

**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 POLARIS WIRELESS, INC.

Polaris Wireless, Inc. (Polaris), through its attorneys, hereby submits its Reply Comments in response to the Federal Communications Commission’s Notice of Proposed Rulemaking in the above-captioned proceeding.¹ Polaris has reviewed the comments filed in response to the NPRM and desires to elaborate on a couple of points raised by other parties. First, while it is far from certain that Phase II location and accuracy compliance at the public safety answering point (PSAP) level is achievable in all cases for all carriers, it is clear that overall accuracy and consistency can be improved beyond currently deployed levels. In the short-term, the industry should focus on improving performance in recurrent problem areas while working to create long-

¹ See *Wireless E911 Location Accuracy Requirements*, PS Docket 07-114, *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*, CC Docket No. 94-102, *911 Requirements for IP-Enabled Service Providers*, WC Docket No. 05-196, Notice of Proposed Rulemaking, FCC 07-108 (rel. Jun. 1, 2007) (“NPRM”).

term technical solutions for less prevalent scenarios. Second, despite the statements of some commenters, multiple technology methods already exist for the network component of hybrid systems. Pattern-matching technologies, such as Polaris's Wireless Location Signatures (WLS) product, represent viable and effective network-based components of hybrid systems. Time-difference-of-arrival methods (*e.g.*, U-TDOA and AFLT) are not the only network-based systems that can be combined with handset-based technologies to form a hybrid solution.

About Polaris. Polaris is a privately held company that was founded in 1999. Polaris has developed and commercialized a wireless location technology for the delivery of location services, including E911 Phase II public safety applications. Polaris's software products have been deployed extensively since 2003 by ten U.S. wireless carriers to meet their E911 Phase II emergency call location requirements and enhance their customers' safety.

Polaris's WLS technology has several key advantages over other technology alternatives: no modifications are required in the handset, as opposed to GPS/A-GPS technologies; and the location algorithms are implemented on a standard computer server, which requires no hardware additions to the base stations, as opposed to other network-based technologies such as U-TDOA (uplink time-difference-of-arrival) or AOA (angle-of-arrival) that require new radio hardware. In addition, the WLS system achieves high accuracy and reliability results due to its reliance on measurements that are made as a part of normal wireless network operations. Moreover, the initial investment to provide an E911 solution with WLS is a fraction of that required by alternate technologies, and deployment times are significantly faster than what is necessary to install new radio network equipment or to replace the installed base of wireless handsets in the marketplace.

While it is far from certain that PSAP-level compliance is achievable in all cases for all carriers, it is clear that overall accuracy and consistency can be improved beyond current levels. As noted in Polaris’s prior comments, due to the fact that currently deployed E911 Phase II location technologies cannot practically and economically meet the Commission’s goal of compliance at the PSAP level in some cases, it will take time for wireless carriers to bring new technologies, such as hybrid approaches, to bear on the problem at hand. There are numerous, considerable challenges that wireless carriers still must overcome to achieve PSAP-level accuracy in their networks, including those faced by network-based technologies in sparse rural areas and handset-based technologies in dense urban and indoor areas. Therefore, imposing a new E911 Phase II mandate alone will not solve the technical or funding challenges, which represent the difficult, practical issues in this proceeding.²

Several parties commented on the wide array of challenges presented in the diverse PSAPs across this country.³ For example, the problems with handset-based technologies in dense urban areas and network-based technologies in sparse rural areas have been known for some time. However, some commenters also mentioned the opposite (and perhaps counter-intuitive) problems: difficulties for handset-based technologies in specific rural scenarios (*e.g.*, within dense forests and inside metal constructed buildings)⁴ and network-based technologies in particular urban areas.⁵ Polaris shares these commenters’ concerns about the varied difficulties encountered across different PSAP environments. Any rules resulting from the NPRM, however, should strive to realize quickly and efficiently the potential improvements that are most readily available, such as those for handset-based technologies in dense urban areas and network-based technologies in sparse rural areas. Simply stated, the industry should focus first and foremost on

² See Comments of Polaris Wireless, Inc., PS Docket No. 07-114, at 3-4 (filed Jul. 5, 2007) (“Polaris Comments”).

³ See, *e.g.*, Sprint Nextel Comments, PS Docket No. 07-114, at 3-6, 8-14 (filed Jul. 5, 2007); Comments of Verizon Wireless, PS Docket No. 07-114, at 14-22 (filed Jul. 5, 2007) (“Verizon Wireless Comments”).

⁴ See Verizon Wireless Comments at 17-20; Comments of QUALCOMM Incorporated, PS Docket No. 07-114, at 5-6 (filed Jul. 5, 2007).

⁵ See Comments of King County E911 Program, PS Docket No. 07-114, at 5-8 (filed Jul. 5, 2007).

the “low hanging fruit.” It may take longer for the industry to create technical solutions for the other, perhaps less prevalent, problems, such as those encountered by handset-based technologies in specific rural scenarios and network-based technologies in particular urban areas.

Polaris looks forward to a much-needed discussion regarding practical methods of capitalizing on achievable location accuracy improvements, even if in the short term the industry does not reach the goal of all carriers achieving compliance at the PSAP level for each and every PSAP. As discussed in Polaris’s comments, an industry and public safety stakeholders’ forum would be the best way to direct these efforts to prioritize both short-term and long-term improvements. It could also facilitate the development of appropriate testing (and test data-sharing) methods.⁶

These points about the differences between short-term and long-term improvements also serve to reinforce Polaris’s prior observations that the geographic compliance area and deferred enforcement questions raised by the Commission in Section III.A of the *NPRM* are inextricably linked to the underlying location technology, accuracy standards, and test methodology lines of inquiry contained in Section III.B.⁷ It would be extremely difficult and inefficient for wireless carriers to deal with new compliance and testing standards without simultaneously understanding the short-term and long-term roadmaps ahead for technologies, accuracy standards, and testing. Such an approach would likely lead to considerable delays and economic inefficiencies in achieving the Commission’s E911 goals.

Multiple technology methods already exist for the network component of hybrid systems. Time-difference-of-arrival systems, such as U-TDOA and AFLT technologies, are not the only network-based methods that are deployed and available for use in a hybrid system. In its filing, Verizon Wireless mentions that “almost every [radio frequency] location finding

⁶ Polaris Comments at 8.

⁷ *Id.* at 4-5.

technique is based on TDOA technology, which uses the time difference of arrival to estimate the time of propagation for a signal and to calculate the range.”⁸ Although many radio frequency location-finding techniques are based on TDOA technology, some are not. Pattern-matching technologies, such as Polaris’s WLS product, base their location estimation on the signal strengths or signal-to-interference ratios (possibly in combination with time delay information) and have key advantages over TDOA systems. For example, as Verizon noted for TDOA methods, “. . . multipath signals that reflect off of buildings or other obstructions bias ground-based ranging measurements, by introducing time delays as the signals bounce around, negatively impacting accuracy measurements.”⁹ Pattern-matching methods such as WLS, on the other hand, can take advantage of the signal variations in multipath environments, effectively using shadows and reflections to improve rather than degrade accuracy.

TruePosition also claims that “. . . no hybrid approach other than a combination of U-TDOA and A-GPS will produce the [Commission’s] desired result.”¹⁰ Polaris disagrees. Pattern-matching technologies, such as Polaris’s WLS method, can produce the desired accuracy and consistency results with potential advantages in performance, without the cost and complexity of U-TDOA. Both U-TDOA and WLS are network-based technologies with accuracies that depend on cell tower (base station) densities and geometries, so they typically perform best in high cell density scenarios. TDOA methods, such as U-TDOA, depend on direct line-of-sight propagation from the base stations to the handsets to estimate the differences in times-of-flight. This means that they can be affected by obstructions that block or shadow the line-of-sight paths, such as buildings in urban scenarios. On the other hand, pattern-matching technologies can take advantage of the shadowing effects to improve accuracy (rather than be degraded by them). As Professor Henry Bertoni, a noted radiowave propagation researcher at

⁸ Verizon Wireless Comments at 19.

⁹ *Id.*

¹⁰ TruePosition Comments at 5.

Polytechnic University, observed for pattern-matching location-signature approaches (using the terminology Power Signature), “[a]nother urban location technology gaining attention is known as the Power Signature (PS) method. . . . Power signatures contain information about the shadowing of the signals by the buildings surrounding the mobile. To the extent that this shadowing is unique to each mobile location the shadowing information can serve to locate the mobile.”¹¹ Therefore, both WLS and U-TDOA represent viable and relevant network-based approaches for combining with handset-based methods in a hybrid combination to produce the desired result.

Many carriers face unique scenarios with existing and new air interfaces, legacy location technologies, and handset feature availability; therefore, it is important that the Commission consider the full range of alternatives for the network-based and handset-based components of hybrid systems.

Respectfully submitted,

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¹¹ See “Simulation of Location Accuracies Obtainable from Different Methods,” H. L. Bertoni and J. W. Suh, Institute for Electrical and Electronics Engineers 62nd Vehicular Technology Conference (Sept. 25-28, 2005), Proceedings Volume 4 at 2196-2200.