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ATTORNEYS AT LAW

September 7, 2007

Ms. Marlene Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: *In the Matter of Wireless E911 Location Accuracy Requirements, PS*
Docket No. 07-114, *911 Requirements for IP-Enabled Service Providers,*
WC Docket No. 05-196

Dear Ms. Dortch

Attached please find for the record the Declaration of John F. Pottle and Ryan N. Jensen in support of T-Mobile's Comments and Reply Comments filed in response to both Parts III.A and III.B of the NPRM.

Sincerely,


John T. Nakahata
Counsel to T-Mobile USA, Inc.

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

In the Matter of

Wireless E911 Location Accuracy
Requirements

911 Requirements for IP-Enabled Service
Providers

PS Docket No. 07-114

WC Docket No. 05-196

DECLARATION OF JOHN F. POTTLE AND RYAN N. JENSEN

Declarants hereby state as follows, under penalty of perjury:

1. My name is John F. Pottle. I am the Director of National Systems Engineering, Engineering Services for T-Mobile USA, Inc. (T-Mobile). I have been employed at T-Mobile for 13 years. I have 27 years experience as an electrical engineer and manager in the wireless industry, the last nine of which have been involved in the development and deployment of location technologies and E911 systems. I manage several functional areas within T-Mobile including the teams responsible for deployment and maintenance of E911 services, complying with mandated PSAP request timelines, assurance of Phase 2 location accuracy performance, and PSAP technical support. I am also responsible for formulating T-Mobile's technology roadmap for E911 services and ongoing assurance that T-Mobile systems and networks continue to meet requirements for E911 as the network grows and new technologies are introduced. In this capacity, I have direct and personal knowledge regarding T-Mobile's E911 location technology and deployments, and of the accuracy issues presented in this proceeding.

2. My name is Ryan N. Jensen. I am a Member of the Technical Staff, National Systems Engineering for T-Mobile. I have been employed at T-Mobile for 16 years, with nine of those years spent in the research, development, deployment and analysis of the performance of various location technologies for mobile phones. I have 24 years experience as an electrical engineer, hold a Masters of Science in Electrical Engineering, and have been issued 22 U.S. Patents. I am responsible for investigating potential new location technologies for T-Mobile, and for E911 performance and accuracy compliance methodology and testing within T-Mobile. I have participated extensively in the Emergency Services Interconnection Forum since its inception, including working on the development of ESIF's Technical Reports on Accuracy Testing, Maintenance Testing, and Functional/End-to-End Testing for wireless E911. In this capacity, I have direct and personal knowledge regarding T-Mobile's E911 location technology and deployments, and of the accuracy issues presented in this proceeding.

3. This declaration is intended to support the Comments and Reply Comments filed by T-Mobile in the Federal Communications Commission's proceeding in PS Docket 07-114, both with respect to Part III.A and III.B of the Notice of Proposed Rulemaking issued therein.¹ We are familiar with the technical aspects of the comments filed in this docket. Specifically, we support the conclusion that PSAP-level compliance with the FCC's accuracy standards is not technically feasible in all PSAPs now or in the

¹ Comments of T-Mobile USA, Inc., PS Docket No. 07-114 (filed July 5, 2007) ("*T-Mobile Part III.A Comments*"); Reply Comments of T-Mobile USA, Inc., PS Docket No. 07-114 (filed July 11, 2007) ("*T-Mobile Part III.A Reply Comments*"); T-Mobile USA, Inc., Comments on Section III.B of the Wireless E911 Location Accuracy NPRM, PS Docket No. 07-114 (filed Aug. 20, 2007) ("*T-Mobile Part III.B Comments*").

foreseeable future. As such, Rule 20.18(h), codified at 47 C.F.R. 20.18(h), should not be amended to specify compliance within the PSAPs' boundaries.

4. T-Mobile has deployed a network-based Uplink-Time Difference of Arrival (U-TDOA) solution. This solution has several advantages, not the least of which is that it allows T-Mobile to provide a Phase 2 location estimate for all wireless handsets in the deployed area, including all roamers, even when the caller is not using a location-capable handset. This technology is also currently the most robust solution for estimating the location of a caller in an urban setting or an indoor caller, although we hasten to point out that locating callers indoors is extremely challenging with any technology.

5. T-Mobile's comments and reply comments in this docket accurately describe the capabilities and challenges faced in estimating location using U-TDOA, some of which are discussed further below. U-TDOA is not capable of delivering location estimates within the accuracy requirements of Rule 20.18(h) at 100 percent of PSAPs even if LMUs are placed on every cell site where doing so would make a material difference. In our experience, while both parts of the network-based accuracy requirements can be challenging to meet in some settings, it is the requirement that a caller's location be estimated within 300 meters for 95 percent of calls that is typically the most difficult to achieve.

6. U-TDOA varies in performance depending on the RF environment and topography. Although U-TDOA produces results that are within the FCC's accuracy standards in most cases, some environments and topologies are particularly challenging for the technology. U-TDOA, like any triangulation solution, works only when the

handset's signal can be received by at least three cell sites. In some rural and isolated areas that have only a few, widely-dispersed cell sites, there simply will not be enough measurements to perform a triangulation. In addition to highways or similar areas with "string of pearls" cell site configurations, areas where handsets may encounter difficulty in connecting with at least three cell sites include sparsely populated areas with only one or two cell sites, coverage area edges, and wooded, mountainous and other challenging terrain. This can also occur at the edges of the network areas. Similarly, indoor environments can be challenging because the building structure may itself limit the number of cell sites that can receive the handset's signals, and reflections from walls can cause RF multipath issues that make it more difficult to accurately determine the correct time of arrival measurement.

7. There is no technology solution or combination of technology solutions of which we are aware that can be predicted to deliver location estimates within the Rule 20.18(h) accuracy requirements at 100 percent of PSAPs using existing cell sites. This assessment includes consideration of the U-TDOA, Assisted Global Positioning System (A-GPS), and Angle-of-Arrival (AOA) technologies that have been discussed by some commenters in this docket, whether considered alone or in combination. In fact, a combined solution of U-TDOA and AOA only recently became available in a pre-production environment. As far as we are aware, no vendor has yet created or tested, let alone deployed, a hybrid of U-TDOA and A-GPS.

8. A "hybrid" U-TDOA/A-GPS solution is not the sure route to a unified accuracy standard that can be met at the PSAP level in all cases. Notably, A-GPS is not always strong where U-TDOA is weak and vice versa. Thus, we agree with Qualcomm's

statement that “it would be inaccurate to say that the accuracy requirements can be met on a PSAP-by-PSAP basis merely by the deployment of hybrid solutions.”² Not only do both technologies have areas where they are strong and weak, in some cases both technologies have difficulties in the same locations:

- A handset located at the bottom of a rural canyon or in a wooded area both may not be able to receive enough satellites to determine a GPS location estimate, and may not be able to get a well triangulated network-based location estimate because cell sites may be widely dispersed or have a “string-of-pearls” configuration.
- In dense urban settings, the handset may not be able to receive enough satellites for a GPS location estimate. At the same time, the handset may not be able to be received by enough cell sites (because some cell sites, although relatively nearby, may be blocked by buildings or other structures) or multipath issues may introduce greater error into the network triangulation calculations.
- Similarly, indoor environments present challenges to both technological solutions because of limited or reduced visibility of satellites and cell sites and associated multipath issues. A handset served by a single pico cell, for example, may see no other cell sites, and would most likely be out of view of the GPS satellites.

9. It is also our current expectation that AOA combined with U-TDOA would not improve location accuracy estimates enough to meet PSAP-level accuracy in many instances, including areas where the handset signal is being received by fewer than three cell sites. In addition, AOA accuracy degrades with increased distance from the cell site. Where the degradation is most evident is in the same areas that U-TDOA accuracy is most challenged (*e.g.*, rural areas and highways). Furthermore, AOA requires additional and larger antennas than U-TDOA. The addition of these antennas would present significant challenges in obtaining necessary permitting approvals to place these antennas on cell towers, and would, even when approved, make the installation and space

² Comments of Qualcomm Inc., PS Docket No. 07-114 at 7 (filed July 5, 2007).

rental for these antennas much more difficult and costly due, among other things, to the increased weight and wind load factors involved.

10. Building additional cell sites for location estimation purposes only is not a feasible way to comply with Rule 20.18(h). Although in theory further accuracy might be gained by building sites solely to create additional time of arrival monitoring points (*i.e.*, not because the additional sites are needed to support the provision of the underlying service), this is not a practical or an economically viable option. Because the costs of building and operating additional sites are substantial, we think it highly likely that in order to comply with a requirement to meet Rule 20.18(h) accuracy parameters at the PSAP-level we would have to turn off – or not deploy – service in many locations where Rule 20.18(h) cannot be met. In addition, the costs of building and operating these location-only sites would detract from the ability to build and operate sites that would enhance coverage and/or service, with the associated safety benefits for consumers from such enhanced coverage and/or service. Given the limitations of U-TDOA technology, this factor comes into play most acutely in underserved rural areas, where the economic case for entry by new carriers already is the most challenging. Thus, the Commission’s new rules could have an unintended consequence of less coverage, less competition, and less ability to use mobile 911 and E911 in rural areas.

11. In addition to the cost of building and operating new location-only cell sites, in some instances, it will not be possible to build such sites given geographic and other constraints on tower siting. Moreover, even in areas where additional tower deployments otherwise would be technically feasible, some local jurisdictions have

opposed new sites (the “Not In My Back Yard” phenomenon) even if they understand that they could improve E911 performance.

12. We have reviewed TruePosition’s comments in which TruePosition states that it could develop the network support software for a hybrid U-TDOA/A-GPS solution within 18 months.³ That estimate – which appears to be highly optimistic – does not, in any manner or form, include the time needed to standardize such an approach, manufacture equipment and chipsets, put them into handsets and cell sites for testing purposes, complete the testing, make adjustments to software and algorithms, optimize and validate PSAP-level accuracy performance capability, manufacture the equipment and chips for commercial distribution, add them to handsets and deploy required equipment throughout the network, and introduce the new handsets into the carriers’ lineups. T-Mobile’s Part III.B Comments correctly outline a realistic timeframe to complete these steps, which would likely take five or more years to complete before volume handset production incorporating the new hybrid capability could commence.⁴ The process of achieving a 95 percent penetration into the subscriber base would then start, likely taking at least five years from the start of volume production, and possibly more, as recently seen with the CDMA carriers. Furthermore, as stated above, since no vendor that we are aware of, including TruePosition, has built or tested such a hybrid location system, there is no evidence this approach would satisfy the Rule 20.18(h) accuracy requirements.

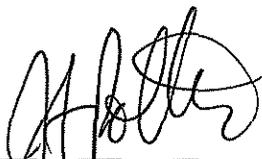
13. The lack of certainty and definition as to what constitutes a PSAP for compliance purposes under the proposed rule, and the likelihood that PSAP boundaries

³ Comments of TruePosition, Inc., PS Docket No. 07-114 at 10 (filed Aug. 20, 2007).

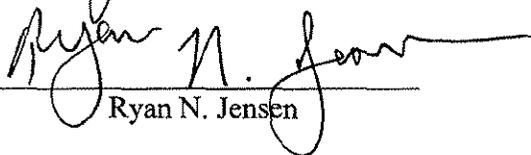
⁴ *T-Mobile Part III.B Comments* at 17-20.

will continue to regularly change, further makes it impossible, from a practical standpoint, to comply with Rule 20.18(h) at the PSAP-level. Furthermore, from our extensive experience with empirical accuracy testing, it would be extremely logistically challenging, time-consuming, and costly for carriers and potentially PSAPs to test in each and every PSAP, including on-going maintenance testing, further rendering compliance with Rule 20.18(h) impracticable at the PSAP-level. Effective evaluation of compliance with the 95 percent accuracy requirement with the 90 percent confidence level specified by OET Bulletin 71 can require hundreds of observations.⁵

14. In addition, the Commission is also considering whether to change testing requirements in Part III.B of the NPRM to, for example, require testing at a greater percentage of indoor locations than is currently specified under the Network Reliability and Interoperability Council Focus Group 1A recommendations. Changes to these testing requirements, such as by specifying a higher percentage of indoor locations, would add to the technical infeasibility of PSAP-level compliance with Rule 20.18(h) by a date certain.



John F. Pottle



Ryan N. Jensen

Executed on September 7, 2007

⁵ See OET Bulletin 71 at 7.