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

In the Matter of	)	
	)	
Wireless E911 Location Accuracy Requirements	)	PS Docket No. 07-114
	)	
Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems	)	CC Docket No. 94-102
	)	
Association of Public-Safety Communications Officials-International, Inc. Request for Declaratory Ruling	)	
	)	
911 Requirements for IP-Enabled Service Providers	)	WC Docket No. 05-196

REPLY COMMENTS OF MOTOROLA, INC.

Motorola, Inc. ("Motorola") hereby submits these reply comments in response to the comments filed in the above-captioned proceedings regarding changes to the Commission's requirements for enhanced 911 ("E911") location accuracy requirements.[1] The record in this proceeding clearly demonstrates that further study is needed before the Commission modifies its current E911 location accuracy requirements.[2] Accordingly, Motorola strongly urges the Commission to establish an

[1] *See Wireless E911 Location Accuracy Requirements, Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, Association of Public-Safety Communications Officials-International, Inc. Request for Declaratory Ruling, 911 Requirements for IP-Enabled Service Providers*, Notice of Proposed Rulemaking, 22 FCC Rcd 10609 (2007) ("*Notice*").

[2] Indeed, not a single commenter opposed the establishment of an industry forum to address the wide variety of issues raised in the Notice.

industry working group to consider the issues surrounding the provision of location information and develop an achievable long-term E911 location accuracy standard. Several proposals put forth by commenters in this proceeding should be referred to this industry forum, including the inclusion of elevation information, the provision of uncertainty data to public safety answering points ("PSAPs") on a per-call basis, establishing a representative number of in-building test points that are utilized, and the provision of automatic location information by wireless VoIP providers. In addition, Motorola encourages the Commission to involve the National Institute of Standards and Technology in its deliberations on location technologies.

I. THE PROVISION OF ELEVATION INFORMATION, AS SUPPORTED BY SOME COMMENTERS, MAY NOT GIVE RELIABLE DATA IN THE ENVIRONMENTS WHERE ELEVATION IS MOST NEEDED.

Several commenters urge the Commission to include elevation information in any new standard that is adopted for E911 location accuracy.[3] For example, APCO states that "[t]he increased use of wireless phones in multiple-story buildings also requires potential inclusion of elevation information."[4] Similarly, the Texas 9-1-1 Agencies assert that "[t]he industry and vendors need to expand the envelope of technology to perhaps consider and address issues like 'elevation.'"[5]

The provision of elevation information is not an easy task. Although current GPS technology does have some ability to provide elevation data, it is heavily dependent upon obtaining clear line of sight to at least four GPS satellites, to resolve X, Y, Z, and

---

[3] *See, e.g.*, APCO Comments at 4; Texas 9-1-1 Agencies Comments at 8; Intrado Comments at 7, n.11.

[4] APCO Comments at 4.

[5] Texas 9-1-1 Agencies Comments at 8.

Time coordinates. Such clear lines of sight are often limited in urban canyons, inside buildings, tunnels, and mountainous areas. Thus, GPS-based location technologies cannot effectively provide elevation measurements in these locations.[6] Indeed, the altitude accuracy for GPS is rarely better than 25 meters and is more commonly 50 meters or greater. This level of accuracy would mean that at least 15 or more floors of a multi-story building would need to be searched by first responders. These areas, however, are where elevation information would be most useful.

In addition, elevation information cannot be accurately derived from network-based E911 location technologies at this time. This is primarily because the cellular base stations are themselves similar in height, relative to the distance to a subscriber.[7] Moreover, many carrier databases, which may store base station location data, do not store antenna height data. Redefining an existing database would lead to major operational difficulties during the transition. As a result, significant research and development will be necessary before any elevation information could be incorporated into network-based or combination location technologies.[8]

---

[6] Limiting this discussion to GPS, the World Geodetic System 1984 ("WGS84") altitude datum, which is used in virtually every GPS receiver, models the earth as an ellipsoid. Because the earth's shape is more complex, there is a separation error, and the Mean Sea Level ("MSL") difference can reach hundreds of meters. A given receiver could mitigate the error through the use of an interpolated lookup table, but in a handset that table must be of limited size. Even more difficult to achieve, the geometric position of the handset relative to the satellites in view must be favorable. The effect of poor geometries results in a poor Vertical Dilution of Precision ("VDOP"). In the best case from a VDOP point of view, there would be one satellite directly overhead, and the other (at least three) satellites would be evenly distributed in a 360 degree ring just above the handset's horizon. However, from a signal strength perspective, the satellites near the horizon will be significantly attenuated, leading to a compromised vertical accuracy.

[7] Thus the VDOP factor is even worse for network-based location technologies.

[8] In the long term, a technology that should be explored for elevation solutions is

Indeed, the commenters requesting the inclusion of elevation information acknowledge these potential difficulties. APCO indicates that elevation information should only be provided to the extent "technologically feasible."[9] The Texas 9-1-1 Agencies also provide that further information regarding how elevation information would be used by PSAPs is needed before elevation become part of any carrier requirement.[10] Thus, the Commission should not require the provision of elevation information at this time but instead should encourage further study of the need for this capability and the technology necessary to provide it.

II. PROVISION OF UNCERTAINTY DATA SHOULD BE CAREFULLY STUDIED BY THE PROPOSED E911 WORKING GROUP.

NENA requests that the Commission require wireless carriers to provide PSAPs with uncertainty data (in meters) in a uniform manner with every 911 call.[11] Providing this data with every call allegedly will assist first responders in locating 911 callers and "in determining the appropriate resources to dispatch."[12]

While NENA puts forth an interesting proposal, further study is needed to assess whether and how it could be implemented, Motorola is currently uncertain whether such

---

(Continued . . .)
the beacon location method discussed by Motorola in its initial Part III.B. Comments. However, this technology path needs much more extensive research as it may not prove to provide accuracy levels desired by public safety entities.

[9] APCO Comments at 4.

[10] Texas 9-1-1 Agencies Comments at 8 ("at the present time, while realizing the conceptual potential value of elevation, the Texas 9-1-1 Agencies would like to see more information on how 'elevation' would specifically be proposed for use in practice at the PSAP before it would be considered further to become a requirement").

[11] NENA Comments at 7-8.

[12] *Id.* at 8.

an approach is even technologically feasible. However, if it is technologically feasible, a single confidence level should be used, as suggested by NENA in its Comments.[13] Accordingly, Motorola encourages the Commission to direct the industry forum to consider and address this issue.

III. THE WEIGHTING OF IN-BUILDING TESTING NEEDS ADDITIONAL STUDY.

Many commenters indicate that location accuracy testing should reflect the real world environment in which 911 calls are made.[14] Consistent with this general position, several commenters encourage the Commission to increase the number of indoor calls that are made during compliance testing because they believe in-building calling has increased greatly. For example, TruePosition states that "compliance testing should include a much larger percentage of test calls made indoors."[15] APCO and the Texas 9-1-1 Agencies also ask the Commission to declare that 30 percent of all testing points be in-building.[16]

While Motorola agrees that in-building calling has steadily increased over the years and that testing should generally reflect real-world experiences, Motorola does not believe that it has increased so much to warrant that 30 percent (or some other large percentage) of all test points be in-building. In fact, NRIC recently modified the number of test points that should be in-building when testing for E911 location

---

[13] NENA Comments at 7 (proposing that a single confidence level be chosen and applied to every error estimate rather than individualized confidence levels be included in data transmissions to PSAPs).

[14] *See, e.g.*, NENA Comments at 8-9; Intrado Comments at 11; Rural Telecommunications Group Comments at 11.

[15] TruePosition Comments at 19.

[16] APCO Comments at 4; Texas 9-1-1 Agencies Comments at 10.

accuracy.[17] It modified the percentage, however, to 5 percent,[18] not 30 percent, thereby acknowledging that the number of indoor calls is increasing gradually (not astronomically). In determining what is the right percentage of test points for various locations, consideration should be given to the fact that a caller is more likely to know where they are if calling 911 indoors than if they are calling outdoors. In addition, commenters in this proceeding offer differing views as to how much indoor calling patterns have changed and whether the FCC should increase the number of indoor test points.[19]

Given the variety of information that has been received by the Commission on this point, the number of indoor test points that should be used should be considered by the industry forum. The forum will be able to assemble real-world data and experiences to develop a realistic vision of how the calling patterns have changed and determine whether a modification to testing procedures is necessary to take into account any such change.

IV. MOTOROLA AGREES WITH THE POTENTIAL FOR DIFFERENTIATION IN LOCATION MEASUREMENT FOR VOIP SERVICES.

Several commenters urge the Commission to allow VoIP service providers to provide varying location information based on the type of VoIP service being provided. For example, APCO states that "where an interconnected VoIP service connects to a PSAP through an IP/wireline technology, it should provide validated Master Street

---

17 *See* NRIC VII Focus Group 1A Final Report.

18 *Id.*

19 *See, e.g.*, T-Mobile Comments at 13-14 (arguing that the percentage of indoor testing should not increase); Qualcomm Comments at 5-6 (asserting that an indoor testing requirement is not necessary).

Address Guide ("MSAG") information. However, where the interconnected VoIP service connects to a PSAP through a wireless network, then the location information should be delivered in the same form as required of other wireless service providers."[20] Nsighttel Wireless and the Texas 911 Agencies put forth similar proposals.[21]

Motorola fully agrees with these commenters that VoIP IP/wireline providers should be required to provide validated MSAG information. However, Motorola seeks clarification on these commenters' proposal regarding the requirements that they believe should apply to wireless VoIP. Specifically, Motorola seeks to understand what the category of "wireless VoIP" would contain. For example, if a consumer is using WiFi in a residence, can it provide MSAG information? Or if a consumer is using WiMAX or other wide area network technologies that use VoIP technology, would the location information need to be delivered in the same form as required of other wireless service providers? How should this determination be made on a real-time basis? Given the many questions that remain unresolved, Motorola urges the Commission to defer consideration of this issue until an industry working group has had adequate time to consider all of the relevant issues surrounding the provision of location information by wireless VoIP providers.

V. THE COMMISSION SHOULD CONSIDER INVOLVING NIST IN ITS DELIBERATIONS ON LOCATION TECHNOLOGY.

The National Institute of Standards and Technology ("NIST") is a non-regulatory federal agency whose mission is "to promote U.S. innovation and industrial

---

[20] APCO Comments at 5-6.

[21] *See* Nsighttel Wireless Comments at 11; Texas 9-1-1 Agencies Comments at 12-13.

competitiveness by advancing measurement science, standards and technology in ways that enhance economic security and improve our quality of life."[22] Consistent with this overall mission, the Communications and Networking Technologies for Public Safety Project of the Advanced Network Technologies Division of NIST is designed to "facilitate the development, standardization, and deployment of modern communications, networking, and indoor localization technologies for public safety operations."[23] Specifically, this project disseminates test and evaluation results to standardization organizations and government agencies responsible for public safety and studies the interoperability of public safety communication technologies and develops mechanisms to improve interoperability.

With this significant experience in developing and testing standards and technologies, NIST could be well-positioned to investigate feasible technical capabilities for both wireless and VoIP technologies. Indeed, NIST's Communication and Networking Technologies for Public Safety already plans to develop methodologies and evaluate performance of indoor localization techniques. More specifically, this project has indicated that it intends to design and evaluate Session Initiation Protocol ("SIP") extensions for emergency communications.

To take full advantage of NIST's expertise, proponents of new location technologies should be required to provide NIST data on their proposed technology that could be used to determine the feasibility of their location claims. With this information,

---

[22] National Institute of Standards and Technology, General Information, http://www.nist.gov/public_affairs/general2.htm (last visited Sept. 7, 2007).

[23] *See* Information Technology Laboratory, Advanced Network Technologies Division, National Institute of Standards and Technology, http://w3.antd.nist.gov/pubs/ANTD-overview-FY04.pdf, at 10 (last visited Sept. 14, 2007).

NIST could evaluate the performance of emerging commercial localization techniques. Without such an evaluation process, many technology developers can be expected to make claims that individual, proprietary technologies will solve all location problems, without fully testing such technologies in the wide variety of environments in which accurate E911 location information must be provided.

VI. CONCLUSION

Accordingly, Motorola encourages the Commission to establish a working group to gather information and data on real world experiences, consider all of the issues raised herein, and ultimately develop and implement achievable 911 location accuracy standards that take into account all of these considerations.

Respectfully submitted,

By: */s/ Mary E. Brooner*

Mary E. Brooner
Senior Director, Regulatory Strategies
Motorola, Inc.
1455 Pennsylvania Avenue, NW
Washington, DC 20004
202.371.6899

Dated: September 18, 2007