Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
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The Wireless Telecommunications Bureau and the Office of Engineering and Technology Seek Comment on Progeny's M-LMS Field Testing Report	)	WT Docket No. 11-49

To: Chief, Wireless Telecommunications Bureau and
Chief, Office of Engineering and Technology

RESPONSE OF PROGENY LMS, LLC

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March 30, 2012

SUMMARY

On January 27, 2012, Progeny LMS, LLC ("Progeny") filed with the Commission a report on field tests performed by Spectrum Management Consulting, Inc., a respected and independent RF engineering firm, that demonstrate that Progeny's Multilateration Location and Monitoring Service ("M-LMS") will not cause unacceptable levels of interference to Part 15 devices in the 902-928 MHz band. The filing of Progeny's test report follows a lengthy development process, which included operating an experimental M-LMS network in the San Francisco Bay Area for more than two years without any complaints of harmful interference to Part 15 devices in the 902-928 MHz band.

Progeny and its affiliate companies have designed and developed its M-LMS network primarily to provide critically-needed position location services for consumers that use wireless devices to request E911 emergency services. Progeny's location technology produces high yield and accuracy (including elevation accuracy) even in urban canyons and deep indoors where existing position location services are severely challenged. Consumers are increasingly using wireless devices to make calls from indoor locations, including calls to request public safety assistance. The Commission should therefore promptly authorize Progeny to make its M-LMS service available to the public safety community, wireless carriers, and the public.

A few parties have challenged aspects of Progeny's Part 15 test report. Several of these parties complain that they were not involved in the test process. The most vocal of these parties, however, was repeatedly asked to participate, and refused under any circumstances to do so.

Questions were also raised regarding the test methodology, such as the selection and mix of Part 15 devices used in the tests and the choice of Santa Clara County, California as the test location. As Progeny explains in this response, each of the test conditions were carefully

scrutinized to ensure that the tests reflected real world and worst case operating conditions for Part 15 devices and Progeny's M-LMS network.

Several parties also claim that Progeny's test report fails to demonstrate that its M-LMS network will not cause unacceptable levels of interference to Part 15 devices. These parties highlight portions of the test report that indicate that some Part 15 devices can in very limited cases detect signals from Progeny's M-LMS network (although the report also indicates that these Part 15 devices can overcome or avoid such detections using various automatic and user-controlled mitigation techniques). Parties also claim that Progeny's M-LMS network could reduce the performance of some Part 15 devices, even though the test results clearly indicate otherwise.

In making these arguments, the parties disregard the fact that Part 15 devices routinely experience equal or greater interference from other Part 15 devices operating in the same spectrum. This is the reason why all Part 15 devices are designed to withstand or avoid such interference using numerous mitigation techniques, all of which can be used just as effectively to overcome or avoid potential interference from Progeny's M-LMS network.

Given these facts, the handful of parties that filed comments on Progeny's test report cannot credibly claim that Progeny's M-LMS network will cause unacceptable levels of interference to Part 15 devices. Progeny employed important spectrum sharing techniques in its network design, including the elimination of two-way transmissions, the use of a relatively low number of high site antennas, and a duty cycle of no more than 20 percent. It will therefore be much easier for Part 15 devices to share spectrum with Progeny's M-LMS network than with many existing Part 15 devices that are far less conducive to spectrum sharing and are widely deployed in the market. Therefore, the Commission should conclude expeditiously that Progeny

has demonstrated that its M-LMS network will not cause unacceptable interference to Part 15 devices and Progeny has satisfied the regulatory condition on its provision of critically-needed position location services to consumers.

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RESPONSE OF
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The Commission tasked Progeny with demonstrating that its M-LMS network will not cause unacceptable levels of interference to Part 15 devices[1] and Progeny has met this requirement. Progeny sought the assistance of a respected and independent RF engineering firm, Spectrum Management Consulting, Inc., to develop and execute a wide range of tests on the spectrum sharing characteristics of Progeny's M-LMS network on Part 15 devices.[2] These tests verify that exceedingly few Part 15 devices can detect Progeny's M-LMS signal when used in typical user conditions, and all Part 15 devices continue to function normally in those limited

[1] *Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems*, Report and Order, 10 FCC Rcd 4695, 4737 (1995) ("*M-LMS Order*"); *Request by Progeny LMS, LLC for Waiver of Certain Multilateration Location and Monitoring Service Rules*, Order, 26 FCC Rcd 16878, 16889-90 (2011) ("*Waiver Order*") (granting conditional waivers of Sections 90.155(e) and 90.353(g) of the Commission's rules).

[2] *See Coexistence of M-LMS Network and Part 15 Devices*, Spectrum Management Consulting Inc. (Jan. 27, 2012) ("*Part 15 Field Test Report*") (included as an attachment to *Letter from Bruce A. Olcott, Counsel to Progeny LMS, LLC, to Marlene H. Dortch, Secretary, Federal Communications Commission*, WT Docket No. 11-49 (Jan. 27, 2012) ("*Progeny Part 15 Field Test Report Filing*").

cases in which an M-LMS signal is detected. Further, users of Part 15 devices can avoid Progeny's M-LMS signal using the same automatic and user-controlled mitigation techniques that are routinely used to avoid interference from other Part 15 devices.

Progeny's test results are confirmed by lengthy developmental operations that Progeny and its affiliates undertook in the San Francisco Bay Area. In an effort to perfect its M-LMS technology, Progeny and its affiliates constructed an M-LMS network in the Bay Area and have operated this network for more than two year without ever receiving a complaint of interference to Part 15 devices in the 902-928 MHz band.[3] In fact, Progeny's M-LMS network is still in operation today. Given the breadth of Progeny's developmental operations, and the very favorable results of the Part 15 test process, Progeny is confident that its M-LMS network will not cause unacceptable levels of interference to Part 15 devices.

Several parties dispute whether Progeny has satisfied its regulatory obligation. These arguments fall into two categories. Some arguments focus on the test results, arguing that Progeny's M-LMS network can in limited situations be detected by some Part 15 devices and, therefore, Progeny's obligation has not been met. In making such arguments, the parties reveal an apparent misunderstanding regarding the carefully balanced interrelationship that the Commission developed to enable spectrum sharing between Part 15 devices and M-LMS networks in the upper portion of the 902-928 MHz band.

Other arguments raised by the parties focus on the test methodology and scope, raising questions about the selection of Part 15 devices employed in the tests, the involvement of third

[3] *See OET Experimental Licensee Call Sign WE9XEP*.

parties, and the test environment.[4] Progeny refutes each of these collateral arguments in this response and, in so doing, explains why its test report fully demonstrates that its M-LMS network will not cause unacceptable levels of interference to Part 15 devices.

I. THE PART 15 TESTS CONDUCTED BY SPECTRUM MANAGEMENT CONSULTING CLEARLY DEMONSTRATE THAT PROGENY'S M-LMS NETWORK WILL NOT CAUSE UNACCEPTABLE LEVELS OF INTERFERENCE TO PART 15 DEVICES

Progeny has demonstrated through in depth field tests conducted by Spectrum Management Consulting that its M-LMS network will not cause unacceptable levels of interference to Part 15 devices. Several parties nevertheless dispute the results, observing that the test report implicitly acknowledges that Progeny's M-LMS signals could in limited cases be detected by some Part 15 devices. These arguments disregard the distinction between the Commission's definition and use of the terms "harmful interference" and "unacceptable levels of interference" and the important role of each of these two terms in governing spectrum sharing between Part 15 devices and M-LMS networks.

As the Commission has repeatedly explained, "unlicensed Part 15 devices in the 902-928 MHz band, as in any other band, may not cause harmful interference to and must accept interference from all other operations in the band;[5] persons operating unlicensed Part 15 devices

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[4] *See Comments of Itron, Inc. on Progeny Test Report*, WT Docket No. 11-49, at 10-11 (March 15, 2012) ("*Itron Comments*") (*citing Analysis of Progeny Part 15 Test Report*, RKF Engineering, WT Docket No. 11-49, at 3 (March 15, 2012) ("*RKF Paper*") (*included as an attachment to Itron Comments*)); *Comments of Cellnet Technology, Inc., a Landis+Gyr Company*, WT Docket No. 11-49, at 4 (March 15, 2012) ("*Cellnet Comments*"); *Comments of the Wireless Internet Service Providers Association*, WT Docket No. 11-49, at 4 (March 15, 2012) ("*WISPA Comments*"); *Reply Comments of IEEE 802*, WT Docket No. 11-49, at 2 (March 23, 2012) ("*IEEE 802 Reply Comments*").

[5] *M-LMS Order* at 4714 (citing 47 C.F.R. § 15.5(b)).

have no vested or recognizable right to continued use of any given frequency."[6] Harmful interference is defined in the Commission's rules as interference "which seriously degrades, obstructs or repeatedly interrupts" the functioning of the device.[7]

In order to function successfully in the noisy RF environment inherent in this unlicensed band, manufacturers of Part 15 devices must design their systems to be resilient to interference and most Part 15 devices on the market incorporate a variety of technical strategies such as automatic and manual frequency selection or frequency hopping and spread spectrum techniques to ensure robust operation in a noisy environment.[8] Such designs ensure that Part 15 devices can accommodate harmful interference as a matter of course.[9]

Although Part 15 devices are required to accept harmful interference, both from other Part 15 devices and from M-LMS networks, the Commission apparently recognized that the potential resiliency of unlicensed Part 15 devices is not unlimited.[10] Therefore, the Commission

[6] *Id.* (citing 47 C.F.R. § 15.5(a)).

[7] 47 C.F.R. § 15.3(m); *see also* 47 C.F.R. § 2.1(c).

[8] WISPA asserts that Progeny's test report "erroneously states that 'many Part 15 devices employ automatic frequency selection capabilities.'" *WISPA Comments* at 6. WISPA, however, fails to explain why it believes that this statement is incorrect, indicating only that "typical BWA equipment does not employ frequency hopping or automatic frequency agility as a modulation mode." WISPA's claim does not change the fact that many Part 15 devices do employ automatic frequency selection capabilities and WISPA is therefore incorrect in arguing that Progeny's statement is erroneous.

[9] Some Part 15 devices may not operate optimally in the presence of harmful interference, but they are supposed to be designed to continue to operate effectively.

[10] *See M-LMS Order* at 4714 (explaining that "we have decided to balance the equities and value of each use without undermining the established relationship between unlicensed operations and licensed services").

directed that M-LMS licensees must demonstrate that the interference that they cause to Part 15 devices does not reach the point that it constitutes "unacceptable levels of interference."[11]

In defining the term "unacceptable levels of interference," the Commission borrowed language directly from its definition of harmful interference. As noted above, harmful interference "seriously degrades, obstructs or repeatedly interrupts" the functioning of a device.[12] Employing this same language, the Commission explained that its "unacceptable levels of interference" requirement is intended to ensure that M-LMS networks "are not operated in such a manner as to *degrade, obstruct or interrupt* Part 15 devices *to such an extent* that Part 15 operations will be negatively affected."[13] In other words, unacceptable levels of interference means harmful interference that Part 15 devices are incapable of withstanding or avoiding using the various interference mitigation techniques typically employed by Part 15 devices to withstand or avoid harmful interference from other such devices and from other authorized users of the 902-928 MHz band.

This definition of unacceptable levels of interference is consistent with the day-to-day reality of spectrum sharing in the 902-928 MHz band. Transmissions from Part 15 devices routinely inject noise into portions of the 902-928 MHz band potentially making it more difficult for other Part 15 devices to operate in the same vicinity on the same channel. Some Part 15 devices employ error correction approaches to address such noise. For example, the IEEE Local and Metropolitan Area Networks Standards Committee ("IEEE 802") explains that modern

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[11] *See* 47 C.F.R. § 90.353(d).

[12] 47 C.F.R. § 15.3(m); *see also* 47 C.F.R. § 2.1(c).

[13] *See Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems,* Order on Reconsideration, 11 FCC Rcd 16905, 16912 (1996) ("*M-LMS Reconsideration Order")* (*emphasis added*).

wireless local area networks ("WLAN") and wireless personal area networks ("WPAN") systems "use a variety of protocols to check for a clear channel, determine if transmitted packets of data are received, and retransmit packets when reception cannot be confirmed."[14]

Other Part 15 devices may be less capable of operating on the same channel with other Part 15 devices and may have to move automatically (or manually by the user) to a different channel to avoid degradation. This is particularly true when a Part 15 device is attempting to share spectrum with an unlicensed broadband wireless access ("BWA") system, which often employ very large bandwidths (*i.e*, as much as 20 MHz[15]) and no duty cycle. WISPA provides an example of this, acknowledging that when a BWA system operates on a particular channel in the 902-928 MHz band, that channel becomes effectively unusable for other BWA links in the same area and another channel must be found for any additional BWA systems.[16] If no additional channels are available, the two BWA systems must be able to operate on the same channel, accepting the resulting degradation that may occur.

Although such spectrum sharing techniques are commonplace by and between Part 15 devices, WISPA, IEEE 802 and others object to the use of these same techniques to withstand or

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[14] *See Comments of IEEE 802*, WT Docket No. 11-49, at 2 (Jan. 25, 2012) ("*IEEE 802 Comments*"). IEEE 802 filed its comments prior to the submission by Progeny of its Part 15 test report to the Commission and was addressing in its comments Progeny's request for waiver of certain of the Commission's rules. Progeny's waiver request had already been granted by the Commission on the date IEEE 802 filed its comments with the Commission. Progeny is therefore addressing IEEE 802's comments in the context of its Part 15 test report.

[15] In fact, any BWA device that is based on the 802.11 standard will have a bandwidth of up to 20 MHz and no duty cycle. One of many potential examples is the LigoPTP 900 system. *See http://www.ligowave.com/sites/default/files/LigoPTP%20900-13_900-Npv.pdf* (last visited on March 29, 2012).

[16] *See WISPA Comments* at 6 (observing that "manually or automatically switching to another channel is not an option for most outdoor WISPs because the number of available 900 MHz channels is limited and other channels are typically already occupied by other WISPs").

avoid potential interference from licensed M-LMS networks. IEEE 802 argues "[u]nlicensed WLAN and WPAN networks will be forced into retransmission after a randomized backoff period whenever the broadcast signal interferes with a transmission, reducing throughput in the unlicensed network."[17] WISPA further complains that "while Progeny states that commercial devices are 'more tolerant of other signals in the band because the transmitted data can be encoded or retransmitted if necessary,'[19] [Progeny] fails to recognize that retransmission lowers the data rate, which unacceptably and repeatedly slows fixed broadband service to end users."[18]

Cellnet takes a similar position, acknowledging that Progeny's 20 percent duty cycle "is much preferred over a system that is always transmitting," but maintaining that a conflict between the M-LMS signal and the data packets of Cellnet's meter reading devices could result, which "may cause the loss of the entire packet" and the "data interfered with will likely need to be retransmitted, reducing overall performance."[19]

As a preliminary point, the assertions of IEEE 802, WISPA and Cellnet are contradicted directly by the results of Progeny's test report, which identified no appreciable reduction in the throughput of a Canopy BWA device, or in the range of various other commercial Part 15 devices when operated in the presence of Progeny's M-LMS signal. In any event, a potential reduction in throughput is a normal condition when two high capacity Part 15 devices use the same spectrum in the same area. Thus, it is unreasonable for IEEE 802, WISPA and Cellnet to suggest that their tolerance to potential interference from licensed M-LMS networks should be lower than the interference they already receive from other unlicensed Part 15 equipment.

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[17] *IEEE 802 Comments* at 2.

[18] *WISPA Comments* at 6 (*quoting Part 15 Field Test Report* at 12).

[19] *Cellnet Comments* at 5-6.

A similar argument is made by Havens' technical consultant, Dr. Nishith Tripathi, who expresses concern that Progeny's testing of Part 15 consumer devices under typical user conditions identified one device, an FM analog pendant, that detected the beacon signal at two of the 13 test locations at distances of 0.2 miles and 0.8 miles from the M-LMS transmitter.[20] In attempting to suggest that these isolated findings are unacceptable, Tripathi asserts "[t]hese distances are realistic distances where Part 15 devices can be found."[21]

Granted, some Part 15 devices may be used by consumers relatively close to Progeny's M-LMS transmitters. Progeny tested for this case, demonstrating that very few such devices will detect the beacon signal and all such devices will continue to function in its presence. Users of Part 15 devices can also avoid the M-LMS signal if it is detected by using the same mitigation techniques that are routinely employed to avoid interference from other Part 15 devices.

Tripathi nonetheless questions the availability of common mitigation techniques, observing, for example, that "it may not always be practical to change the distance between the Part 15 transmitter and the Part 15 receiver" in order to eliminate noise from another Part 15 device or from Progeny's M-LMS network.[22] Changing the distance between a Part 15 transmitter and receiver, however, is only one of many interference mitigation techniques that

[20] *See Review of the "WAPS" and "Part 15 Test Report,"* Nishith D. Tripathi, WT Docket No. 11-49, at 11 (undated) ("*Tripathi Paper*") (*included as an attachment to Comments of the Progeny Test Report and Request to Extend the deadline for Replies to Comments,* Skybridge Spectrum Foundation, et al., WT Docket No. 11-49 (March 15, 2012) ("*Havens Comments*"). Cellnet makes the same argument, taking Progeny to task for observing in its test report that Part 15 devices will not be able to detect Progeny's signal in "the vast majority of cases." *Cellnet Comments* at 6.

[21] *See Tripathi Paper* at 11.

[22] *Id.* at 10.

Part 15 devices routinely use to avoid interference from each other.[23] Most Part 15 consumer devices include multiple available channels or employ technologies that automatically skip between channels. All of these techniques are effective in avoiding interference from other Part 15 devices and, if detected, from Progeny's M-LMS network.

Tripathi further argues that a Part 15 device may not always be able to switch to another channel to avoid interference because there may be other Part 15 devices (or non-Part 15 devices) using the other channels.[24] This possibility, of course, already exists today in the 902-928 MHz band and it has not deterred the widespread use of Part 15 devices in that spectrum. The long-authorized addition of Progeny's M-LMS network will not alter the spectrum sharing conditions that currently exist in the band any more than the purchase and use by a consumer in a particular location of one more Part 15 device (particularly one more BWA device).[25]

Therefore, the appropriate question before the Commission is not whether an M-LMS network may, in rare circumstance, be detectable by Part 15 devices. Instead, in assessing whether Progeny's M-LMS network will cause "unacceptable levels of interference" to Part 15 devices, the Commission must determine whether Progeny's network will preclude Part 15 devices from continuing to employ the various spectrum sharing techniques that permit them to operate effectively with other users of the 902-928 MHz band, including other Part 15 devices and M-LMS networks.

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[23] Further, in the case of the wireless pendant, eliminating the background sound of the M-LMS beacon signal may not have been necessary given the fact that the pendant still operated effectively, transmitting and receiving the desired audio signal.

[24] *See Havens Comments* at 3.

[25] As noted above in this response, many BWA devices operate with bandwidths of up to 20 MHz and do not employ a duty cycle, thus making them much less conducive to spectrum sharing than Progeny's M-LMS network. *See supra note 15 and accompanying text.*

Progeny's M-LMS network complies with this requirement, in part because Progeny has employed in its M-LMS network design a number of techniques that facilitate spectrum sharing with Part 15 devices. First, Progeny is forgoing the use of return path transmissions from M-LMS user devices even though the Commission's rules for M-LMS permit such transmissions at power levels of up to 30 Watts. In this way, Progeny has eliminated the single greatest potential source of interference to Part 15 devices – communications from M-LMS enabled handsets and vehicles that could be ubiquitously deployed and immediately adjacent to Part 15 devices and systems. [26]

Second, Progeny is preferentially placing its transmitters on high sites such as existing broadcast and paging towers. In doing so, each such transmitter will likely be a considerable distance from both consumer and commercial Part 15 devices, thereby significantly reducing the areas within which Part 15 devices may be able to detect Progeny's Wide Area Positioning Service ("WAPS") signal.

Progeny's use of high transmitter sites also increases the potential coverage area for each transmitter, thereby reducing site density. Further reductions in transmitter density result from Progeny's use of: (1) a common broadcast signal (eliminating the need for additional transmitter sites to increase capacity as the number of users increase), (2) a very low signal information rate (resulting in higher processing gain and further enabling reception at greater distances), and, as noted above, (3) no return path transmissions from user devices (eliminating the need to locate base stations sufficiently close to each other to receive relatively weak return transmissions).

[26] As the Commission recognized when it created M-LMS, "reverse link transmissions could present significant problems to Part 15 operations depending on the power levels, duty cycles and density of mobile units." *M-LMS Order* at 4735.

Third, even though there is no such requirement in the Commission's rules, Progeny is employing a duty cycle of no more than 20 percent, with many M-LMS transmitters operating with a duty cycle of only 10 percent. Because of this low duty cycle, many, if not most, Part 15 devices will not require the use of interference avoidance techniques in order to continue to operate in the presence of Progeny's M-LMS signal.

The significant number of spectrum sharing techniques employed by Progeny's M-LMS network should facilitate those Part 15 devices that detect the WAPS beacon to operate in its presence or take measures to avoid it. This is reflected in the results of Progeny's Part 15 test report, which show that relatively few Part 15 devices were able to detect the WAPS signal at a typical range, and nearly all of the Part 15 devices that did detect the signal were able to either switch to another channel or continue to function in its presence. In fact, based on Progeny's test results, it can be concluded that spectrum sharing with Progeny's M-LMS network will likely be easier than spectrum sharing with many existing Part 15 devices that have been widely deployed in the market.[27] It therefore must be concluded that Progeny's M-LMS network will not cause

[27] One reason why Progeny's M-LMS network may be easier to share spectrum with than many existing Part 15 devices is because, despite repeated efforts by the Commission, Part 15 device manufacturers and users are under no regulatory obligation to employ spectrum etiquette techniques, such as those voluntarily employed by Progeny's M-LMS network, that would make it easier for Part 15 devices to share spectrum with each other. As the Commission has frequently noted, spectrum etiquette rules for Part 15 devices could increase the effectiveness of coexistence between the various users. *See, e.g., Report of the Unlicensed Devices and Experimental Licenses Working Group*, Spectrum Policy Task Force (2002); *Modification of Parts 2 and 15 of the Commission's Rules for Unlicensed Devices and Equipment Approval*, ET Docket No. 03-201, Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 11383, 11389 (2007) ("*Spectrum Etiquette NPRM*"); *Working Paper 41: Enhancing Spectrums Value Through Market Informed Congestion Etiquettes*, Office of Spectrum Policy (2008). In fact, Part 15 users have sought spectrum sharing requirements. *See Spectrum Etiquette NPRM* at 11387, 11390-92 (detailing Cellnet petition for duty cycle limits and protection obligations toward other unlicensed devices).

unacceptable levels of interference to Part 15 devices and Progeny's obligation under Section 90.353(d) of the Commission's rules has been satisfied.

II. THEORETICAL ARGUMENTS THAT PROGENY'S M-LMS NETWORK WILL CAUSE UNACCEPTABLE LEVELS OF INTERFERENCE ARE INCORRECT AND CONTRADICTED BY THE TEST RESULTS

Apparently recognizing that Progeny's Part 15 test report demonstrates that Progeny's M-LMS network will not cause unacceptable levels of interference to Part 15 devices, some of the parties attempt to reach beyond the test report in order to create theoretical conditions in which they claim unacceptable interference may result. As explained below, each of these arguments is disproven by Progeny's test report and/or is based on incorrect assumptions regarding the design of Progeny's M-LMS network or the operations of Part 15 devices.

A. Progeny's M-LMS Network Will Not Overload the Receivers of Part 15 Devices

Itron and its technical consultant, RKF, argue from a theoretical perspective that Progeny's M-LMS transmissions could overload the receivers of Part 15 devices within 250 meters of a Progeny transmitter.[28] RKF's calculations, however, disregard the characteristics of the WAPS transmitters and antennas and the resulting isolation in the antenna patterns towards the ground.

Specifically, Progeny is locating its transmitters primarily on high sites such as on existing broadcast and paging towers, maximizing the distance toward the ground. Progeny is also employing antennas that have high gain, yielding its maximum ERP only within the narrow (6 to 9 degrees) main lobe of the antenna. The gain in all other directions is reduced, resulting in

[28] *See Itron Comments* at 11 (citing *RKF Paper* at 11).

additional isolation toward the ground around the antenna. As a result, the power on the ground at any point around a WAPS transmitter is never anticipated to reach the -35 dBm power level that RKF suggests would be necessary to overload common Part 15 receivers.[29]

Receiver overload also should not be a problem in tall buildings that may surround a WAPS transmitter location. First, precisely because the WAPS antenna is rooftop mounted on tall buildings, the area below and around the building will normally remain outside the main lobe of the WAPS antenna. Second, the building upon which the WAPS antenna is mounted (along with the surrounding buildings) provide structural attenuation that further reduces the power of the WAPS signal. This is reflected in Progeny's test report, which detected no instances of receiver overload despite testing Part 15 devices within 50 feet directly below a WAPS transmitter positioned on the roof of a hotel (break case location D),[30] in a high rise hotel (test location J) about 150 meters from a WAPS beacon positioned on the top of another high rise hotel (the Hyatt), and on the top of a parking garage within line of sight of a WAPS beacon about one tenth of a mile away (the BWA test case). Therefore, Itron's concerns about possible Part 15 receiver overload are unavailing and contradicted by the results of Progeny's field tests.

B. Progeny's M-LMS Network Will Not Cause Unacceptable Levels of Interference to Part 15 Devices That Transmit at Fixed Intervals

Itron's consultant, RKF, also suggests that "many" Part 15 devices operate using a "fire+forget" model and avoid interference by transmitting on a fixed schedule, such as every few

[29] Calculations using patterns of antennas employed in the test network show a 7 dB margin of safety at RKF's arbitrarily chosen 250 meter distance, assuming 40 meters of antenna height, which, while lower than most antennas that will be used by Progeny, is the height assumed in RKF's paper. *See RKF Paper* at 10-11.

[30] *See Part 15 Field Test Report* at 47-49.

seconds.[31] RKF speculates that such a device could employ an identical transmission schedule as a nearby Progeny transmitter, preventing any of the Part 15 device transmissions from receiving the desired receiver.[32]

Progeny did employ such a "fire+forget" Part 15 device in its testing (the AMR Meter Reader device), which transmitted a signal every six seconds. Despite this transmission pattern, the range of the device was not diminished when operated in the presence of the WAPS beacon signal. Further, Progeny anticipates that the exact timing of such "fire+forget" devices is unlikely to be maintained with tremendous precision (since there is no reason to do so) and likely drifts slightly over time and from device to device, thus preventing them from synchronizing with each other. In contrast, the timing of Progeny's M-LMS transmissions is maintained with extreme accuracy. Therefore, any overlap between the transmissions of a Progeny beacon and a fire+forget" Part 15 device operating on a fixed schedule will be temporary, if at all. Further, in the unlikely event the specific timing schedule for a fire+forget Part 15 device in a particular area is identified as continually in synch with a nearby WAPS transmitter, Progeny would be willing to change the transmission schedule for that transmitter so that its broadcasts are moved to a different time slot each second.

C. Tripathi is Incorrect in Arguing that the Brief Beacon Sounds Detected by Some Part 15 Consumer Devices Constitute Unacceptable Interference

Havens' technical consultant, Tripathi, argues that the brief "shh" or "beep" sound that was detected by some Part 15 devices "implies that the level of the WAPS interference is high

[31] *RKF Paper* at 12-13.

[32] *See id.*

enough to cause the failure of the physical layer operation of the Part 15 receiver."[33] Although Tripathi does not explain his claim, a failure of the physical layer of a Part 15 device can occur in two conditions in a co-channel environment, neither of which would likely exist in this case.

The first improbable cause would result from carrier to interference (C/I) based interference, which could occur only if a Part 15 device used the same bandwidth, modulation, and coding (*i.e.*, exactly the same signal in all respects) as employed by the WAPS system. For any other Part 15 receiver, Progeny's DSSS modulated signal would appear as a source of white noise and therefore C/I based failure would almost certainly not occur, and did not occur in the tests that were conducted.

The second improbable cause of failure of the physical layer of a device would be the result of carrier to noise (C/N) based interference. Part 15 devices address noise-based interference in different ways depending on the modulation employed. In all cases, however, a failure of the physical layer operation of the Part 15 devices would be evidenced by drop outs of the desired Part 15 signal. No such drop outs or interruptions were detected in any of Progeny's tests. Instead, in each case, the Part 15 device continued to function, transmitting and receiving its desired signal. Although the addition of the beacon audio fragment could sometimes be detected, the desired audio transmission could also be concurrently monitored. Therefore, a failure of the physical layer of operation of the Part 15 device does not result.

Tripathi alternatively argues that the brief sound that was detected in a small number of cases for Part 15 consumer devices could cause a loss of five consecutive speech frames in a

[33] *Tripathi Paper* at 9.

digital Part 15 device, corresponding to a 5 percent error rate.[34] Tripathi asserts that acceptable speech quality corresponds to an error rate of only up to 3 percent in a digital device.[35]

In making this second argument, Tripathi overlooks the fact that the Progeny M-LMS signal was detected with any regularity only by analog FM devices. Therefore, Tripathi's argument regarding acceptable error rates and lost speech frames in digital devices is irrelevant.

III. PROGENY MADE A CONCERTED EFFORT TO CONDUCT ITS PART 15 TESTS IN COOPERATION WITH USERS OF PART 15 DEVICES

In the *M-LMS Order* adopting rules for M-LMS networks, the Commission expressed an "expectation" that Part 15 testing would be conducted in close cooperation between M-LMS licensees and operators of Part 15 systems.[36] The Commission further explained in its *M-LMS Reconsideration Order* that close cooperation would be "the more prudent course of action."[37] The Commission, however, did not include this guidance in its rules for M-LMS licensees,[38] or as a specific condition of its 2011 grant of waivers to Progeny.[39] Therefore, despite the claims of

[34] *See Tripathi Paper* at 10. Presumably Tripathi has some specific speech coding scheme in mind here, *i.e.*, one that creates 50 frames per second to be encoded. He does not indicate, however, which of the many possible schemes that exist he is employing in his example.

[35] *See id.*

[36] *M-LMS Order* at 4737; *see also Itron Comments* at 4 (citing to the same statement in the *M-LMS Order*).

[37] *M-LMS Reconsideration Order* at 16911-12; *see also Itron Comments* at 4 (citing to the same statement in the *M-LMS Reconsideration Order*).

[38] *See* 47 C.F.R. § 90.353(d). The rule states in relevant part: "[a]dditionally, EA multilateration LMS licensees will be conditioned upon the licensee's ability to demonstrate through actual field tests that their systems do not cause unacceptable levels of interference to 47 CFR part 15 devices." *Id.*

[39] *See Waiver Order* at 16889-90.

some parties,[40] the use of cooperative testing does not constitute a binding rule that would require the grant of a waiver by the Commission to forgo.[41]

In some instances, specifically with respect to consumer devices, Progeny concluded that cooperative testing was impractical and unlikely to yield useful results. One becomes a user of such a device – a cordless phone, baby monitor, wireless headset and so forth – by purchasing one at retail. There was no way to survey users after purchase without the user knowing about the survey and reacting to it, at which point many well-known issues such as the "Hawthorne effect" would confound the results.[42] Therefore, Progeny purchased a range of consumer devices at retail and Spectrum Management Consulting devised and conducted tests on them pursuant to various sets of use cases that are typical of their use in practice.

In contrast, with respect to Part 15 devices intended for commercial and industrial use, Progeny agreed with the Commission that cooperative testing was desirable. Therefore, on

[40] *See WISPA Comments* at 9 (arguing that the *M-LMS Order* "requires M-LMS licensees to 'verify through cooperative testing'"); *Itron Comments* at 6 (asserting that cooperative testing was "the Commission's requirement); *Cellnet Comments* at 6-7 (arguing that Progeny's waiver including a "condition mandating 'cooperative testing'").

[41] The contrast between mandatory language imposing a discrete testing "condition" on and the aspirational language of the cooperation "expectation" illustrates that the testing was intended to be a requirement, while the expectation was intended only as guidance. *C.f. Applications for Consent to the Transfer of Control of Licenses XM Satellite Radio Holdings Inc., Transferor, To Sirius Satellite Radio Inc., Transferee*, MB Docket No. 07-57, Memorandum Opinion and Order and Report and Order, 23 FCC Rcd 12,348, 12420-21 (2008) (observing that binding rules are characterized by language which is "clear, specific, and unequivocal…leaves no room for exercise of agency discretion" and contains a "mandatory connotation"). Additionally, the *M-LMS Reconsideration Order* implicitly left room for agency judgment by refusing to apply specific guidelines for part 15 testing and instead only stating its belief that cooperation on testing guidelines would be "more prudent." *M-LMS Reconsideration Order* at 16911-12. Finally, the fact that the testing requirement appears in the Code of Federal Regulations while the expectation does not is an additional "dividing point" between the intended force of the two clauses. Wilderness Soc. v. Norton, 434 F.3d 584, 595 (D.C. Cir. 2006).

[42] In the Hawthorne effect, subjects modify their behavior in response to the fact that they know they are being studied.

September 15, 2011, Progeny contacted Itron regarding what it expected would be the first of multiple Part 15 spectrum users that would be engaged in the testing of Progeny's M-LMS network.[43] In support of its request, Progeny made numerous additional telephone calls to Itron and sent repeated email inquiries. Progeny also supplied supporting explanatory materials and responded to questions during a conference call with Itron officials. Despite these efforts, Itron delayed responding to Progeny's request for two months, sending an email to Progeny on November 11, 2011 stating that Itron would not under any circumstances participate in cooperative testing with Progeny.[44]

Itron acknowledges in its March 15th comments its rejection of Progeny's request for cooperative testing. Itron, however, blatantly misrepresents the reason for its rejection. Itron claimed in its comments that Itron did not want to participate in cooperative testing because Progeny's test plan "was extremely limited in scope and would not adequately test the potential of the Progeny system to interfere with the operation of Itron's and its utility customers' Part 15-based metering technologies."[45]

In reality, Itron informed Progeny that it would not cooperate in testing with Progeny regardless of the test plan or scope. Specifically, Itron claimed that "[t]esting of most of [Itron's] systems, for a sufficient length of time (several months) would be necessary" and Itron is "not in

[43] The initial request to participate in cooperative testing was made by Progeny's legal counsel by telephone to Itron's legal counsel.

[44] See *Email from Jay Holcomb, Itron, Inc. to Gary Parsons, Progeny LMS, LLC*, dated Nov. 11, 2011 ("*Holcomb Email*") (a copy of this email is on file with the undersigned and is available upon request).

[45] *Itron Comments* at 2 n.4; *see also id.* at 6 n.15.

a position to support the full testing with Progeny that would be needed to validate what the interference levels would be for Itron's systems."[46]

Having thus lost two of the remaining ten months before Progeny's initial milestone deadline in fruitless talks with Itron, it should come as no surprise that Progeny did not repeat this exercise with other users of Part 15 devices, instead relying on the capabilities of an outside and independent RF engineering firm to conduct the testing of Progeny's M-LMS network. The simple fact is that Progeny could not force Part 15 device users to cooperate with its testing. Such users have a strong incentive to drag out such testing (and, in Itron's case, the discussions proceeding the rejection of such testing) for as long as possible in order to exclude M-LMS from the 902-928 MHz spectrum band.

The Commission should not encourage or facilitate such obstruction. Instead, the Commission should acknowledge that the Part 15 device testing that was conducted by an outside and independent RF engineering firm is sufficient to demonstrate that Progeny's M-LMS network will not cause unacceptable levels of interference to Part 15 devices. As discussed previously in this response, the test report clearly shows that unacceptable levels of interference will not occur to Part 15 devices. Further, although various parties challenge the methodology and scope of the tests, Progeny refutes each of those arguments throughout this pleading.

IV. SUBSTANTIAL EFFORTS WERE EMPLOYED TO IDENTIFY AND TEST A REPRESENTATIVE SAMPLE OF PART 15 DEVICES DEPLOYED IN THE FIELD

Progeny engaged in exhaustive efforts to identify a representative sample of Part 15 devices that comprise an accurate cross section of the types of devices, technologies and modulation techniques employed in the 902-928 MHz band. As several parties noted in their

[46] *Holcomb Email* at 1.

comments, hundreds of millions of Part 15 devices may operate in the 902-928 MHz band.[47] Itron argues in its comments that, at least with respect to commercial and industrial Part 15 technologies, "specific testing is required for *all these systems* to understand the true impact of Progeny."[48]

Obviously, testing every Part 15 system type would be impractical and unnecessary. It is necessary only to test a representative sample of Part 15 equipment types in order to demonstrate that Progeny's M-LMS network will not cause unacceptable levels of interference to Part 15 devices. Further, although many different types of Part 15 devices operate in the 902-928 MHz band, most of them do not appear to operate in those portions of the band that Progeny is proposing to use for its WAPS service. For example, Cellnet argued in its comments that if the Progeny system operates close to the center frequency of an AMI or AMR device, "the latter can become nonoperational."[49] Irrespective of whether Cellnet is correct in this claim, the fact is that Progeny was unable to identify any AMI or AMR device in use in the market that employed a center frequency that matched (or came close to) either of the two spectrum segments that Progeny will initially use for its M-LMS network.

Tripathi made a similar observation. Although the spectrum used by 16 of the 17 unlicensed devices tested by Progeny overlapped substantially with Progeny's spectrum, some (mainly the digital devices) used a much greater bandwidth, and one device overlapped only a

[47] *See Cellnet Comments* at 2; *Itron Comments* at 5.

[48] *Itron Comments* at 10 (*emphasis added*).

[49] *Cellnet Comments* at 6.

little with Progeny's bandwidth.[50] Tripathi claims that Progeny's test results may have been different if Progeny tested with Part 15 devices that used spectrum that matched more precisely with Progeny's beacon signals.[51]

Progeny, however, went to great lengths to identify and secure Part 15 devices that use spectrum that matched its WAPS bandwidths and this was the most precise alignment that it could identify. What Progeny discovered is that most Part 15 devices appear to operate in the middle of the 902-928 MHz band. Itron's technical consultant concurs with this finding, observing that "many" Part 15 devices "are centered, and only frequency hop, in the middle of the 902-928 MHz band."[52] The RKF Paper claims that "M-LMS beacons located close to the center of the band (such as the Progeny system) would have a greater impact on these devices."[53] Progeny, of course, will not operate close to the 915 MHz center of the 902-928 MHz band, but well into its upper half, with one signal near the upper edge of the band where relatively few Part 15 devices appear to operate.

This raises a question identified by at least one party – why Progeny employed two different processes to select the Part 15 devices it used for testing.[54] Although the reason for this was clearly

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[50] *See Tripathi Paper* at 8. Progeny questions Tripathi's specific findings regarding which Part 15 devices operate in which bands. Tripathi makes reference to only 12 of the 17 devices that were tested by Progeny, avoiding any mention of device numbers 1, 4, 6, 7 and 8, all of which operate either in very similar spectrum to Progeny, or in a much larger band. *See id.* In any event, all of this information is provided in Table 1 on page 17 of Progeny's test report and is therefore available for the Commission's review.

[51] *See id.*

[52] *RKF Paper* at 12.

[53] *Id.*

[54] *See id.* at 3.

explained in the Appendix to the test report,[55] Itron attempts to claim unfairly that "the ultimate selection of devices tested was based on a determination that such devices would produce a more favorable result."[56]

In reality, Progeny first attempted to select Part 15 devices through a random selection process involving the Commission's Equipment Authorization System ("EAS"), but that process identified only commercial/industrial Part 15 devices and not consumer devices that operated in Progeny's M-LMS spectrum.[57] Progeny therefore went through a second process of combing through the EAS in an effort to find Part 15 consumer devices that used the same spectrum as Progeny's M-LMS network.

Some parties also questioned the mix of modulation types that Progeny employed in its Part 15 tests.[58] Common modulations used in Part 15 devices are analog FM, digital spread spectrum system ("DSSS") and frequency hopping spread spectrum ("FHSS") devices, all of which were included in Progeny's tests of Part 15 devices.

In identifying the specific count and mix of tested Part 15 devices that employ each of the common modulation types, Progeny strove to ensure that it was considering to the extent feasible worst case conditions. Thus devices with modulation types that are more robust and better capable of withstanding interference from other users of the 902-928 MHz band, including M-LMS networks, were employed in the tests in lower numbers than devices with less robust

[55] *See Part 15 Field Test Report*, Appendix at 3.

[56] *Itron Comments* at 8.

[57] *See Part 15 Field Test Report*, Appendix at 3.

[58] *See RKF Paper* at 3 (arguing the list of devices tested "were heavily biased towards specific types of modulation and coding, such as FHSS, DSS and Analog FM, while many Part 15 devices commonly use types of coding that may encounter different problems with the Progeny waveform and hence should be tested").

modulation schemes. This is reflected in the Part 15 devices that were tested by Progeny, most of which were analog FM devices, and the remaining devices were DSSS and FHSS devices.[59]

Thus, assertions that Progeny's tests are flawed because Progeny tested only one BWA device,[60] only one AMI device,[61] or only one AMR device[62] are irrelevant as long as the devices that were tested are adequately representative of the Part 15 devices deployed in the field or are generally no less susceptible to interference than Part 15 devices that were not tested.

To this end, Itron's technical consultant challenges Progeny's choice for testing of an AMR device that operates using a wideband digital spread spectrum signal using only a single channel.[63] The RKF Paper argues that some AMR devices employ FHSS modulation that is designed to operate on a select set of channels.[64]

As indicated in Progeny's test report, FHSS devices were among the most resilient of the devices that were tested in the presence of the WAPS signal. This is because FHSS systems generate carriers from 20 to 250 kHz wide that hop through a wide bandwidth. By continually shifting from one frequency segment to another, the dwell time on any particular band segment is minimized and any interfering signals in any band segment offer only fleeting interference to the Part 15 device. Further, the maximum power flux density of FHSS transmitters is significantly greater than other Part 15 devices (which is why they are not permitted to dwell on any one

[59] *See Part 15 Field Test Report* at 17.

[60] *See WISPA Comments* at 5.

[61] *See Cellnet Comments* at 4.

[62] *See RKF Paper* at 4.

[63] *See id.*

[64] *See id.*

frequency for very long), adding further to their ability to reject undesired signals in the 902-928 MHz band. Given these facts, Progeny tested with only a few FHSS devices in order to avoid the suggestion that it was trying to avoid difficult test cases.

WISPA also challenged the choice of modulation types used in Progeny's tests, arguing that the Canopy BWA system that was employed in the tests "uses BPSK modulation that is very robust in its ability to accept interference."[65] In reality, the Canopy system employs FSK modulation and not PSK. FSK is a simple digital modulation that is not nearly as capable of withstanding interference as more robust technologies. Unlike FHSS, DSSS, and orthogonal frequency-division multiplexing ("OFDM"), which spread the carrier's information content widely over the utilized bandwidth, the FSK modulation used in the Canopy system generates a wideband carrier that focuses much of the power and data close to the center frequency of operation. This leaves FSK systems more susceptible to interference from sources operating co-channel to its center frequency (which is precisely one of the ways in which the Canopy system was tested in the presence of Progeny's M-LMS network).[66] Therefore the Canopy system was specifically identified for inclusion in the tests because it is more susceptible to interference. Even in these highly susceptible conditions, the Canopy system evidenced no appreciable reduction in throughput performance.[67]

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[65] *See WISPA Comments* at 6.

[66] *See Part 15 Field test Report* at 51. The Canopy system was actually tested in eight different states – four with the WAPS network on and four with it off. In half of the tests, the Canopy system's 8 MHz bandwidth channel was tuned to a center frequency of 920 MHz, very close to Progeny's B-block center frequency of 920.773 MHz. In the other half of the tests, the Canopy center frequency was tuned to 906 MHz in order to provide a comparison. *See id.*

[67] *See id.*

Finally, Itron questions Progeny's use of only Part 15 devices that were registered with the Commission after January 1, 2005.[68] Progeny tested with newer Part 15 devices in order to increase the likelihood that such devices would still be in circulation and widely used by the public, thus further reflecting the real world conditions in which Progeny's M-LMS network will operate. Further, as Progeny explains in its test report, Progeny experienced significant difficulty securing Part 15 devices registered as recently as 2005 and sooner. Older devices (particularly ones that still work) proved extremely difficult to secure. Although Itron claims that it has older legacy equipment still in use by its customers, Itron refused to cooperate in Progeny's test process and therefore Progeny had to test with other representative equipment.

In summary, Progeny undertook substantial efforts to identify and secure a representative sampling of Part 15 devices for testing that included a wide variety of consumer and commercial devices, including devices using different modulation types (particularly the most susceptible modulation types) and devices that are commonly used today by businesses and consumers. The Commission should therefore disregard arguments that the Part 15 devices that were employed in the Part 15 tests were biased in Progeny's favor, or were otherwise insufficient to demonstrate that Progeny's M-LMS network will not cause unacceptable levels of interference to Part 15 devices.

V. SPECTRUM MANAGEMENT CONSULTING EMPLOYED RIGOROUS TEST PROCEDURES THAT STROVE TO IDENTIFY WORST CASE CONDITIONS FOR PART 15 OPERATIONS

An important consideration for the Commission should be the significant level of diligence that was employed by Spectrum Management Consulting in the design and execution of its tests on Progeny's M-LMS network. The test report describes a total of 618 individual test

[68] *See Itron Comments* at 10.

scenarios (546 for consumer devices and 72 for commercial devices), each scenario involving a different device in a different test condition or environment, half with the WAPS beacon on and half with it off. The test process was not only lengthy, but uncompromising. Whenever a WAPS signal was detected during the tests of the consumer devices, no matter how fleeting the detection may have been, the test result was reported as a detection.

Further, the test set up was intentionally biased against Progeny's M-LMS network. For example, a disproportionate number of the test locations were unusually close to a WAPS beacon location. As a result, the occasions when a Part 15 device did detect the WAPS beacon were proportionally greater than could be expected in real world conditions.

Despite the tremendous level of effort that was employed in ensuring the accuracy, fairness, and reliability of Progeny's test report, some parties challenge aspects of the report as being inadequate or favorable to Progeny. Each of these assertions is addressed fully in the sections of this response below.

A. Many of the Claims Against Progeny's Part 15 Test Report are Erroneous or Excessive and Reflect an Incomplete Review of Progeny's Report

Some of the comments on Progeny's Part 15 report appear to reflect fundamental misunderstandings regarding the nature of Progeny's M-LMS network and the methodology of its Part 15 testing. For example, Itron, its consultant, RKF, and Havens each claim that a major deficiency in Progeny's test report is the lack of testing of the vehicle location portion of its proposed service.[69] Progeny's Part 15 test report, however, does address the vehicle location portion of its M-LMS service. Progeny will use the same M-LMS beacons (and beacon signals) to provide multilateration service to vehicular and non-vehicular devices. Progeny will not need

[69] *See Itron Comments* at 9; *RKF Paper* at 5; *Havens Comments* at 6.

to make any alterations to its M-LMS beacon transmitters to provide multilateration services to vehicles in motion. Therefore, this was a test on Progeny's vehicular M-LMS service.[70]

Further, in attempting to identify other deficiencies in Progeny's Part 15 test report, Itron quotes the Commission's statement that "[i]t would be inappropriate to apply uniform testing parameters to those varied technologies, *as no one testing method would adequately address the needs of either LMS or Part 15 operations*."[71] Progeny concurred and complied with this guidance, employing different test methodologies and procedures for consumer Part 15 devices, different types of commercial devices, and broadband wireless access devices. Progeny's tests also employed multiple and varied test conditions for each device, including "break case" tests for all of the devices tested.

Itron counters that Progeny did not employ "break case" tests for commercial Part 15 devices.[72] In fact, Progeny's tests of commercial devices did include break case testing, although not in the same manner as was employed for consumer devices (another example of Progeny's avoidance of uniform test parameters for different technologies).

With respect to the break case tests for commercial devices, in most cases they involved testing outside with near line of sight to a WAPS transmitter about 0.5 to 0.8 miles away and extending the link distance (range) of the commercial device until the link between the Part 15

[70] A remote possibility exists that Itron and Havens were arguing that Progeny should have tested Part 15 devices that are intended for vehicular use. The Part 15 rules, however, are not limited to certain types of use. If there are any exclusively vehicular Part 15 devices (as opposed to mobile Part 15 devices used in vehicles) they would have the same spectrum sharing capabilities as other Part 15 devices. An example is RFID tags for toll roads. To the extent they are manufactured under the rules for Part 15 devices, they should perform in a manner that is consistent with the RFID readers that Progeny employed in its Part 15 tests.

[71] *See Itron Comments* at 4 (quoting *M-LMS Reconsideration Order* at 16911) (*emphasis added by Itron*).

[72] *See Itron Comments* at 10; *RKF Paper* at 7-8.

transmitter and receiver was effectively broken, meaning that reliable transmissions could no longer be maintained.

Cellnet argues in its comments that an even more extreme break case should have been used for commercial devices, such as testing such devices within line of sight and 50 feet from a WAPS transmitter.[73] Progeny, however, does not believe that it is realistic to consider the possibility of a commercial Part 15 receiver operating outside within 50 feet of a WAPS transmitter given Progeny's intended use of high site transmitter locations. Such a Part 15 receiver would effectively have to be co-located on the same tower.

Not surprisingly, Itron and its consultant went so far as to suggest this, arguing that Progeny should have tested the impact of collocating an M-LMS transmitter and a Part 15 commercial receiver on the same tower.[74] Progeny believes that it is exceedingly unlikely that users of commercial Part 15 devices will want to place receivers on the same high site locations (broadcast and paging towers) that Progeny intends to employ for its M-LMS transmitters. In this regard, Progeny observes that Section 90.361 of the Commission's rules removes the safe harbor protections for secondary Part 15 devices if they are placed on towers or other structures that exceed 15 meters above the ground.[75]

Progeny further notes that nearly all tower lease agreements routinely require that new tenants on a tower must not cause harmful interference to existing tower tenants. This will protect operators of commercial Part 15 receivers from harmful interference potentially resulting from the addition of an M-LMS transmitter on the same tower. Progeny is also willing to agree that, if it seeks

[73] *See Cellnet Comments* at 5.

[74] *See Itron Comments* at 10; *RKF Paper* at 5 and 7-8.

[75] *See* 47 C.F.R. § 90.361.

to place an M-LMS transmitter on the same tower with an existing Part 15 receiver, it will make arrangements with the operator of the Part 15 receiver to ensure that no harmful interference results.

B. The M-LMS Network Used for Testing Was Truly Representative of Progeny's Nationwide Deployment

WISPA challenges Progeny's use of Santa Clara County as the location of its Part 15 tests. On the one hand, WISPA argues that the county is not sufficiently urban and therefore not representative of larger cities with relatively narrow "urban canyons" where Progeny will likely need to deploy its transmitters more densely.[76] On the other hand, WISPA argues that Progeny should have tested "in rural areas typical of the areas where many WISPs operate."[77]

In raising these dueling arguments, WISPA misses the point. It does not matter where Progeny's tests were conducted as long as the test conditions employed were reflective of real world and worst case conditions. To accomplish this, a significant number of the test locations utilized in the report were within close proximity to a WAPS beacon (50 feet to several hundred meters). This was specifically done to avoid being accused of doing testing in environments that were more representative of the vast majority of the area covered by WAPS. Instead, the testing focused on areas where the possibility of interference was highest: locations close to a beacon.

The results of the tests therefore accurately demonstrate the impact to Part 15 devices in an urban as well as in a non-urban environment. Granted, in an urban area Progeny will need to deploy its transmitters more densely, but only because the urban canyon environment will attenuate the signal of each transmitter much more rapidly. Progeny's test results clearly show that the WAPS system will not be a source of unacceptable levels of interference even in

[76] *WISPA Comments* at 7. The Tripathi Paper also claimed that inadequate testing was performed in dense urban areas. *See Tripathi Paper* at 4.

[77] *WISPA Comments* at 6.

situations where the beacon is relatively close to the Part 15 device. Therefore the results of Progeny's tests are truly representative of the spectrum sharing that will result throughout Progeny's nationwide deployment.

Itron's technical consultant further claims that the WAPS transmitter density that Progeny employed in Santa Clara County was not sufficient to provide adequate multilateration coverage in the test area.[78] RKF bases this assertion on an inappropriate use of an Urban Hata radio propagation model, the assumptions for which were flawed in several respects.

The portions of Santa Clara County where testing was conducted include a representative mix of urban, suburban, and open urban areas, similar to most metropolitan areas of the country. The vast majority of the county, however, is suburban. Therefore, RKF's use of an *Urban* model for the entire area yielded a result that is not representative of the actual coverage.

RKF's calculations also assume the WAPS network that was used for testing in Santa Clara County employed beacon antenna heights that were 40 meters above average terrain.[79] As indicated in Progeny's test report, the WAPS antennas employed in the tests were significantly higher than RKF assumed.[80] Given the fact that the WAPS system is a broadcast style network, it can take advantage of the benefits of propagation from high elevation sites. By using the correct elevation instead of an incorrect tower height, RKF should have confirmed that the test area is adequately covered by the network that was used in the testing.

In designing the coverage of the WAPS system in Santa Clara County, Progeny used an industry accepted propagation tool (Keima Overture) that takes into account the actual terrain,

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[78] *See RKF Paper* at 10.

[79] *See id.*

[80] *See Part 15 Field Test Report* at 22.

morphology, and antenna pattern when calculating coverage. The results of this tool were then post processed with our proprietary GDOP tool to determine the areas effectively covered by the network.[81] Finally, as the system was brought into operation, field validation of the propagation modeling was conducted through drive testing and specific point field testing. The results of this field testing validated the modeling tools and show the area covered in actuality to be consistent with the area predicted to be covered. Further, in response to the specific question of Havens' technical consultant, the WAPS beacon network that was described in Progeny's test report and accompanying materials was, of course, the same network that was used for the testing.[82] Therefore, the commenting parties are incorrect in claiming that the test location and network that was used for Progeny's testing was either inadequate or insufficiently representative to demonstrate adequately that Progeny's M-LMS service will not cause unacceptable levels of interference to Part 15 devices.

C. The Test Locations and Conditions for Part 15 Commercial Devices Were Selected to Scrutinize Closely the Spectrum Sharing Capabilities of Progeny's M-LMS Network

Although no party raised concerns about the wide variety of test locations that were chosen for tests of Part 15 consumer devices, some parties questioned the choice of locations for the tests of commercial and industrial Part 15 devices. Progeny used a variety of different configurations to test commercial and industrial Part 15 devices, each reflecting the unique design and customary use of the device in question. Both the AMR and the BWA devices were

[81] *See Tripathi Paper* at 4 (raising questions regarding how the GDOP map was created and whether it was based on real M-LMS receiver measurements or theoretical signal-strength based propagation tools).

[82] *See id.* (claiming that it is "unclear if this 'operational system' is the same system with a certain number of beacon transmitters at specific locations that yielded the claimed performance accuracy or this test system is a simplified configuration").

tested outdoors in almost direct line of sight with a nearby WAPS beacon.[83] Most of the commercial Part 15 devices were also subjected to height testing in order to replicate the conditions that would exist if a Part 15 receiver was receiving data from a transmitter erected on a pole or small tower.[84]

In addition to its outdoor test locations, Progeny employed two different indoor test locations for the Part 15 commercial devices, one consisting primarily of concrete construction (location A) and the other with a much greater percentage of glass exterior (location B).[85] Although both of the test locations were relatively close to a WAPS transmitter (0.8 miles for location A and 0.5 miles for location B), this is consistent with Progeny's efforts to test at or close to worst case conditions.[86] Further, the individuals conducting the tests noted that the existing noise in the band from other Part 15 devices and users of the 902-928 MHz band were

[83] *See Part 15 Field Test Report* at 49-50. Although the test report states that that BWA testing was performed outdoors, the description on the AMR testing was not explicated on this point, but could easily be inferred given the fact that the range tests for the AMR device extended nearly 1,000 feet in some cases. *See id.*

[84] *See id.* at 42 (noting that Test Case 1 for the AMR, Remote Control and RFID devices involved height testing); *contra Itron* at 9; *RKF Paper* at 6 (suggesting that such height testing was not performed).

[85] *See Part 15 Field Test Report* at 27; *contra Intron Comments* at 9 (arguing that the two locations used for commercial device tests were very similar).

[86] *See Part 15 Field Test Report* at 27. Itron's consultant argues that by positioning both commercial test locations relatively close to the same WAPS transmitter, Progeny may not identify variations that may exist in the propagation characteristics of different WAPS transmitters. *See RKF Paper* at 6. All of the transmitters used in the tests were identical, however, each complying with the technical characteristics that are specified in the FCC equipment certification for the transmitters. *See FCC ID Number* A4P-100-0004-05.

significantly different at the two test locations, which was an important factor in Progeny's efforts to ensure that the tests reflected real world conditions.[87]

Itron and its technical consultant focus considerable attention on their claim that the outdoor tests of commercial Part 15 devices were at near line of sight to the closest WAPS transmitter and not in direct line of sight.[88] In reality, the tests of the BWA system were conducted with both the BWA receiver (the Access Point, in this case) and in the BWA transmitter (the subscriber unit) in direct line of sight with the WAPS transmitter, the former no more than 0.1 miles away from the WAPS transmitter and the latter about 0.4 miles away with its bore site pointed almost directly at the WAPS transmitter. Thus, Progeny's test report does examine the potential impact of operating a Part 15 transmitter and receiver in direct line of sight with a nearby WAPS transmitter, concluding that no material degradation in the operation of the Part 15 device resulted.

Given this outcome, it was unnecessary to test every commercial Part 15 device in direct line of sight conditions. Operating a tested Part 15 device in direct line of sight with a WAPS transmitter, as compared to nearly in direct line of sight, results only in a change in the received

[87] Havens' technical consultant agrees on the importance of conducting tests in the presence of other Part 15 device transmissions, asserting that this is the only way to "truly guarantee the testing in a multi-device real-world environment." *Tripathi Paper* at 9. To this end, Tripathi expresses concern about the statement in the test report that it was "expected that the concentration of Part 15 uses in the vicinity of the test location would be quite high." *See id.* (*quoting Part 15 Field Test Report* at 36). Tripathi argues that "the existence of other Part 15 devices cannot be assumed." *Id.* The existence of other Part 15 device transmissions in the test environment was not assumed by the individuals conducting Progeny's tests. The presence of other Part 15 transmissions in the test environment was clearly identified and noted immediately prior to the initiation of each test.

[88] Given the significant distances that were often employed by Spectrum Management Consulting between the commercial Part 15 transmitters and receivers (almost 1,000 feet at times), it was extremely difficult to identify locations in the heavy mix use of the non-residential portions of Santa Clara County that maximized the line of sight between a test location and a nearby WAPS transmitter.

WAPS signal strength at the Part 15 device – just as would result by changing the distance between the tested Part 15 device and the closest WAPS beacon. In this regard, the test locations for commercial Part 15 devices included a variety of relatively short distances to the nearest WAPS beacon (0.1 mile for the BWA Access Point, 0.4 miles for the BWA subscriber unit, 0.5 miles for the location B commercial test site, and 0.8 miles for the location A commercial test site), and the inclusion of one additional distance or received signal strength was unlikely to be probative.

Itron's consultant also tries to build its case using the minor variations that existed between the distances measured for the maximum ranges that could be achieved for the RFID and AMR devices with the WAPS beacon turned on and the WAPS beacon turned off.[89] The test report explains that the small variations were almost certainly caused by errors introduced through the use of a handheld distance measuring wheel on uneven surfaces (often across streets with curbs and other obstacles).[90]

RKF claims, however, that the variations are "very significant" and argues that since a slight majority of the variations increased the measured range when the WAPS beacon was on, the variations may indicate that the AMR and RFID devices may have detected the WAPS signal and responded by "switching to another channel with better multipath or increasing the transmit power."[91] Although RKF's theory is intriguing, it is not supported by the facts.

Both of the RFID devices employed FHSS modulation technology and therefore were always switching to another channel, as is required by the Commission for such devices,

[89] *See RKF Paper* at 8.

[90] *See Part 15 Field Test Report* at 49.

[91] *RKF Paper* at 8.

regardless of whether the WAPS signal was present. In contrast, the AMR device that was tested operates on fixed frequencies and has no capability for two-way communication. The AMR device would therefore be unaware of (and unable to respond to) any changes in the communications environment. Further, the tests were conducted to measure the maximum range of each device. Therefore, if an automatic power adjustment capability existed in either the RFID or AMR devices (and since none of them had two-way transmit capabilities, this does not seem possible), the devices would have boosted to their maximum power levels as the tested range increased regardless of whether the WAPS beacon was on or off.

Itron further challenges the sufficiency of Progeny's test report, observing that the report acknowledges that not all test devices could be "forced" to operate co-frequency with Progeny's M-LMS beacons.[92] Itron declares that, if some devices cannot be forced to operate co-frequency with Progeny's network, this means "these devices were not adequately tested for co-channel interference."[93]

As clearly indicated in Progeny's test report, however, all of the Part 15 devices that were included in Progeny's tests employ operating frequencies that overlap with at least one of the two WAPS bandwidths. Some of the Part 15 devices, particularly the FHSS devices, transmit in the WAPS bandwidth only some of the time, while other devices, such as the DSSS devices, transmit in a bandwidth that includes at least one of the two WAPS channels all of the time. Itron, however, appears to be suggesting that Progeny should have modified the basic functioning of these devices so that they operate all of the time only in the discrete bandwidths that the WAPS signal will occupy.

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[92] *See Itron Comments* at 10.

[93] *Id.*; *see also RKF Paper* at 8-9.

Itron's argument begs an important question – what measures are appropriate to attempt to force a Part 15 device to operate co-frequency with an M-LMS network? For example, FHSS devices, by Commission rule, cannot be forced to operate on just one channel (or limited group of channels) because they would no longer qualify as FHSS devices. If Progeny breaks open a device and alters its function (assuming that such reverse and re-engineering would be reasonably possible), would that alter the device so fundamentally that it no longer qualifies as a Part 15 device? Certainly its FCC certification would no longer apply and it would also likely no longer comply with Part 15 of the Commission's rules. The re-engineered device would also no longer be representative of any Part 15 device that is sold and available for use in the market.

Therefore, even if it were possible, the resulting tests would not be probative or relevant to the real world spectrum sharing conditions that exist between Progeny's M-LMS network and Part 15 devices in use by businesses and consumers. In order to avoid creating artificial and irrelevant test conditions, the Part 15 devices that were used in the tests were forced to operate on the same frequencies as Progeny's M-LMS network only if this could be accomplished without breaking open and re-engineering the device.

The test conditions and locations that were chosen for Progeny's Part 15 tests therefore truly were representative of typical and worst case conditions for unlicensed devices operating in the 902-928 MHz band in the presence of Progeny's M-LMS network. Accordingly, the Commission should conclude that the results of the Part 15 tests were fully adequate to demonstrate that Progeny's M-LMS network will not cause unacceptable levels of interference to Part 15 devices.

D. Progeny's Tests of Broadband Wireless Access Equipment Reflect the Limitations of Such Equipment in Non-Rural Environments

WISPA argues that Progeny should have tested the Canopy BWA system that was employed in the tests at much higher throughput rates[94] and over much greater distances.[95] Specifically, WISPA claims that, based on the Canopy marketing literature, the Canopy system is capable of a maximum data rate of 3 Mbps and a maximum range of 40 miles.[96] WISPA therefore challenges Progeny's use of a maximum throughput rate for testing of 1 Mbps and a range of about 0.4 miles.[97] WISPA claims that, at a range of just 0.4 miles, the Canopy signal would have been so strong "as to make them almost impervious to interference" from the WAPS signal.[98]

Spectrum Management Consulting, however, investigated a number of different configurations for the Canopy BWA system in different locations in Santa Clara County and was unable to replicate, or approximate, the claims of the Canopy marketing literature.[99] In the test location that was employed (which was specifically chosen because it was very close to and had direct line of sight with a nearby WAPS beacon), Spectrum Management Consulting could not move the Canopy transmitter and receiver further apart with the WAPS beacon turned off without degrading the throughput to below the 1 Mbps threshold that was identified for the test.

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[94] *See WISPA Comments* at 8.

[95] *See id.* at 8-9.

[96] *See id.*

[97] *See id.*

[98] *Id.*

[99] All of these preliminary test set ups were conducted using multiple different Canopy channels and, of course, with the WAPS network turned off.

In fact, when the transmitter and receiver were set up just one block further apart, the link between the transmitter and receiver could not be established at all.

Granted, BWA systems are likely to work must better in very rural areas where noise from other Part 15 devices is much less prevalent. Progeny, however, was striving to replicate real world and worst case conditions for its tests, which necessitated conducting its tests in a highly dynamic environment where numerous Part 15 devices and other users of the 902-928 MHz band routinely operate. The spectrum sharing conditions between a BWA system and Progeny's M-LMS network in a very rural environment would obviously be much easier given the likely abundance of minimally encumbered frequencies on which the BWA system could operate.

WISPA further claims that Progeny's tests on the Canopy BWA device were inadequate because the test set up resulted in the WAPS antenna transmitting directly into the bore sight only of the Canopy subscriber device and into the side lobe of the Canopy Access Point.[100] Given the fact that test was conducted by measuring the throughput of the signal that was transmitted from the subscriber device to the Access Point, WISPA claims that the test conditions should have been reversed.[101]

In making this argument, WISPA apparently assumes that the antenna on the Canopy Access Point is directional and is capable of significant rejection of signals entering into its side lobe. Spectrum Management Consulting investigated this issue, however, and determined that the antenna utilized at the Access Point had less than 5 dB of gain, and exhibited almost no side lobe signal rejection.

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[100] *See WISPA Comments* at 9.

[101] *See id.*

Further, the design of the Canopy BWA network prevents it from operating unless the transmitter and receiver both record signals from each other and complete an initiation "hand shake." The transmission from the WAPS antenna directly into the bore site of the Canopy subscriber device did not prevent the device from completing this set up with the Access Point.

The tests that were conducted by Spectrum Management Consulting on the Canopy BWA system truly reflect the results that will be received in real world conditions involving spectrum sharing between BWA networks and Progeny's M-LMS network. The Commission should therefore confirm that Progeny has satisfied its regulatory obligation and can begin commercial operations because Progeny's network will not cause unacceptable levels of interference to BWA, or any other Part 15 devices.

VI. PROGENY'S M-LMS NETWORK IS DESIGNED TO WITHSTAND INTERFERENCE FROM PART 15 DEVICES AND ITS SERVICE WILL NOT FORCE COMPLIANT PART 15 SYSTEMS OUT OF THE BAND

Recognizing that M-LMS is allocated on a primary basis in the 902-928 MHz band relative to secondary Part 15 devices, WISPA expresses a further concern regarding the possibility that the Part 15 devices manufactured and used by its member companies may cause harmful interference to Progeny's M-LMS network and, pursuant to the Commission's rules for secondary spectrum users, may be forced to cease operations in the band.[102]

The Commission, of course, gave considerable attention to this issue when it adopted its rules for M-LMS in the 902-928 MHz band.[103] The Commission established a regulatory safe harbor for Part 15 devices, concluding that all such devices that are designed and used in a manner that is consistent with Part 15 of the Commission's rules and also comply with Section

[102] *See WISPA Comments* at 7.

[103] *See, e.g., M-LMS Order* at 4715.

90.361 of the rules is exempt from any claim by an M-LMS licensee that the device is a source of harmful interference.[104]

Having tested its M-LMS network throughout much of the San Francisco Bay Area for more than two years, Progeny can confirm that it has not identified interference concerns to its M-LMS network caused by Part 15 devices operating in non-compliance with Part 15 of the Commission's rules or Section 90.361. Progeny therefore believes that WISPA and the Commission can safely assume that WISPA's member manufacturers and users of Part 15 devices are complying with the safe harbor requirements specified by the Commission and interference to M-LMS networks therefore should not be an issue of concern.

VII. THE COMMISSION HAS ALREADY FULLY ADDRESSED THE CONCERNS RAISED BY A NON-MULTILATERATION LMS LICENSEE

One party filed comments in response to Progeny's Part 15 test report expressing concern that attention is not being given to spectrum sharing between M-LMS and non-multilateration LMS ("NM-LMS") in the 919.75-921.75 MHz spectrum that is shared between M-LMS and NM-LMS licensees.[105] Kapsch Trafficcom is a supplier and integrator of electronic toll equipment licensed under the Commission's NM-LMS rules.[106] Kapsch Trafficcom expresses concern about the possibility of interference from Progeny's service into NM-LMS systems and requests the Commission to either: (1) remove M-LMS from the 919.75-921.75 MHz band, (2) further restrict the operational limits of M-LMS networks, or (3) require coordination between

[104] *See* 47 C.F.R. § 90.361.

[105] *See Comments of Kapsch Trafficcom IVHS Inc.*, WT Docket No. 11-49, at 1 (March 15, 2012) ("*Kapsch Trafficcom Comments*").

[106] *See id.*

M-LMS and NM-LMS network in a manner that would not only require M-LMS licensees to protect existing NM-LMS deployments, but future MN-LMS installations as well.[107]

The Commission carefully considered spectrum sharing between M-LMS and NM-LMS networks when it adopted rules for the two services more than fifteen years ago. The Commission concluded, and codified in Section 90.353(d) of its rules, that M-LMS and NM-LMS systems "will share the 919.75-921.75 MHz band on a co-equal basis."[108] The Commission explained that such sharing must be accomplished in accordance with Section 90.173(b) of the Commission's rules, which requires licensee, *inter alia*, to "cooperate in the selection and use of frequencies in order to reduce interference and make the most effective use of the authorized facilities."[109]

To this end, Progeny is prepared to cooperate with Kapsch Trafficcom in Progeny's selection of M-LMS transmitter locations. As Kapsch Trafficcom acknowledges, Progeny intends to deploy its beacons primarily at the highest available points on existing broadcast, paging or cellular towers, while NM-LMS equipment is installed primarily "on highways and on access or egresses to highways, bridges, and tunnels."[110] Given the significant divergence of these transmitter deployment approaches, it should not be difficult for Progeny and Kapsch Trafficcom to cooperate adequately in their shared use of the spectrum.

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[107] *See id.* at 8-9.

[108] 47 C.F.R. § 90.353(d).

[109] *See Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems*, Memorandum Opinion and Order and Further Notice of Proposed Rule Making, 12 FCC Rcd 13942, 13962, n.91 (1997).

[110] *See Kapsch Trafficcom Comments* at 6.

Further, as Kapsch Trafficcom also acknowledges,[111] Progeny is forgoing the use of M-LMS return path transmissions that, pursuant to the Commission's rules, could have included transmitters of up to 30 Watts installed on vehicles passing immediately adjacent to Kapsch Trafficcom's NM-LMS installations. Progeny's M-LMS network will therefore cause exponentially less interference in the 919.75-921.75 MHz band than the Commission's rules instructed Kapsch Trafficcom to anticipate when it was designing its NM-LMS equipment. Progeny therefore looks forward to working cooperatively with Kapsch Trafficcom in their shared use of the 919.75-921.75 MHz band spectrum. Progeny further believes that no need exists for the Commission to revisit its longstanding spectrum sharing rules for M-LMS and NM-LMS licensees.

VIII. THE COMMISSION HAS NOT IMPOSED A CHANNEL LOADING MILESTONE REQUIREMENT FOR M-LMS LICENSEES

As indicated in Progeny's WAPS Network Description, Progeny is planning to employ initially two beacon signals, each with a null-to-null channel bandwidth of 2.046 MHz[112] and with center frequencies of 920.773 MHz and 926.227 MHz.[113] Havens argues that if Progeny does not use all 8 MHz of its licensed M-LMS spectrum in its initial deployment (and does not secure a waiver or extension of its build out requirement), it must return to the Commission the spectrum that it does not use.[114]

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[111] *See id.* at 4.

[112] The use of this bandwidth is intended to match the GPS bandwidth, thus making it easier to incorporate Progeny's service into GPS chipsets.

[113] *See Wide Area Positioning System Network Description* at 4-5 (included as an attachment to *Progeny Part 15 Field Test Report Filing*).

[114] *See Havens Comments* at 3 and 7.

What Havens appears to be arguing is that the Commission's build out rules for M-LMS include a channel loading requirement. Although the Commission has in the past imposed such requirements on some communications services, the Commission has forgone such requirements for milestone compliance in recent decades for services licensed on a geographic area basis in favor of adopting rules specifying quantitative coverage obligations. This is the case for M-LMS, in which the Commission adopted requirements addressing the percentage of the population in each Economic Area to which service must be made available.[115]

Although the Commission did not explain in its various M-LMS orders why it was forgoing the imposition of channel loading requirements for M-LMS, the Commission did elaborate on this issue in 2004 when it granted licensees in the M-LMS and other services the option to satisfy their milestone requirements by demonstrating substantial service.[116] The Commission explained that "[a]s demonstrated by our trend towards licensing services on a geographic-area basis, we believe that licensees can provide a meaningful and socially beneficial service without providing ubiquitous service and that providing licensees with sufficient flexibility to respond to market fluctuations will promote the public interest."[117]

As the Commission observed at the time, its decision to refrain from imposing channel loading or similar requirements on M-LMS licensees was consistent with the long standing

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[115] *See* 47 C.F.R. § 90.155(d).

[116] *See Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies to Provide Spectrum-Based Services*, WT Docket No. 02-381, *2000 Biennial Regulatory Review Spectrum Aggregation Limits For Commercial Mobile Radio Services*, WT Docket No. 01-14, *Increasing Flexibility To Promote Access to and the Efficient and Intensive Use of Spectrum and the Widespread Deployment of Wireless Services, and To Facilitate Capital Formation*, WT Docket No. 03-202, Report and Order and Further Notice of Proposed Rulemaking, 19 FCC Rcd 19078, 19122-23 (2004).

[117] *See id.*, ¶ 78.

evolution of its milestone policies for geographic area licensees.[118] For example, one decade previously, the Commission eliminated its channel loading requirements for the Part 90 Commercial Mobile Radio Service ("CMRS").[119] The Commission explained at the time that "we agree with those commenters who advocate a strong regulatory emphasis on construction timetables and coverage requirements in lieu of loading requirements."[120] The Commission also eliminated its channel loading requirements for Part 22 licensees, concluding that traffic loading studies are not a reliable indicator of efficient channel usage and that these studies are burdensome both for licensees to prepare and for Commission staff to evaluate."[121] The Commission also eliminated such rules for narrowband and broadband PCS,[122] and also for the Part 90 paging and 220 MHz services, in which the Commission also concluded that "loading is

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[118] *See id.*

[119] *Implementation of Sections 3(n) and 332 of the Communications Act; Regulatory Treatment of Mobile Services Amendment of Part 90 of the Commission's Rules To Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band Amendment of Parts 2 and 90 of the Commission's Rules To Provide for the Use of 200 Channels Outside the Designated Filing Areas in the 896-901 MHz and 935-940 MHz Band Allotted to the Specialized Mobile Radio Pool*, Third Report and Order, 9 FCC Rcd 7988, 8081 (1994).

[120] *Id.*

[121] *See Revision of Part 22 of the Commission's Rules Governing the Public Mobile Service,* CC Docket No. 92-115, *Amendment of Part 22 of the Commission's Rules To Delete Section 22.119 and Permit the Concurrent Use of Transmitters in Common Carrier and Non-Common Carrier Service,* CC Docket No. 94-46, *Amendment of Part 22 of the Commission's Rules Pertaining to Power Limits for Paging Stations Operating in the 931 MHz Band in the Public Land Mobile Service*, Report and Order, 9 FCC Rcd 6513, 6523 (1994).

[122] *See Amendment of the Commission's Rules To Establish New Narrowband Personal Communications Services*, First Report and Order, 8 FCC Rcd 7162, 7168 (1993); *Amendment of the Commission's Rules to Establish New Personal Communications Services,* Second Report and Order, 8 FCC Rcd 7700, 7754 (1993).

not a reliable indicator of efficient channel usage and that spectrum warehousing concerns can be adequately addressed by other means.[123]

Given the substantial Commission precedent that exists favoring the elimination of channel loading requirements for geographic area licensees, and also given the Commission's express decision to refrain from imposing such obligations on M-LMS licensees, the Commission should conclude that Havens is incorrect in arguing that M-LMS licensees that do not use all of their licensed spectrum by the July 19, 2012 initial milestone deadline must return their unused spectrum to the Commission.

IX. IN LIGHT OF THE CRITICAL PUBLIC SAFETY SERVICE THAT PROGENY'S M-LMS NETWORK WILL SUPPORT, THE COMMISSION SHOULD NOT PERMIT DELAY IN THE AVAILABILITY OF ITS POSITION LOCATION SERVICE

Progeny's M-LMS network provides an attractive solution to the increasingly urgent problem of locating wireless 9-1-1 callers, particularly in challenging environments such as indoors and in dense urban areas. As the Commission is well aware, the transition in the communications industry to wireless networks has made achieving highly accurate location information for E911 simultaneously more important and more difficult. An ever increasing percentage of wireless calls are made from indoor locations, reaching estimates of as much as 58 percent of all wireless calls.[124] Progeny's goal, shared by the Commission, is to ensure that

[123] *See Amendment of the Commission's Rules To Provide Exclusivity to Qualified Private Paging Systems at 929-930 MHz*, Report and Order, 8 FCC Rcd 8318, 8327 (1993); *Amendment of the Commission's Rules to Provide for the Use of the 220-222 MHz Band by the Private Land Mobile Services*, Report and Order, 6 FCC Rcd 2356, 2367 (1991).

[124] *See* News Release, *Wireless Network Data Problems Increase as More Subscribers Use Web Applications,* J. D. Power and Associates, at 1 (March 1, 2012), *available at:* http://www.jdpower.com/content/press-release/p5rCap4/2012-u-s-wireless-network-quality-performance-study-volume-1.htm (last visited March 30, 2012).

public safety entities are able to locate these citizens in distress as accurately as possible wherever they are located. Progeny's M-LMS network can help realize this goal in a manner that meets and exceeds current industry capabilities and Commission requirements.

Since the implementation of E911, the Commission has recognized that accurate and timely location information "saves lives by helping emergency services personnel do their jobs more quickly and efficiently."[125] Although the very success of E911 location has led consumers to expect that calling 9-1-1 will provide their location to a Public Safety Answering Point (PSAP), [126] consumer groups, industry, and public safety entities recognize that current generation location accuracy often falls far short of fulfilling this expectation.[127] Furthermore, despite the Commission's conclusion in 2011 that that effective E911 operation "requires development of indoor technical solutions," indoor location has remained a challenge.[128]

The limited accuracy of existing location technologies is exacerbated in challenging areas such as urban canyons and indoors, where current technologies require significant time to locate

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[125] *See Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket No. 94-102, Report and Order and Further Notice of Proposed Rulemaking, 11 FCC Rcd 18676, 18679 (1996) (noting that "[ALI] capability permits rapid response in situations where callers are disoriented, disabled, unable to speak, or do not know their location").

[126] Communications Security, Reliability and Interoperability Council Working Group 4C Final Report, at 29 (March 14, 2011) ("*CSRIC 4C Report*") (concluding that "unmistakably the expectation among consumers and public safety entities is that highly accurate location needs to be provided when calling 9-1-1 from any service").

[127] *See, e.g., Comments of APCO*, Docket Nos. 11-153 & 10-255, at 4 (Dec. 12, 2011); *Comments of King County E911 Program*, Docket Nos. 11-153 & 10-255, at 5 (Dec. 13, 2011); *Comments of Sprint Nextel*, Docket Nos. 11-153 & 10-255, at 12-13 (Dec. 12, 2011).

[128] *Amending the Definition of Interconnected VoIP Service in Section 9.3 of the Commission's Rules*, GN Docket No. 11-117, *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114; *E911 Requirements for IP-Enabled Service Providers*, WC Docket No. 05-196, Notice of Proposed Rulemaking, Third Report and Order, and Second Further Notice of Proposed Rulemaking, 26 FCC Rcd 10074 (2011).

a caller, if they can do so at all.[129] Too often, wireless location determination is too slow or too inaccurate to route the call properly, much less effectively dispatch public safety first responders.[130] By contrast, WAPS can provide a location fix in approximately five seconds, and can do so in most indoor environments.[131] Progeny's M-LMS network has particular value in densely populated urban settings where commercial and residential high-rises often have not only many separate addresses close together, but also a vertical dimension that current location technologies cannot effectively measure. In solving these shortfalls, Progeny will enable wireless location capability that finally meets the expectations of consumers and the needs of public safety.

Progeny's M-LMS network will provide a significant public safety benefit by extending critical location capabilities into these challenging areas and realizing the Commission's goal of ensuring that public safety entities are able to reliably, rapidly, and accurately locate citizens in distress wherever they are. Therefore the Commission should proceed expeditiously in completing its review of Progeny's test report and in granting authority to Progeny to provide its service to the public.

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[129] *CSRIC 4C Report* at 29 (finding that a time to first fix of 30 seconds or more is "excessive" for use in E911 position location).

[130] *See Comments of APCO*, Docket Nos. 11-153 & 10-255, at 6 (Dec. 12, 2011); *Comments of King County 911 Program*, Docket Nos. 11-153 & 10-255, at 3 (Dec. 13, 2011).

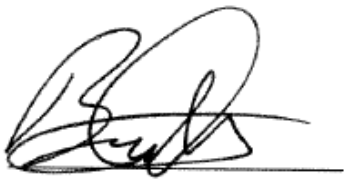
[131] *CSRIC 4C Report* at 47. Havens and his technical consultant question the position location capabilities of Progeny's WAPS service and argue that Progeny's Part 15 field test report does not provide sufficient information on the location accuracy of Progeny's service. *See Havens Comments* at 4; *Tripathi Paper* at 5-6. The stated purpose of Progeny's January 27, 2012 filing, however, was to provide a technical description of its M-LMS network and demonstrate that its network will not cause unacceptable levels of interference to Part 15 deices. Progeny's filing fully accomplished both of these obligations.

X. CONCLUSION

For the reasons provided herein, the Commission should promptly conclude that Progeny has demonstrated that its M-LMS network will not cause unacceptable levels of interference to Part 15 devices and therefore Progeny can makes its critically-needed position location service available to the public safety community, wireless carriers, and consumers.

Respectfully submitted,

PROGENY LMS, LLC

By: 

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March 30, 2012