

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of

Amending the Definition of Interconnected VoIP
Service in Section 9.3 of the Commission's Rules

Wireless E911 Location Accuracy Requirements

E911 Requirements for IP-Enabled Service
Providers

GN Docket No. 11-117

PS Docket No. 07-114

WC Docket No. 05-196

COMMENTS OF QUALCOMM INCORPORATED

Dean R. Brenner
Vice President, Government Affairs

John W. Kuzin
Senior Director, Regulatory

1730 Pennsylvania Avenue, NW
Suite 850
Washington, DC 20006
(202) 263-0020

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SUMMARY

Qualcomm is pleased to provide these comments in response to the FCC's Wireless E911 Location Accuracy *Second Further Notice of Proposed Rulemaking* that seeks to further improve the ability of public safety personnel to locate wireless 911 callers. Qualcomm concurs with the FCC's decision in the *Third Report and Order* to phase out the network-based location criteria and to immediately require new CMRS networks to comply with the significantly more accurate handset-based location criteria. This decision will not only improve emergency caller location accuracy but it will also allow the agency to focus its attention on enabling a more interoperable and comprehensive next-generation emergency response capability for PSAPs and first responders in cooperation with the wireless industry.

As the developer of the innovative handset-based Assisted GPS ("AGPS") technology – the world's most widely-used and accurate wireless cellular position location technology – Qualcomm has worked, and continues to work, tirelessly to develop enhancements to this life-saving technology. Qualcomm strongly agrees with the FCC's assessment that future improvements in wireless position location technology will include tools that complement AGPS technology such as Wi-Fi positioning and smartphone sensors because those new types of technologies lack the ubiquitous coverage of AGPS technology and are not available to all users.

In this regard, Qualcomm supports the Commission's measured approach in this proceeding in setting an achievable and clear path towards improving indoor location accuracy for wireless 911 callers, which is fully consistent with Qualcomm's comments to the Commission on this topic in the past. The Commission appropriately recognizes the challenges to improving location accuracy in certain locations, such as deep inside of buildings, parking garages and basements, and acknowledges the need for additional research, development,

standardization efforts, and field testing before establishing indoor location accuracy rules. As noted in the *Second FNPRM*, the Commission has asked industry groups comprised of experts from the public safety community and the wireless industry to study the current and future means of locating indoor wireless 911 callers and, more broadly, develop a comprehensive approach to enabling emergency communications from a broad range of locations and from IP-based communications devices.

As the pioneering developer of a cornerstone of the current wireless cellular emergency communications, AGPS technology, Qualcomm looks forward to working with the wireless industry, the public safety community, and the Commission on viable plan that appropriately addresses the challenges posed by the growing use of mobile communications in emergency situations.

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COMMENTS OF QUALCOMM INCORPORATED

QUALCOMM Incorporated (“Qualcomm”) is pleased to submit these comments in response to the FCC’s Wireless E911 Location Accuracy *Second Further Notice of Proposed Rulemaking* that seeks additional input on means of further improving the ability of public safety personnel to locate wireless 911 callers – particularly the population of users that are increasingly placing emergency calls from inside of buildings and on VoIP-enabled connections.¹ Qualcomm supports the Commission’s measured approach in this proceeding to set an achievable and clear path towards improving wireless position location accuracy. In this regard, Qualcomm applauds the FCC’s decision in the *Third Report and Order* to phase out over time the network-based location criteria and to immediately require new CMRS networks to

¹ See Amending the Definition of Interconnected VoIP Service in Section 9.3 of the Commission’s Rules, GN Docket No. 11-117, Wireless E911 Location Accuracy Requirements, PS Docket No. 07-114, E911 Requirements for IP-Enabled Service Providers, WC Docket No. 05-196, *Notice of Proposed Rulemaking, Third Report and Order, and Second Further Notice of Proposed Rulemaking*, FCC 11-107, ¶¶ 40-99 (July 13, 2011) (hereinafter “*Second FNPRM*” or “*Third Report & Order*,” as appropriate).

comply with the more stringent handset-based location regulations.² In addition to providing more accurate location determination, the Commission’s decision to move towards a single standard will allow the agency to better focus on enabling an interoperable and integrated next-generation emergency response capability for PSAPs and first responders in close cooperation with the wireless industry.³ Such a comprehensive emergency response capability should include more accurate means of locating wireless emergency callers inside of buildings⁴ as well as improved means of locating emergency callers using VoIP services and Next Generation 911 communications tools that use IP-based network architectures.⁵

As the pioneering developer of Assisted-GPS (“AGPS”) technology – the world’s most accurate cellular wireless location determination technology in use today – Qualcomm is continuing to improve location determination in a variety of settings via AGPS enhancements and by taking advantage of state-of-the-art tools being integrated into many of today’s handsets. For example, working with its wireless industry partners, Qualcomm is actively developing means of further improving the reliability of wireless cellular connectivity and indoor and outdoor location determination via AGPS, Advanced Forward Link Triangulation (“AFLT”), and the existing cellular infrastructure, as well as supporting access to satellites from GLONASS (and developing Assisted-GLONASS and Assisted GNSS).⁶

² See *id.* at ¶¶ 17-23.

³ See *id.* at ¶ 8.

⁴ See *id.* at ¶¶ 81-95.

⁵ See Facilitating the Deployment of Text-to-911 and Other Next Generation 911 Applications, PS Docket No. 11-153, Framework for Next Generation 911 Deployment, PS Docket No. 10-255, *Notice of Proposed Rulemaking*, FCC 11-107 (Sept. 22, 2011).

⁶ Wireless carrier efforts to improve location determination are summarized in ¶¶ 17-18 of the *Third Report & Order*.

Additionally and specifically for indoor location determination purposes, Qualcomm is researching and developing means of taking advantage of a building's existing communications infrastructure, *e.g.*, Wi-Fi access points and femto cells, along with position location information from new smartphone tools, such as gyroscopes, accelerometers, compasses, and pressure sensors. As the Commission recognizes in the *Second FNPRM*, these new tools will complement existing tools like AGPS in further refining location determination means.⁷

Finally, Qualcomm applauds the FCC's decision to charge the Third Communications Security, Reliability, and Interoperability Council ("CSRIC III") with further developing means of improving wireless position location determination technologies.⁸ The important work of CSRIC III that will take place over the coming months will allow emergency responders and the public at large to take timely advantage of position location technology improvements.

BACKGROUND

Qualcomm has been serving public safety needs since its inception more than 25 years ago, and it is actively working on enhancing its AGPS location accuracy solutions through hybrid solutions that take advantage of new phone and network capabilities. Qualcomm has been committed to the highest degree of E911 location accuracy since before the FCC issued its first wireless location accuracy requirements in 1998. Qualcomm pioneered the development the most accurate wireless cellular position location technology in use today, AGPS, a cornerstone of U.S. public safety communications that has been implemented worldwide by dozens of OEMs and well over 50 wireless carriers. Qualcomm's AGPS technology also is an important law

⁷ See *Second FNPRM* at ¶ 93.

⁸ See *id.* at ¶ 12.

enforcement tool, as it enables law enforcement personnel to locate kidnapping victims in a timely manner.

Qualcomm is actively engaged with its carrier customers, equipment infrastructure manufacturers, and handset vendor partners, as well as the public safety community, to improve outdoor wireless E911 location accuracy and to develop new tools to provide useful indoor location accuracy information. At the same time, Qualcomm is developing technology to support providers' ability to offer consumers "location aware" services. There is no question that precise location determination both outdoors and indoors is critically important for public safety purposes, but it also offers consumers enhanced opportunities for real-time interaction for social networking, educational, informational, and marketing purposes.

A. Qualcomm Has Played A Pioneering Role In The Development Of Multiple Innovative Cellular Technologies And Location Accuracy Tools

Qualcomm is a world leader in developing innovative wireless technologies, including the Code Division Multiple Access ("CDMA")-based and Orthogonal Frequency Division Multiple Access ("OFDMA")-based cellular technologies that are used throughout the world for wireless voice and broadband communications and countless mobile products and services. Qualcomm technology powers 3G and 4G cellular networks operated by wireless carriers that enable hundreds of millions of Americans, in rural, suburban, and urban areas alike, to enjoy ubiquitous and highly advanced mobile voice and broadband data services.

Qualcomm has invested more than \$15.5 billion in R & D since its inception in 1985. In fiscal 2010 alone, Qualcomm spent \$2.55 billion, or 23% of its revenues, on R & D. These enormous expenditures have enabled Qualcomm to invent many of the wireless technologies fueling the unprecedented growth in mobile voice and broadband services, including an ever expanding number of location-based services that use AGPS technology.

Through its Technology Licensing business unit, Qualcomm broadly licenses its technology to more than 180 handset and infrastructure manufacturers worldwide that make network equipment, handsets and other consumer devices, and develop applications for cellular networks based on 3G and 4G technologies. More than 745 devices based upon Qualcomm technology were launched in fiscal 2010 alone.

Qualcomm's chip division, Qualcomm CDMA Technologies ("QCT"), is the world's largest provider of wireless chipset technology that is used in cell phones and consumer electronics devices. QCT's chipsets support all the major frequency bands, the full gamut of standardized, globally harmonized 3G and 4G wide area mobile broadband and cellular technologies, AGPS, AFLT, AGLONASS and AGNSS location tools, Bluetooth, Wi-Fi, and many operating systems, such as Android, Windows Phone 7, and Qualcomm's own Brew Mobile Platform. QCT produces chips that the world's leading equipment manufacturers integrate into their 3G devices. QCT also produces chips based on the 4G Long Term Evolution ("LTE") interface that incorporate 3G technologies to ensure wide coverage for multi-mode LTE/3G devices.

B. Qualcomm-Enabled Wireless Networks And Devices Have Supported Public Safety Communications For More Than A Quarter Century

Qualcomm's wireless technologies have supported the public safety sector since the company's founding in 1985. Qualcomm Government Technologies division ("QGOV") has been at the forefront of developing wireless communication solutions for public safety personnel, pioneering efforts in cellular standards, chip design, mobile broadband data, encryption, and value-added end-user applications for wireless phones. QGOV modifies and adapts Qualcomm's successful commercial products to meet the specialized needs of federal and state emergency personnel. By leveraging Qualcomm's wireless expertise, innovative technologies, and industry

reach, QGOV offers products and engineering and advisory services to meet government needs for classified and unclassified solutions in the areas of deployable mobile broadband, information sharing, interoperability, as well as tracking, locating, and situational awareness.

C. Qualcomm's gpsOne Technology Is The Most Widely Deployed GPS-based Location Technology In The World

Qualcomm's gpsOne solution is the most widely deployed GPS-based location technology, with more than 800 million gpsOne-enabled handsets in use around the world. It enables network operators to cost-effectively meet the FCC's E-911 mandate and offer a wide range of location-aware services. Compatible with all major air interfaces, gpsOne technology is the only fully-integrated AGPS and wireless baseband product. The cost of devices with gpsOne technology is greatly reduced because the same gpsOne hardware is used to access both the 3G terrestrial network and GPS satellites.

Qualcomm is constantly enhancing the highly versatile gpsOne platform. Mobile gaming devices, cameras, and handheld computing devices, to name a few, are being integrated with gpsOne technology to support location-aware applications in next generation products. And, as described below, gpsOne is the foundational component of Qualcomm's QPoint ubiquitous location determination solution. It also is used in Qualcomm's Gobi global mobile platform for notebook computers, and it supports inGeo™ tracking technology.

1. The QPoint Solution Is Enabling High Performance Location Services

Qualcomm's QPoint solution integrates gpsOne technology with location-based server software accompanied by a complementary set of location-based tools and services. More than 50 wireless operators worldwide have deployed the QPoint solution, and it is supported by thousands of handset models. QPoint is compatible across multiple operating systems including Android, iOS, Brew, Java, and Windows Phone 7. Principally, the QPoint solution is for smaller

wireless carriers who lack the resources to operate their own position determination system or prefer to contract with Qualcomm to do so.

The QPoint positioning solution will continue to evolve and support new positioning sources, such as new satellite constellations and Wi-Fi access points; be integrated further into additional location-aware services, such as social networking, advertising and promotions; and support new classes of mobile devices and services, like dedicated tracking devices and first responder services.

2. The Gobi Platform Integrates gpsOne With Worldwide Mobile Connectivity

Qualcomm's Gobi platform is a global mobile broadband and AGPS solution for wireless devices. It integrates within a single module support for all the major frequency bands and GPS functionality. Gobi is compatible with leading mobile connectivity technologies, including CDMA2000, EV-DO Rev. A and Rev. B, HSPA+, dual-carrier HSPA+, and LTE and is backwards compatible with the earlier HSPA and EV-DO technologies. Gobi currently enables a broad collection of location-based services on more than 111 mobile products ranging from laptops and netbooks to tablets, e-Readers, and routers. The latest generation embedded Gobi module provides a number of enhancements, including increased data speeds, enhanced GPS functionality, integrated power management, and additional operating systems, such as Windows 7 and Linux.⁹

⁹ See Qualcomm Announces Commercial Availability of Gobi 3000 Modules, Third Generation Gobi Module Extends Wireless Leadership to Multiple Forms of Connected Devices (Feb. 14, 2011) available at <http://www.qualcomm.com/news/releases/2011/02/14/qualcomm-announces-commercial-availability-gobi-3000-modules>; Qualcomm's Expanded Gobi Connectivity Portfolio Gains Broad Industry Support Huawei, Novatel, Option, Sierra Wireless and ZTE Now Developing Gobi-compliant Offerings (June 29, 2010) available at <http://www.qualcomm.com/news/releases/2010/06/29/qualcomms-expanded-gobi-connectivity-portfolio-gains-broad-industry-support>.

In this way, Gobi is well suited to support emergency services with devices that require broad coverage and connectivity to multiple interfaces while on the road and within public safety facilities, homes, and businesses. Gobi modules can readily enable emergency responders to select the best available connection from multiple networks and obtain the best possible cellular service at the lowest possible cost.

DISCUSSION

I. Qualcomm Is Actively Working To Further Improve Location Accuracy In Indoor Environments As Well As In Challenging Outdoor Settings

Qualcomm is actively researching and developing multiple means of improving location accuracy determinations for wireless 911 callers. First, as noted above, Qualcomm is actively studying and developing the ability to use a building's existing wireless and wired communications infrastructure, such as unlicensed Wi-Fi access points or femto cells that operate on licensed spectrum, for indoor location determination purposes. This approach, which takes advantage of the Wi-Fi position location technologies available today in smartphones and a building's existing communications infrastructure, may work well in urban settings where there often exists multiple, overlapping wireless broadband access networks.¹⁰

In addition, Qualcomm is looking to use for position location purposes new smartphone tools, such as gyroscopes, accelerometers, compasses, and pressure sensors that can be used to track user location and movement inside of buildings and in other challenging settings.

Qualcomm also is aggressively working on technology enhancements to AGPS / AGNSS (*i.e.*, the Assisted Global Navigation Satellite System),¹¹ mobile phones, and the existing cellular

¹⁰ See *Second FNPRM* at ¶¶ 78, 89. However, the concerns noted by CSRIC (*see Second FNPRM* at ¶ 90) need to be addressed.

¹¹ The Global Navigation Satellite System ("GNSS") includes the United States' GPS, Russia's GLONASS, and the European Union's Galileo satellite system.

infrastructure to refine the reliability of wireless cellular connectivity and indoor and outdoor location accuracy determinations. This includes the development of chipsets with improved satellite receivers and the ability to work with multiple satellite position determination systems as well as improved means of integrating into the location determination system calculus Wi-Fi measurements including power and time.

Wi-Fi positioning techniques and smartphone sensors can be used separately or in concert with AGPS/AGNSS and Advanced Forward Link Triangulation (“AFLT”) / Observed Time Difference Of Arrival (“OTDOA”) algorithms to improve location determination inside of buildings. Qualcomm is investigating improvements to location determination via 4G LTE networks that will support OTDOA.

However, as noted above, additional R & D work and testing in a variety of indoor and outdoor environments is needed on each of these fronts before the FCC imposes additional location accuracy and testing requirements.¹² Qualcomm agrees with the Commission that the development of indoor technical solutions and testing methodologies is critically important, and the company looks forward to continue to work with its wireless industry partners, the public safety community, and the FCC through CSRIC and other groups to improve the ability to accurately locate wireless 911 callers in emergency situations.¹³

II. The Next Generation Of Location Determination Tools Will Supplement, Not Replace, Today’s Highly Successful AGPS Technology Solutions

Qualcomm wholeheartedly agrees with the FCC that the next generation of wireless position location technologies used to identify the location of emergency callers will supplement – not replace – today’s highly successful AGPS technology. In fact, each of the technologies

¹² See *Second FNPRM* at ¶ 86-88.

¹³ See *id.*

being considered as means of refining indoor location accuracy, namely, Wi-Fi access nodes, femto cells, and device sensors, are far from ubiquitous and are not able to match the broad coverage of AGPS technology in outdoor environments.

In fact, AGPS technology may be able to play a role in cases where a 911 call is placed by a mobile VoIP user. As the FCC notes by way of example, where an over-the-top VoIP service provider has a direct relationship with the end-user but does not have information on the end-user's location, while the broadband provider may know where the user is located but does not know when the user is placing an emergency call, it may be possible for both providers to work together and use position location data available via AGPS technology to the extent it is available.¹⁴ AT&T itself noted that devices supporting mobile VoIP services that are used for emergency calls may be able to make use of AGPS capabilities to the extent the device also potentially supports wireless cellular calls to 911.¹⁵

III. Working Together Through CSRIC And Other Groups, The Wireless Industry and Public Safety Community Will Improve Wireless Location Accuracy

The best way for the Commission to move forward in this proceeding is to allow the wireless industry and the public safety community to continue to work together through the Third Communications Security, Reliability and Interoperability Council ("CSRIC III") and other industry groups. Indeed, Qualcomm appreciates the Commission's express request that CSRIC III seek to develop flexible and cost-effective testing criteria and methodologies for outdoor location accuracy testing.¹⁶

¹⁴ See *Second FNPRM* at ¶ 71.

¹⁵ See *Second FNPRM* at ¶ 67 (citing AT&T comments); see also *id.* at ¶¶ 59, 64. However, as AT&T also noted, to the extent mobile VoIP callers use the service indoors, they suffer from the same indoor location challenges as other currently available solutions. See *id.* at ¶ 67.

¹⁶ See *Third Report & Order* at ¶¶ 34-38.

Qualcomm also welcomes the FCC's request that CSRIC III make initial findings and further develop technical recommendations for indoor testing.¹⁷ Other groups, such as the Alliance for Telecommunications Industry Solutions ("ATIS"), through its collection of committees and forums,¹⁸ are in the midst of developing standards for indoor location accuracy testing, including means of integrating Wi-Fi positioning information with existing technologies such as AGPS and OTDOA. This information will also serve to inform the recommendations from CSRIC III, as ATIS and its member companies are CSRIC members.

Among the complex set of issues being grappled with are: what mix of equipment can and should be employed for location accuracy purposes, what other sources of location information can be used to improve indoor accuracy, how best to integrate Wi-Fi access points. For these reasons, Qualcomm supports the FCC's decision to let the wireless industry and public safety community, through CSRIC and other groups, to develop indoor location accuracy methods, tools, and testing processes that can be updated in a timely fashion.

The Commission should continue to support these joint efforts given that the FCC "has successfully leveraged such working groups in the past to drive policy forward, particularly in the public safety area, where the Commission's objectives are clear but the technical path forward requires further research and development before implementation is possible."¹⁹

Qualcomm believes strongly that such a measured approach offers the best way for the

¹⁷ See *Second FNPRM* at ¶¶ 86-88.

¹⁸ ATIS, which is comprised of more than 200 companies, works on emergency communications matters through its Wireless Technologies and Systems Committee ("WTSC"), Emergency Services Interconnection Forum ("ESIF"), Packet Technologies and Systems Committee ("PTSC"), and Next Generation Interconnection Interoperability Forum ("NGIIF").

¹⁹ See *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114, *Second Report and Order*, FCC 10-176 at ¶ 38 (Sept. 23, 2010).

Commission to spur innovation in location accuracy in both the short term and in the future, particularly in increasingly challenging environments.

CONCLUSION

Given that more and more emergency calls are being placed on mobile handsets in a variety of settings, Qualcomm agrees with the Commission that new tools are needed to supplement proven technologies like AGPS to further improve location accuracy in challenging environments, such as deep inside buildings. For this reason, Qualcomm is working aggressively on further improving wireless E911 location accuracy not only in outdoor environments but also in indoor environments through integration of new tools, such as smartphone sensors, and leveraging of existing infrastructure, such as femto cells and Wi-Fi access points. The company is continuing its close cooperation with mobile operators, infrastructure vendors, handset suppliers, the FCC, and the public safety community through CSRIC and other industry groups to successfully deploy necessary next generation location determination tools.

Respectfully submitted,

QUALCOMM INCORPORATED

By: 

Dean R. Brenner
Vice President, Government Affairs

John W. Kuzin
Senior Director, Regulatory

1730 Pennsylvania Avenue, NW
Suite 850
Washington, DC 20006
(202) 263-0020

Attorneys for QUALCOMM Incorporated

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