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

In the Matter of	)	
	)	
Revision of the Commission's	)	CC Docket No. 94-102
Rules To Ensure Compatibility	)	
With Enhanced 911 Emergency	)	
Calling Systems	)	

T-MOBILE USA, INC.
OCTOBER 2002 SEMI-ANNUAL REPORT ON
E911 PHASE II IMPLEMENTATION PLAN

(CORRECTED)

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T-MOBILE USA, INC.
FIFTH SEMI-ANNUAL REPORT ON
E911 PHASE II IMPLEMENTATION PLAN

T-Mobile USA, Inc. ("T-Mobile"), formerly known as VoiceStream Wireless Corporation ("VoiceStream"),[1] pursuant to the *Fourth Memorandum Opinion and Order* issued in this proceeding,[2] submits this Fifth Semi-Annual Report regarding its deployment of Enhanced 911 ("E911"), including Network Software Solution ("NSS") and Enhanced Observed Time Difference ("E-OTD") technologies.

I. SUMMARY

T-Mobile continues to make substantial progress in its development and deployment of its Phase II E911 solutions. Since its last report in April 2002, T-Mobile successfully installed Phase II NSS in all its switches nationwide, completing this installation on or before July 31,

[1] T-Mobile USA, Inc. including both the former VoiceStream and Powertel, Inc. ("Powertel"), is the sixth largest national wireless provider in the U.S., with licenses covering over 96 percent of the U.S. population and currently serving over eight million customers. T-Mobile and Powertel are wholly-owned subsidiaries of Deutsche Telekom, AG and are part of its T-Mobile wireless division. Both T-Mobile and Powertel are, however, operated together and are referred to in this request as "T-Mobile." (References to previous filings will preserve the "VoiceStream" designation.)

[2] *See Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Fourth Memorandum Opinion and Order, 15 FCC Rcd 17442, 17464 (¶ 67) (2000) ("*Fourth Memorandum Opinion & Order*").

2002, as T-Mobile had proposed in its *Amended Request for Limited Modification*.[3] T-Mobile has completed Phase II PSAP deployments based on NSS to five PSAPs (including the entire state of Rhode Island) thus far, with further deployments anticipated soon.

Also consistent with its *Amended Request for Limited Modification*, T-Mobile approved its first E-OTD capable handset for commercial distribution on August 16, 2002. This handset is now being sold in T-Mobile stores in Rhode Island, the St. Louis, Missouri area, and Houston and Dallas, Texas. T-Mobile will also soon make this handset available from its website. Subsequent shipments of E-OTD capable handsets will not be geographically limited in availability. T-Mobile anticipates that it will approve at least three more handset models, including two high volume/low tier models over the next six months, and is confident that it can meet its proposed benchmark of having 50 percent of new handset activations after February 28, 2003 be for E-OTD capable handsets.

T-Mobile is in the process of conducting First Office Applications ("FOAs") of the E-OTD solution for its Ericsson and Nortel infrastructures in Rhode Island and Denton County, Texas, respectively. Working with other GSM carriers, T-Mobile has agreed to allow Nokia to focus its E-OTD efforts on AT&T Wireless' system in Portland, Oregon. Once that installation is completed, T-Mobile will proceed with completing its Harris County, Texas deployment, and other Nokia systems for which PSAPs have made valid Phase II requests.

The accuracy results from the E-OTD deployments are very encouraging, with Nortel already meeting Commission requirements over its core area. The wider area of Nortel's deployment, covering over 450 square kilometers, is performing at 104 meters and, once edge

[3] VoiceStream Wireless Corporation Amended Request for Limited Modification of E911 Phase II Implementation Plan, CC Docket No. 94-102 (filed Feb. 28, 2002). ("*Amended Request for Limited Modification*"). As T-Mobile described therein, portions of the New York and Philadelphia MTAs require an NSS interworking solution that will be available by the end of 2002. *See also, infra*, p. 13.

effects are eliminated, appears likely to meet Commission requirements. Additional improvements are to be tested over the coming weeks, which will further improve the Nortel system performance.

Performance in the Ericsson test bed in Hayward, California, is also showing performance levels that meet Commission requirement for Motorola and Nokia handsets. Performance issues still exist in Nokia's test bed in Portland and in Ericsson's implementation in Rhode Island. In addition, some handset models show performance issues that need to be addressed.

In addition, handset and infrastructure vendors have committed to working cooperatively and intensely on E-OTD and have expressed their belief that E-OTD can ultimately meet the Commission's performance requirement as evidenced by written statements appended to this report. *See* Appendices A & B.

Because of delays in the final development of E-OTD solutions across all its infrastructures and because of continued delays in LEC ALI database upgrades, among other factors, T-Mobile no longer anticipates that it will complete deployment by December 31, 2002 for all PSAPs that had made valid Phase II requests on or before June 30, 2002. T-Mobile is currently assessing the time needed to complete the FOAs and the projected completion of LEC ALI database upgrades, and anticipates that it will file a further modification to its *Amended Request for Limited Modification* in the near future.

II. BACKGROUND

In a series of orders since 1996, the Commission has sought to improve the quality and reliability of 911 emergency services for users of interconnected wireless telephones by regulating the availability of basic 911 services and the implementation of E911 services. The

implementation of E911 services was split into two phases. Under Phase I, as of April 1, 1998, or within six months of a valid request by the designated PSAP, whichever is later, wireless carriers must provide the telephone number of the originator of a 911 call and the location of the cell site or base station receiving the call to the PSAP through the use of Automatic Number Identification ("ANI") and Pseudo-ANI.[4] Under Phase II, carriers are required to provide the PSAP with the latitude and longitude of a handset making a 911 call.[5]

T-Mobile (via acquisition of Aerial Communications, Inc. ("Aerial")) began to focus on the development of E-OTD as an Automatic Location Identification ("ALI") solution for GSM in early 1999, when it became apparent that no other solution would likely satisfy the Commission's requirements for ALI for the GSM air interface. T-Mobile (through the acquisition of Aerial as well as the acquisition of Omnipoint Corporation) had participated in GSM standards development for ALI since 1998. One of T-Mobile's infrastructure vendors, Nokia, also began focusing in earnest on E-OTD in 1999. T-Mobile and one of its location technology partners, Cambridge Positioning Systems ("CPS"), conducted field tests in early 2000 to demonstrate that E-OTD was a solution *potentially* capable of meeting the Commission's regulatory requirements, including the fifty-meter handset accuracy requirement that the Commission announced in October 1999.[6] Over the last several years, T-Mobile has been the leading carrier in the development of Phase II location technology for the GSM air interface.

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[4] 47 C.F.R. § 20.18(d)(1). When the number is not available, the carrier need only deliver the 911 call and available calling party information to the PSAP. 47 C.F.R. § 20.18(d)(2).

[5] 47 C.F.R. § 20.18(e).

[6] *Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Third Report and Order, 14 FCC Rcd. 17388, 17392 (¶ 9) (1999) ("*Third Report and Order*").

The Commission recognized that development of ALI solutions for the GSM air interface lagged development for CDMA platforms, because GSM has held only a small portion of the U.S. market. Just two years ago, the Commission found that although GSM "is the standard air interface in most countries worldwide, GSM is used by carriers serving only a small percentage of U.S. wireless subscribers" and "there is evidence to suggest that the development of ALI capabilities for use by GSM carriers has lagged behind that for carriers using other interfaces that are more widely used in the United States, such as AMPS, CDMA, and TDMA."[7] At that time, T-Mobile was the only nationwide or near-nationwide carrier fully utilizing GSM, and T-Mobile served only 3.5 percent of national subscribership in 2000 (and substantially less than 1 percent of the global subscribership). It is therefore not surprising that manufacturers dedicated greater resources to other solutions.[8] GSM today is still used by only a fraction of the U.S. market, although Cingular Wireless and AT&T Wireless have stated they will overlay their networks with GSM going forward.

A. Waiver & Conditions

In September 2000, the Commission approved T-Mobile's plan to adopt a hybrid network/handset-based solution for meeting its Phase II obligations.[9] This plan had two components. First: the implementation of a network-based NSS solution covering all network users, to be accurate within 1000 meters. Second: the introduction of E-OTD-capable handsets combined with an upgrade of network infrastructure technology, based upon requests from PSAPs, in order to use E-OTD to provide more precise estimates of the location of the 911

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[7] *Fourth Memorandum Report & Order,* 15 FCC Rcd at 17461-62 (¶ 56).

[8] T-Mobile currently has over 8 million subscribers, out of a total of over 137 million nationwide. This renders it the sixth in size, following Verizon Wireless (30 million), Cingular Wireless (22 million), AT&T Wireless (20 million), Sprint PCS (15 million) and Nextel (10 million).

[9] *Fourth Memorandum Opinion & Order,* 15 FCC Rcd at 17461-64 (¶¶ 55-68).

caller. T-Mobile was concerned that its E-OTD solution would not immediately meet the requirements for handset-based solutions. Based on these concerns, T-Mobile sought a waiver of Section 20.18(h). T-Mobile requested that the Commission impose the network-based standard, rather than the more stringent handset-based standard, on its E-OTD system for the first two years of handset activations (*i.e.*, requiring the E-OTD system to be accurate to 100 meters 67 percent of the time and 300 meters 95 percent of the time), and stated that it would deploy NSS throughout its coverage area without need for a PSAP request.

The Commission granted the waiver in September 2000. Scrutinizing technological development to date, the Commission recognized that, as the only major U.S. carrier then committed to a GSM platform, T-Mobile "faced special circumstances."[10] The Commission found that the "NSS/E-OTD approach may be the only method available to GSM carriers for compliance with Phase II for some time."[11]

The Commission imposed several conditions on the waiver. With respect to NSS, the Commission imposed an accuracy requirement of 1000 meters, or better, for 67 percent of calls, and required that NSS deployment be completed by December 31, 2001.[12] With respect to E-OTD, the Commission required that T-Mobile achieve 95 percent penetration of ALI-capable handsets among its subscribers no later than December 31, 2005, the same date as required of carriers using other air interfaces.[13] The Commission also required that all new E-OTD handsets activated on or after October 1, 2003, comply with an accuracy requirement of 50 meters for 67

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[10] *Id.* at 17461-2 (¶ 56).

[11] *Id.*

[12] *Id.* at 17463 (¶ 61).

[13] *Id.* at 17464 (¶ 66).

percent of calls, and 150 meters for 95 percent of calls.[14] The standard was relaxed for the first two years of deployment to an accuracy level of 100 meters, 67 percent of the time and 300 meters, 95 percent of the time.[15]

A set of waiver requirements was keyed to the Commission's expectation that carriers would begin Phase II service by October 1, 2001. The Commission's rules require T-Mobile, like other carriers, in the absence of a waiver to implement the necessary network or infrastructure upgrades and begin providing Phase II location information by October 1, 2001, or within six months of a PSAP request, whichever is later. They also require carriers to begin selling ALI-capable handsets by October 1, 2001, so that they would be available to consumers when the first PSAPs could receive and use Phase II information. Pursuant to its waiver, however, T-Mobile was required to ensure that 50 percent of its handsets newly activated as of October 1, 2001, and 100 percent by March 31, 2002, are ALI capable-requirements greater than those imposed by rule.[16]

B. Request for Limited Modification

Although T-Mobile worked diligently since its waiver was issued in September 2000, the challenges of developing, procuring, testing and implementing both NSS and E-OTD proved to be more difficult and time consuming than T-Mobile had initially anticipated. T-Mobile updated the Commission with respect to these difficulties in July 2001,[17] and in its October 2001 Semi-

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[14] *Id.* (¶ 64).

[15] *Id.* at 17463 (¶ 63).

[16] *Id.* at 17463 (¶ 62). The general rule for handset-based solutions requires the following: introduction of one entry-level handset with ALI capability by October 1, 2001; 25 percent of handset activations with ALI capability by December 31, 2001; 50 percent of activations by June 30, 2002; and 100 percent of activations by December 31, 2002. 47 C.F.R. § 20.18(g)(1).

[17] *Ex Parte* Presentation of VoiceStream Wireless, CC Docket No. 94-102 (filed Jul. 6, 2001).

Annual Report, which provided details on its revised deployment plans.[18] Finally, on December 21, 2001, T-Mobile filed a request for modification of its waiver to reflect the fact that NSS infrastructure equipment was not anticipated to be ready for commercial deployment prior to the December 31, 2001 deadline, E-OTD infrastructure equipment was not anticipated to be ready for commercial deployment until spring of 2002, and E-OTD handsets could not be tested and approved for commercial distribution until a live E-OTD network was operating using actual commercial equipment.[19] Subsequently, on February 28, 2002, T-Mobile amended its request for modification of its waiver to reflect a further intervening delay with respect to critical infrastructure software and to address technical issues caused by a unique configuration of network equipment in portions of the Philadelphia and New York MTAs.[20] T-Mobile's proposed modifications would make the following specific, focused and limited modifications to the deployment benchmarks set in September 2000:

- T-Mobile will deploy NSS throughout its network, without necessity for a PSAP request, by July 31, 2002 (except for those portions of the New York and Philadelphia MTAs that currently are being served by a combination of Nortel Base Station Controller ("BSC") and Ericsson Mobile Switching Center ("MSC") equipment); in those portions of the New York and Philadelphia, T-Mobile will deploy NSS by December 31, 2002, without necessity for a PSAP request;

- By December 31, 2002, T-Mobile will implement E-OTD for all valid PSAP requests pending as of June 30, 2002, and, after June 30, 2002, will satisfy valid PSAP requests for Phase II service within six months of receipt, in full compliance with Commission rules; and

- By September 1, 2002, T-Mobile will approve at least one model of E-OTD handsets for commercial distribution. T-Mobile will ensure that 50 percent of new handsets

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[18] Third Semi-Annual Report of VoiceStream Wireless Corporation on Its E911 Implementation Plan, CC Docket No. 94-102 (filed Oct. 1, 2002) ("*Third Semi-Annual Report*").

[19] VoiceStream Wireless Corporation Request for Limited Modification of E911 Phase II Implementation Plan, CC Docket No. 94-102 (filed Dec. 21, 2001).

[20] *Amended Request for Limited Modification* at 19.

> activated after February 28, 2003, and 100 percent of new handsets activated after June 30, 2003, will be E-OTD capable.[21]

T-Mobile did not request any other changes to the interim waiver benchmarks in its *Amended Request for Limited Modification*.

Although T-Mobile's *Amended Request for Limited Modification* of its September 2000 waiver remains pending, because T-Mobile's proposed deployment dates are the most instructive (and non-discriminatory) yardstick against which to compare T-Mobile's progress toward implementing Phase II E911 requirements, we will report compliance with respect to those proposed deployment benchmarks.[22]

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[21] *Id*. at 3.

[22] It would be wholly arbitrary and capricious for the Commission to refuse to grant VoiceStream's request for modification of its waiver. Many of the proposed modifications are identical to conditions of a waiver already granted to Cingular for the GSM portions of its networks. There is no basis for treating one GSM carrier differently than another GSM carrier when both are implementing the same technical solutions, and the delays stem from platform-wide technical issues. Moreover, the Commission cannot impose technologically or economically infeasible requirements without Congress enacting a specific, technology-forcing statute. *Compare Bunker Hill Co. v. EPA*, 572 F.2d 1286, 1293-1301 (1977) (reversing and remanding EPA Clean Air Act regulations because "the EPA cannot require … technology that is technologically and economically infeasible") *with Edison Electric Institute, et al. v. EPA*, 996 F.2d 326, 335-336 (D.C. 1993) (upholding EPA Resource Conservation and Recovery Act regulations "even though it may have been impossible" for companies to comply where Congress spoke directly to the precise question at issue in "a highly prescriptive, technology-forcing statute" intended to be "draconian"). In this case, Congress has enacted no such statute requiring wireless carriers to meet the E911 Phase II benchmarks set by the Commission regardless of technical or economic feasibility. Instead, the Commission has relied principally on its general regulatory authority under section 303(r) of the Communications Act in its adopting E911 rules. Needless to say, Congress's basic grant of regulatory power in 1934 did not mandate the adoption of the E911 benchmarks or even its final deadlines. In the *Fourth Memorandum Opinion & Order*, the Commission again cited its authority under section 303(r) and asserted that Congress had ratified the Commission's E911 decisions by enacting the 1999 Wireless Communications and Public Safety Act. *Fourth Memorandum Opinion & Order*, 15 FCC Rcd at 17445 (¶ 6). The Wireless Communications and Public Safety Act, however, merely directs the FCC to "encourage and support" E911 development. 47 U.S.C. § 615. Moreover, in that Act, Congress expressly disclaimed any intent to authorize the Commission to adopt a technology-forcing regulation, stating that "[n]othing in this subsection shall be construed to authorize or require the Commission to impose obligations or costs on any person." *Id.* Thus, any assertion that the Commission can enforce its E911 Phase II benchmarks regardless of technological or economic infeasibility would not survive judicial review.

III. PHASE II E911 DEPLOYMENT

Over the last six months, T-Mobile has continued to move its advanced hybrid network/handset solution from engineering theory to operational reality. T-Mobile has completed deployment of its NSS "safety net" location capability in switches throughout its network and has activated NSS-based Phase II service to five PSAPs, with more deployments underway. With respect to Phase II E-OTD service, T-Mobile is now conducting FOAs for its Ericsson and Nortel systems, and is participating in joint GSM carrier development of E-OTD test networks for Nortel, Nokia, Ericsson and Siemens infrastructure. Reflecting the heightened level of carrier and equipment vendor cooperation presently in place, T-Mobile has allowed Nokia to focus its development efforts on the Portland, Oregon test area with AT&T Wireless. This increased cooperation was seen as the fastest way by the industry to meet Commission's E911 requirements. Once Nokia is satisfied that it has completed the software development in Portland, T-Mobile will complete an abbreviated FOA in its own network with Nokia. In the meantime, T-Mobile's installation of Location Measurement Units ("LMUs"), antennas and other supportive equipment has been progressing in the Seattle, Washington, and Harris County, Texas, Nokia markets in anticipation of Nokia completing its development activities.

E-OTD capable handsets are also now being sold to the public, with initial sales targeted to those markets in which E-OTD capability is first expected to be deployed. Nonetheless, developing and testing this complex system, which requires coordination among multiple parties and technologies, has been and continues to be an iterative process. Because many components, both in the network and in handsets, must work together seamlessly, delays in the development and delivery of key network software or hardware, as well as delays in LEC upgrades to ALI databases, have cascaded through the entire deployment plan.

A. Description of T-Mobile's NSS/E-OTD Network Infrastructure

The NSS and E-OTD Phase II solutions use the same basic data delivery infrastructure. In order to implement both NSS and E-OTD, new software is required in two major elements of T-Mobile's existing network, the Mobile Switching Center ("MSC"), which provides the systems switching functions, and the Base Station Controller ("BSC"), which provides the control and supervisory functions for the base stations. In addition to software upgrades for existing MSCs and BSCs, both NSS and E-OTD require the addition of two entirely new network elements, the Serving Mobile Location Center ("SMLC") and the Gateway Mobile Location Center ("GMLC"). The SMLC performs location calculations for both NSS and E-OTD. The SMLC captures data from the handset and the relevant network elements (MSC, BSC, and LMU) and computes positional information during E911 calls. The GMLC acts as the interface between T-Mobile's network and the PSAPs. It initially triggers the request for positional information from the SMLC and subsequently presents the calculated latitude/longitude location to the PSAP.

For E-OTD, the SMLC must be upgraded beyond the level necessary to provide NSS and a new piece of equipment, the LMU must be ready for deployment. The LMU is a small measurement receiver located at each base station to measure the relative time differences among base stations.[23] Delays in providing any of the basic elements necessary for NSS, or in providing an upgraded SMLC or the LMU, delay deployment of E-OTD.

[23] When a signal from at least three base stations is received by an E-OTD capable handset and the LMU, the time differences between arrival of the signal from each base station at the handset and at the LMUs at each base station are calculated. The time difference between transmissions from the base stations to the handset and between the base stations themselves are then combined with the coordinates of the base stations to produce intersecting hyperbolic lines from which the location of the handset is estimated.

As a legacy of the merger of four different companies (*i.e.*, Aerial, Omnipoint, Powertel, and VoiceStream), each with unique infrastructure configurations, T-Mobile's network infrastructure is comprised of equipment from three different manufacturers—Ericsson, Nortel, and Nokia. Each manufacturer must independently develop different MSC, BSC, SMLC and LMU hardware and software upgrades for use with its own existing equipment. Generally, hardware components and software upgrades developed by one manufacturer cannot be ported to the corresponding equipment of another manufacturer.

B. Network Infrastructure Equipment Testing and Deployment

T-Mobile has followed the same testing and deployment process for its E911 capability as for all other new features and functionalities introduced into its wireless networks. First, equipment was shipped to T-Mobile's laboratory, where it was subjected to preliminary tests. After preliminary testing was completed, the equipment was deployed in a test market (First Office Application or "FOA"), which is a commercial field installation where the actual commercial-grade equipment can be evaluated and tested. Once the FOA has been completed for the relevant system (NSS or E-OTD), T-Mobile begins full-scale deployment throughout its network. This testing and deployment process is complete for NSS switch deployments, and continues with the E-OTD FOA and deployments today.

C. Phase II NSS Deployment

T-Mobile met its Phase II NSS deployment benchmarks as proposed in its *Amended Request for Limited Modification*. With the limited exception of previously specified areas that operate with a combination of a Nortel BSC and an Ericsson MSC, T-Mobile generally deployed the NSS capability in all of its switches nationwide on or before July 31, 2002, without regard to

whether the PSAP had made a request.[24] (During the software rollout, two Nokia BSCs in the Houston, Texas, and Tucson, Arizona, markets were found to have hardware problems unrelated to the NSS functionality, but subsequently were unable to complete the S10 software upgrade. Both these individual BSCs were corrected and made available for NSS functionality as of August 2, 2002.)

T-Mobile has moved its Phase II NSS into full scale deployment with PSAPs and is deploying where interconnection with the PSAP allows. Currently interconnectivity is available via Verizon, Sprint and PSAPs that operate standalone systems. T-Mobile has already turned up full NSS-based Phase II service in Clay, Starke, Kosciuzko and Adams Counties, IN, and statewide in Rhode Island. T-Mobile continues to anticipate that NSS will be deployed in its switches in the areas that currently operate a combination of Nortel and Ericsson equipment by the end of December 2002.

T-Mobile is pleased to report that its NSS system is meeting the 1000 meter accuracy standard on a nationwide basis, as required in the Commission's *Fourth Memorandum Opinion and Order.*

D. Phase II E-OTD Development and Deployment

1. Handsets

On August 16, 2002, ahead of T-Mobile's proposed deadline of September 1, 2002, T-Mobile approved its first E-OTD handset, the Samsung R225, for commercial distribution. These handsets are now available for purchase in T-Mobile stores in the St. Louis, Missouri, Rhode Island and Houston and Dallas, Texas areas. (T-Mobile is also planning to make these

[24] The portion of the Washington DC MTA (western Virginia) previously served by a combination of Nortel BSC and Ericsson MSC equipment has been converted entirely to Ericsson infrastructure, and now also has NSS capability deployed in the switch.

handsets available soon from its website.) T-Mobile targeted initial sales of these handsets in order to direct the limited initial quantities to the markets where they would be most useful. With subsequent shipments of handsets, these geographic restrictions on distribution will be removed.

T-Mobile anticipates that over the next six months it will approve at least three more models of E-OTD capable handsets for commercial distribution, two of which are low-tier, high volume handsets, and one of which is a mid-tier handset. T-Mobile remains confident that it can meet the deadline proposed in its Amended Modification that 50 percent of new handset activations after February 28, 2003 will be E-OTD capable. As T-Mobile previously explained to the Commission, it may be difficult to achieve a literal 100 percent new activation rate by June 30, 2003.[25] This is due to some amount of legacy product residing in, for example, dealer warehouses, as well as a very small number of high-end, specialized data terminals (such as PDAs or computer cards) that may not be E-OTD capable by June 2003. T-Mobile expects to have 100 percent of its general market handset activations E-OTD capable by June 30, 2003.

2. E-OTD FOAs

a. Nortel (Denton, TX)

T-Mobile's FOA of an E-OTD solution for its Nortel infrastructure is currently ongoing in Denton County, Texas. The test area is primarily suburban in nature, and encompasses 22 cell sites equipped with LMUs and approximately 160 square kilometers. The first round of system optimization has been completed and accuracy testing has shown the performance to be 95.7 meters for 67 percent of calls, and 208 meters for 95 percent of calls using T-Mobile's current commercially-approved Samsung R225 handset. Results for the test area using both the

[25] Letter of John T. Nakahata, Counsel to VoiceStream, to Marlene Dortch, Secretary, FCC, dated July 18, 2002, CC Docket No. 94-102 at 2.

Samsung R225 and the Nokia 3390 are 99.8 meters for 67 percent of calls and 194 meters for 95 percent of calls. Yield in the test area (percentage of positionings made with E-OTD) is at 99.7 percent. Performance over a much wider area of 450 square kilometers is currently at 104 meters for 67 percent of calls using the Samsung handset (107 meters for 67 percent of calls using both Nokia and Samsung handsets combined), but this area involves measurements from 88 additional sites that do not currently have LMUs installed. This creates edge effects that will not be present in a full deployment. Nortel has been able to achieve these results without several major enhancing features activated, including extended averaging time, use of GPS and absolute time measurements at the LMU, and assistance data at the handset. These additional features will be tested over the next several weeks, and should also improve accuracy.

b. Ericsson (Rhode Island)

T-Mobile's FOA of E-OTD for its Ericsson infrastructure is currently ongoing in Rhode Island. At this point, virtually all equipment has been installed (a few sites still await completion of leasing negotiation), trunks have been put in place, and connectivity with the Rhode Island PSAP's ALI database has been established. The E-OTD FOA is being conducted in and around the city of Providence, encompassing 29 cell sites equipped with LMUs covering about 28 square kilometers. The first round of system optimization has been completed and extensive testing at 83 test locations shows that the T-Mobile's commercially approved Samsung R225 handset is performing at 128 meters for 67 percent of calls and 315 meters for 95 percent of calls. Yield is 94 percent of measurements. Ericsson's equipment shows significant problems in terms of LMU stability and base station timing accuracy, which are influencing the accuracy of the system. Ericsson is aware of the problems and is undertaking corrective action, which should improve accuracy.

c. Nokia (Harris County, TX)

In Harris County, although Nokia is still developing and tuning the software algorithms, T-Mobile has started the hardware installation and installed antennas on 278 out of 298 sites (20 rooftop sites are still under lease amendment negotiation). 150 LMUs are currently installed, and a cluster of 30 LMUs were activated to allow commissioning tests to begin on September 24, 2002.

With respect to the E-OTD rollout in Nokia markets generally, development is progressing, and T-Mobile is now working very closely with the Cingular and AT&T Wireless GSM teams as well as the infrastructure and handset vendors to accelerate final testing and deployment. Following agreement in August 2002 between these groups, the focus on testing and developing E-OTD for Nokia GSM markets has moved to Portland, Oregon. T-Mobile agreed to allow Nokia to focus its development effort on the AT&T Wireless network in Portland, Oregon, so that E-OTD handsets and infrastructure would be available more quickly to all three GSM operators than if each had continued to stretch resources across three separate FOAs. Once the testing has been completed in Portland, and Nokia has determined that its products are ready for wide scale deployment, T-Mobile will move to completing deployment in the Houston market and progressing from there. T-Mobile is also currently working on deploying Phase II E-OTD technology for Nokia systems in St. Clair, IL.

d. Other Field Trials

Cingular Wireless and Ericsson have been conducting a joint field trial of E-OTD in Hayward, California, and have been sharing the results with the other operators and vendors. The latest results from the Hayward trial system, based on a 150 point test, shows E-OTD achieving 90 meters for 67 percent of calls and 243 meters for 95 percent of calls using the

Motorola V60 handset. Performance using three different Motorola and Nokia handsets was 94.7 meters for 67 percent of calls and 268 meters for 95 percent of calls. The Sony/Ericsson handset results appeared out of line with the Motorola and Nokia results, and thus were excluded.

AT&T Wireless and Nokia have also been conducting a joint trial of E-OTD in Portland, Oregon. The Portland test area utilizes 29 LMUs in a rural/suburban setting and has been operational since June. Accuracy results were derived from 12 points within the trial area (50 measurements taken per test point) using the Nokia 8390 handset. The latest released data (August 16, 2002) from this trial shows accuracy at 131 meters for 67 percent of calls and 315 meters for 95 percent of calls.

Once the E-OTD FOA tests progress successfully, T-Mobile will proceed with E-OTD rollout on a PSAP-by-PSAP basis, working with APCO's Project LOCATE Guidelines.[26] As T-Mobile has always cautioned, even after nationwide deployment of E-OTD begins, there may still be location specific roadblocks to full E-OTD deployment. E-OTD deployment currently requires placing a small second antenna on towers to capture incoming positioning signals for the LMU. In some instances, adding these small (7 inch) antennas requires either landlord or zoning approval. In at least one instance (Salt Lake City), a locality has denied T-Mobile the zoning authorization necessary to implement E-OTD. T-Mobile is working with that locality to try to educate them and address their concerns, but until this situation is addressed, E-OTD cannot be implemented in that locality. T-Mobile has encountered other instances that suggest the zoning/permitting process could pose delays for E-OTD rollout.

[26] See Part III.E below for a discussion of PSAP requests and readiness.

e. E-OTD Compliance with Accuracy Requirements

Based on the field trial results, T-Mobile remains confident that E-OTD will meet the Commission's standards of 100 meters for 67 percent of calls and 300 meters for 95 percent of calls for the 2002 deployments, and can improve in accuracy to meet the 50/150 meter requirement during 2003. Results for some vendors are still disappointing but point to implementation and equipment errors rather than fundamental weaknesses in the E-OTD technology. Both infrastructure and handset vendors are working diligently to improve the accuracy of the systems. All vendors have presented ideas for improvements that should help make the 50 meter target realizable. These improvements will be needed in both the handset and infrastructure and will require continued cooperation within the industry. Although the test results obtained to date are extremely encouraging, delays in the development of the technology or a reduction in the commitment of the vendors may affect the date at which the 50-meter target will be met. T-Mobile continues to strive to achieve that benchmark by October 2003, but the compression of time between initial commercial deployment and October 2003 adds further to the technical feasibility challenges posed by the Commission's Phase II E911 rules.

As described previously, T-Mobile and the other GSM operators, together with their vendors and technology providers, are cooperating to an unprecedented extent in the conduct of field trials of E-OTD and sharing lessons learned. Handset and infrastructure vendors have furnished the GSM operators separate statements of their commitment to working collaboratively and of their belief that E-OTD can ultimately meet the Commission's 2003 accuracy requirements.[27]

[27] See Appendix A (Infrastructure Vendor Statement) and Appendix B (Handset Vendor Statement).

T-Mobile continues to monitor industry trials of E-OTD and other Phase II technologies, and to evaluate its plans accordingly. At this point, however, T-Mobile continues to believe that E-OTD represents the quickest path to a full compliance with the Commission's Phase II requirements for GSM.

E. PSAP Phase II Requests and Deployments

There are a total of 2400 PSAPs in T-Mobile's current service area. Excluding requests from PSAPs outside its service area,[28] 286 PSAPs have requested Phase II service, representing about 11.9 percent of the PSAPs within T-Mobile's coverage area. In accordance with Section 20.18(j) of the Commission's rules, as amended by the *Richardson Order*,[29] T-Mobile has requested PSAP documentation that demonstrates its Phase II readiness from all but four PSAPs.[30] To date, only 15 PSAPs from which T-Mobile requested *Richardson* documentation provided complete documentation that they are capable of receiving and utilizing the data elements associated with the service. T-Mobile has suggested to the Association of Public Safety Communications Officials ("APCO") and the National Emergency Number Association ("NENA") that they work together to create guidance on documentation that PSAPs can provide to meet the *Richardson* verification requirements. T-Mobile also submitted this issue to the Emergency Services Interconnection Forum ("ESIF"). An ESIF study group is currently developing a simplified process by which a PSAP can easily verify its Phase II readiness using the *Richardson* guidelines. It would be helpful, for example, if PSAP equipment vendors could develop a standard vendor letter verifying Phase II customer premises equipment readiness,

---

[28] T-Mobile has received 9 requests for Phase II service from PSAPs outside its coverage area.

[29] *Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, Petition of City of Richardson, Texas*, Order, FCC 01-293, 16 FCC Rcd 18982 (2001) ("*Richardson Order*").

[30] T-Mobile is treating four PSAPs as if they have met *Richardson* requirements, although it reserves the right to investigate whether these PSAPs in fact have met *Richardson*.

which those vendors could then provide to the PSAPs. Similarly, it would be helpful if local exchange carriers ("LECs") and other major PSAP vendors could develop such letters so that the verification process can proceed quickly, accurately and smoothly. The following table summarizes PSAP requests for Phase II E911 service received by T-Mobile.

Table 4 – Phase II PSAP Requests

Total PSAPs in Coverage Area	2400
Requesting PSAPs in Coverage Area	286
Percentage of Requesting PSAPs in Coverage Area	11.9%
Requesting PSAPs Out of Coverage Area	9
In-Area PSAPs Verified as Ready for Phase II or Treated as If Verified	19
In-Area PSAPs on Hold at PSAP Request	12
In-Area Unverified PSAPs	267

T-Mobile is participating in wireless forums organized by APCO and NENA and is communicating directly with PSAPs in order to keep them apprised of T-Mobile's plans and to suggest improvements to the Phase II request process. In the fourth quarter of 2001 and again in the first quarter of 2002, T-Mobile sent letters to all PSAPs that have requested Phase II service to keep them informed of its progress in implementing Phase II.

T-Mobile has also taken steps in-house to facilitate E911 deployment at the PSAP level. It sent a orientation team to its major markets, concentrating on those with valid Phase II requests, to brief its personnel on the details of its Phase II deployment plan and its policies

regarding E911 implementation. Upon receiving a valid E911 request from a PSAP, T-Mobile's policy is to provide the PSAP with site data so that routing determinations and ALI database upgrades can be done at the earliest opportunity and implementation delays avoided

T-Mobile has also purchased equipment to enable the J-STD-036 E-2 interface for PSAPs to get Phase II location data after call set up and to update the handset location during the E911 call, if needed and if the PSAP is equipped to do so.

Like other wireless carriers, T-Mobile is also encountering implementation delays caused by LEC delays in upgrading ALI databases and in making those upgraded databases available.[31] T-Mobile cannot implement Phase II NSS service for PSAPs for which LECs have not made necessary database upgrades. Similarly, once E-OTD FOAs are available, T-Mobile will not be able to deliver Phase II service to those PSAPs until LECs have completed necessary database upgrades. In addition, T-Mobile has had difficulty completing ALI database connectivity with a number of LECs (including SBC's Ameritech region, Qwest, and BellSouth), as those LECs had been using obsolete X.25 connections, and T-Mobile's GMLC uses IP connections. T-Mobile expects this last ALI database IP connectivity issue (which also affects Phase I NCAS deployments) to be resolved in the near future.

T-Mobile completed deployment of NSS capability in its switches by July 31, 2002, and has now implemented a full Phase II NSS solution to five PSAPs. T-Mobile will be continuing to implement NSS for other PSAPs that desire the NSS solution. However, delays caused by LEC failures to complete ALI database upgrades, ALI database connectivity issues, the continuing impact of earlier delays in the delivery of network infrastructure equipment, and time

[31] Letter of John T. Scott, III, Vice President & Deputy General Counsel Regulatory Law, Verizon Wireless to Marlene H. Dortch, Secretary, FCC, dated August 19, 2002, at 8-9; Letter of Luisa L. Lancetti, Vice President Regulatory Affairs – PCS, Sprint to Marlene H. Dortch, Secretary, FCC, dated September 9, 2002, at 2; Letter of Christopher R. Day, CTIA, dated September 17, 2002, at Attachment p. 4.

needed to complete current FOAs, and, for Nokia systems to complete development, all lead T-Mobile to the conclusion that it will not complete E-OTD deployment by December 31, 2002, for those PSAPs that requested Phase II service on or before June 30, 2002. T-Mobile is currently evaluating its deployment schedule in light of these developments, and will file a further amendment to its *Amended Request for Limited Modification* in the near future.

IV. CONCLUSION

T-Mobile continues to make strong progress in implementing Phase II E911.

Respectfully submitted,

T-MOBILE USA, INC.

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Legislative and Regulatory Affairs

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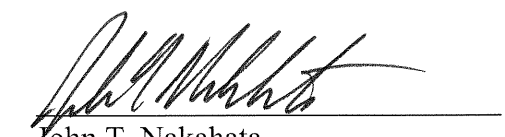

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Counsel to T-Mobile USA, Inc.

Appendix A

JOINT EOTD INDUSTRY GROUP STATEMENT

July 25, 2002

- A Joint EOTD Industry Group has been created where technical information regarding EOTD is openly shared among the members and where an end-to-end approach is taken involving infrastructure, terminals and network design.
- Based on the recent and newly shared EOTD Field Trial results and the areas that have already been identified for improvements, the Joint EOTD Industry Group believes that the EOTD community, with focused efforts from infrastructure vendors, terminal vendors and carriers, should meet the FCC's 2003 requirements. Specific test results and areas for improvement are described in Exhibit 1.
- Improvements selected by the Joint EOTD Industry Group will focus on eliminating the need for additional cell sites.
- The Joint EOTD Industry Group is fully committed to providing products and services capable of achieving the E911 FCC mandates
- The Joint EOTD Industry Group will work in close alignment with the EOTD Handset Taskforce.

CAMBRIDGE POSITIONING SYSTEMS

For
By: Chris Wade
Title: CEO

John Barbor
Chief Commercial Officer
& Director

ERICSSON INC.

By: Angel Ruiz
Title: President & CEO

NORTEL NETWORKS

By: Vivian Hudson
Title: President & GM, GSM/GPRS

NOKIA NETWORKS

By: Tim Eckersley
Title: Senior Vice President

SIEMENS

By: Berndt Baumgarti
Title: President & CEO, ICM Siemens LLC

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Title: President & CEO, ICM Siemens LLC

EXHIBIT 1

Test Results

New test results show significant improvements, which demonstrate that the E-OTD infrastructure is already capable of supporting performance approaching FCC 2003 requirements

Several vendors have reported E-OTD performance results that exceed the FCC 2002 requirements and approach the 2003 requirements:

- First field trial measurements at 70-100 m performance at 67% in a non-tuned and non-optimized system (PSAP Area 1)
- 62 m at 67% and 118 m at 95% (PSAP Area 2)
- 68 m at 67% and 118 m at 95% with 97% Success Rate (PSAP Area 3, Handset 1)
- 69 m at 67% and 75 m at 95% (PSAP Area 3, Handset 2)
- Lab test results with simulated RF environment: 21 m at 67% and 38 m at 95%
- Initial evaluation by technical experts suggest live environment inaccuracy may be reduced up to an additional 20 m with planned handset and SMLC algorithm development activities.

Action Plan:

- **Working Item 1: EOTD Inaccuracy Contribution/Framework**

  Feature: Empirical and analytical evaluation of inaccuracy results to identify primary error sources (i.e. multi-path, network synchronization, handset performance, etc). A "budget" of inaccuracy contributions is established and reduction targets for each "budget" item are defined. "Budget" becomes tool for managing performance improvement. Technical resources attack error sources based upon inaccuracy contribution.

  Benefit: Structures and focuses development on FCC 2003 objectives. Provides ready-made measure of progress.

- **Working Item 2: Sharing of Field Trials and Experiences**

  Feature: Accelerated learning environment where all vendors gain knowledge from different environments and techniques to improve performance of the live environment.

Benefit: Establishes common "Best of the Best Practices" and shortens new product evaluation times.

- **Working Item 3: Network Deployment and Optimization**

  Feature: Establish best practices for network build-out and methods for getting the most out of the existing network design. Data is analyzed to identify and quantify observed error sources. Joint EOTD Industry activities are targeted at reducing observed error sources.

  Benefit: Reduces network contribution to inaccuracy and bridges design/development to live environment performance.

- **Working Item 4: Use Base Stations from all Carriers**

  Feature: Analysis has indicated FCC 2003 performance in properly planned areas with high cell densities is possible. High cell densities reduce error due to multi-path because path lengths are shorter. Additional multi-path improvements may be possible by processing multiple co-located but different carrier frequencies. Joint E-OTD Industry Group to investigate the feasibility of this concept and report to carriers.

  Benefit: Provides additional degree of freedom for reducing multi-path error and reduces/eliminates the need for adding cell sites.

- **Working Item 5: Acceptance and "Prime Site" Set-Up**

  Feature: Establish standard test procedures, test environments, and acceptance methods to facilitate performance comparisons and stabilization of results. Prime Site lessons learned and best practices quickly distributed to other operational E-OTD networks. Recommend and control HW/SW configurations for all operators.

  Benefit: Minimize time for FCC 2003 to be realized across all deployments.

- **Working Item 6: Standardization Issues**

  Feature: Ensure that algorithm developments in either handsets or infrastructure are compatible and interoperable across all infrastructure platforms. Establish best validation test methods demonstrating compliance that aligns with published FCC requirements.

  Benefit: All E-OTD networks measured against same FCC accepted standard. E-OTD performance is assured across infrastructure and handsets.

Action Plan Focus Areas

Network Design and Performance: BA-List Optimization, Multi-Path Mitigation, Tool Development, Inter Carrier Base Station Sharing

Handset Performance: Signal/Noise Improvement, Multi-Path Mitigation, Assistance Data Handling, BCCH Scanning Algorithms

E-OTD Infrastructure: Integrate different positioning methods, Tune Algorithms (SMLC, LMU, MS), Assistance Data Development Algorithms, ATD vs RTD, Antenna Placements, LMU list Optimization, Positioning Neighbor Optimization

Operations & Maintenance: Integration into Normal Operator Workflow, Protect Database Integrity, Automation of O&M Functions

Appendix B

Joint Statement on EOTD
by
EOTD Handset Taskforce

August 28, 2002

- The undersigned GSM handset suppliers have created an EOTD Handset Taskforce to focus industry efforts on delivering handsets that support the carriers' effort to meet Phase 2 E911 FCC requirements. This taskforce complements the Joint EOTD Industry Group formed in July 2002 and is open to all GSM handset suppliers who participate in the exchange of information to reach that goal.

- To expedite the delivery of Phase 2 E911 capable handsets, members of the EOTD Handset Taskforce agreed to exchange test results and share best practices. However, the parties will not share or exchange any information regarding product pricing, cost or marketing plans. To facilitate this exchange, the handset Taskforce did not execute Non-Disclosure Agreements. This level of cooperation is unprecedented within the handset community and demonstrates our commitment to achieving the FCC requirements.

- Results from EOTD field trials indicate progress in deploying the EOTD system solution. With continued research and optimization of the EOTD system the Taskforce believes that further improvements are readily achievable. Handset vendors have plans in place (Exhibit 1) to support industry efforts that should meet the FCC's Phase 2 E911 requirements. Specific test results and areas for improvement are described in Exhibit 1.

- The EOTD Handset Taskforce is fully committed to provide products and services capable of supporting the industry efforts to meet FCC's Phase 2 E911 requirements.

- The EOTD Handset Taskforce will produce quarterly updates to the GSM carriers.

- The EOTD Handset Taskforce will work closely with the Joint EOTD Industry Group to achieve the above-mentioned objectives.

Motorola

By: _____

Title: Corp VP & GM North America

Nokia Mobile Phones

By: _____

Title: SVP, Prod. Mgmt + Bus. Dev

Samsung

By: _____

Title: VP

Siemens ICM, LLC

By: _____

Bernt Klein

Title: SVP/GM 9/16/02

Sony Ericsson

By: C. Sandeep

Title: CTO

Panasonic Wireless Design Center

By: _____ Jim Marion

Title: President 9/25/02

NEC

By: _____

Title: Asst. GM

EXHIBIT 1

Test Results

Extensive field tests done over the past several weeks indicate the ability to improve accuracy. These results were achieved with close co-operation between handset vendors, infrastructure vendors and carriers. Similar advancements in performance are expected in the future with continued close co-operation.

The handset vendors collected the following data since July 23, 2002. This data represents some of the best results observed to date:

- **Hayward, CA** TP31 with 46 measurements: 77m @ 67% and 133m @ 95%
- **Portland, OR** TP1491 with 53 measurements: 63m @67% and 87m @ 95%
- **Portland, OR** TP1163 with 50 measurements: 83m @67% and 133m @ 95%
- **Portland, OR** TP1243 with 26 measurements: 56m @67% and 138m @ 95%

This data was obtained shortly after EOTD testbeds were initialized and made available for testing. Considerable effort remains to extend and improve performance over complete service areas. This data is provided to indicate the potential accuracy that can be achieved with E-OTD.

Vendors supplying EOTD handsets have demonstrated commitment and expertise in integrating a relatively new technology. As a result of their efforts, several handset vendors doubled their EOTD yield results and experienced significant reductions in the error associated with their position estimate.

Action Plan:

The Joint EOTD Industry Group created 6 Working Items to support Phase 2 E911 FCC requirements. The Handset Taskforce will be a key contributor to these working items as they relate to handset technology. The Taskforce will support the Joint EOTD Industry Group monthly report.

- **Working Item 1: EOTD Inaccuracy Contribution/Framework**

  Feature: Using empirical and analytical methods, identify sources of error (viz., multi-path, network synchronization, handset performance, etc.) in an EOTD positioning system. A "budget" of error contributions will be established and reduction targets for each "budget" item will be defined. "Budget" serves as a tool for managing performance improvement. Technical resources attack error sources based upon inaccuracy contribution.

  Benefits: Structures and focuses development towards accuracy requirements set forth by the FCC for October 1, 2003 (50m for 67% of calls and 150m for 95% of calls). Provides measure of progress.

  Handset Taskforce: The Handset Taskforce will be a prime contributor on multipath mitigation, idle mode measurement tradeoff analysis, and RF optimization techniques.

- **Working Item 2: Sharing of Field Trials and Experiences**

  Feature: Accelerated learning environment where all vendors gain knowledge from different environments and techniques to improve performance of the live environment.

  Benefit: Establishes common "Best Practices" and shortens new product evaluation times.

Handset Taskforce: The Handset Taskforce will be a prime contributor to establishing a testing methodology and supplying best practices for the collection and distribution of field test data.

- **Working Item 3: Network Deployment and Optimization**

  Feature: Establish best practices for network build-out and methods for getting the most out of the existing network design. Data is analyzed to identify and quantify observed error sources. Joint EOTD Industry activities are targeted at reducing observed error sources.

  Benefit: Reduces network contribution to inaccuracy and bridges design/development to live environment performance.

  Handset Taskforce: The Handset Taskforce will be a prime contributor to assisting in network optimization. Data collected in the field will be essential to assisting infrastructure vendors in the optimization of the networks.

- **Working Item 4: Use Base Stations from all Carriers**

  Feature: Analysis has indicated that EOTD performance, compliant with FCC's October 1, 2003 requirements, is possible in properly planned areas with high cell densities. High cell densities reduce error due to multi-path because path lengths are shorter. Additional multi-path improvements may be possible by processing multiple co-located but different carrier frequencies. Joint EOTD Industry Group to investigate the feasibility of this concept and report to carriers.

  Benefit: Provides additional degree of freedom for reducing multi-path error and reduces/eliminates the need for adding cell sites, thus minimizing time for deployment.

  Handset Taskforce: The Handset Taskforce will be a secondary contributor as needed.

- **Work Item 5: Acceptance and "Prime Site" Set-Up**

  Feature: Establish standard test procedures, test environments, and acceptance methods to facilitate performance comparisons and stabilization of results. Prime Site lessons learned and best practices to be quickly distributed to other operational EOTD networks. Recommend and control HW/SW configurations for all operators.

  Benefit: Minimize time for FCC 2003 requirements to be realized across all deployments.

  Handset Taskforce: The Handset Taskforce will be a prime contributor outlining acceptance methods and testing procedures

- **Work Item 6: Standardization Issues**

  Feature: Examine current standards and propose improvements to improve accuracy in position determination. Ensure that algorithm developments for handsets and infrastructure are compatible and interoperable across all GSM networks. Establish test and validation methods that demonstrate compliance and alignment with published FCC requirements.

Benefit: All EOTD handsets would be measured against same standard. Reduction in time taken to approve and deploy EOTD capable handsets.

Handset Taskforce: The Handset Taskforce will be a prime contributor to standardization efforts that may improve EOTD accuracy, ensure interoperability, and establish compliance validation methods.

Action Plan Focus Areas

Network Design and Performance: BA-List Optimization, Multi-Path Mitigation, Tool Development, Inter Carrier Base Station Sharing

Handset Performance: Signal/Noise Improvement, Multi-Path Mitigation, Assistance Data Handling, BCCH Scanning Algorithms

EOTD Infrastructure: Integrate different positioning methods, Tune Algorithms (SMLC, LMU, MS), Assistance Data Development Algorithms, ATD vs RTD, Antenna Placements, LMU list Optimization, Positioning Neighbor Optimization