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

In the Matter of	)	
	)	
Wireless E911 Location Accuracy Requirements	)	PS Docket No. 07-114
	)	
	)	
E911 Requirements for IP-Enabled Service Providers	)	WC Docket No. 05-196
	)	

REPLY COMMENTS OF POLARIS WIRELESS, INC.

Polaris Wireless, Inc. ("Polaris"),[1] through its attorneys, hereby submits these Reply Comments in response to the Federal Communications Commission's ("FCC" or "Commission") Further Notice of Proposed Rulemaking and Notice of Inquiry ("*FNPRM*" and "*NOI*") in the above-captioned proceeding.[2] As the comments from public safety groups, wireless carriers, and vendors indicate, there are many new challenges associated with E911 – and many alternative approaches to meeting the goals of the Commission. Polaris strongly supports the efforts of the Commission and stakeholders to improve E911 location accuracy and reliability, and it is encouraged by the consistency in the comments and the developing consensus on how best to address E911 challenges. Polaris also acknowledges the contributions of companies and organizations that have only recently joined the E911 discussion, and particularly welcomes innovative ideas and beneficial technologies beyond the currently available options.

While Polaris looks forward to continued innovation and technical improvement, however, more mature (*i.e.*, currently deployed) technologies should be the primary focus of new

[1] Founded in 1999, Polaris is a privately held company that has developed and commercialized a wireless location software technology for the delivery of location services, including E911 Phase II.

[2] *Wireless E911 Location Accuracy Requirements*, Further Notice of Proposed Rulemaking and Notice of Inquiry, 75 FCC Rcd 67321 (2010) ("*FNPRM*" and "*NOI*").

rules and metrics for measuring and improving E911 location accuracy. The new technologies being promoted all face significant logistical and implementation (as well as technical) challenges, and they are years away from providing additional support to currently deployed technologies.[3] Also, the veracity of performance claims and functionality cannot yet be fully assessed as most of these technologies have only been tested in limited vendor-operated trials. As commenters note, technologies are already deployed and operating that can meet existing requirements and which, when properly combined and integrated, can provide a solid foundation for continued E911 location accuracy enhancement and functionality, particularly in challenging environments.

I. READILY AVAILABLE, COST-EFFECTIVE HYBRID TECHNOLOGIES CAN SIGNIFICANTLY ENHANCE E911 LOCATION ACCURACY AND YIELD IN CHALLENGING ENVIRONMENTS.

Commenters encourage the Commission to continue its efforts to improve location accuracy across all environments by facilitating the deployment of hybrid technologies.[4] As Polaris discussed in its initial *FNPRM* comments and other filings in this proceeding, "hybrid" systems that incorporate both terrestrial technologies (*e.g.*, RFPM, UTDOA) and satellite technologies (*e.g.*, A-GPS) represent the best and only current mechanism for fully meeting the Commission's accuracy and yield goals in **all** of the environments where E911 calls might be originated.[5] Despite the continued improvements and enhancements to satellite technologies

[3] The Communications Security, Reliability and Interoperability Council ("CSRIC") Work Group 4C was reviewing the viability of certain emerging technologies. *See, e.g.*, Technical Options for E9-1-1 Location Accuracy, CSRIC Work Group 4C (Dec. 13, 2010), *at* http://www.fcc.gov/pshs/docs/csric/CRISC_December_13_2010_Readout-v2.pdf.

[4] *See, e.g.*, Comments of APCO, PS Docket No. 07-114, 2-3 (filed Jan. 19, 2011) ("APCO Comments") (stating that the Commission should consider hybrid technologies because "no single technology appears . . . to be ideal in all types of locations"); Comments of TruePosition, Inc., PS Docket No. 07-114, 20-22 (filed Jan. 19, 2011) ("TruePosition Comments").

[5] *See, e.g.*, Comments of Polaris Wireless, Inc., PS Docket No. 07-114, 3-4 (filed Jan. 19, 2011) ("Polaris Comments"); Comments of Polaris Wireless, Inc., PS Docket No. 07-114, 4-5 (filed Nov. 20, 2009).

such as A-GPS, there is no realistic expectation that these technologies will be able to *fully* address the Commission's location accuracy requirements without being combined with terrestrial-based (*i.e.*, network-based) technology.[6] Hybrid location systems with currently deployed and system-tested technologies, on the other hand, *can* realize county-level accuracy in urban areas and *can* greatly improve indoor performance.

While some "hybrid" systems might be envisioned with hardware-intensive terrestrial systems (with the associated cost and complexity), Polaris's software-based Wireless Location Signatures ("WLS") technology has been proven to provide high-accuracy location in the satellite-challenged environments of dense urban and in-building scenarios. WLS technology is based on the observation that the radio environment varies from location to location due to features such as terrain, buildings, foliage, and cellular signal coverage. Based on handset and network measurements, each set of measured values provides a radio signature that uniquely identifies a particular location. Therefore, a "hybrid" system employing commonly available A-GPS technology with a high-accuracy software-based solution such as WLS can enhance location accuracy in a cost-effective manner.[7]

Some commenters have suggested the use of "hybrid" technology *only* in environments where satellite technologies have widely accepted challenges (*e.g.*, urban environments).[8] Polaris cautions the Commission against this approach to hybridization. The goal of the *FNPRM* is to provide accurate location information and capability to **all** callers in **all** environments, and

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[6] *See, e.g.*, Comments of Andrew, a CommScope Company, PS Docket No. 07-114, 6 (filed Jan. 18, 2011) (stating that "while A-GPS is generally reliable in rural and suburban environments, it is best augmented with non-GPS-based methods in environments where A-GPS is challenged, such as in in-building and urban situations").

[7] *See, e.g.*, Polaris Comments at 6.

[8] *See, e.g.*, Comments of Commlabs, Inc., PS Docket No. 07-114, 3-4 (filed Jan. 19, 2011).

commenters have noted that satellite technologies are challenged in environments other than dense urban areas (*e.g.*, areas with heavy foliage or tree cover).[9]

Additionally, multi-story and large buildings that provide challenges to satellite technologies are certainly not restricted to dense urban environments. Thus, the only way to provide consistent accuracy and performance in all environments is to deploy hybrid technologies on a network-wide basis. When deployed in this manner and operated simultaneously, hybrid technologies will consistently provide better location yield and more accurate location estimates.[10]

Some commenters also suggest that although hybrid technologies might provide an improvement in yield, they cannot provide improved accuracy over whichever independent technology is best suited to the call environment.[11] This flawed argument seems to reflect an absence of real-world experience with developing or operating actual hybrid systems. Polaris therefore submits additional data to demonstrate the practical, real-world performance comparisons of hybrid technologies versus the individual component location technologies operating alone. As shown in the trial data below, hybridization of multiple technologies can and does provide improved location accuracy performance over either of the component

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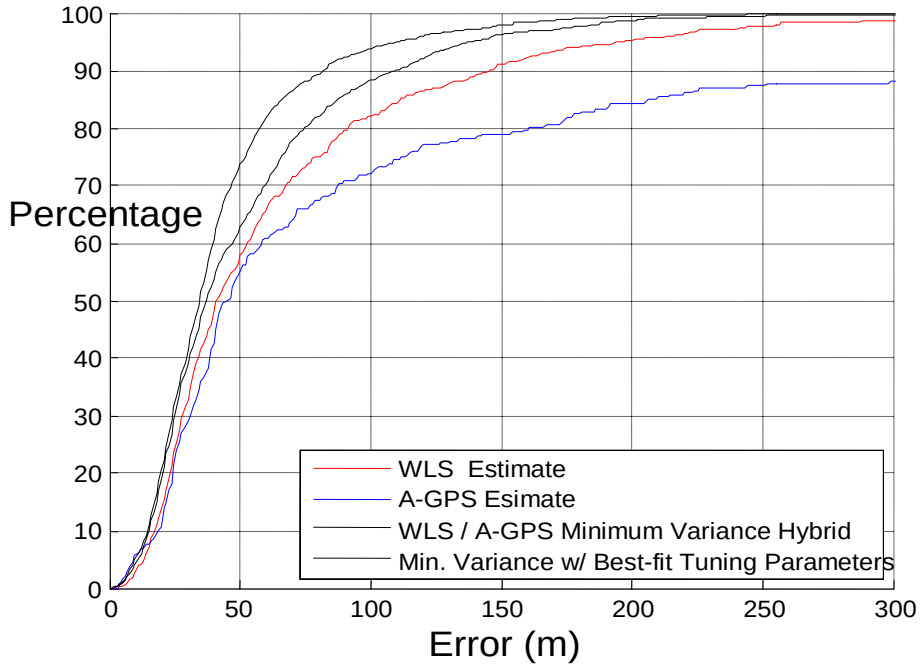
[9] *See, e.g.*, Comments of Verizon Wireless, PS Docket No. 07-114, 20 (filed July 5, 2007) (stating that in dense forest areas, "GPS satellite visibility can be poor and the ability to obtain ranging measurements for nearby cell sites can be difficult"); Comments of CTIA –The Wireless Association®, PS Docket No. 07-114, 7 (filed Jan. 19, 2011) (noting that challenges remain in environments such as rural areas with heavy forestation or mountainous terrain).

[10] *See, e.g.*, TruePosition Comments at 20-22 (stating that "[i]mplementing network-based location solutions while also deploying A-GPS handsets may not harness all the benefits of both technologies if only one or the other is used for a given emergency call); Comments of Verizon and Verizon Wireless, PS Docket No. 07-114, 2 (filed Jan. 19, 2011) ("Verizon Comments") (describing Verizon Wireless's hybrid deployments).

[11] *See* Comments of T-Mobile USA, Inc, PS Docket No. 07-114, 19 (filed Jan. 19, 2011) ("T-Mobile Comments"); Comments of Motorola Mobility, Inc. and Motorola Solutions, Inc., PS Docket No. 07-114, 6-7 (filed Jan. 19, 2011) ("Motorola Comments").

technologies operating alone, in addition to yield improvements. Polaris has significant experience in the hybridization of location technologies and can supply additional field data regarding the improvements associated with hybridization. In Polaris's experience, the level of integration of the component technologies will have a direct impact on the potential accuracy improvements of hybridization.

To the extent that the Commission imposes hybrid requirements, it should avoid defining hybrid systems in a manner that "risks hamstringing companies [and] preventing them from using the technology that works best for them."[12] An example of a simple and universally acceptable definition of hybrid technology would be "any system that deploys both a satellite-based component and a terrestrial (network)-based component, working in cooperation." The specific technologies could then be adopted by carriers to best suit the needs and capabilities of their individual networks.



Data Gathered in Field Trial of Hybrid WLS/A-GPS System in an Urban Market

[12] T-Mobile Comments at 19.

Commenters also agree with Polaris that the adoption of a single location accuracy standard would be premature at this time.[13] As Polaris has previously stated, it may be appropriate to implement a single location accuracy standard in the future, but only if applied in the context of a hybrid solution requirement.[14] Companies currently advocating a single accuracy standard may still be under the mistaken impression that satellite-based handset solutions will be able to fully meet the needs of the Commission (with some assumed future enhancements).[15]

Given the general consensus around the benefits and need for hybrid location systems, the Commission should consider seeking input for a specific hybrid implementation timeline. Some commenters have proposed adherence to a single technology solution along with a "wait and see" attitude, but this would delay the implementation of hybrid technologies, along with the associated benefits, for as long as eight years. Polaris cautions the Commission that delaying the migration to hybrid technologies will have a deleterious effect on E911 location accuracy, safety, and technical innovation.

II. MANY COMMENTERS HIGHLIGHT THE BENEFITS OF INDOOR TESTING AND REPORTING REQUIREMENTS.

In its comments, Polaris discussed the need to address testing and reporting requirements for the ever-increasing portion of wireless emergency calls that are made indoors.[16] Commenters

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[13] Comments of Sprint Nextel Corporation, PS Docket No. 07-114, 4 (filed Jan. 19, 2011) ("Sprint Nextel Comments"); Comments of the Telecommunications Industry Association, PS Docket No. 07-114, 5-6 (filed Jan. 19, 2011); Comments of AT&T Inc., PS Docket No. 07-114, 5-7 (filed Jan. 19, 2011) ("AT&T Comments").

[14] *See* Polaris Comments at 5; *see also* Comments of Qualcomm Incorporated, PS Docket No. 07-114, 15 (filed Jan. 19, 2011) ("Qualcomm Comments") (stating that the Commission "may be able to implement a single location accuracy standard" as 3G and 4G-capable networks "become ubiquitous").

[15] *See* Verizon Comments at 3-4; Comments of Intrado Inc. and Intrado Communications Inc., PS Docket No. 07-114, 5 (filed Jan. 19, 2011).

[16] Polaris Comments at 6-7.

generally agree. Certainly, the public safety groups who are ultimately responsible to citizens are clear in their statements that indoor testing is "essential";[17] and that there may be a "need for new indoor/outdoor testing to more accurately reflect consumer trends in the use of mobile devices."[18]

Polaris acknowledges the challenges engendered by the need for indoor testing.[19] These issues notwithstanding, indoor testing is both feasible and increasingly critical to public safety. Polaris agrees with other commenters that the best way to approach indoor testing would be the establishment of a new E911 Technical Advisory Group to assist with developing appropriate indoor testing and reporting requirements and a testing schedule.[20]

III. COMMENTERS AGREE THAT IT WOULD BE PREMATURE FOR THE COMMISSION TO ADOPT VERTICAL LOCATION ACCURACY REQUIREMENTS.

Commenters generally agree with Polaris that it is too early to adopt vertical location requirements.[21] Indeed, even public safety groups have stated that "providing effective vertical location data for CMRS-based calls is a future objective, not a present-day reality."[22] However, as Polaris stated in its comments, the Commission should facilitate the development of vertical location technologies, including through workshops and other stakeholder groups.[23] Polaris is actively working to enable vertical location with its own technology and is aware of work by

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[17] APCO Comments at 4.

[18] Comments of the National Emergency Number Association, PS Docket No. 07-114, 8 (filed Jan. 19, 2011) ("NENA Comments").

[19] T-Mobile Comments at 21-23; AT&T Comments at 9-10; Comments of the Alliance for Telecommunications Industry Solutions, PS Docket No. 07-114, 8 (filed Jan. 19, 2011) ("ATIS Comments").

[20] AT&T Comments at 9-11.

[21] T-Mobile Comments at 20-21; Motorola Comments at 8-9; ATIS Comments at 9.

[22] APCO Comments at 5.

[23] Polaris Comments at 8-9.

other vendors in this area as well. Thus, the Commission should encourage the voluntary delivery of Z-axis information to PSAPs to leverage this additional information in the earliest timeframe possible.[24] Polaris emphasizes, however, that early implementations of vertical location technologies will be fraught with challenges and must be well-coordinated among the stakeholders noted above.

IV. THERE ARE BENEFITS TO A UNIFORM TESTING METHODOLOGY AND TESTING INTERVAL.

Some common understanding of testing specifics and goals and general agreement around testing methodology and frequency is necessary to provide an optimal solution for public safety. Polaris recognizes that many commenters have concerns about the existing OET Bulletin 71 as a guideline for compliance testing.[25] However, a mutually agreeable methodology must be established for testing, and a specific testing interval should be adopted as a baseline (NENA suggested five years[26]). Also, Polaris agrees with commenters that as the technologies that drive location capability and accuracy improve and as system implementation architectures evolve (*e.g.*, hybrid systems), the Commission should consider adopting rules for a periodic review of its location accuracy requirements.[27]

V. CONCLUSION

Polaris applauds the Commission for its continued attention and efforts in improving the capabilities of emergency service location technologies and in driving continued innovation and development. These actions serve to improve the safety and security of our citizens and help

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[24] *See* NENA Comments at 11-12.

[25] Sprint Nextel Comments at 7; Qualcomm Comments at 13; *see also* Verizon Comments at 13 (opposing the codification of OET Bulletin No. 71 into rules).

[26] NENA Comments at 9-10.

[27] *See id.* at 3-4.

maintain the technical leadership of the United States in this area. Polaris is encouraged to see that there is an emerging consensus among commenters around certain aspects of the E911 location accuracy rules and the technologies used to support them. It is optimistic that this consensus will grow as more and more stakeholders gain experience with the operation of the various technologies, both in unilateral operation and in tandem (hybrid). The Commission therefore should establish a timeline for hybridization, work with industry groups regarding requiring indoor testing and facilitating vertical location information, and consider establishing a mutually agreeable testing methodology and testing interval.

Respectfully submitted,

POLARIS WIRELESS, INC.

By: /s/ *Michele C. Farquhar*

Norman Shaw
Executive Director, Regulatory Affairs
Martin J. Feuerstein, Ph.D.
Chief Technical Officer
Manlio Allegra
Chief Executive Officer
Polaris Wireless, Inc.
5201 Great America Parkway
Suite 440
Santa Clara, CA 95054

Michele C. Farquhar
Mark W. Brennan
Hogan Lovells US LLP
555 Thirteenth Street, NW
Washington, DC 20004
Telephone: (202) 637-5663
Email: michele.farquhar@hoganlovells.com

Its Attorneys

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