wiley & Sons, 2001): ". . . UMTS . . . . If there is to be a killer application, it is most likely to be quick access to information and filtering appropriate to the location of a user." (p. 9; in subsequent pages, discussing location-based services and technologies). (2) In the feature articles on 3G in the March 2002 issue of *Land Mobile* (Symposium Ltd, Buckinghamshire, England), the Editor writes, "Location-based capabilities are an integral feature of the 3GPP specification, but it will be up to the network operator to choose what to implement and how" (discussing network-based and handset/GPS-based techniques, etc.) (p. 23); and a representative of Siemens writes, ". . . 3G must deploy services . . . that become indispensable. The canonical 3G applications are calendaring/scheduling and location-based services." (pp. 24, 25).

[15] E.g, APCO "P25" (Motorola, etc.) and "Tetrapol" (EADS-Nortel, Siemens, etc.) current and future-generation networks.

Rule Allowances and Restrictions

§ 90.353(b) and §90.353(c): Progeny writes,

> . . . LMS [LMS-M] . . . can only provide . . . certain communications . . . . on a store-and-forward basis (except for emergency communications) (. . . § 90.435(c)) [*sic*].[16] Thus, "real-time" communications currently are proscribed. [p. 19]

LMSW disagrees. § 90.353(b) involves permitted services (in addition to the required "multilateration" location service): certain voice and non-voice services are described. § 90.353(c) imposes certain restrictions on some means of providing these permitted service: if the means are via "interconnection" then the service is allowed only on a store-and-forward (non-real-time) transmission basis, except via real-time transmission in emergencies. § 90.353(c) does not prohibit or restrict *real-time non-Interconnected* voice and data services permitted under § 90.353(b).[17] [18]

Progeny writes,

> . . . LMS providers are subject to . . . restrictions on content of messages. [p. 7.] [Citing § 90.353(b) and § 90.351: see below.]
>
> The current LMS rules also directly limit the types of services and communications that an LMS licensee may provide. The Commission's Rules indicate that "LMS

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[16] Progeny must have meant §90.353(c).

[17] Also, Internet Protocol- ("IP"-) based transmissions, via the Internet or private IP networks, which by their nature do not utilize the Public Switched Telecommunication Network, are by FCC definition and precedent, and by case law, not "Interconnected" service. Thus, IP-based transmissions are permitted under § 90.353(b) and not restricted by § 90.353(c).

[18] LMSW has reviewed FCC rules on LMS-M, including §§ 90.353(b) and (c), with Teletrac (a holder of grandfathered LMS-M licenses) and Metricom (operator of the Ricochet Part-15 network using the 902-928 MHz spectrum). Teletrac was the largest operator of LMS-M systems to date, and Metricom was the largest operator of Part-15-device networks in this 902-928 MHz spectrum to date. LMSW had numerous in-person meetings and other communications with senior officers in two companies. Each concurred with the interpretation of §§ 90.353(b) and (c) given above.

> systems utilize non-voice radio techniques to determine the location and status of mobile radio units," and go on to state that "LMS systems are authorized to transmit status and instructional messages, either voice or non-voice, so long as they are related to the location or monitoring functions of the system."[19] Thus, the Commission's Rules narrowly circumscribe the types of services and communications that an LMS licensee may offer. [p.26.] [Footnote in original.]

LMSW in large part disagrees. The first quote within the second above quote, from § 90.351 ("LMS systems utilize . . . .") pertains to LMS (to LMS-M, and to nonmultilateration LMS or "LMS-N") (i) use of radiolocation technique (multilateration for LMS-M, and other techniques for LMS-N) to determine the location of the subject vehicle (or person or thing) and (ii) use of data communications to relay such location determinations and the status and other "monitoring" functions of such thing being located. § 90.351 does not pertain to content of the permitted voice and data communications under §§ 90.353 (b) and (c).

Regarding § 90.353(b), while Progeny does not give its interpretation of what restrictions it believes this rule imposes on the "content" or "types" of communications, LMSW does not believe this rule section may be interpreted to restrict the content of voice and data communications that accompany the provision of the required location service. That is, if the LMS-M operator is providing, as it must, the location service, then it must be up to the end user as to the content of any particular voice and data communication (that is otherwise permitted). It is not possible legally or practically to construe this rule otherwise.[20]

In addition, in LMS-M as designed under the rules, the required location function is executed separately from the permitted voice and data communication, and there is no need for

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[19] 47 C.F.R. §§ 90.351 and 90.353(b). [This footnote from the above Progeny Petition quote.]

[20] The LMS-M operator cannot monitor the content of a voice or data transmission and cut off transmission if its content does not sufficiently relate to the location. It would be impractical, illegal, and unacceptable to the customer.

the voice and data communications, which are elective, to repeat what the former is automatically doing.[21]

Nor have the LMS-M commercial systems that have operated to date restricted the content of permitted communications to only location-specific content.[22]

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[21] The location fixes are via multilateration radiolocation and are transmitted as data to authorized parties (e.g., to a fleet dispatcher or other person who is tracking the vehicle, asset, or person subject to the location, and/or to the end-user, if the end user needs to know its location.) There is no need for a permitted voice or data communication under § 90.353(b) or (c) to repeat this location information. However, such permitted voice and data ("calls") would automatically, in the course of the service (not on every "call" but in the ordinary course of the service) be "related to" the ongoing location since the location of a mobile person or asset is a critical element of mobile communication service (especially where the location tracking function is an integral capability of the service). This is entirely clear in the conclusions reached by the wireless industry that location be a central component of 3G wireless and beyond. See footnote 14 above. For example, consider a fleet of service personnel use an LMS-M network providing both the required location service and this permitted voice and data: the voice and data "calls" may typically consist of receiving instructions and giving reports on the various routine and emergency service jobs, all or most of which have the location of the service person as a key component, but which may not be reflected in the content of the "calls." Rather, the dispatcher and the service person (assume here that both the dispatcher and service person use computers for the location tracking and for certain records being updated throughout the day) (i) via their computers linked to the ongoing multilateration location-fix function of the LMS-M system, are automatically kept up-to-date on the service vehicle's (or service person's) location, and (ii) in parallel, as they choose, place such "calls" for needed or useful status, instructions, and other communications. The content of the latter (elective "calls") need not repeat or even imply the location provided by the former (automatic location updates), but the latter would most often, and certainly as a regular essential function, be related to such location determinations: The correlation would be done naturally, on the fly, by the persons involved in such communications and reflected in the records of their computers logging the location and communications as needed.

[22] Teletrac systems. Teletrac filed bankruptcy in or about year 2000, took most of its LMS-M systems off the air, and sold its remaining assets in year 2001. LMSW met with and had numerous follow-up communications with Teletrac commencing in year 1999. Teletrac provided status messages under § 90.353(b) along with the required multilateration automatic vehicle location service. It imposed no control on the content of the permitted status messages. Teletrac had also undertaken technical development towards provision of permitted voice service but never completed such development.

Nor can the phrase "status and instructional messages" be construed as limiting communications used in business-task oriented mobile communications.[23]

Progeny also comments,

> . . . Furthermore, in today's world, it is hard to imagine that LMS services would not be heavily dependent on Internet-based service offerings. In such an environment, an arbitrary 30-second delay in messaging as currently mandated by the Commission's Rules, is inappropriate and serves only to make LMS less competitive with other potential service providers. [p. 25.]

LMSW disagrees that there is any rule including §§ 90.353(b) and (c) that prohibits ordinary (or other) Internet and other IP-based transmissions or restrict these to store-and-forward technique. As noted above, such IP transmissions do not use the Public Switched Telephone Network and by FCC definition and precedent, and case law precedent, are not "interconnected" communication.

§ 90.361. Part 15 and amateur operations. Progeny writes:

> . . . [L]icensed amateur radio operators and unlicensed users of Part 15 equipment. Progeny recognizes that LMS operations cannot adversely impact those users. [p. 27.]

LMSW disagrees. There is no rule, including § 90.361, that restricts LMS-M operations from causing adverse impact (interference) to these operations that are secondary to LMS-M.[24]

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[23] Regarding § 90.353(b)'s reference to "status and instruction," apart from sheer entertainment, other communications are various forms of "status and instruction." Thus, this appears to limit only entertainment communications. By the nature of the service provided, at least the service proposed for LMS-M by LMSW (see Part II herein) the communications would be business task oriented, not entertainment. In any case, as noted above, the LMS-M operator could not legally or practically listen in on and cut-off voice and data communications for any reason, including to restrict content.

[24] As noted above, there is a requirement that LMS-M operators, when deploying systems, test to attempt to minimize interference to Part 15 devices when encountering *existing* Part 15-device *"*deployments or systems.*"* See § 90.353(d)'s last sentence, as explained in ¶69 of Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle

3. Rule Changes Proposed by Progeny

Proposed "Technical Limits" on LMS-M. In its petition in part IV.D, Progeny generally suggests a few types of technical restrictions on LMS-M as substitute for its proposed relaxation of what it interprets as current service limitations. As noted above, for the most part, LMSW disagrees with Progeny as to the current-rule requirements, allowances, and limitations described by Progeny. Also, Progeny is not specific enough in this suggestion for a reviewer to understand what it has in mind. In any case, LMSW does not agree that LMS-M be restricted along the lines proposed by Progeny. LMSW feels that such types of limitation could gravely undermine viable LMS-M operations.

A technical analysis of a wireless network, particularly in relation to the operations of other devices or networks on the same channels, is a highly complex undertaking that cannot be so generally discussed, as Progeny has, with meaningful result. For example, LMSW designed and commenced with Metricom a study to simulate the effects of LMS-M networks on the Metricom Ricochet II network that was, at the time, under deployment. This was a "six-figure" undertaking by high-level engineers with scores of variable inputs. The study was suspended when Metricom filed bankruptcy. But is demonstrated the complexities involved.

Elimination of the spectrum cap. LMSW believes this is premature. If LMS-M, or the entire LMS band, is to be developed as a special service providing for land transportation and other critical industries, then competition within the band may be appropriate. Per the LMSW ATLIS proposal for the LMS band— both LMS-M and LMS nonmultilateration ("LMS-N")— there would be 26 MHz (902-928 MHz) used among well-coordinated wide-area LMS-M and

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Monitoring Systems, PR Docket No. 93-61, *Memorandum Opinion and Order and Further Notice of Proposed Rule Making*, FCC 97-305 (released September 16, 1997).

localized LMS-N dedicated for primary use to the nation's transportation and other critical infrastructure. If this ATLIS plan or something similar is adopted, it would create a unique service in which competition, warranting a spectrum cap, may be appropriate. LMSW agrees with Progeny that there should be a major re-examination of the role of and rules for LMS-M, but suggests that until the role is determined, and the ATLIS plan is considered in this regard (along with others that may be proposed), it is premature to lift or amend the spectrum cap. In addition, in the meantime, if Progeny or any other LMS-M licensee becomes interested in a particular transaction involving buying or selling some LMS-M spectrum which is prevented by the current spectrum cap, then it can seek a waiver upon showing of good cause.

Elimination of the restriction on real-time interconnection. LMSW agrees to this. But as noted above, LMSW disagrees with Progeny as to what the current rules impose in this regard. LMSW agrees to this, in particular, for the critical needs that LMS-M can fulfill per its ATLIS proposal (see Part II below). Many core ITS (Intelligent Transportation System) services, other location-and-monitoring based services, and the other essential wireless services LMS-M can provide to critical infrastructure entities described in the attached (Part II) ATLIS white paper cannot be effectively or fully provided without real-time interconnected service.[25]

Elimination of the restriction on the types of communications or services. LMSW gives its views above as to what restrictions are and are not imposed by current rules. These are different than those expressed by Progeny. In any case, for the critical needs that LMS-M can fulfill per the LMSW ATLIS proposal, LMSW believes there should be no restriction on types of communications or services. See Part II, attached below.

Modify or eliminate the 'safe harbor' provision. LMSW agrees. The 900 MHz spectrum assigned to LMS-M should be used for wide-area relatively high power licensed LMS-M services. It is ideal spectrum for this, as noted in the FCC proceedings on LMS. Part 15 devices, on the other hand, are low power devices designed for relatively short-range operation. They do not need the longer-range propagation characteristics of 900 MHz, but operate very well in the 2.4 and 5 GHz ISM bands which, as compared to 902-928 MHz, are available internationally (providing a much larger and longer-term market), provide much more spectrum, and are not subject to licensed operations. In short, these other bands are the future of major unlicensed device development and deployments. Already they are the bands in which all of the major new unlicensed developments are occurring: Bluetooth, Wi-Fi (802.11b), Home RF, and Hiperlan.[26]

In addition, consumer Part 15 devices are steadily moving away from the 902-928 MHz ISM band to the 2.4 GHz ISM band.[27]

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[25] LMSW intends to discuss this matter further when it submits its proposal for LMS rule changes noted in the Introduction section above.

[26] E.g.: 1) International Data Corporation, from: "http://www.idc.com" in a report on wireless LAN's: "The wireless LAN (WLAN) market finally has an opportunity to prove itself. . . .legitimacy in the form of a standard (IEEE 802.11) and room to move, an extra 300MHz in the 5GHz band allocated by the FCC. . . . 900MHz WLANs are losing ground. The 2.4GHz systems are now preferred as the internationally recognized WLAN system." 2) The Wireless LAN Alliance, at http://www.wlana.com describes the 802.11 standards which are for 2.4GHz and 5GHz, not 900 MHz ISM. 3) The FCC OET's "Trends in Unlicensed Spread Spectrum Devices" presentation at FCC Commission Meeting, May 10, 200, describes Bluetooth, Wi-Fi, Home RF, 802.11g, etc.: for the 2.4 and 5 GHz unlicensed bands: no mention of the 900 MHz ISM band. 4) The text, *Wireless Spectrum Finder* (Bennett Kobb, McGraw Hill, 2001) in the section on 902-928 MHz at page 161 notes: "The unlicensed Part 15 device industry is largely shifting to the 2400– 2483.5 MHz and the 5.725– 5.875 GHz ISM bands." 5) See also Part II below.

[27] From Consumer Electronics Association's Market Research Department: Market Activity Reports: "Monthly US Factory Sales of 900 MHz and 2.4 GHz [consumer market] Products": in August 2000 (the month in which they began to track monthly the sales of 2.4 GHz products) the percentage of the total dollar sales (sales of 900 MHz combined with 2.4 GHz products, in dollar

While, as noted, there is a far stronger development of and future for business and consumer Part 15 products and networks on the bands available other than 900 MHz ISM band, including the 2.4 and 5 GHz bands, without phasing out or reducing Part 15 devices in this 900 MHz band, development of LMS-M technology and network deployment will suffer. See the discussion in this regard in Part II below. Again, as with its other comments above, LMSW's proposal regarding Part 15 devices is based on the critical needs of the nation's critical infrastructure that LMS-M can serve under its ATLIS proposal or the like. This proposal is set forth in Part II, and involves phasing out of Part 15 devices.

LMSW also comments that, for the relatively small number of remaining vendors of Part 15 network devices on the 900 MHz IMS band and their customers, use of the higher-power licensed LMS-M spectrum would give numerous benefits, including greatly reduced cost of coverage, increased data speed, greater reliability, etc.— overall, better performance and security per cost, even factoring in a fair-market charge for the licensed spectrum use.

Finally, the "Safe Harbor" under § 90.361 is defective in serving its purposes. In brief, it was based upon, as reflected throughout its history in PR Docket No. 93-61, providing operational parameters for Part 15 devices, including networks of them, which would not cause harmful interference to LMS-M operations, and under which such devices could operate without claims of interference by LMS-M operators. Among important parameters noted in various places in this docket were proximity of Part 15 transmitters to fixed LMS-M transceivers. However, only Part 15 transmitter antenna height and power parameters ended up in the Safe Harbor: there is no parameter on proximity. Without this proximity parameter, the Safe Harbor's

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amounts of sales) of the 2.4 GHz products was 23%. This rose steadily to 28% by the end of year 2000. By July 2001, it reached 30%, and by December 2001, it reached 43%.

fundamental basis is clearly undermined, since regardless of the height and power limits, a network of closely spaced Part 15 transmitters in the field being served by a LMS-M network will cause substantial interference. The Safe Harbor is thus defective in its purpose. See Part II (the Attachment below, Exhibit 5 thereto) for a further discussion on these matters.[28] In any case, as noted above and discussed in Part II below, LMSW proposes a phasing out of Part 15 as an integral part of its ATLIS proposal. If phased out as proposed, it is irrelevant whether the Safe Harbor is defective or not.

Part II

Outline of LMSW's "ATLIS" Proposal for the LMS Band

(a white paper)

This is attached hereto.

Respectfully submitted,

Warren Havens

Warren C. Havens

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[28] A noted above, and in Part II below, LMSW designed and was engaged in a joint study with Metricom to simulate the interference between various types of LMS-M networks and Metricom's Ricochet II network. This study is proprietary and subject to a nondisclosure

May 15, 2002

agreement. However, LMSW can discuss this with Commission including OET staff under § 0.459.

Attachment to LMSW Comments on the Progeny Petition

Comments on the Progeny Petition

Part II

Outline of LMSW's "ATLIS" Proposal
for the LMS 902-928 MHz Band

The following is a draft to be amended, completed, and submitted to the FCC as a rule-making petition in the near future, after further discussion with the stakeholders described below.

Contents

Introductory Sections

Background, Problem, and Current Environment

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Solution: Amend LMS Rules to Enable and Test ATLIS in Marketplace

8. LMS Rules: Specific Proposed Minimum Amendments

Exhibits[29]

1. FCC LMS Rules and Rule Summaries

2. ATLIS Outline, Rationale, and
   Best Solution for Critical Infrastructure and Resources

3. Petitioner's LMS and other Licenses Lists and Maps

4. LMS verses Part 15 in 902-928 MHz, and
   Part 15 Safe Harbor Defects in its Purpose.

5. Part 15 Devices, Trends off of 902-928 MHz to 2.4 and 5 GHz

6. Part 15- LMS Interference Simulator Study Materials,
   And Petitioner's Research into LMS Multilateration Technology

7. "Is a Wireless Architecture the Future of ITS?":
   An article from the journal of ITS America

[29] Exhibits 1, 3, and 6 have been deleted in this version attached to these Comments on the Progeny Petition. Exhibits 1 and 3 are available to stakeholders by contacting LMSW.

Introduction:
Petitioner, Purposes, ATLIS, Stakeholders, Summary

1. Petitioner and Purposes:
   902-928 MHz LMS Rule Making, and
   Multi-Band 4G ATLIS Concept Forum
   Supplements to this Petition to be posted at www.lmswireless.com.

Petitioner. Petitioner, Warren C. Havens and Telesaurus Holdings GB LLC (together doing business as "LMS Wireless, "LMSW" herein) hold LMS geographic licenses for the A-Block, a 6 MHz block, covering approximately 78% of the US population, acquired at two FCC auctions. (See Exhibit 1 below.) LMSW also holds or has interest in other wireless licenses: geographic VPC (156/162 MHz) and 220-222 MHz licenses, acquired at four FCC auctions, covering the western half of the nation, as well as multi-site AMTS 217-222 MHz licenses for major areas in the Rocky Mountain states. (See Exhibit 1 below.)

Proposed Amendments Purpose. This Petition proposes major amendments to the Commission's Rules for the Location and Monitoring Service for the entire 902-928 MHz band (for the three spectrum blocks, 14 MHz in total, currently assigned to "Multilateration" licenses for wide-area mobile-services, as well as the other 14 MHz currently assigned to "Non-Multilateration" licenses for short-range communications along highway, railways, etc.)[30] These proposed amendments are designed to allow LMS to be a viable service, in particular, to form the core-spectrum basis of ATLIS, noted next.

Stakeholder Forum Purpose. This Petition (the "ATLIS 900 MHz Petition") is also meant to commence Commission rule making that will provide a forum for parties with existing

[30] The 2-MHz-wide "Block B" is shared by Multilateration and Non-Multilateration. Each is assigned 12 MHz exclusively, and 2 MHz shared: 26 MHz combined total.

or potential participation in the 902-928 MHz band (including spectrum licensees, users, and equipment providers) ("Stakeholders," described below) regarding the ATLIS proposal.[31]

Supplements to this Petition will be posted at www.lmswireless.com. While this Petition is the official document for FCC purposes, LMSW will present supplementary information relating to this filing, including the ATLIS proposal, at the above-noted web site.

2. ATLIS:
Advanced Technology Land Infrastructure Service:
902-928 MHz Core:
Summary, and Related FCC Filings

LMSW proposes *permanent dedication, for primary exclusive*[32] *use*, to the nation's critical infrastructure ("CI") industries, including roadway,[33] rail, utilities, pipelines, airports, etc., as well as to public facilities, lands, and environmental resources (together, "Critical Infrastructure and Resources," or "CIR"), of (i) all of the 26 MHz in the 902-928 MHz Location and Monitoring Service ("LMS") band, (ii) most of 6 MHz in the 216-222 MHz band, and (iii) all of the 75 MHz in the 5.9 GHz ITS band, along with some of the 4.9 GHz federal transfer band, for nationwide multi-band "Advanced-Technology Land Infrastructure Service" or "ATLIS" (the "ATLIS Proposal"). *This ATLIS 900 MHz Petition concerns the 902-928 MHz component of this ATLIS Proposal.*

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[31] LMSW understands that the FCC has received another petition for rulemaking concerning the 902-928 MHz band, from Progeny LMS, LCC ("Progeny"), which will be placed on public notice with this ATLIS 900 MHz Petition. LMSW and Progeny have not coordinated their respective petitions, but have exchanged initial views on each other's petitions.

[32] In this regard, with respect to the 902-928 MHz band, by "primary exclusive use" we mean of the use rights assigned to the LMS licenses under this ATLIS Petition, which does not propose to eliminate all other uses of this band.

The spectrum proposed is largely available at this time, including the vast majority of the 26-MHz wide 902-928 MHz band which would provide the core spectrum for ATLIS. With reasonable changes in FCC rules for these bands, well within precedent, this ATLIS Proposal is entirely feasible and would provide most if not all of the spectrum much needed for CIR.

This need is well documented, including in (i) FCC Docket DA 02-361, in the matter of NTIA Docket 0010327080-1080-01, regarding the NTIA Report on Current and Future Spectrum Use by the Energy, Water, and Railroad Service Industries, and (ii) various publications by the Intelligent Transportation Society of America (ITS America), e.g., see Exhibit 7 below.

The security and efficiency of the nation's interconnected nationwide Critical Infrastructure and Resources, CIR, is central to "Homeland Security." A coherent wireless service employing advanced technology dedicated to CIR and interoperable with next-generation public safety wireless—as per the ATLIS Proposal— is essential for both Homeland Security and the advancement of CIR, which together provide the foundations of the economy, environmental protection, and quality of life.

In the last two years, LMSW (Warren C. Havens and Telesaurus Holdings GB LLC) have submitted proposals to the FCC in dockets involving the ITS 5.9 GHz and the 217-222 bands setting forth the central ideas in what is herein called ATLIS.[34] (The Commission has yet to

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[33] Primarily for Intelligent Transportation System ("ITS") applications, both public, private, and shared. The US roadway system is one of the most extensive and important infrastructure networks. All of the nation's critical infrastructure components are interrelated.

[34] Comments and/or Reply Comments in FCC dockets: (i) DA 02-361noted above, regarding the NTIA study on spectrum needs of Critical Infrastructure industries, (ii) DA 01-686 regarding the 75-MHz-wide 5.9 GHz band allocated for Intelligent Transportation System ("ITS") uses, (iii) PR Docket No. 92-257 regarding 217-220 MHz AMTS (Automated Marine Telecommunications System) Service (for maritime and land services), and (iv) WT Docket No. 02-08 regarding "Reallocation of the . . . Government Transfer Bands" including spectrum in 216-220 MHz.

decide upon the issues in these dockets.) In addition to this ATLIS 900 MHz Petition, LMSW intends to submit to the FCC and the NTIA in this year 2002 other requests needed to enable and facilitate the ATLIS Proposal, including: (i) to the FCC, a proposal for rule making in the 217-225 MHz bands, and a proposal concerning licensing and services in the 5.9 GHz ITS band, and (ii) to the NTIA, a proposal concerning amending certain Federal use rights of the 902-928 MHz band to enable ATLIS and to secure benefits thereunder for Federal agencies.

In this regard, while we outline herein this planned request to the NTIA for purposes of a complete outline of the ATLIS Proposal, such Federal use rights are outside the scope of a petition to the FCC. LMSW will seek comment by NTIA and various Federal agencies on this ATLIS 900 MHz Petition to the FCC for purposes of developing a feasible proposal to the NTIA (see Stakeholders, below).

3. Stakeholders:
Current and Potential Stakeholders:
Contacts to Date and Plan for Participation

In the past month, LMSW has presented, and had or invited communications concerning, its outline of the ATLIS Proposal contained in its Reply Comments in DA 02-361noted above (regarding the NTIA study on spectrum needs of Critical Infrastructure industries) with representatives of a large percentage of entities with current or potential participation in the subject matters of the ATLIS Proposal: see footnote.[35]

[35] (i) CI Associations: (a) Energy and Water: United Telecom Council (UTC) (for itself and representing the Critical Infrastructure Communications Coalition), National Rural Telecommunications Cooperative (NRTC), American Petroleum Institute. (b) Transportation: Intelligent Transportation Society of America, American Automobile Association (AAA), American Association of State Highway and Transportation Officials (AASHTO); Association of American Railroads, ARINC. (ii) Spectrum holders in the ATLIS-target bands: Progeny LMS LLC, FRC Inc., NRTC. (iii) Public safety: APCO International, AASHTO, AAA. (iv)

Via the forum provided by the FCC placing this ATLIS 900 MHz Petition on Public Notice for comments, and via further direct communications, LMSW will continue to seek participation by Stakeholders in the issues presented herein.

Also, as noted in Section 8 below, LMSW will separately seek amendment of Federal use rights in the subject 902-928 MHz band via communications with and requests to NTIA and Federal agencies.

4. Petition Summary

A summary is provided by the extensive section headings in the table of Contents above.

Equipment and Service Providers: SAIC, Motorola, Microwave Data Systems, Nortel-EADS, Tait Electronics, Industrial Telecommunications Association. (iv) Federal Entities (concerning use rights to 902-928 MHz, and users of ATLIS as planned): NTIA (including IRAC), NOAA, EPA. (v) DARPA: the Advanced Technology Office's "XG" Next-Generation 4G wireless technology project. (vi) the American Amateur Radio League.

Background:
902-928 MHz Band

5. Background: 902-928 MHz: LMS and Other Users

a. 902-928 MHz LMS:
LMS Multilateration and Non-Multilateration
LMS History and Purpose

The LMS (Location and Monitoring Service) is composed of Multilateration and Non-Multilateration licenses described and regulated in Subpart M of Part 90 of the Commission Rules. See Exhibit 1 below. Site-based Multilateration license systems involve very wide-area-coverage for location and monitoring of (and related voice and data communications to) vehicles, persons, and assets. They were attempted in past years but did not succeed.[36] Non-multilateration license systems are used successfully at a substantial number of locations throughout the nation, mostly along roadways for automatic toll collection from vehicles equipped with a system "tag" or transponder, and along railroads for identification of rail traffic so equipped. They typically have a very short range of under several hundred yards. Accordingly, the Non-multilateration spectrum involved is used in a very small percentage of the nation's urban and rural areas.

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[36] Teletrac was the only company that operated Multilateration systems providing service to the public. Teletrac deconstructed most of these systems, returned to the Commission the licenses involved, transferred other licenses to Ituran (who had supplied the LMS equipment to Teletrac), filed for bankruptcy, and was acquired by Traffic Masters. Traffic Masters is maintaining a small number of Multilateration systems, but is primarily using GPS units along with CMRS wireless (such as CDPD and Cellemetry) for its location based wireless services in the United States. Teletrac cancelled its equipment contract with Ituran and this equipment is no longer being marketed, at least in the United States. The technology involved is not viable and is

As described throughout PR Docket No. 93-61 (the "LMS Docket"): LMS was established for a wide range of Intelligent Transportation System ("ITS") wireless applications. These include uses by the vehicular fleets and mobile workforces of utilities, railroads, pipelines, and other "critical infrastructure" entities, as well as Federal and other public entities. LMS rules do not restrict LMS operations to ITS applications, but require "multilateration" (certain network-based) location services, and allow certain voice and data service related to such location service (see Exhibit 1). Including Telematics applications, the ITS market and location-services markets, while still in early stages, are projected to grow considerably and eventually involve a majority of all wireless users, individual and enterprise. As described in the LMS Docket, LMS 900 MHz spectrum is ideal for the wide-area coverage needed for such services, as noted by the FCC in LMS rulemaking.

b. 902-928 MHz Other Users:
Federal Radiolocation and ISM,
Federal Fixed and Mobile,
Amateur,
Part 15

See Exhibit 1 below for rules concerning these users, and summaries of the rules regarding the hierarchy of these users, including the Part 15 "Safe Harbor."

As noted in Section 8 below, and further discussed in Exhibit 2 below, there is very light use by all of the above classes of uses except by Part 15 devices.

Part 15 devices used in this band are primarily consumer devices such as cordless phones, along with some wireless LANS, and some point-to-point and point-to-multipoint

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limited to location and status messaging. No other technology or equipment is currently available for LMS Multilateration systems.

systems. As discussed below, there is a migration of Part 15 devices out of this band to the wider 2.4 and 5 GHz UNII bands.

The Problem in 902-928 MHz:
Its Background, and Its Assessment in Current Environment

6. Problem: Spectrum Encumbrances:
Other-Use Interference Cloud and Rule Restrictions
Force Non-Competitive Niche Technology for Mirage Market

a. Other-Use Interference Cloud, and Study of Shared-Spectrum System-Deployment Battles

While, as noted above, use is slight by the other, non-LMS Licensee, entities and devices, their potential use creates a cloud of unpredictable and possible major interference. This impedes development of LMS Multilateration technology, equipment, systems, and services.

See Exhibit 6 (extensive confidential proprietary materials filed concurrently with this Petition filing under §0.459): LMSW commenced and co-funded with Metricom and joint study to simulate the interference between its Ricochet network of Part 15 devices and a LMS Multilateration network, assuming various types of Multilateration technology and architecture was employed. This study was suspended due to the bankruptcy of Metricom. Before suspension however, much of the work was completed, and it revealed, as was expected, that the higher-power higher-height (network transmitters' height) LMS network could be constructed to overpower the lower-power Part 15 network. However, the Part 15 network would use more closely spaced transmitters and could decrease this spacing to compensate as the LMS network was built out. In turn, the LMS network could decrease its transmitter spacing and increase power (up to permitted levels)—and so on, back and forth. This would be a costly exercise for both sides, very possibly leading to commercial failure due such costs, time delays, and poor and disrupted quality of service, and unpredictability of the other user.

b. Rule Restrictions: Requirements, Prohibitions, and Lack of Clarity

The current rules for Multilateration LMS require use of a particular type of location technology (see §90.7) to provide required location services, allow only certain voice and data communications related to such location services, prohibit interconnection except in emergencies or via store-and-forward methods, etc. These are severe impediments for any wireless service, including a service that is intended to provide an array of ITS applications.

Moreover, the current rules are vague as to the meaning of both these restrictions and the permitted services. While vague governmental rules may be interpreted in favor of the subject, when they form the basis of a business, such lack of clarity poses a further hindrance.

c. Forced Non-Competitive Niche Technology and Networks

Due to these severe rule requirements and restrictions, there is no technology and equipment available. See Exhibit 6 as to details why, and extensive due diligence by LMSW to assess technical solutions for LMS Multilateration. For several years, LMSW has had substantial discussions with most first-tier wireless vendors and many others and none were willing to undertake the work needed develop the technology and products.

Due to such rule requirements and restrictions, and to the need to build-in powerful interference excision techniques (to withstand interference by the noted other users), new techniques not employed in any commercial wireless technology are needed. (Again, see Exhibit 6 for details.) No vendor is willing to undertake such work since, with such unfavorable rules and other-user interference issues, the products that would be produced and restricted services they would provide can not be reasonably projected as competitive, even with the large theoretical capacity of networks employing the substantial-size LMS Multilateration spectrum.

d. Mirage Market: ITS Location and Monitoring a Mirage Market;
Critical Infrastructure Wireless (including ITS) a Bedrock Market

The "location and monitoring" market, even the entire ITS wireless market, is a mirage market in that it involves still-early-stage evolving definitions and applications. There are few entities that need, per se, only location and monitoring, or ITS, applications. Any market is ultimately entities who will transact business, not applications.

On the other hand, the "Critical Infrastructure and Resource Entities" defined in Section 8 below, are a bedrock market in that they have well clear need for more spectrum, a broad array of particular wireless services, and advanced wireless technology to deliver such services. This need is discussed in Exhibit 2 and 7 below.

e. Result: Waste of Excellent Band in Mobile Spectrum Drought

As a result of the above-noted restrictions and encumbrances, the 902-928 MHz spectrum is largely wasted and will remain so absent rule changes as proposed in section 8 below. This is an especially great waste considering the well-know spectrum drought in the ranges suitable for wide-area mobile systems.

In this regard, Part 15 devices, even networks of them, do not need the propagation capabilities of 900 MHz. The are better suited to the 2 to 5 GHz ranges, and in fact, are migrating there. See Exhibit 5. It is a waste to encumber 900 MHz that is ideal for wide-area mobile applications with Part 15 rights and devices.

7. Assessing the Problem and a Solution in the Current Environment: FCC, LMS, Other (Non-LMS) Users, Market and Technology, NTIA and Public Wireless Exigencies

a. FCC Environment Favorable: Flexibility, Parity, 4G, Critical Infrastructure, Homeland Security, Secondary Markets, Priority and Interoperability, Market Rules but US Infrastructure and 4G Require a Plan.

The above-noted Progeny petition addresses FCC regulatory flexibility and parity as a basis for appropriate changes in rules for LMS Multilateration licenses. I refer to their presentation in these matters. The other FCC regulatory principals and interests noted above are well known and need not be discussed here, except to note that, as is described herein, this ATLIS 900 MHz Petition and the multi-band ATLIS Proposal are justified by and serve all these principals and interests.

"4G" wireless technology is becoming an important interest of the Commissioners. It is critical for the US Communications market as well as national defense and Homeland Security. 4G as a main component of ATLIS is discussed in Exhibit 2. LMSW has discussed the ATLIS Proposal with the head of the DARPA (Defense Advanced Research Projects Agency) 4G development project and head of the FCC Spectrum Task Force. The idea being considered is the use of LMS spectrum and the mission-critical applications targeted by the ATLIS Proposal as a test bed for the DARPA 4G technology.

While generally the market should determine the highest and best use, thus calling for broad regulatory flexibility policy, when it comes to critical infrastructure and resources and Homeland Security, there needs to be a plan, and the plan should be secured. The ATLIS Proposal is a major effort in this regard, and the rule changes outlined in Section 8 are needed to enable this proposal.

b. Other Non-LMS Use Slight/ Migrating: Slight Past Federal and Amateur Use, and Migration Off by Part 15: Show Lack of Need and Yet Cloud Best Use of Spectrum

As noted elsewhere herein, there is slight use by Federal entities of 902-928 MHz. See section 8, last item. See also Exhibit 2.

There is also slight use by Amateur Radio operators. For example, at the AARL website, and in the popular Amateur Radio magazines and product guides, there is very slight mention of this band, and in publications listing all Amateur open repeaters, in most states, out of hundreds of repeaters listed, there are none in this frequency range, and in the minority of states where there are any, there is only one or a few.

As noted above, Exhibit 5 discusses trends by Part 15 devices off this 900 MHz band. With Bluetooth, Wi-Fi, Home RF and other advanced Part 15 technologies all made for the 2.4 band and the 5 GHz UNII bands (and not this 900 MHz band) and with the inevitable spread of LMS systems in this 900 MHz band, the trend for Part 15 devices and applications will be increasingly off of 902-928 MHz.

c. LMS 26 MHz Available: Petitioner's and Other's LMS Multilateration Spectrum Not Developed; and Non-Multilateration Spectrum Used Only in Microcells: 26 MHz Coordinated Service Possible and Best Spectrum Use: Feasible Under Current Rules but Far Superior Under Proposed Rules

The LMS Multilateration spectrum, thought almost fully licensed, is not developed at all (except, as noted above, in a few site-based systems). It is thus available for the ATLIS Proposal: If there is sufficiently positive response to this proposal, including this ATLIS 900 MHz Petition, then, while LMSW can only speak for itself, the other licensees should also take interest.

In addition, as noted above, the Non-Multilateration spectrum (see Exhibit 1, first page) is used in only a very small percentage of urban and rural land mass of the nation. It is thus available for the proposed spectrum sharing described in item 7 of section 8 below, by which LMS Multilateration licensees would be able to use Non-Multilateration spectrum for wide-area systems "in exchange for" for making Multilateration spectrum available for Non-Multilateration systems.

d. State of the Market and Technology Demand ATLIS Approach; LMS as Core ATLIS Spectrum, Other Targeted Spectrum Available; Critical Infrastructure Wireless Demands 4G (More than Does CMRS); LMS as Ideal Test-Bed for DARPA 4G Technology; 4G Needed by US

See Exhibit 2: while the ATLIS Proposal proposes use of much of 216-225 MHz and the 5.9 GHz ITS spectrum for ATLIS, the 902-928 MHz spectrum would provide the essential core spectrum. As noted in Exhibit 2, this other spectrum is largely available at this time, and if the ATLIS Proposal gains sufficient support among the FCC and the Stakeholders (see above), then securing this other spectrum is likely.

Critical Infrastructure and Resource Entities (defined in Section 8) need the capabilities and security of 4G wireless technology more than does the general consumer market.

See section 8: footnote regarding the greater range of services required by these entities. This full range needs 4G to implement well.

As noted above, "4G" wireless technology is becoming an important interest of the Commissioners. It is critical for the US Communications market as well as national defense and Homeland Security. 4G as a main component of ATLIS is discussed in Exhibit 2. LMSW has discussed the ATLIS Proposal with the head of the DARPA (Defense Advanced Research Projects Agency) 4G development project and head of the FCC Spectrum Task Force. The idea being considered is the use of LMS spectrum and the mission-critical applications targeted by the ATLIS Proposal as a test bed for the DARPA 4G technology. Europe is generally ahead of the US in wireless, including via its highly successful GMS, and in terms of 3G. The 902-928 MHz band, if suitable mended as proposed herein, can provide excellent undeveloped soil for testing and cultivating 4G in the US, bypassing 3G which is designed for the general consumer market.

e. Conclusion: ATLIS Warranted, Calls for LMS Rules Amendment

These are presented in the following section.

Solution for 902-928 MHz:
Amend LMS Rules to Enable and Test in the Marketplace ATLIS:
Advanced Technology Land Infrastructure Service

8. LMS Rules: Specific Proposed Minimum Amendments

Introductory notes: (i) Current principal LMS rules (for licenses of Multilateration and Non-Multilateration LMS spectrum, together encompassing 902-928 MHz) are set forth in Exhibit 1 below. (ii) The below numbered items present the concepts and basic substance of proposed new rules for all LMS Licenses (each, below, a "License"). Terms and definitions given below, while intended as adequate to present the proposed concepts, would need additions and amendments to constitute suitably precise and enforceable rules to implement such concepts.[37]

1). Primary Use Obligation: LMS licenses, for their "primary use," "*restricted to serve"* Critical Infrastructure and Resources: 902-928 MHz LMS licenses, currently allocated for Intelligent Transportation System (ITS) applications (the transportation sector of US critical infrastructure), would be permitted to serve, and for its "*Primary Use*" (defined below) "*Restricted to Serve*" (defined below) any or all "*Critical Infrastructure and Resources Entities*" ("*CIR Entities*," defined below).

*"*CIR Entities" is defined as:[38] private and public entities directly providing or managing:

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[37] LMSW intends to comment on such implementing language within the rule making proceeding requested by this ATLIS 900 MHz Petition after substantial comment from the Stakeholders and other interested parties.

[38] LMSW requests comments by Stakeholders on an appropriate precise definition.

(i) Critical Infrastructure (a) *Transportation*: roadways, railroads, airports and other transportation terminals, and other transportation infrastructure, and (b) *Energy and Water*: utilities and pipelines.

(ii) Critical Resources: (a) *public facilities*[39] including entertainment, sports, and convention facilities, (b) *public lands* including Federal USFS, NPS, and BLM, and State and Local equivalents, and (c) *environmental monitoring and protection* programs of Federal, State, and local government agencies and private non-profit entities.

"Restricted to Serve" any or all CIR Entities means limiting use, for the Primary Use (defined below), as follows: either

(i) The licensee may be a CIR Entity using the spectrum for its internal purposes, or

(ii) The licensee may be non-CIR entity such as LMSW who may use any legal instrument to (a) provide use rights to the subject 902-928 MHz LMS spectrum to CIR Entities for their internal use, including via spectrum leases, band-manager type sub-licensing, or rights defined in a joint-venture or build-lease contract (that may also include equipment vendors and network integrators), or (b) provide wireless services to a CIR Entities on dedicated or virtual-private networks employing the subject 902-928 MHz spectrum.

"Primary Use" means either:

(i) With respect to the a License, greater than 50% of the "*License Spectrum Capacity*" (defined below) is used by or reserved for use by CIR Entities; or

[39] Public facilities as listed may be considered infrastructure more than resources. But we include them in "Critical Resources" since by that term we mean publicly owned.

(ii) With respect to an operating system using the License spectrum, greater than 50% of any "*License System Capacity"* (defined below) is used by or reserved for use by CIR Entities.

"License Spectrum Capacity" means:

(i) For a geographic-area License,[40] the "*License MHz-Pops*" calculated as the total population in the License's geographic area multiplied by the amount of spectrum authorized for use by the License. (For example, a License for 6 MHz of spectrum for a geographic area containing one million residents would have a License Spectrum Capacity of 6 million MHz Pops.)

(ii) For a site-based License,[41] for each site, the amount of spectrum authorized for use at such site.

"License System Capacity" means:

(i) For a geographic-area License, the "*System MHz-Pops*" calculated as the aggregate of the MHz Pops of each "*Component Site*." "Component Sites" means the System's fixed-location transmitters communicating with end-user terminals. The MHz Pops for each Component Site is the population in its coverage area[42] (area of acceptable radio coverage) multiplied by the amount of spectrum used at that site.

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40 The current Multilateration licenses issued via auctions are "geographic" licenses for "Economic Areas.

41 Pre-auction Multilateration licenses and current Non-multilateration licenses are site based licenses.

42 This is easy to determine using GIS software available at reasonable cost, and such calculations are required in other FCC wireless services. For example, in the AMTS service, an applicant must calculate the number of TV households within certain coverage contours of a

(ii) For a site-based License, for each site, the amount of spectrum authorized for use at such site.

2). Secondary Use Allowance: Subject to fulfilling the above Primary-Use condition, and the below Public-Safety priority condition, LMS Licenses would be allowed to serve non-CIR entities ("Secondary Use"). (See next footnote.)

3) Public-Safety Priority:[43] LMS Licenses would be obligated to provide priority access to Public Safety entities in emergencies. To be defined: To involve priority access to all LMS License systems, other than (i) reserved defined emergency-condition use by the CIR Entities, and (ii) access to Non-Multilateration systems used for identification of passing vehicles and similar purposes not involving communications of the type used by Public Safety entities (basically, two-way, dispatch, and broadcast, voice, data, and video).

4) Any class of service. Any type of mobile or fixed wireless service would be permitted, including any "traffic class."[44] No requirement for any class of service, including (as is currently required) location services.[45]

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proposed AMTS station. (Havens has submitted many AMTS applications demonstrating such determinations.)

[43] Public Safety entities may also be served under the Secondary Use Allowance, providing to them non-emergency services to supplement their internal wireless systems, for redundancy, additional coverage (in cases), interoperability with CIR Entities.

[44] Including the four classes defined for UMTS. See Holma and Toskala, *WCDMA for UMTS* (Wiley, 2001), p. 12: (1) Conversational" class (real-time two-way voice and videotelephony, etc.), (2) "Steaming" class (one-way streaming multimedia), (3) "Interactive" class (two-way: SCADA, interactive work projects, Web browsing, etc.), and (4) "Background" class (one- and two-way: background download and receipt verification of email, meter reading, Telemetry, etc.).

5) Interconnection via the Public Switched Network would be permitted, as well as non-interconnected service (which is currently allowed) including via the Internet or other public or private Internet-Protocol-based networks.

6) Part 15 phased out of 902-928 MHz. No new consumer devices would be permitted on the market after the end of year 2005, and no external Part 15 systems operations (via fixed antennas outside buildings or intended to transmit outside) would be permitted after end of year 2005.

7) LMS Multilateration and Non-Multilateration Spectrum Sharing: Block-A and Block-C LMS Multilateration licensees would be permitted to use in their operating systems covering a particular area (the "Area"), a quantity of Non-multilateration spectrum (the "Quantity"), subject (i) to allowing use of the same Quantity of their Block-A or Block-C spectrum for use by any Non-multilateration systems in the same Area, and (ii) to protecting such Non-multilateration system from harmful interference by their system, and accepting any harmful interference from such Non-multilateration system.

In addition to what is planned for UMTS, ATLIS would include the additional classes for which mission-critical dispatch mobile communications are designed, and those needed for various ITS applications: (5) "Broadcast" class (broadcast by a supervisor or other person to a work groups, or to all users on the system in emergencies), (6) "Dispatch" class (instant key-up, two or more persons), (7) "Location" class (event-based [emergencies, etc.] as well as constant or periodic [Fleet location, asset tracking, etc.], network based and/or GPS-mobile-unit based).

Petitioner submits that Critical Infrastructure and Resource entities need the first four classes *more than* the general public, needs the other classes as well, and should have them all provided via an integrated service and network.

[45] While location services will in many or perhaps most cases be desired, the mix of services should be up to the CIR Entities being served, and in some cases, such as some rural applications, there may not even be a demand for mobile services.

8) ISM devices. No change in current rules proposed. (If operated under FCC rules, these devices would virtually never cause interference to LMS operations as planned by LMSW, nor would LMSW-planned LMS operations cause interference to such ISM devices.)

9) Amateur status, comment sought. Under current rules, amateur radio license operators may use 902-928 MHz spectrum subject to accepting interference from and not causing interference to[46] operations of Federal systems, ISM device, and LMS systems. There has been very slight use of this band by Amateurs. Petitioner seeks comments by the Amateur Radio community on the matters of this petition, including (i) the extent of their current and predicted use of this band, and (ii) whether they may play a contributing role, under current *or amended* Part 97 rules, in the proposed ATILS service to Critical Infrastructure and Resource Entities under rule changes proposed herein.

For example, Amateurs play roles, via standing arrangements (ARES, RACES, etc.) or ad-hoc arrangements in civil defense emergencies and other public-service matters. Given the proposed primary use of this band for Critical Infrastructure and Resource applications (both critical day-to-day and emergency applications), and the wealth of amateur radio operators across the nation, LMSW believes it is worth exploring whether amateurs may play supporting roles in such ATLIS services, at least in certain times and places, and whether such roles warrant permitted operations outside of the current Safe Harbor (see preceding footnote) or any changes in Part 97 rules.

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[46] There is a "safe harbor" setting forth technical conditions under which Amateur radio operations (and Part 15 devices) may operate and be considered as not causing harmful interference to LMS Multilateration operations.

10) Technology, modulation, channelization: Any would be permitted, subject to protecting adjacent-band licensees. Such protection should be re-examined.

11) Fixed-site Transmitter Power: Current power limits would be increased to an appropriate level to best accommodate the other changes proposed herein. For comment by Stakeholders.

12) Spectrum cap: In the context of the rule changes proposed herein, which would (i) result in ATLIS, a unique radio service for Critical Infrastructure and Resources, and (ii) allow more spectrum for wide-area licenses (currently called "Multilateration" licenses, although as proposed above, the requirement to provide "multilateration" location service would be eliminated), it should be examined what spectrum cap, if any, there should be for wide-area LMS licenses.

An additional factor is consideration of the ATLIS Proposal's plan to include much of the 216-225 MHz bands and the 75-MHz-wide 5.9 GHz ITS band in multi-band ATLIS networks and services.

LMSW also notes that currently, LMSW and Progeny LMS LLC hold the vast majority of all LMS Multilateration licenses (especially if measured by licenses' population). Thus, if they so chose, for good cause, they could seek a waiver of the current spectrum cap (8 MHz per Economic-Area ["EA"] license area) cap for any EA in which they both hold licenses. And if they do not so choose, there may be insufficient cause for a change in the spectrum cap.

LMSW will comment further on this issue after comments by Stakeholders on the ATLIS Proposal in the expected forthcoming 902-928 MHz rule making proceeding.

12) Not for FCC action, but *for a separate proposal to NTIA*: (i) New, *additional* Federal primary-use rights on major Federal lands and facilities, (ii) coupled with Federal use caps in geographic areas outside these major lands and facilities.

(i) Use cap: A use cap would be established based on the existing and current projected Federal uses. There appear to be few uses outside of major Federal facilities, and little use even at such facilities.[47] The purpose of the cap would be, while preserving actual and projected uses (the "Preserved Uses"), to lift the cloud created by the current nationwide (anytime, anywhere) Federal *radiolocation* primary-use rights in 902-928 MHz and the Federal co-equal use rights in this band with LMS licensees, and by such, to assure availability of this spectrum and to make it available on a primary basis, away from the areas of such Preserved Uses, to LMS operations for Critical Infrastructure and Resource Entities, *including Federal entities*.

(ii) New rights: "In exchange" for this cap, for non-radiolocation wireless (where currently Federal rights are co-equal with those of LMS licensees) the Federal entities would be moved up to primary-use status, above LMS licensees, for use on their major lands and facilities (to be defined). As noted above, (i) they would also retain primary-use status for radiolocation under the noted cap.

[End text of draft.]

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[47] Federal use has been very light: some Navy ship radar, some land-based radar, and some land-based fixed and mobile uses. The Federal entities with rights to use LMS spectrum submitted no comments in past LMS rulemaking, reflecting their light use in this band. Petitioner was informed by NTIA recently that it is not getting from agencies with authorizations to use 902-928 MHz much information on actual use (although such use is supposed to be reported), and to obtain such information may require agency-by-agency inquiry.

Exhibit 1

Location and Monitoring Service ("LMS"):
Principal rules in Subpart M of Part 90, and derrived summaries

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[Deleted in this draft.]

Exhibit 2

Note: The below was taken, with few changes, from the Reply Comments of Warren Havens and Telesaurus Holdings GB LLC (DBA LMS Wireless, below called "LMSW-Havens") in FCC Docket 02-361 submitted prior to this Petition. *Where the below text does not conform to the Petition text (in use of terms or other aspects), the Petition text take precedence.*

For Service to Critical Infrastructure and Critical Resource Entities (as defined in the text above)

Outline of a Nationwide Advanced-Technology Land Infrastructure Service ("ATLIS") Using Available 30+ MHz of Lightly Used Spectrum in 900 MHz and 200 MHz and the New 5.9 and 4.9 GHz CI-Oriented Allocations

1. Summary

The recent NTIA Study (see FCC Docket DA 02-361) presents an overview of spectrum uses and needs of certain critical infrastructure industries. In this regard, below we outline a practical long-term solution for these and other critical infrastructure and critical resource entities and applications.

Presenters and Spectrum Base: LMS Wireless ("LMSW") and Warren Havens ("Havens") (together, "LMSW-Havens") hold 6 MHz or more of spectrum from VHF to 900 MHz in over 80% of the nation, and with several other licensees in the same bands, over 15 MHz nearly nationwide. LMSW-Havens and this spectrum are described elsewhere in this filing. This provides an ample spectrum base for the success of the Advanced-Technology Land Infrastructure Service ("ATLIS") proposed herein, and this spectrum base would be increased via FCC rule changes to be proposed soon by LMSW-Havens.

ATLIS Spectrum: LMSW-Havens proposes *permanent dedication, for primary exclusive use (see text above),* to the nation's critical infrastructure ("CI") industries, including roadway,[48] rail, utilities, pipelines, airports, etc. of (i) all of the 26 MHz in the 902-928 MHz Location and Monitoring Service ("LMS") band, (ii) most of 6 MHz in the 216-222 MHz band, and (iii) all of the 75 MHz in the 5.9 GHz ITS band, along with some of the 4.9 GHz federal transfer band, for nationwide multi-band "Advanced-Technology Land Infrastructure Service" or "ATLIS" (the "ATLIS Proposal").

The spectrum proposed is largely available at this time, including the vast majority of the 902-928 MHz band which would provide for the majority of the wide-area mobile services. LMSW-Havens has 6 MHz in this band almost nationwide: geographic licenses issued by

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[48] Primarily for Intelligent Transportation System ("ITS") applications, both public, private, and shared. The US roadway system is one of the most extensive and important infrastructure networks. All of the nation's critical infrastructure components are interrelated. The 902-928 MHz band is licensed for use in wide-area and localized systems for various ITS purposes. Per this ATLIS Proposal,

auction. LMS spectrum was allocated by the FCC to serve the nation's roadway infrastructure (generally, wireless for "Intelligent Transportation Systems" ["ITS"]), and may also be used for other CI. With reasonable changes in FCC rules for these bands (well within precedent) this ATLIS proposal is entirely feasible and would provide most if not all of the needed spectrum subject of this NTIA Spectrum study and the Comments submitted in this docket by CI entities.

FCC Rule Changes for ATLIS: To commence ATLIS with the noted 200 and 900 MHz spectrum, rule changes will be proposed to the FCC by LMSW-Havens in the near future, based on several years research into the relevant market, regulatory, and technical issues.

ATLIS and CI Entities. LMSW-Havens has previously discussed (commencing with a presentation to the UTC Technical Committee in Phoenix in year 2000, and presentations to ITS America in year 2000) and will continue to discuss the concepts in this ATLIS proposal with ITS America, UTC, and various CI companies, and commencing with these Reply Comments, will include additional CI industry companies and representative organizations, and parties involved in Homeland Security. With sufficient interest from the CI community, the noted FCC initiative is likely to succeed since the targeted spectrum is already largely committed to CI, and the ATLIS proposal would fulfill a major public interest.

ATLIS Technology, Capacity Growth, Interoperability. Commencing with current digital technology, such as Project 25 or Tetrapol for mobile, and various technologies for Telemetry and other fixed services ("ATLIS Phase 1"), and migrating to "4th Generation" ("4G") technologies (e.g., using SDR [software defined radio], SDMA [spatial division multiple access], OFMA, ODMA, etc.), whereby capacity per MHz would increase by an order of magnitude or more (such as per the DARPA "XG" 4G project) ("ATLIS Phase 2"), this spectrum would provide for the rapidly growing wireless service needs of the nation's CI, both mobile and fixed, from conversational class such as conventional voice to "broadband" for real-time video, two-way biometric identification and authorization, and other high-speed applications. Both initial and subsequent ATLIS technologies and networks would be interoperable with Public Safety systems to large extents.

ATLIS Integration with Current CI Wireless. The current CI wireless systems would be reasonably integrated into ATLIS in its initial stage and would provide most of the network facilities needed (including properly spaced base station sites for the ATLIS 200 and 900 MHz spectrum employed in the FDMA-based Project 25 or Tetrapol), and the current CI spectrum could be fully integrated into ATLIS in its "4G" stage (including via SDR [software defined radio] base and terminal equipment that would handle from VHF to 900 MHz and higher).

ATLIS Cost and Quality Advantages: Per this ATLIS proposal, the cost to CI entities of the wireless services (combined cost of spectrum and network capacity and end-user devices) should be considerably less, and the reliability, scope, and quality, of the wireless services considerably higher, than if they obtained at no cost spectrum for their exclusive use and operated exclusive networks.

These ATLIS cost and quality advantages would be due to (i) the relatively low cost of this CTIS spectrum at FCC auctions, (ii) building and operating the ATIS networks largely on CI infrastructure (antenna sites, rights of way, switch and node shelters, backhaul link facilities, installation and maintenance capabilities, etc.), which use would be credited toward network use rights, or ownership, as cash-equivalent in-kind payments, (iii) the vast economies of scale

achieved via very-wide-area high-capacity ATIS networks shared by many CI entities in each region providing secure virtual private networks, but interoperable as desired, (iv) the multiple bands employed yielding far more cost-effective coverage than any single-band network, and allowing more cost-effective provision of the multiple QoS classes needed (a full range of "Conversational," "Streaming," "Interactive", and "Background" Quality of Service classes), and (v) the large spectrum base and broad CI-wide plan would provide an unprecedented market opportunity for equipment vendors and technology and network development and integration entities,[49] justifying greater and more rapid development of technology and products needed for advanced wireless for CI than if there was lesser and more fragmented spectrum and a less coordinated approach to future CI wireless.

ATLIS Schedule: If the FCC grants preliminary relief (waivers and STA) related to the above-noted proposed ATLIS rule changes in a reasonable period of time, then within the first half of 2003 ATLIS Phase 1 (see above) can commence with re-banded current digital technologies, with Phase 2 following several years thereafter.

2. LMS Wireless and Warren C. Havens

Warren C. Havens ("Havens") and Telesaurus Holdings GB LLC, together doing business as LMS Wireless ("LMSW") (herein, "LMSW-Havens"), hold FCC licenses in (i) the Location and Monitoring Service ("LMS") in 902-928 MHz (LMSW-Havens hold 6 MHz covering 80% of the nation population, and 90% of the land), (ii) the AMTS Service in 217-220 MHz (LMSW-Havens holds 1 MHz in some regions), (iii) the VHF Public Coast ("VPC") Service at ~160 MHz (LMSW-Havens hold .35 MHz in most of the Rocky Mountain states), and (iv) the 220-222 MHz Service (Havens holds direct and indirect interest in ~.25 to 1 MHz in the Western half of the nation). See Exhibit 3 for details. These license holdings represent approximately 1.3 billion MHz Pops (6 MHz or more in most all of the nation), one of the largest holdings of spectrum in the nation for wide area systems, especially new systems. (See Exhibit 3, end.)

In addition, LMSW is pursuing participation by other parties holding major quantities of spectrum in these frequency services for the proposed ATLIS. With participation of several of the largest other current spectrum holders in these services along with LMSW-Havens, the ATLIS spectrum would exceed 3 billion MHz Pops (15 MHz or more in most all of the nation). (See Exhibit 3, end, for comparison to the nationwide CMRS operators in terms of total MHz Pops. This reflects the capacity needed to service CI nationwide.)

3. NTIA Study and Comments in FCC DA 02-361: Need for ATLIS

The NTIA Study presents an overview of spectrum and wireless technology uses and needs of certain critical infrastructure industries. In this regard, below we map out a practical long-term solution for these and other critical infrastructure industries and applications.

The physical foundations to advance and sustain the nation are its man-made infrastructure (herein, "CI") and its ecosystems. Of our activities, CI uses the most, and returns the most

[49] Among others, LMSW -Havens has thus far discussed this ATIS plan with SAIC, Motorola, Microwave Data Systems, Nortel, EADS, and Siemens.

burden upon, the ecosystems. They both require wireless networks far advanced from their current state for monitoring, protection, and efficient and effective operation. (See below regarding nationwide environmental wireless services.) They both require similar vast coverage and highest-quality technologies and systems. The proposed ATLIS will provide for both. Along with related Public Safety wireless, there is no more important wireless service.

For this CI wireless to advance as it should will require (i) appropriate large new spectrum allocations and (ii) much more advanced wireless technology and networks than exist or are discussed in the NTIA Study and Comments thereupon,[50] or than exist and are planned for commercial wireless (cellular, PCS, etc.). However, over the last few decades, the situation has become reversed: it is commercial wireless that has obtained far more advanced technology and network developments than CI, and the ultimate foundation of the economy and quality of life, the ecosystems, are hardly "wired" at all, lacking a needed electronic web of monitoring and protection, which must largely be via wireless.

For such CI wireless to succeed, it first needs a large appropriate spectrum base (in addition to current spectrum held and fully or mostly used by CI). This spectrum base will justify the development of advanced technology specific to CI wireless, and the long-term planning and implementation of networks providing the needed enhanced and new applications. The ATLIS proposal is designed to fulfill this need.

4. ATLIS, Further Discussion

ATLIS Description in Other FCC Proceedings. See Attachment below, Comments by LMSW-Havens in the FCC docket regarding the 75-MHz-wide 5.9 GHz band allocated for Intelligent Transportation System ("ITS") Dedicated Short Range Communications ("DSRC").[51] In these Comments, LMSW-Havens discusses NIRS, the same as ATLIS in these Reply Comments to the NTIA CI spectrum study. *The availability and value the three spectrum bands, as well as other matters, is provided in this existing FCC filing, Attached.* This Attachment includes at its end two depictions of basic ATLIS network architecture.

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[50] Neither the NTIA study nor Comments thereupon substantially discussed new technologies that may be used to increase spectrum efficiency, performance, and types of services. Without considering technology and network deployment architecture, and without defining grades of service to be satisfied, capacity to provide for wireless needs can at best only be very roughly estimated.

[51] As noted in these Comments in the 5.9 GHz proceeding, Havens also gave similar proposals of NIRS (ATLIS) (i) in the FCC docket regarding 217-220 MHz AMTS: PR Docket No. 92-257: see Comments and Reply Comments of Warren C. Havens to the *Third Further Notice of Proposed Rule Making*, released November 16, 2000, and (ii) in the FCC docket on "Reallocation of the . . . Government Transfer Bands" (including 216-220 MHz) WT Docket No. 02-08: see Comments and Reply Comments of Warren C. Havens to the *Notice of Proposed Rule Making*, released February 6, 2002.

ATLIS Stage 1 and Stage 2, FCC Rule Changes and Relief

[See Petition text, above].

In ATLIS, the 902-928 MHz LMS spectrum would be the core spectrum, carrying most of the traffic and being most widely deployed. 900 MHz is good for such purposes in terms of propagation. It is also in the band most used worldwide for wireless: GSM 900 MHz, and thus, very cost effective components are and will remain available. Spectrum in the ranges good for such wide-area cost effective coverage, including via portables (roughly 400 to 1000 MHz) is rare—there is not much left in substantial quantities. Thus, it is important to take a hard look at this ATLIS proposal and grant the relief outlined in Exhibit 3 needed for enabling commencement of ATLIS via LMS. If 902-928 MHz LMS is fragmented and not used for ATLIS as proposed, it will be hard to find another comparable opportunity for the nation's Critical Infrastructure.

Attachment noted above follows.

Exhibit 2 Attachment

The following are Comments by LMSW-Havens in the proceeding regarding the 5.9 GHz (75 MHz wide) spectrum allocation for Intelligent Transportation System applications.

In these Comments, by "National Infrastructure Radio Service" or "NIRS," we mean the same as what is described above as "Advanced Technology Land Infrastructure Service" or "ATLIS."

In the below, some formatting is changed and typographical errors fixed from the original. Comments added to original text are in brackets. Also, footnote numbering is changed from the original.

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
ITS 5.9 GHz Band	)	DA 01-686
Licensing and Service Issues	)	PN released 3-22-01
	)	

To: Chief, Wireless Telecommunications Bureau

Comments
of Warren C. Havens and Telesaurus Holdings GB, LLC

I, Warren C. Havens, hereby submit comments in response to the Public Notice dated 3-22-01 in this matter: Intelligent Transportation System ("ITS") services in the 5.850- f.925 MHz Band ("5.9 GHz"), in particular, with respect to the "Status Report" on this matter submitted on October 6, 2000 by ITS America by John J. Collins and Robert B. Kelly (the "ITS Report").

I currently hold licenses in the A-block of the Location and Monitoring Service ("LMS") (the A-block is 6 MHz within the 902-928 MHz range) covering approximately 60% of the nation's population (including most all major markets). [Since this text was written, this has increased to 80%.] I also hold licenses in the VHF Public Coast Service ("VPC") covering most of the Rocky Mountain parts of the nation, in the 220-222 MHz Service ("220 MHz") in which, with Net Radio Communications LLC (in which I have a majority interest on a [contingent] fully diluted basis [)], I hold a plurality of spectrum in the Western 60% of the nation, and in the Automated Marine Telecommunication System Service ("AMTS") in the 217-220 MHz band, in which I hold licenses for 1 MHz in large parts of Arizona, Nevada, and Utah [and Colorado], and have approximately one hundred additional station applications for other parts of the nation.

I will be transferring all or most of the above named licenses and applications, subject to FCC approval, to Telesaurus Holdings GB, LLC, ("Telesaurus") [or another entity as I may form] in which I will retain controlling interest. Telesaurus is backed by additional parties with regard to financing and is in the processing of selecting appropriate companies for technology and systems equipment, and systems deployment, operations, and marketing. In addition, Telesaurus is a participant in FCC Auction 39 (the second auction of licenses in the VPC and LMS bands: licenses not sold in the first auctions several years ago).

In addition, I have substantially discussed the views expressed herein with the two other parties holding geographic licenses in the LMS service: Progeny LMS LLC and FCR, Inc. While I do not speak for them, they have expressed to me their general interest in the views I express herein, based on such ideas promoting a more viable design and potential for of wireless communication systems for ITS functions.

In this regard, the FCC has designated this 5.9 GHz, along with LMS, as the two current Transportation Infrastructure Radio Services. The apparent logic behind this joint designation--both services were allocated for ITS wireless: the former for DSRC; the latter for wide-area location and related voice and data services--is the basis of the views expressed herein. The ITS master plan also calls for both DRSC and wide-area communication systems. The need for both is obvious and need not be discussed here. I will note that the existing wide-area services (via the various CMRS networks), are not designed for the needs of ITS, will not easily be adaptable for integration with advanced DSRC, and are very expensive due to the cost of the spectrum involved and of the current 2G systems and the upcoming 2.5G and 3G technology upgrades and swap outs. For longer-range needs, ITS in the nation needs both 5.9 GHz and LMS to be planned and deployed in integrated fashion. This will provide a strong foundation of success of ITS in the United States, and this success is a high priority for public safety, pollution control, worker productivity, and a host of commercial services. ITS America has and has had a substantial participation from vendors, operator, and others involved in DSRC in the "Non-multilateration" sub bands within the 902-928 MHz band. It has not had much participation by LMS licensees since these licenses were issued on a geographic basis only recently, [52]and licensees have been, since licensing, working on fundamental issues (appropriate technology and deployment plans and partners, etc.).

I and Telesaurus have participated in ITS America and its 5.9 GHz stakeholder workshop held December 1999 (the "Workshop") (see Appendix A to the Report). In this regard, I included Ralph Haller, former Chief of the FCC Private Radio Bureau, and now head of Fox Ridge Communications, Inc.

The Report does not reflect the major comments I and Mr. Haller made at the Workshop or a follow-up white paper I submitted to ITS America. At the Workshop and in the white paper, Mr.

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[52] Some licenses issued in mid 1999, and others in mid 2000. Others (covering a substantial portion of the nation and substantial percentage of the population) will be licensed pursuant to FCC Auction 39 scheduled to commence June 6 of this year. After this auction, LMS will be fully licensed across the nation. This should lead to acceleration of deployment of these licenses.

Haller and I proposed that this ITS 5.9 GHz should be used nationwide 1) for the Dedicated Short Range Communications ("DSRC") services which the Workshop focused on, but also 2) for other ITS functions that would involve coordinated or integrated networks of wide-area LMS systems overlaying localized 5.9 GHz stations or systems, and 3) high-speed wireless Internet services in the vast majority of the land mass of the nation away from highways and roads on which DSRC could be deployed.*[SEE NOTE[*]]* Herein, I summarize this proposal.

The essential rationale for our proposal was that any new spectrum allocation should be put to the highest and best use to justify the allocation and for it to be a success in the marketplace, and this involves expanding the use of the 5.9 GHz beyond DRSC on busy transportation routes to the uses noted above, and such expanded use will result in probably some orders of magnitude increase in volume of system and end-user-device components specific to 5.9 GHz which will be needed for its commercial success.

Indeed, one of the major reasons given by vendors and others at the Workshop for potential failure or slow pace of adoption of DRSC in 5.9 GHz was the high cost of components verses costs of current 900 MHz DRCS (in the 902-928 MHz range). The proposal outlined herein could solve that problem: by making the best and highest use of 5.9 GHz, advanced DSRC use of 5.9 GHz will be enhanced.

Multi-band nationwide ITS-focused networks: 5.9 GHz, LMS 902-928 MHz, and 217-225 MHz. [See depictions in the two Attachments below.] These three bands may be used for regional and ultimately nationwide ITS-focused networks, serving both public safety entities and applications, as well as commercial operators and applications related to transportation uses (mostly highway, but others also). Herein (and for other purposes),[53] we use the term "National Infrastructure Radio Service." The following is from the Comments I filed in PR Docket No. 92-257 on or about 2-6-01 (with regard to proposed new rules for AMTS):

> NIRS, 4 bands: AMTS . . . [would be, as proposed] designated as a National Infrastructure Radio Service ("NIRS") along with 220 MHz, LMS Multilateration[54] and LMS Non-Multilateration (together herein, "LMS"), and the

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[LMSW-Havens, per the ATLIS proposal, revises this: rather than use for general wireless Internet in addition to ITS DSRC, LMSW-Havens proposes that, in addition to this 5.9 GHz spectrum being used for DSRC, that it also be used on a non-interference basis for other high-speed Critical Infrastructure wireless, such as real time video, whether via IP protocol and Internet or other means of transmission.]*

[53] See, e.g., Comments of Warren Havens in PR Docket No. 92-257 filed on or about 2-6-01 (with regard to proposed new rules for AMTS).

[54] LMS Multilateration licensed systems must provide wide-area location services and may provide associated voice and data, including (as I plan for my LMS licensed systems) voice and data largely over the Internet and Intranets (as opposed to the Public Switched Network) (but with PSN voice and data for emergency situations).

recently allocated 5.9 GHz (a Transportation Infrastructure Radio Service) (herein, "5.9 GHz"), and all such NIRS be subject to certain rules to foster joint development for the purposes of NIRS. (See below, IVDS and 222-225 should also be integrated into NIRS.)

These components listed above are discussed below after discussion of the overall concept. This concept is that AMTS and 220 MHz are still largely undeveloped,[55] as are LMS and 5.9 GHz, and together, these provide a needed combination of frequencies for the combination of macrocell, minicell, and picocell topologies needed for a nationwide service for major US infrastructure entities.[56] Such entities need a new integrated nationwide high-capacity[57] service to use as their primary radio service, or to use as a critical virtual-PMR adjunct (for redundancy, extra capacity, interoperability, and more advanced services) to their primary radio services, as further discussed below. I believe that what I am proposing here will be supported by the majority of existing licensees and "stakeholders" in the noted proposed component bands. [58] [59]

The proposed NIRS end-user "infrastructure" entities include two main classes ('a' and 'b' below), and two other user classes ('c' and 'd' below) that may choose to participate.

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[55] These services, while in large part licensed, involve licenses that are very lightly loaded, and from evidence I have gained, pre-auction licenses reported as constructed are in many cases not actually in operation.

[56] Use of appropriate mobile satellite system for most remote areas may also be a valuable component of NIRS, such as the recently "rescued" Iridium system now targeted in large part to service important needs in remote areas not covered or not covered well by terrestrial wireless networks.

[57] Without a very large market created by such nationwide high capacity service, there is not sufficient volume to warrant the cost of development of advanced digital 3G or 4G technology (e.g., involving expensive ASICS and other components) and the manufacturing volumes needed to obtain sufficiently low cost and advanced features to be successful. The best evidence is GSM: a large market was created by the EC member nations requiring GSM and allocating the radio spectrum for GSM. It thus took off and has now dominated worldwide wireless. An example at the other end of the scale is 220 MHz in the US: it "flopped" as noted in the text and footnotes above, as has AMTS to date.

[58] I can discuss the basis of this with the FCC if the FCC decides to consider an alternative licensing scheme as I propose herein. Essentially, I believe (and have had substantial communications to support my belief) that such licensees will expect the best financial return by participation in NIRS as the highest and best use of their spectrum.

[59] I am involved in all these bands, including as a potential "stakeholder" in 5.9 GHz, designated by the FCC, along with LMS, as a Transportation Infrastructure Radio Service.

a. Private-sector utility and transport entities: utilities (electric, gas, water), pipelines, transportation entities (rail, trucking, local transit, marine, highway departments, airport ground services, some Telematics service providers such as AAA).

b. Public-Sector land and real property agencies:[60] i.e., under the US Department of Interior[61] and Department of Agriculture[62] and the analogous State entities, and other such entities, private and public, involved in developing, providing, or managing basic infrastructure-based services and or public lands.[63]

c. ITS core-function entities and functions: A concept being discussed by stakeholders in US "Intelligent Transportation Systems" (such as among members of the ITS America) involves mandatory or wide-spread use in highway-capable vehicles of basic ITS functions such as location-based services for crash and emergency notification and information, providing to highway departments real-time data on highway traffic flows; providing to law enforcement entities information regarding defined major motor vehicle violations.[64] NIRS could provide such basic Telematics functions by design more effectively and at less cost than CMRS. NIRS could also serve to integrate these wide-area mobile radio ITS functions with the DSRC functions of LMS non-multilateration and 5.9 GHz.[65]

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[60] Such public entities involve vast infrastructure to manage such lands and property, and thus have analogous wireless needs as the noted private sector infrastructure entities: both classes have vast physical improvements (roads, plant, buildings) and mobile workforce needing integrated mobile and fixed wireless over wide areas.

[61] National Park Service, BLM, etc.

[62] US Forest Service, Fish and Game, etc.

[63] There is a significant degree of correlation and interoperation between such private infrastructure entities and such public land and property entities, e.g., on rights of way, service to the public in emergencies, wide-area radio coverage needs; and both classes need similar advanced radio services with features far advanced from those offered by current two-way radio systems and current and planned CMRS. Both classes also need interoperation between other such "infrastructure" entities.

[64] E.g., speeding and certain unsafe driving, unsafe condition of the vehicle, lack of valid vehicle registration, etc.

[65] DSRC stands for Dedicated Short Range Communications. DSCR is used in non-multilateration LMS such as for "smart tag" readers (e.g., as used as the toll booths along the Dulles Airport access toll road in northern Virginia), and several dozen more advanced forms of DSRC (each involving a very short range fixed transmitter along a roadway or facility used by vehicles to transmit one- or two-way data to the vehicle or users in the vehicle). Such pico cells, normally isolated (in current practice and as planned by those planning DSRC for the new 5.9 GHz TIRS radio service), can be beneficially integrated with NIRS, such as by NIRS: linking the DSRC sites via its wide-area backhaul network, exchanging traffic flow data; clearing some vehicles for toll payment prior to reaching toll booths; etc.

d. Public Safety entities may also choose to be an end user of NIRS for such noted adjunct purposes, described further below.

The above-noted private-sector NIRS entities need NIRS for primary wireless services since they do not at this time hold or have set aside by the FCC sufficient allocation of radio spectrum set aside for their needs.[66] The above-noted public-sector NIRS entities need NIRS for critical adjunct wireless services since NIRS will provide an otherwise non-obtainable nationwide radio service with mission-critical features at a low cost (partly in trade for infrastructure-use rights), such adjunct services providing (in addition to such entities primary radio services on its dedicated spectrum) (i) redundancy and additional capacity for peak periods, emergencies, and failures of such primary service, (ii) interoperability among various such public-sector NIRS entities, with such private-sector NIRS entities, and with Public Safety entities who may also choose to use NIRS for such adjunct service. The use for ITS core functions is noted above and would be of substantial benefit to Highway Departments, Transit entities, Public Safety, and ultimately to US commerce and population in general as it would increase the safety and efficiency of roadway traffic.

Today, Information Technology is leading the world economy and wireless is a leading component in IT, often projected to soon have more traffic than wired networks. [67] Change is occurring rapidly and in wireless, and a new technology good enough for any nationwide deployment involves billions of dollars in development and construction and years of work. For this, there must first exist the underlying spectrum available of sufficient quantity and nature. For the proposed NIRS in the US, the proposed four frequency bands are ideal and (as noted above) they are currently still largely "available." They are ideal as follows described below, and partially depicted in Exhibit 2 below.

---

[66] I have met with leaders of many of these entities in the last eighteen months (since obtaining the radio licenses listed in Exhibit 1 below) and base this needs assessment on the views expressed to me by such leaders and their internal needs assessments. I have also found first-tier wireless equipment vendors who have independently come to the same assessment. Expert consultants in wireless have also confirmed such assessment.

[67] Even is close to correct, there will be a need for many times the spectrum that exists in total that is usable for wide-area systems (several GHz down to 100 MHz or thereabouts). The need for more spectrum for more and more advanced wireless is a major concern these days from commercial wireless operators and vendors, the FCC, Congress, the Executive Branch, and the Military (which wants to keep what it has in the face of demands to release spectrum to the burgeoning commercial wireless industry). NIRS as proposed herein should be seriously considered at this time for the critical US needs I have described while there exists the opportunity to develop NIRS around these four frequency bands. If not pursued at this time, LMS multilateration licensees will move on to other things-- we LMS licensees will have no other choice.

217-222 MHz (of AMTS and the 220 MHz services, including also 217-218 "IVDS"),[68] extended to 225 MHz by reallocating the 222-225 Amateur band to NIRS,[69] and possibly also including most or all of 216-217 MHz[70]: Thus, 4 MHz total if only AMTS and 220 MHz, and 7-9 MHz total with such extension(s). This frequency range is ideal for a base macro-cell layer to cover the majority of the land mass of the US, including smaller cities towns, rural plants and facilities, rough terrain, highways and railroads linking major markets, and modest-speed data links to vehicles with high-power mobile radios and high-gain antenna. These may also be used for certain remote fixed services and point-to-point links.

902-928 MHz LMS: used for an overlaying mini-cell layer largely in the larger markets, busiest highway corridors, and other heavy use locations. These would also be used for a low-tier low-power "cordless phone" mode. (3G and 4G wireless generally contemplates both high-tier high-power mobile mode, and such low-tier mode, the two largely integrated.)

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[68] IVDS, 220 MHz, and incumbent AMTS licensees could elect to become part of TIRS and adopt TIRS technology, and those that do not do so by the end of a certain reasonable period (such as the end of the first five after the end of the initial auction proposed herein of AMTS and 222-225 MHz) would be required to conform to TIRS technology and services.

[69] This band is not heavily used by Amateurs, e.g., as indicated by a review of catalogs of Amateur radio equipment. It is in the public interest to reallocate this to such NIRS purposes which are more critical to the US private and public sectors than the services contemplated by the FCC in the 3rd FNPRM for AMTS. I would propose that this reallocation licensing be done via auction at the same time as the AMTS auction and via the same NIRS-related Guard Band Manager scheme, but with the whole 222-222 MHz for the above described "NIRS Set-Aside" (proposed above for 1 of the 2 MHz in AMTS). In addition, by allocating 216-225 MHz or thereabouts as proposed, this frequency band component of NIRS could achieve approximately a 4 MHz separation in Tx and Rx frequencies, if used in pairs for frequency division duplex ("FDD"). However, we would probably propose use of time division duplex ("TDD") (which achieves full duplex via rapidly alternating Tx and Rx on one frequency, not on separated frequency pairs, and thus is used with unpaired blocks of spectrum) as the primary diplexing technique due to multiple advantages including simpler end-user radios, and more spectrum efficiency especially for the contemplated *variable* asymmetrical up- and down- link IP-centric traffic, and leveraging the precise timing at each base station that NIRS would have for providing GPS-based location technology required for LMS and NIRS (network assisted GPS location techniques for both constant and periodic wireless location applications).

[70] With the techniques available in the contemplated 4G NIRS technology noted herein, I believe the TV channels below 216 MHz could be protected and the current uses also protected. At least, this should be studied. A goal of such 4G, including the DARPA 4G initiative, is to develop technology that, among other things, increases spectrum efficiency via interference excision and sharing of bands by multiple users.

> 5.9 GHz: 75 MHz recently allocated by the FCC for ITS functions, used as noted above for DSRC. As proposed in this NIRS concept, it would also be used for high-speed backhaul, and where not needed along the highways for DSRC, it would be used for various peripatetic and fixed wireless services.[71]
>
> The FCC should not move ahead at this time and auction AMTS. Due to the weaknesses in AMTS (and the adjacent 220 MHz service) noted above, and the fact that the FCC has already licensed AMTS covering the vast majority of the US population (and allowed "Fill-in" stations that will enable warehousing: see Exhibit 3 below), such an auction in the near future will yield small sums and not be yield the best use of AMTS. Instead, the FCC should via an appropriate rulemaking explore the NIRS concept for AMTS and the other noted bands . . . .
>
> Summary [from this quoted text]
>
> Today, Information Technology is leading the world economy and wireless is a leading component in IT, often projected to soon have more traffic than wired networks. [72] Change is occurring rapidly and in wireless, and a new technology good enough for any nationwide deployment involves billions of dollars in development and construction and years of work.
>
> For this, there must first exist the underlying spectrum available of sufficient quantity and nature, along with suitable regulatory framework. "Advanced Technology 220 MHz" ("AT 220 MHz") as outlined below would contribute to this.
>
> Also, public-resource-licensed commercial business (including FCC wireless licensees) should be held to higher "corporate citizen" standards than other private enterprise. In this regard, I propose below a "Nationwide Environmental Wireless Service" as a component of AT 220 MHz.
>
> Finally, spectrum reallocation should be combined with FCC (and other Federal) support for US advanced wireless technology, "4G technology." One way to achieve this is noted below: support of the DARPA 4G initiative now underway.

As noted above, we propose that 5.9 GHz be used not only for DSRC but for high-speed backhaul functions of integrated DRCS and LMS wide-area ITS-focused networks (described above in the concept of NIRS), and for mobile and fixed high-speed wireless

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[71] As noted elsewhere herein, the 4G technology contemplated for NIRS will include techniques to enable sharing of a radio band by systems employing air interfaces whether directly overlaid or side-by-side.

[72] Even is close to correct, there will be a need for many times the spectrum that exists in total that is usable for wide-area systems (several GHz down to 100 MHz or thereabouts). The need for more spectrum for more and more advanced wireless is a major concern these days from commercial wireless operators and vendors, the FCC, Congress, the Executive Branch, and the Military (which wants to keep what it has in the face of demands to release spectrum to the burgeoning commercial wireless industry).

Internet services which would be operated by such integrated network for both ITS related functions and a broad array of commercial applications [ATLIS change: see footnote "*" preceding footnote 22 above: CI high speed wireless applications, not commercial ones]. See attached depictions.

We will comment further in Reply Comments.

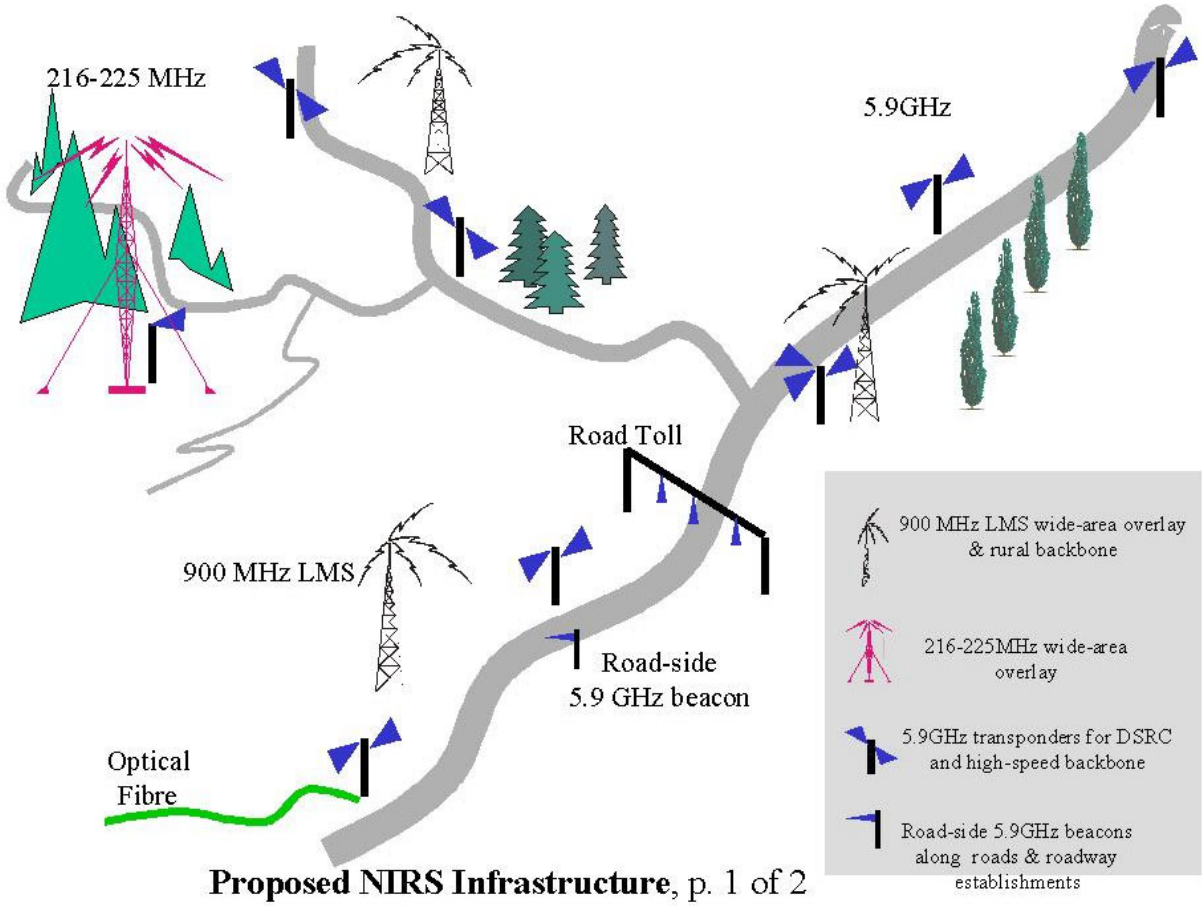
Respectfully submitted,

Warren C. Havens

Telesaurus Holdings GB, LLC
2509 Stuart Street
Berkeley, CA 94705

[filed May 17, 2001]

[Two Attachments]

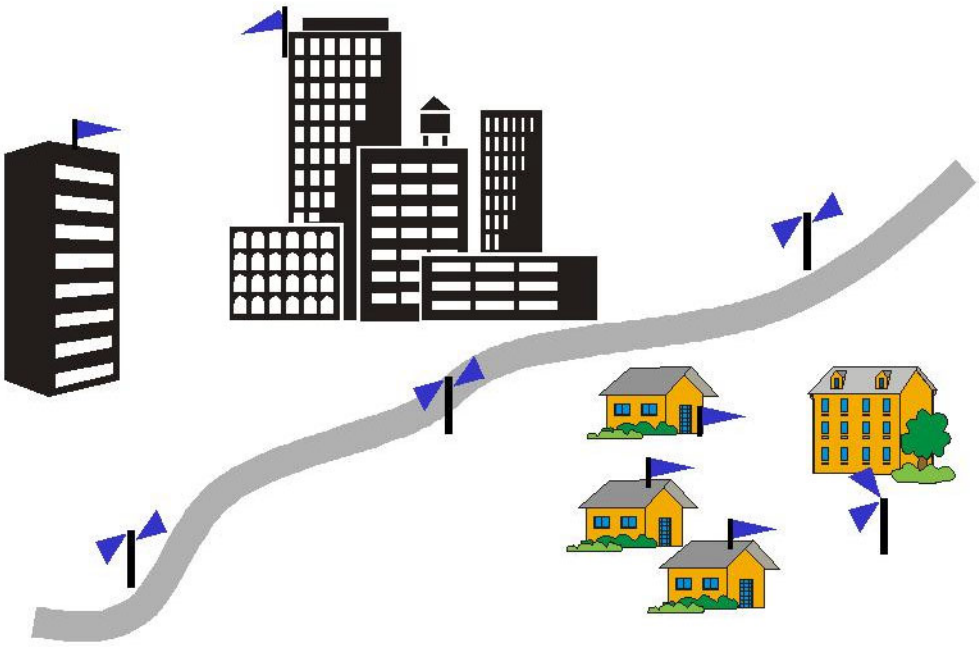


[NIRS is renamed ATIS in these Reply Comments under DA 02-361.]

[The 200 MHz (much of 216-225 MHz) would be used for very wide area coverage extending into rural and remote areas. The 900 MHz LMS (902-928 MHz) would be used mostly in urban and suburban areas and major highway corridors (eventually more rural areas also). The 5.9 GHz (75 MHz wide) would be used for ITS (Intelligent Transportation System) DSRC (several dozen types of Dedicated Short Range Communications) on and along the highways, and in addition, on a non-interfering basis, for other high-speed wireless for various fixed and some mobile services to other (other than highway-related) Critical Infrastructure.]

[Some of the recently allocated **4.9 GHz** (50 MHz wide) for Public Safety (which for this allocation may include Critical Infrastructure entities) may also serve the purposes described above for this 5.9 GHz.[73]]

[[73] See "Reallocation of the . . . Government Transfer Bands," *Notice of Proposed Rule Making*, WT Docket No. 02-08, released February 6, 2002.



Proposed NIRS Infrastructure, p. 2 of 2

(further depiction of roadway DSRC and other use of 5.9 GHz)

[NIRS is renamed ATIS in these Reply Comments under DA 02-361.]

[Depicts the 5.9 GHz used for high-speed point-to-point backhaul along highways (this carry traffic to and from the 200 and 900 MHz wide-area and 5.9 GHz local area or "hot spot" base stations, and points of interconnection to the PSTN and Internet. Also depicts high-speed wireless to facilities off of the roadways: homes, offices, plants, etc. All such uses would be in addition to ITS DSRC which would be protected from interference from such other uses.]

Exhibit 3

Warren C. Havens and Telesaurus Holdings GB LLC
(DBA LMS Wireless)

Lists and maps of FCC Licenses
and related matters

Location and Monitoring (904-910 MHz) (6 MHz licenses)

VHF Public Coast (156/162 MHz) (350 kHz licenses)

AMTS (217-220 MHz) (1 MHz licenses)

220-222 MHz (.25 to 1 MHz per area)

(~1.3 billion MHz Pops total: see last page for comparison with major CMRS operators.)

[The rest of this Exhibit deleted in this draft.]

Exhibit 4

Part 15 Devices, Trends off of 902-928 MHz to 2.4 and 5 GHz

1. Below information is taken from proprietary research reports purchased by Petitioner from the Consumer Electronics Association. Below is the heading from one of the three years of monthly reports Petitioner purchased for the purpose the purposes noted below.

CEA MARKET RESEARCH DEPARTMENT
MARKET ACTIVITY REPORTS & ANALYSIS PROGRAM
Monthly US Factory Sales of 900 Mhz & 2.4 Ghz Products

The information contained in the following reports is considered confidential, and its use is intended exclusively

---

These copyrighted reports document that there has been in recent years and there continues to be increasing percentages of Part 15 consumer devices in the 2.4 GHz range and lesser percentage of such devices in the 902-928 MHz range. (This is also reflected in visits to popular consumer electronic stores: note the increase in 2.4 GHz cordless phones and devices in last few years relative to the 900 MHz devices.)

2. In addition, see the slide show, at www.fcc.gov : "Trends In Unlicensed Trends In Unlicensed, Spread Spectrum Devices Spread Spectrum Devices," a Presentation at the FCC Commission Meeting, May 10, 2001by the FCC Office of Engineering and Technology. This discusses the 2.4 GHz and 5 GHz UNII bands (each much larger than the 902-928 MHz band) and their increasing use by Bluetooth, Wi-Fi 802.11b, Home RF and other technologies. It does not mention the 902-928 MHz band.

Note: these are becoming very popular technologies and will soon involve huge volumes and economies of scale. This will increasingly make products for 902-928 MHz uncompetitive, especially when high-power LMS Multilateration systems are deployed and substantially loaded with traffic.

3. Also, Metricom, the former head of the Ad Hoc Part 15 Association (organized for FCC purposes in LMS rulemaking), informed Petitioner in year 2000 that the vendors of wireless LAN products had almost all moved off of the 902-928 MHz band to these higher bands. Similarly, the same was told to Petitioner by Part 15 device vendors, including WiLan of Calgary, Canada.

Exhibit 5

LMS verses Part 15 in 902-928 MHz, and
Part 15 Safe Harbor Defects in its Purpose.

Below is from another document: "we" means Petitioner.

Part 15 has no sound basis in LMS or any band for a major commercial network. We (and may others who have looked at these matters) do not believe that Part 15 provides a sound basis for a major wide-area or other commercial network. Without license rights, higher power, reasonable antenna height, and ability to select the best technology, the huge cost to build and operate cannot be justified. The cost to operate such a network of Part 15 devices is greater that if license rights (including power, height, and technology choices) were available, and the risk is enormously greater due to having to tolerate noise from more powerful licensed operations. Not a sound business case, and thus, such attempts will likely fail and then such Part 15 ventures in LMS spectrum should subside or end, especially as LMS operations become increasingly established.

Safe Harbor: no vested rights. The Part 15 "Safe Harbor" with respect to LMS does not provide license rights or any vested rights to Part 15 to use spectrum in LMS 902-928 MHz. Part 15 must accept interference from LMS and must not interfere with LMS. However, the Safe Harbor provides Part 15 a measure of protection from claims of interference by LMS. It applies more to systems using Part 15 devices such as Ricochet than to individual devices such as cordless phones. See, e.g., par.32, FCC 97-305; par. 18, FCC 96-115.

Safe Harbor: defects. The Part 15 ad hoc coalition, previously headed by Metricom, lobbied the FCC heavily during LMS rule making in the 1990's. They sought co-equal rights with LMS but did not succeed. The obtained a "Safe Harbor," noted above. That Safe Harbor may be challenged, for one thing, since the FCC did not contemplate closely spaced transmitters in Part 15 (discussed below), nor other things Metricom attempted such as many mobile end-user devices resulting in transmitters at heights higher than allowed in the Safe Harbor : see, e.g., par. 34, FCC 97-305 (geographically close Part 15 transmitters were not contemplated by FCC—this is clear in various paragraphs of the rulemaking). See also below regarding other weaknesses in terms of Part 15 public or private networks (as opposed to devices): end-user devices on the network, mobile applications, etc.

Part 15 not entitled to protection/ and "testing" by LMS with respect to Part 15 systems. See par. 69, FCC 97-305: This is the final pronouncement by the FCC on these issues in the rule making, clarifying previous discussions. Part 15 not entitled to protection from interference by LMS. (LMS narrowband piece of license can operate at up to 300 watts ERP and the wideband up to 30 watts ERP, and transmitters can be placed where we choose and at heights we choose.) LMS has only to show that, where there are *existing systems* of Part 15 devices (these rarely

exist), we have to take into consideration a goal of minimizing interference and verify via cooperative testing.

Metricom's CTO told me that his view of this provision is that we could choose the best technology and network topology for our purposes, but if we could execute this one way verses another, each being roughly equal cost/benefit to us, then we would have to choose the execution that caused less interference to the Part 15 system. We believe this assessment is a fair one-- it is about all this provision, and the related actual rule, requires of LMS in this matter.

End-user Part 15 devices-- Safe Harbor issues. Par. 30, FCC 97-305--("Metricom submits that the safe harbor limits should not apply [*sic*: Metricom must have meant, "should apply"] to mobile and portable devices. [E.g.] [i]t posits that a cordless phone [or Ricochet modem, I assume] being operated off a 50th floor balcony as part of a wireless network should not be subject to complaints of interference from LMS providers.") The FCC did not agree to this. (See Rules.) Thus, when Ricochet subscribers take their modems outdoors and if they are above the height limits of the Safe Harbor, it may be that we can shut them down if interference is caused.

Ricochet [or the like] as *Mobile* Network. Regarding mobile-vehicular high-speed service (Metricom advertises this). The FCC, in LMS rulemaking and rules, discusses LMS Multilateration networks and mobile transmitters. However the FCC did not contemplate Part 15, at least for purposes of the LMS rules, as a wide-area network, especially not a wide-area mobile network. The Safe Harbor was not meant as a tool by which Part 15 networks could, by design or unplanned growth, be shielded from actual systemic harmful interference to LMS operations.

From Safe Harbor rule 90.361:

> . . . Part 15 . . . operations will not be considered to be causing harmful interference to a multilateration LMS system . . . if they are non-video links . . . and at least one of the following conditions are met: . . . (b) **It** does not employ and outdoor antenna; or (c) If **it** does employ an outdoor antenna, the if . . . . The antenna . . . . The antenna . . . .

LMS multilateral systems are described and defined in FCC rules as very wide-area systems or networks to cover highway and road traffic across the nation, etc. In contrast, in such rules' Safe Harbor, the Part 15 being considered is described as a device: "It. . . . it . . . . antenna. . . antenna. . . . antenna. . . " etc. No where in the FCC rules or rulemaking proceeding on LMS does the FCC consider or contemplate wide-area Part 15 networks of the magnitude of current Ricochet networks. Part 15 is unlicensed, and as such, there is no mechanism by which the FCC considers regulation of Part 15 as wide-area networks. It sees, in such rules, Part 15 as devices not spaced close together, not transmitting much of the time, and not permitted to cause interference to the LMS

FCC 97-305, par. 32, 34:

> . . .safe harbor rule . . . to limit the potential for harmful interference. [par. 32] . . . outdoor antennas . . .. less than five meters in height driven by a transmitter with one watt or less of output power . . . will only affect [interfere with] LMS operations that are geographically close. [par. 34]

This reflects my argument above: the FCC did not contemplate close spacing of outdoor transmitters in a Part 15 wide-area network over a market or large area in which a LMS operation must cover (per macrocell-based architecture noted in reference in above footnote) to provide viable vehicle location services, since this would result in such "geographically close" interference. [There are similar references elsewhere in the rulemaking that I can point out.]

FCC 97-305, par. 38, discussing 90.361, video links are not subject to (not afforded the shield of protection from interference claims by) the Safe Harbor due to interference with LMS. I believe this is due to the Time and Amount involved in such links needed to transmit the high data speeds needed for video. Unlike the technology described by the Part 15 entities at the time the Safe Harbor was created, the current and planned generations of Ricochet involve far higher Time and Amount, as did the video links not afforded Safe Harbor protection.

FCC 95-41, par 32:

> . . .Because Part 15 devices operate at extremely low power and each has a limited area of operation, the record indicates they **can coexist more easily with non-multilateration** LMS systems, which also operate with relatively short range. Conversely, Part 15 commenters generally contend that they will not be able to effectively share the spectrum with multilateration LMS systems . . . . cannot coexist . . . .without a limit in the power and location of the multilateration transmissions . . . .

This shows that the Space aspect or factor in Network Band Usage (see memo of ___ , noted below, re these terms) is understood by the FCC and Part 15 community, and that at the time the LMS rules were made, Part 15 operations in this band were conceived of as having limited areas of operation, not wide-area networks of the current Richochet better-than-CMRS-type. Also reflected here, the Part 15 community sought to limit the Space factor (location/ spacing of transmitters) in LMS wide-area networks of the type , thus, must have assumed Space limitations for their own devices in the field. There is no meaning to "extremely low power" without a Space limitation, since relatively very high power transmitters at high sites in a macrocell LMS network will create much lower field signal strength in most of a covered market than a dense mesh network of such "extremely low power" Part 15 devices. More accurately, see letter: Power, Height, Space, Time, and Amount are all factors in actual Network Band Usage.

[These capitalized terms were from another memo by me, and essentially mean: power of the transmitter, height of transmitter, spacing of transmitters, and amount (percentage) of time transmitters are in use: all factors in determining the effective signal strength over a given metro area being covered and given time period by a Part 15 network or a LMS wide-area network.]

Regardless of the shortcomings in FCC rules in terms of reflecting, but not directly addressing Space, Time, and Amount [Power and Height are addressed], the rules do clearly address the principle that Part 15 may not cause harmful interference to LMS operations. The current design, deployment, and direction of Metricom's nationwide Ricochet network appears to be a major departure from the Part 15 usage contemplated at the time of the rulemaking, and may (per my initial review) be a breach of such principal.

[[ ] Update—again, Metricom is in Chapter 11 and has taken down its Ricochet networks, or at least taken them off the air. The above or similar would apply to other similar wide-area Part 15 networks on 902-928 MHz.]

Exhibit 6

Part 15- LMS Interference Simulator Study Materials,
And Petitioner's Research into LMS Multilateration Technology

[Excluded in this draft.]

Exhibit 7

Below is the featured article in the July 2001 Issue of *ITS View*, the journal of the American Transportation Society of America (ITS America).

This journal and this article can be found at the website of ITS American, www.itsa.org .
The below was reformatted for presenting below. Underlining added.

This article expresses the need for a dedicated communications architecture and infrastructure, including its wireless infrastructure components, for Intelligent Transportation System applications, discussed how this need is not being met by existing plans and available networks and technologies, and proposes steps toward meeting this need.

The ATLIS Proposal, if realized, would in substantial measure contribute to meeting this need, and takes an approach similar to what Mr. Najarian discusses below: capacity (spectrum in wireless), technology, and network development designed and dedicated for ITS (and other) critical US infrastructure.

July 2001 Issue of *ITS View*

Is a Wireless Architecture the Future of ITS?
By Paul Najarian*

How much spectrum is needed for ITS applications? What is the appropriate spectrum for each ITS application? Where is the proper "home" for these applications? How much additional spectrum will ITS need for emerging applications? These are a sample of the questions that continue to intrigue telecommunications and RF engineers involved in ITS.

When asked such questions, the most common reply is that the industry has witnessed ITS applications occupying parts of the spectrum anywhere from Direct Current (DC) at 50 or 60 Hz to 77 GHz.

The problem of finding real answers is exacerbated by a lack of understanding between the civil and the electrical (or telecommunications) engineering disciplines. But realistically, the main problem arises from the difficulties in clearly identifying ITS requirements without an ITS telecommunications strategic plan or an ITS Telecommunications Architecture.

While these remarks are generally limited to the United States, they may be widely applicable to various regions of the world, as well.

Current ITS Applications

A number of frequency bands have been, somewhat, allocated to (but not exclusively reserved for) ITS
applications. These include:

1) the AM/FM band, where subcarriers have used the DARC standard
2) the 37 MHz private radio channels for highway maintenance
3) the 220 MHz where ITS has 5 pairs of channels in the U.S. that are barely utilized
4) Location and Monitoring Services (LMS) in the 902-928 MHz where 14 MHz are set aside for Electronic Toll Collection (ETC) and Commercial Vehicle Operations (CVO)
5) Dedicated Short Range Communications at 5850-5925 MHz
6) collision avoidance radar at 46.7-46.9 MHz and 76-77 GHz.

Other known applications may be added, such as Vehicle Information and Communication Systems (VICS) at 2.5 GHz, DSRC at 5.8 GHz operating in the Industrial, Scientific and Medical (ISM) band, and collision avoidance radar in the 61 GHz band. Other fixed point-to-point microwave applications should also be acknowledged.

In other words, ITS applications are scattered throughout the frequency spectrum, without, in most cases, a coherent rationale justifying the allocations of such spectrum.

The Problems

1) Limitations with the National Architecture

The National ITS Architecture provides a common framework for planning, defining, and integrating intelligent transportation systems. It defines the functions that are required for ITS, the physical entities or subsystems, and the information flows that connect these functions and subsystems together into an integrated system. These elements are clearly defined in the U.S. National ITS Architecture (commonly referred to as the famous "sausage" diagram) (see Fig.1).

The Architecture recommends four options for implementing the various communication links between the subsystems, without going into further technical specifics or recommendations. These options are simply defined as:

1) wireline communications
2) wide area wireless communications
3) dedicated short range communications
4) vehicle-to-vehicle communications.

In order to maintain neutrality, the Architecture does not make any recommendations for the implementation of a specific technology. For analytical purposes, the Architecture does analyze implementation processes using analog, cellular (AMPS), cellular digital packet data (CDPD), and Advanced Radio Data Information Service (ARDIS) network.

While the Architecture notes the potential of emerging wireless systems, as well as increased wireline throughput, it is clearly not dynamic enough to continuously accommodate emerging technologies.

2) ITS Telecommunications Policy

Since 1994 in the U.S., the stated ITS telecommunications policy has been that ITS applications should not require dedicated spectrum or exclusive physical layers. It follows from this policy that, to the extent possible, ITS applications should use existing infrastructure established by all telecommunications providers rather than an infrastructure established specifically for such applications.

The ITS telecommunications policy makes sense in so far as the National ITS Architecture is mainly implemented at the Applications Layer (Layer 7).

That policy holds true in all cases of ITS applications except for Dedicated Short-Range Communications (DSRC) and, to some extent, collision avoidance radar. The collision avoidance radar is exempted from this policy for safety reasons.

The Current Process

Although the Architecture and the above-stated telecommunications policy were intended to establish the ground rules for implementation of ITS telecommunications infrastructure and applications, they have instead limited the options available for ITS applications and placed ITS deployers at the mercy of telecommunications providers. It
is the telecommunications providers that now determine the extent and nature of ITS deployment. ITS deployers are left to try to make their technology and applications fit the framework imposed on them by the telecommunications providers.

ITS deployers will not be forced to recognize the inherent limitations on them from this situation as long as ITS applications (Layer 7) may be overlaid on the existing telecommunications infrastructure.

The process, up to now, has been to identify emerging technologies driven by the telecommunications industry that may be useful in ITS applications, then to submit unique ITS requirements to the telecommunications industry, and to hope that the telecommunications industry will adopt those requirements. Whether the telecommunications industry will provide the requested ITS applications relies on the marketplace potential for the application, as seen by the telecommunications industry.

For example, in 1995, the ITS industry submitted its requirements to the International Telecommunication Union (ITU) during the ITU's deliberations on Future Public Land Mobile Telecommunications Services (FPLMTS). Telecommunications providers and manufacturers responded negatively to the request to include ITS requirements. The result is that, today,

FPLMTS, which is known as 3G or Third Generation Systems, do not embody any ITS requirements.

The current process clearly shows the limitations inherent in a failure to develop and implement a Strategic Plan and a suitable Architecture for ITS development and deployment.

A Modest Proposal

The ITS industry needs to be more proactive in defining its requirements and developing the technology and infrastructure needed to make those requirements a reality. A separate telecommunications architecture, which is flexible enough to encompass emerging and changing technologies over time, is the key to deploying ITS applications in a coherent and useful manner.

This approach would alleviate interoperability and harmonization issues at the onset rather than leaving those issues to a later date when solving them would require additional technology or technical modifications.

This approach also would lessen the need to modify existing technologies that were not intended for ITS so as to permit the use of ITS applications. An example of the problems of modifying existing technologies is evident in the move to use the IEEE 802.11 standard for ITS applications. IEEE 802.11, currently under consideration for DSRC applications in the U.S., was clearly intended for wireless Local Area Network (LAN) and indoor applications. This standard was never intended for high speed vehicular or other mobile applications. For that reason, the ITS industry is now faced with the task of modifying this existing standard to accommodate ITS requirements.

With a separate ITS telecommunications architecture, harmonized standards for ITS applications would be developed in sync with that architecture.

Finally, the development of an ITS telecommunications architecture would identify vulnerable spectrum or spectrum slated for auctions and permit those to be avoided for future ITS use. The relocation of existing ITS applications has been an issue over the past few years. For example, in 1998, a number of wireless traffic control systems, operating in the 28 and 31 GHz range, were relocated due to the auction of this spectrum for Local Multipoint Distribution Services (LMDS). In the coming year, ITS applications operating in the 24 GHz band are also slated for relocation.

It seems clear that the only way to avoid the many problems facing the ITS industry due to the reliance on an infrastructure that is not made for ITS applications is for the ITS industry to have its own wireless telecommunications infrastructure dedicated to vehicular applications. It may be that the best way for this structure to be implemented is through ownership of the infrastructure by the vehicle manufacturers.

Proposed Solutions

In April 2001, Working Group 16 (Wide Area Communications) of ISO Technical Committee 204 proposed six draft items covering all three generations of wireless phones, next generation DSRC, Infra Red, Radar, and other millimeter and microwave applications. ITS and telematics applications will certainly flourish across these scattered bands, which further justifies the critical need to develop a wireless architecture.

ITS applications are currently carried over a variety of telecommunications media. They are found in the cellular band, 1800 or 1900 MHz Personal Communication Services (PCS), 2.4 or 5.8 GHz ISM band, 5.9 GHz, LMDS, and collision avoidance radar at 61 and 76 GHz.

Future ITS applications will most likely be carried across 3G and 4G systems, broadband wireless networks, and ultra wideband (UWB) radio and other emerging technologies.

Despite all of the above wireless technology innovations, the FM band remains the most universally harmonized throughout the world.

Although the ITS industry may feel comfortable with merely overlaying ITS applications on existing telecommunications infrastructure, this approach will never resolve interoperability and harmonization problems. One proposed solution is for the ITS industry to develop an ITS telecommunications architecture so that the telecommunications industry would deploy an infrastructure that meets the requirements of the ITS industry rather than having the ITS industry adapt its applications to meet the needs of the telecommunications industry.

The proposed approach would require the ITS industry to seriously undertake a spectrum study for ITS applications, which would result in the convergence of these applications into suitable spectrum bands. No longer would ITS applications be haphazardly scattered throughout the frequency spectrum. The spectrum study would also force the ITS industry to quantify its spectrum needs.

In fact, despite the visionary effort of ISO TC 204 WG 16, the result of such effort will neither produce a wireless architecture nor a convergence toward harmonized bands and applications.

In conclusion, such a spectrum study is long overdue, and is a prerequisite for the development of an ITS telecommunications strategic plan and a wireless architecture. Hopefully, such a spectrum study would be undertaken with a global or, at least, regional perspective.

I realize that the ITS spectrum study will not be easy to undertake, not undertaking the study will raise the hurdles facing the ITS industry. If the spectrum study is not undertaken, the ITS industry will be left to continue developing on a reactive basis, resulting in increasing barriers to deployment.

These problems are difficult enough for developed nations. They may be insurmountable in developing nations, where spectrum may not be regulated in a cohesive manner.

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