FEDERAL COMMUNICATIONS COMMISSION

47 CFR Part 20

[PS Docket No. 07–114; FCC 14–13]

Wireless E911 Location Accuracy Requirements

AGENCY: Federal Communications Commission.

ACTION: Notice of proposed rulemaking.

SUMMARY: In this *Third Further Notice of Proposed Rulemaking,* the Federal Communications Commission (Commission) proposes to revise its regulatory framework to require delivery of accurate location information to PSAPs for wireless 911 calls placed from indoors. In the near term, it proposes to establish interim indoor accuracy metrics that will provide approximate location information sufficient to identify the building for most indoor calls. It also proposes to add a requirement for provision of vertical location (z-axis or elevation) information that would enable first responders to identify floor level for most calls from multi-story buildings. In the long term, the Commission proposes to develop more granular indoor location accuracy standards, consistent with the evolving capabilities of indoor location technology and increased deployment of in-building communications infrastructure. These standards would provide for delivery to PSAPs of in-building location information at the room or office suite level. The Commission also proposes measures to strengthen existing location accuracy requirements. The Commission requests comment on these proposals to improve location accuracy for wireless 911 calls.

DATES: Submit comments on or before May 12, 2014 and reply comments by June 11, 2014. Written comments on the Paperwork Reduction Act proposed information collection requirements must be submitted by the public, Office of Management and Budget (OMB), and other interested parties on or before May 27, 2014.

ADDRESSES: Submit comments to the Federal Communications Commission, 445 12th Street SW., Washington, DC 20554. Comments may be submitted electronically through the Federal Communications Commission's Web site: *http://fjallfoss.fcc.gov/ecfs2/.* In addition to filing comments with the Secretary, a copy of any comments on the Paperwork Reduction Act information collection requirements contained herein should be submitted to the Federal Communications Commission via email to *PRA@fcc.gov* and to Nicholas A. Fraser, Office of Management and Budget, via email to *Nicholas_A._Fraser@omb.eop.gov* or via fax at 202–395–5167. For detailed instructions for submitting comments and additional information on the rulemaking process, see the **SUPPLEMENTARY INFORMATION** section of this document. Parties wishing to file materials with a claim of confidentiality should follow the procedures set forth in § 0.459 of the Commission's rules. Confidential submissions may not be filed via ECFS but rather should be filed with the Secretary's Office following the procedures set forth in 47 CFR 0.459. Redacted versions of confidential submissions may be filed via ECFS.

FOR FURTHER INFORMATION CONTACT: Dana Zelman of the Policy and Licensing Division of the Public Safety and Homeland Security Bureau, (202) 418–0546 or *dana.zelman@fcc.gov.* For additional information concerning the Paperwork Reduction Act information collection requirements contained in this document, contact Judith Boley-Herman, (202) 418–0214, or send an email to *PRA@fcc.gov.*

SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Third Further Notice of Proposed Rulemaking in PS Docket No. 07–114, released on February 21, 2014. The full text of this document is available for public inspection during regular business hours in the FCC Reference Center, Room CY–A257, 445 12th Street SW., Washington, DC 20554, or online at *http://www.fcc.gov/document/proposes-new-indoor-requirements-and-revisions-existing-e911-rules.*

Summary of the Third Further Notice of Proposed Rulemaking

I. Introduction and Executive Summary

1. The wireless landscape has changed significantly since the Commission first adopted its wireless Enhanced 911 (E911) location accuracy rules in 1996, and even since the last significant revision of these rules in 2010. Consumers are increasingly replacing traditional landline telephony with wireless phones, and a majority of wireless calls are now made indoors. This increase in wireless usage is reflected in how Americans call for help when they need it: today, the majority of 911 calls come from wireless phones. In light of these circumstances, it is increasingly important for Public Safety Answering Points (PSAPs) to have the ability to accurately identify the location of wireless 911 callers regardless of whether the caller is located indoors or outdoors. For purposes of this notice, we use the terms ''mobile'' and ''wireless'' interchangeably. These terms do not encompass, for example, cordless telephones such as those using the DECT standard or PBX handsets using Wi-Fi connectivity.

2. We believe the time has come to propose specific measures in our E911 location accuracy rules to ensure accurate indoor location information. In this *Third Further Notice of Proposed Rulemaking* (*Third Further Notice*), we propose to revise our regulatory framework to require delivery of accurate location information to PSAPs for wireless 911 calls placed from indoors. We limit the scope of this proceeding and the applicability of the proposed requirements set forth in this *Third Further Notice* to CMRS providers (and in limited instances, to their E911 System Service Providers, as discussed below) subject to § 20.18 of the Commission's rules, 47 CFR 20.18(a). Our proposal includes both near- and long-term components. In the near term, we propose to establish interim indoor accuracy metrics that will provide approximate location information sufficient to identify the building for most indoor calls. We also propose to add a requirement for provision of vertical location (z-axis or elevation) information that would enable first responders to identify floor level for most calls from multi-story buildings. In the long term, we seek comment on how to develop more granular indoor location accuracy requirements, consistent with the evolving capabilities of indoor location technology and increased deployment of in-building communications infrastructure. These requirements would provide for delivery to PSAPs of in-building location information at the room or office suite level.

3. In particular, we seek comment on the following proposals, and potential alternatives to these proposals, with respect to indoor location accuracy:

- CMRS providers would be required to provide horizontal location (x- and y-axis) information within 50 meters of the caller for 67 percent of 911 calls placed from indoor environments within two years of the effective date of adoption of rules, and for 80 percent of indoor calls within five years.
- CMRS providers would be required to provide vertical location (z-axis) information within 3 meters of the caller for 67 percent of indoor 911 calls within three years of the adoption of rules, and for 80 percent of calls within five years.
- As is the case of our existing E911 location rules, CMRS providers would

be required to meet these indoor requirements at either the county or PSAP geographic level.

• CMRS providers would demonstrate compliance with indoor location accuracy requirements through participation in an independently administered test bed program modeled on the indoor test bed administered by the Communications Security, Reliability, and Interoperability Council (CSRIC), but providers would have the option to demonstrate compliance through alternative means so long as they provide the same level of test result reliability.

• PSAPs would be entitled to seek Commission enforcement of these requirements within their jurisdictions, but only so long as they have implemented location bid/re-bid policies that are designed to obtain all 911 location information made available by CMRS providers pursuant to our rules.

4. In addition, we examine whether there are additional steps the Commission should take to strengthen our existing E911 location accuracy rules to ensure delivery of more timely, accurate, and actionable location information for all 911 calls. We also seek comment on whether we should revisit the timeframe established by the Commission in 2010 for replacing the current handset- and network-based accuracy requirements with a unitary requirement, in light of the rapid proliferation of Assisted Global Navigation Satellite Systems (A–GNSS) technology in wireless networks and the prospect of improved location technologies that will soon support 911 communication over LTE networks.

5. Specifically, we seek comment on whether to implement the following measures:

• Adopt a 30-second requirement for the maximum time period allowed for a CMRS provider to generate a location fix (''time to first fix'') in order for the 911 call to be counted towards compliance with location accuracy requirements.

• When measuring compliance with location accuracy requirements, allow CMRS providers to exclude short 911 calls (*e.g.,* calls lasting 10 seconds or less) that may not provide sufficient time to generate a location fix.

• Standardize the content and the process for delivery of confidence and uncertainty data that is generated by CMRS providers for each wireless 911 call and delivered to PSAPs on request.

• Require CMRS providers to inform PSAPs of the specific location technology or technologies used to generate location information for each 911 call.

• Accelerate the previously established timeframe for replacing the current handset- and network-based accuracy requirements with a unitary requirement.

• Require that CMRS providers periodically report E911 Phase II call tracking information, indicating what percentage of wireless 911 calls include Phase II location information.

• Establish a separate process by which PSAPs or state 911 administrators could raise complaints or concerns regarding the provision of E911 service.

• Require CMRS providers to conduct periodic compliance testing.

6. In setting forth these proposals, we emphasize that our ultimate objective is that all Americans using mobile phones—whether they are calling from urban or rural areas, from indoors or outdoors—have technology that is functionally capable of providing accurate location information so that they receive the support they need in times of an emergency. We seek comment on whether our proposals in this notice are the best way to achieve this objective, and we encourage industry, public safety entities, and other stakeholders to work collaboratively to develop alternative proposals for our consideration.

II. Background

A. E911 Regulatory History

7. In 1996, the Commission first adopted rules to require CMRS providers to implement basic 911 and E911 services. The Commission divided its wireless E911 service requirements into two stages. The initial stage—Phase I—required CMRS providers to deliver, by April 1998, E911 service that includes the telephone number of the wireless 911 caller and the location of the cell site or base station that received the call. Phase II requires delivery, under a phased-in schedule extending until January 2019, of E911 service that includes the latitude and longitude of the 911 call within specific accuracy and reliability parameters, depending on the location technology that the carriers have chosen: (1) For network-based technologies, within 100 meters for 67 percent of calls, and 300 meters for 90 percent of calls; (2) for handset-based technologies, within 50 meters for 67 percent of calls, and 150 meters for 90 percent of calls.

8. The Commission's E911 Phase II requirements do not distinguish between indoor and outdoor 911 calls. In 2000, the Office of Engineering and Technology (OET) published Bulletin No. 71, providing testing guidelines for wireless licensees to comply with the location accuracy requirements set by the Commission. Later that same year, the Commission noted that the guidelines expressed a preference for basing testing on locations from which 911 calls actually are placed. Further, the Commission construed the OET guidelines as confirming that, for testing accuracy performance, carriers could exclude areas where wireless calls cannot be completed, such as inside high-rise buildings and parking garages. The Commission later clarified that its Phase II requirements apply to outdoor measurements only.

B. CSRIC Indoor Location Accuracy Test Bed Report

9. In June 2012, the CSRIC III Working Group 3 (WG3) released a report concerning its goals and recommendations for an indoor location accuracy test bed WG3 indicated that the purpose of such a test bed would be to provide insight into which technologies are technically feasible and economically reasonable for providing indoor location for wireless emergency calls. WG3 conducted the indoor location test bed during the winter of 2012–2013. The test bed examined whether indoor location technologies could achieve the location result needed for improved public safety response—''actionable location'' with dispatchable address within a tight search ring—for the representative environments (morphologies) where wireless devices are expected to be used, *i.e.,* urban, dense urban, suburban, and rural.

10. WG3 selected the San Francisco Bay Area because it included a variety of different environments within a fairly limited geographic area. The area chosen included several building types (steel, glass, concrete, and masonry) and different building heights that were representative of urban and dense urban environments. WG3 tested the indoor location capability of three technologies: (1) AGPS/AFLT by Qualcomm, (2) RF fingerprinting by Polaris, and (3) network beacon technology by NextNav. The first two technologies are currently commercially available. The third technology is an in-building beacon technology that is independent of the CMRS provider's wireless network and uses calibrated, atmospheric pressure sensors in handsets to provide vertical location information.

11. In March 2013, WG3 issued a report discussing the results of the test bed and making recommendations about how best to move forward on indoor location accuracy (*CSRIC Indoor Location Test Bed Report*). In general, WG3 found that for the four

representative environments analyzed, the test bed results ''show significant promise with respect to high yield, relatively high confidence factors and reliability,'' and ''the ability to achieve improved search rings in the horizontal dimension (often identifying the target building, or those immediately adjacent).'' WG3 concluded that ''additional development is required to ensure'' the provision of an ''actionable location,'' especially in urban and dense urban environments. Moreover, the test bed found ''substantial progress'' in the beacon technology's capability to provide vertical (z-axis) location information, providing approximate floor-level accuracy in a significant percentage of calls.

12. Accuracy results varied by technology and the particular environment.

TABLE 1—CSRIC SAN FRANCISCO TEST BED—LOCATION ACCURACY RESULTS BY TECHNOLOGY

[in meters]

Morphology	Technology					
	NextNav		Polaris		Qualcomm	
Percent of Calls	*67%*	*90%*	*67%*	*90%*	*67%*	*90%*
Dense Urban	57	102	117	400	156	268
Urban	63	141	198	448	227	449
Suburban	29	53	232	421	75	205
Rural	28	45	576	3005.1	48	210

13. Following the WG3 test bed in San Francisco, TruePosition, which did not participate in the test bed, commissioned TechnoCom to test TruePosition's indoor location solution, which is based on hybrid technology consisting of UTDOA and assisted Global Positioning System (A–GPS). In February and early March 2013, TechnoCom conducted the testing, utilizing similar testing standards and methodology as used in the CSRIC test bed. In the urban setting, 67 percent of calls were located within 87.3 meters and 90 percent of calls were located within 140.7 meters. For the suburban environment, 67 percent of test calls were located within 66.1 meters and 90 percent of test calls were located within 116.2 meters.

C. Recent Comments on E911 Phase II Location Accuracy and Call Tracking Data

14. In August 2013, the California chapter of the National Emergency Number Association (CALNENA) filed an *ex parte* with the Commission in PS Docket No. 07–114 raising concerns about what it noted to be a ''significant decrease in the percentage of wireless 9–1–1 calls that delivered Phase II location information'' to its PSAPs. According to CALNENA, California State 911 Office data indicated that more than 55% of the over 1.5 million wireless 911 calls throughout the state in the month of March 2013 did not include Phase II location information. CALNENA noted that this phenomenon was much worse in urban areas, ''possibly suggesting that whatever 9–1–1 technologies the wireless carriers may be using lately are not working for wireless calls placed in or near high rise buildings.''

15. The Commission subsequently received E911 Phase II call tracking data sets from several other state and local public safety entities that either oversee or administer E911 service, which in some cases also indicated a decrease in the percentage of calls to PSAPs that included Phase II location. In September 2013, the Commission's Public Safety and Homeland Security Bureau (Bureau) announced that it would host a public workshop to discuss the issues raised by CALNENA and other E911 Phase II call tracking data sets, as well as recent developments in wireless location technology. The Bureau also invited interested parties to file comments on the E911 call tracking data and related topics for discussion, including current trends that may be affecting the provision and quality of E911 location information delivered to PSAPs.

16. Twenty-two parties filed comments, including four CMRS providers, nine public safety organizations and entities, and eight vendors of location technologies, Next Generation system components, or PSAP consumer premises equipment. On November 18, 2013, the Bureau hosted the E911 Phase II Location Accuracy Workshop.

17. Providers uniformly attribute the declining rates of delivery of Phase II data observed by some PSAPs primarily to PSAPs' not ''rebidding,'' *i.e.,* affirmatively seeking to ''pull'' the data from its source location, to obtain the Phase II data that the carriers are, in fact, providing. Carriers indicate that while Phase II data is not always available to the PSAP on call set-up, it is subsequently delivered to the Mobile Positioning Center (MPC) (for GSM networks) or the Gateway Mobile Location Center (GMLC) (for CDMA networks) and is available for PSAPs through the ''rebidding'' process. Other commenters contend, however, that even if PSAPs were to rebid more frequently, a 30-second delay in obtaining Phase II information is highly undesirable, given that a large percentage of 911 calls are under 30 seconds.

18. There was general agreement among public safety commenters that the majority of calls to 911 are now coming from wireless phones, that this trend is increasing, and that a large number of these calls are made from indoor environments. Vendors argue that indoor location technology has since evolved considerably, suggesting the provision of indoor location information may be within reach.

III. Proposed Indoor Location Accuracy Requirements

19. The record in this proceeding demonstrates that circumstances affecting wireless location accuracy have changed dramatically since the Commission adopted its original Phase II location accuracy rules. As discussed below, the great majority of calls to 911 now originate on wireless phones, and the majority of wireless calls now originate indoors. These changes elevate the importance of ensuring that indoor 911 calls can be accurately located.

20. While PSAPs and CMRS providers may be able to address some of the challenges through technological and operational improvements, the record also indicates that the outdoor-oriented focus of the Commission's Phase II rules to date has created a regulatory ''gap'':

By focusing on outdoor measurements for verifying compliance, our rules provide no remedy to address poor performance of location technologies indoors.

21. In addition to changes in wireless usage, there has also been recent progress in the development of technologies that could support improved indoor location accuracy. The CSRIC test bed results, together with parties' representations that they have since been working on improvements to indoor location technologies, suggest that it is likely that location technologies can begin to be deployed in the near term that would deliver 50-meter location accuracy for many indoor environments with a high degree of reliability. The record also contains data suggesting the feasibility of using barometric pressure sensors in mobile devices to provide rough z-axis information when calls are placed from multi-story buildings. Finally, providers assert that the deployment of LTE networks will be accompanied by improvements in location technology that could drive improved performance for both indoor and outdoor calls, but they also express concern about whether they can realistically meet the proposed requirements based on currently available technology.

22. We believe that it is now appropriate to propose measures designed to address public safety's critical need for obtaining indoor location information, and to ensure that wireless callers receive the same protection whether they place a call indoors or outdoors. In the following discussion, we propose a regulatory framework for addressing indoor location accuracy for wireless calls to 911 from indoors that includes a near-term requirement to achieve approximate indoor location information, comprised of horizontal (x- and y-axis) and vertical (z-axis) location information. We also seek comment on how to formulate a long-term requirement with an increased degree of location accuracy, sufficient to identify the caller's specific address, floor level, and suite/room number within a building. We discuss below the achievability of these technical requirements on our proposed time frames, the potential benefits and costs of our proposed indoor location accuracy requirements, a proposed compliance testing framework, and possible exclusions from the proposed requirements to ensure they are imposed in a way that maximizes the rules' effectiveness while mitigating the potential burdens on CMRS providers. We also seek comment on alternative approaches and, in this regard, invite relevant stakeholders—including public safety and industry—to propose a consensus approach that would help ensure that consumers placing wireless calls to 911 from indoor environments receive the same protections as callers in outdoor environments.

A. Costs and Benefits of Indoor Location Accuracy

23. In developing a regulatory framework for indoor location accuracy, our objective is to implement rules that serve the public safety goals established by Congress. While we acknowledge the potential difficulty of quantifying benefits and burdens, we seek to measure how the availability of indoor location information will benefit the public through reduced emergency response times. We also seek to maximize these benefits, while taking into consideration the burden of compliance to carriers. These costs and benefits can have many dimensions and affect many parties, including, for example, more efficient use of public safety resources; cost and revenue implications for the communications industry; health and financial benefits to the public; as well as other less tangible benefits, such as the value of any reduced or avoided pain and suffering, or the apprehension of criminal suspects. Providing accurate E911 information is particularly important in instances where a caller cannot provide information directly—either because they do not know or cannot communicate their location. We therefore request comment on a wide range of questions that will enable us to weigh the costs and benefits associated with the rules we propose in this *Third Further Notice.*

24. First, in order to assess the potential scope of benefits from our proposed rules, we think it is relevant to assess the scope of current wireless usage, both indoors and outdoors. Overall wireless usage has increased substantially since the Commission adopted its E911 location accuracy rules in 1996. At that time, there were approximately 33 million cellular subscribers in the United States. By the end of 2012, there were more than 326 million wireless subscriber connections. At the end of 2007, only 15.8 percent of American households were wireless only. During the first half of 2013, that number had increased to 39.4 percent (nearly two in every five American homes). Furthermore, certain subsets of American consumers are more likely to use wireless phones—for example, adults living in poverty (54.7 percent) were more likely to be living in households with only wireless phones than adults living near poverty (47.5 percent) and higher income adults (35.3 percent). In addition, younger Americans are more likely to live in households with only wireless phones.

25. Significantly, the majority of 911 calls also now come from wireless phones. In January 2011, *Consumer Reports* reported that 60 percent of 911 calls were placed through wireless phones. More recently, the California Office of Emergency Services indicates that the percentage of 911 calls that came from wireless devices increased from 55.8 percent in 2007 to 72.7 percent as of June 2013. Furthermore, an increasing percentage of wireless calls are placed from indoors. A 2011 study showed that an average of 56 percent of wireless calls were made from indoors, up from 40 percent in 2003. That number is even higher for smartphone users, who represent the majority of wireless phone owners, as 80 percent of smartphone usage occurs inside buildings.

26. The large increase in indoor wireless usage over the last decade has made indoor location accuracy increasingly important. Accordingly, we seek more granular information regarding the percentage of wireless calls placed from indoors and, to the extent available, the percentage of wireless calls to 911 from indoors. We also seek data on the types of indoor environments 911 calls are placed, *e.g.,* in the caller's own home, his or her work location or in public accommodations such as airports, schools and movie theaters. Is it possible to identify the type of building morphology where current location technologies routinely fail to provide accurate location information?

27. We know that indoor locations pose particular challenges for first responders in finding the caller. Indoor incidents are often not visible to the first responder, and a city block in an urban environment could potentially contain thousands of apartments. We seek comment on whether and how the increase in wireless calls to 911 from indoors has affected the delivery of E911 information and the ability of public safety officials to respond to calls for help. Has there been a market failure in the provision of E911 information for wireless calls originating indoors? We seek comment on this issue.

28. We believe that requiring location information for wireless calls to 911 from indoors will result in significant public interest benefits, most importantly in ''promoting safety of life and property.'' As the Association of Public-Safety Officials (APCO) notes, in

''the absence of accurate location data associated with a wireless call, the caller must be questioned in detail to provide verbal information regarding their location. This process can be time consuming and callers are sometimes unable to speak or provide correct information.'' A number of public safety commenters state that virtually any improvements in indoor location capabilities would be desirable, even if relatively modest or incremental.

29. We seek comment on the extent to which such improvements would result in tangible benefits with respect to safety of life and property. A study examining 73,706 emergency incidents during 2001 in the Salt Lake City (*Salt Lake City Study*) area found that on average, a one-minute decrease in ambulance response times reduced the likelihood of 90-day mortality from 6 percent to 5 percent, *i.e.,* a 17 percent reduction in the total number of deaths. This implies that, in the Salt Lake City area, a one-minute reduction in response times would have resulted in an annual saving of 746 lives. If we assume that this outcome is reasonably reflective of the country as a whole, we estimate that the location accuracy improvements we propose could save approximately 10,120 lives annually, for an annual benefit of approximately $92 billion. The Commission has also previously relied on a 2002 study focusing on cardiac emergencies in Pennsylvania (*Cardiac Study*), which showed that when location information was provided contemporaneously with a 911 call, the reduction in response time correlated with an over 34 percent reduction in mortality rates from cardiac arrest within the first 48 hours following the incident. Based on this study, we estimate that for cardiac incidents alone, the proposed indoor location rules may well save at least 932 lives nationwide each year, yielding an annual benefit of almost $8.5 billion. Furthermore, as location information quality improves and latency declines, we expect it will result in an even greater improvement in patient medical outcomes. We seek comment on the reasonableness of our analyses of these studies and our underlying assumptions. We also seek comment on whether the time benefit of vertical location, given the spread in horizontal location, is likely to be more, less, or comparable to the estimated gains in the *Salt Lake City Study* and the *Cardiac Study,* when moving from basic 911 to enhanced 911 services.

30. We also believe that improving location accuracy for wireless calls to 911, including from indoor environments, is particularly important for persons with disabilities and for those who may not be able to provide their address or otherwise describe their location. We seek comment on the increased value and benefits of providing more accurate location information to certain populations, such as people with disabilities, victims of crime, senior citizens and children. All such groups may have less ability to identify and relate to a 911 call-taker where they are located, especially in an emergency situation. In such circumstances, accurate, automatically-generated location information can be critical to saving lives. We seek comment regarding the value and scope of benefits that improved location accuracy would provide in such circumstances.

31. We understand that implementation of indoor location accuracy will likely impose significant costs on providers. We seek comment generally on the costs of indoor location accuracy requirements. The *CSRIC Indoor Location Test Bed Report* indicates that while CSRIC attempted to provide some initial insight into costs associated with implementation of these new technologies, it did not attempt to quantify cost to deploy, cost to operate and maintain, and cost impact to the handset. According to the report:

> Some technologies have relatively low costs upfront to deploy but are relatively costly to operate and maintain. Others have relatively high upfront costs and have lower operational/maintenance costs. Some methods have cost implications in the handset, some to the wireless network, and some impact both. Others require infrastructure development independent of the wireless network. Some require the development and maintenance of various databases to operate. . . . Overall, each location technology requires substantial investment in both time and resources.

We seek detailed information on all of the costs providers estimate our proposed indoor location rules would impose on them, including how these costs were determined.

32. We anticipate that providers may implement different solutions to determine a caller's indoor location, and that each of these solutions may present unique costs. We seek comment on what universal costs would be necessary across all indoor location technologies, as well as on any specific costs that are unique to different technologies. We understand that the specific manner in which we implement any indoor location accuracy requirement, including the degree of accuracy required and the timeframe for implementing any such requirement, potentially would affect providers' costs of compliance. We seek comment on these specific factors and how they might affect costs. Additionally, we seek comment on whether additional costs would be passed on to consumers, resulting in higher rates. If costs are likely to be passed on to consumers, we request information regarding how much rates would increase.

33. Finally, we believe that any costs imposed by our rules might be mitigated, at least to some degree, by the fact that providers are already undertaking significant indoor location technology research and development on their own for commercial, non-911 reasons. We seek further comment on the degree to which commercial development—unrelated to any Commission indoor location capability requirement—could be leveraged to mitigate the costs of compliance. What additional costs would be imposed by the potential indoor location requirements set forth in this *Third Further Notice* above and beyond the costs that commercial carriers would already have in implementing indoor location capabilities for commercial purposes?

B. Near-Term Indoor E911 Location Accuracy Requirements

34. As discussed in greater detail below, we propose that after a reasonable implementation period, CMRS providers subject to § 20.18 of the Commission's rules, 47 CFR 20.18, must (1) locate callers within 50 meters for 67 percent and 80 percent of indoor calls within two years and five years of the effective date of adoption of rules, respectively, and (2) provide vertical (z-axis) data, within 3 meters accuracy, for 67 percent and 80 percent of indoor calls within three years and five years of the effective date of adoption of rules, respectively. We propose that these indoor location accuracy requirements be implemented nationwide. Finally, we propose the institutionalization of an indoor location accuracy test bed for purposes of demonstrating compliance with these requirements and ask about other approaches to validating compliance.

35. We seek to promote several key objectives through these proposed rules: (1) Make indoor location as widely available as technically and economically feasible, tracking recent improvements in location technology; (2) help CMRS providers, public safety entities, and the Commission to monitor performance and compliance; and (3) adopt rules that are technology-neutral, cost-efficient, and easy to understand and administer. We seek comment on how our proposed approach, as well as any potential alternatives—particularly

any consensus proposals from industry and public safety stakeholders—might promote these objectives most effectively. We also seek comment on whether there are any other engineering or other issues, not raised in this *Third Further Notice,* that the Commission should consider with regard to promoting the location accuracy goals in this rulemaking proceeding.

1. Horizontal Location Information

36. *Background.* Prior to the *CSRIC Indoor Location Test Bed Report,* the record generally reflected a consensus that it was premature to impose indoor location accuracy requirements. More recently, after CSRIC's submission of its indoor location test bed report and recommendations in March 2013, some public safety groups and technology vendors now urge the Commission to require some level of accuracy for indoor 911 calls. At the same time, however, some industry representatives suggest that ''future progress [is] needed to meet the expressed needs of the public safety community.'' However, as discussed above, CMRS providers express concern about the ability to move forward with indoor location accuracy requirements at this time.

37. WG3 concluded approximately a year ago that ''additional development is required to ensure'' the provision of an ''actionable location,'' especially in urban and dense urban environments. However, participants in the WG3 test bed have indicated that they were then in the process of making improvements to their technologies. Other parties submit that recent developments in hybrid technologies and solutions show that improvements in location accuracy are being implemented. Some industry representatives note the possibility for improved indoor accuracy with the implementation of small cell networks.

38. *Discussion.* We propose a near-term requirement to achieve ''rough'' indoor location information. We propose to require CMRS providers subject to § 20.18 of the Commission's rules, 47 CFR 20.18, to provide horizontal (x- and y-axis) information for wireless 911 calls that originate indoors. Specifically, we propose to require CMRS providers to identify an indoor caller's horizontal location within 50 meters. We propose that CMRS providers must satisfy this accuracy requirement for 67 percent of calls within two years from the effective date of the adoption of any rules, and for 80 percent of calls within five years from the effective date of the adoption of any rules. Under this proposal, the requirement would apply uniformly to all indoor calls and would be technology-neutral; CMRS providers could use any location technology or combination of location technologies to meet this requirement.

39. We believe that a search radius of 50 meters will provide meaningful information while being attainable in the near-term. A larger search ring, while easier to implement, would not yield sufficiently granular information to be of use to first responders. In the longer term, location information should be sufficiently granular to provide a specific residential or business address, including floor and suite or apartment information. Nevertheless, based on existing technological considerations and the needs of the public safety community, we find that the public safety and interest would be better served by adopting this requirement in the near term rather than allowing a regulatory gap to grow. We agree with CSRIC's observation that the objective should ''be for the smallest possible search ring,'' and we seek comment on our proposed location accuracy requirement of 50 meters.

40. The *CSRIC Indoor Location Test Bed Report* also observed that the participating vendors are currently working on improvements to their location technologies that show promise toward achieving more precise accuracy performance. Additionally, the record and the *CSRIC Indoor Location Test Bed Report* indicate that other vendors are actively working on advances in improving location technologies. We seek comment on the extent to which mandating a 50-meter accuracy requirement to indoor calls—after a reasonable period of time—would encourage CMRS providers to work with location and device vendors to implement the advances being made in indoor location technology.

41. As noted above, the CSRIC test bed examined the RF fingerprinting, A–GPS/AFLT, and beacon technologies of Polaris, Qualcomm, and NextNav, respectively. Horizontal location accuracy varied by technology and the representative environments—dense urban, urban, suburban, and rural. For each environment, CSRIC evaluated the accuracy of each technology for 67 percent and 90 percent of the total number of calls tested. While we acknowledge that the test bed results indicate that further improvement is necessary, we are encouraged that, at least in suburban and rural environments, a 50-meter (or less) search ring can already be produced by existing technology. Further, even if technology currently cannot satisfy the proposed near-term 50-meter accuracy requirement in more challenging indoor environments, the adoption of more stringent requirements for indoor location accuracy, together with a reasonable implementation timeframe, would afford CMRS providers with sufficient time and incentive to develop the necessary technology to enable compliance with the proposed requirement regardless of the environment.

42. We propose to combine the 50-meter accuracy requirement with a reliability threshold of 67 percent in two years and 80 percent in five years. With this requirement, the center point of the uncertainty circle should fall within 50 meters of the true location 67 or 80 percent of the time, as applicable, and must be delivered within 30 seconds. Thus, under the first two-year benchmark, up to 33 percent of calls may either have location outside the accuracy threshold or location data that arrives after a delay of more than 30 seconds. We seek comment on whether the proposed two-stage reliability thresholds of 67 and 80 percent would be useful to public safety entities and technically feasible for CMRS providers to achieve. Under the current E911 requirements based on outdoor measurements, CMRS providers using handset-based location technologies must satisfy a reliability requirement of 67 percent for 50 meters. We also note that CSRIC tested for location accuracy based on the reliability percentages of 67 percent and 90 percent of the total number of calls tested. In proposing this two-stage reliability requirement, we seek comment on whether a reliability metric of 67 percent is adequate to meet the needs of public safety in the current environment. CSRIC considered that the public safety entities need reliable, ''consistent caller location information'' for indoor locations; would a 67 percent requirement provide sufficiently reliable indoor location information? We note that CSRIC's analysis of accuracy measurements versus reliability percentages indicates that an 80 percent reliability requirement for indoor calls, while not achievable now, may be attainable with a 50-meter accuracy requirement in the proposed near-term period. We seek comment on whether two-stage approach to adopting reliability requirement would adequately address public safety needs, and seek comment on any alternative approaches.

43. We also seek comment on whether the proposed two-stage reliability requirements are feasible in light of the types of specific challenges that CMRS providers may confront in indoor environments, such as the proliferation

of signal boosters within buildings. We seek comment on the extent to which these types of indoor-specific challenges may affect a providers' ability to deliver location information in compliance with our proposed reliability thresholds for indoor calls.

44. At the same time, we recognize that certain in-building systems and access devices—such as a Distributed Antenna System (DAS) network—could be programmed to provide specific location information, including building address and floor level information, for the origination of the indoor call. In addition to our proposed 50-meter accuracy requirement, should we consider adopting an alternative indoor location requirement that CMRS providers can satisfy by delivering a caller's building address and floor information? Such a requirement would be consistent with our long-term indoor location objective, which is the delivery of ''dispatchable address'' information, including the caller's building address, floor level, and suite/room number.

45. Further, we propose that the combined 50-meter accuracy and 67- and 80-percent reliability requirements comprise the sole ring for testing indoor location accuracy. We seek comment on this proposal. We note that, in the context of E911 location accuracy based on outdoor measurements, our rules include a ''dual search ring'' system, with different reliability thresholds for 50-meter and 150-meter accuracy. While a dual search ring requirement was a reasonable approach based on outdoor measurements, a search ring larger than 50 meters is unlikely to yield sufficiently granular information to prove useful to public safety in the context of locating a caller indoors.

46. We also seek comment on the costs of imposing a 50-meter accuracy requirement (versus some other benchmark), and a two-stage reliability requirement of 67 and 80 percent (or some other reliability benchmark or dual ring system). We anticipate that a more precise horizontal 50-meter accuracy requirement would come at a higher cost than a less precise accuracy requirement, but to what extent? We seek comment on what any cost differential might be, and whether such costs could be mitigated. For example, would a single 50-meter/67 or 80 percent requirement be more costly to CMRS providers than a dual search ring? For example, would a 50-meter/67 percent, 150-meter/80–90 percent requirement (similar to our existing Phase II E911 requirements based on outdoor measurements for handset-based location solutions) serve to reduce costs?

47. We seek comment on alternative approaches to implementing indoor location accuracy and reliability requirements. For example, a potential alternative approach would be to extend the existing E911 Phase II location accuracy requirements, which currently apply to outdoor measurements only, to indoor environments. While this approach would permit providers to simply apply existing outdoor location accuracy requirements to indoor calls, such an approach could be inconsistent with the Commission's intent to progress towards more granular location data for all wireless calls to 911, and, as discussed above, would be unlikely to result in a sufficiently narrow search ring to be of use to public safety in indoor environments. Further, we think that a uniform indoor accuracy requirement, independent from any existing outdoor location requirements, acknowledges that indoor environments are distinct from outdoor environments. In the *CSRIC Indoor Location Test Bed Report,* CSRIC recommended that the Commission treat indoor location accuracy separately from outdoor location accuracy due to differences in testing and technologies. We seek comment on this analysis and our proposed approach.

48. We also invite alternative approaches that would best weigh the costs and benefits of implementing an indoor location requirement with technical feasibility, timing, and other implementation concerns. In particular, we invite industry and public safety stakeholders to propose consensus-based, voluntary commitments that would address the public safety goals set forth in this proceeding and facilitate closing the regulatory gap between indoor and outdoor location accuracy without the need to adopt regulatory requirements. We seek comment on whether there has been a market failure in the provision of E911 information and, if not, whether the market could be relied upon to address indoor location issues on its own, and within a reasonable period of time. Could voluntary commitments, in conjunction with Commission monitoring of indoor location accuracy developments and actual performance, be sufficient and effective in satisfying the public safety objectives of this proceeding? We invite comment on the potential for voluntary commitments and other consensus-based proposals to address these issues.

49. *Timeframe.* In light of recent developments in wireless technology and usage trends, we believe it is critical to address the gap in our existing E911 regulatory framework regarding indoor location accuracy as quickly as possible. Accordingly, we propose a two-stage implementation timeframe from the effective date of an order adopting indoor E911 location accuracy requirements and seek comment on whether such a timeframe would be technically feasible and economically reasonable. We recognize that the extent to which a provider is able to satisfy a specific accuracy or reliability requirement will be linked to the timeframe allowed for implementation of such requirements.

50. The record, to date, is divided regarding whether location accuracy technology is sufficiently developed to support the near-term implementation of an indoor location accuracy requirement. However, evidence in the record suggests that technology is sufficiently developed to support the implementation of an indoor location accuracy requirement in the near term. For example, CSRIC observed that the participating vendors are currently working on improvements to their location technologies that show promise toward achieving more precise accuracy performance. These results also indicate that at least one indoor location technology is already close to achieving the indoor accuracy requirement equivalent to the existing outdoor handset-based location requirement (50 meters for 67 percent of calls). The record and the *CSRIC Indoor Location Test Bed Report* indicate that other vendors are actively working on advances in improving location technologies. In addition, recent filings suggest that the technology is sufficiently developed to support a near-term indoor location accuracy requirement.

51. We seek comment on whether a two-year timeframe is sufficient for CMRS providers to satisfy the horizontal (x- and y-axis) component of the indoor location accuracy requirement discussed above for 67 percent of indoor 911 calls. We believe that the significant public interest benefits of providing indoor location as soon as possible, combined with the current pace of technological developments, suggest that an expedited timeframe may be feasible and warranted. The CSRIC test bed results, which tested three different technologies—all of which provided reasonably accurate indoor measurements—and subsequent testing by others of their indoor location technology with similar results, suggests that location technology, with further advancements, could satisfy our proposed accuracy requirement within this timeframe. Furthermore, as described above, at least two of the indoor location technologies tested in

the CSRIC test bed are commercially available already, while TruePosition asserts that its solution is already in use by two of the nationwide CMRS providers and ''can easily be paired with existing AGPS capabilities, used by many cell phone networks, in a hybrid solution.'' We seek comment on our analysis. In what timeframe could technologies meet the proposed 50-meter requirement for 67 percent of all indoor calls? Is a five-year timeframe appropriate for technologies to meet the proposed 50-meter requirement for 80 percent of all indoor calls? How long would standards bodies need to develop any necessary standards? What else should the Commission consider with regard to the proposed timeframes?

52. We also seek comment on how any necessary network and handset upgrades would impact the proposed timeline. How long would it take CMRS providers to deploy location accuracy systems capable of meeting the proposed requirements throughout their networks? How long would providers need to obtain the hardware necessary for upgrading handsets to work with newly deployed location accuracy systems? How much time would be necessary for upgraded handsets to enter the marketplace to sufficiently penetrate the marketplace, such that providers could meet the proposed 67 and 80 percent reliability requirements?

53. Some commenters suggest a longer implementation timeframe is necessary, but we believe that the establishment of firm timeframes—together with a clear accuracy requirement—will provide the regulatory certainty necessary for parties to dedicate resources to improving location accuracy technology. Further, the extent and pace of recent advancements in indoor location technology suggests that technical feasibility will not prove to be a barrier to implementation of a near-term, two-year indoor location requirement of 50 meters for 67 percent of calls. Given that there are several different indoor location technology solutions already deployed or under development, we think that a two-year timeframe would allow for the development of technological alternatives and encourage competition among location technology vendors, so that CMRS providers would have a choice of solutions to implement. Two years would also allow time necessary to establish the indoor location accuracy test bed.

54. We also seek comment on alternatives to using the effective date of rules as the trigger for the timeline to comply with proposed indoor location accuracy requirements. For example, to address potential uncertainty in the development of technology, should we consider initiating the compliance timeline only after the test bed administrator certifies that a technology has met the proposed accuracy standards in the test bed? Would any process be necessary or appropriate for opportunity for comment on and Commission review of such a determination? If we used technology certification as the timeline trigger, should we require availability of competitive technology options? Should we retain the two- and five-year timelines proposed above or should they be shortened? Would linkage of the timeline to technology certification reduce the incentive to invest in technological development or create incentives to delay testing in the test bed? What other factors should we consider with regard to the impact of test bed certification on proposed timelines?

55. As another alternative, if the timeline is triggered by the adoption of rules, we seek comment on whether the Commission should consider reevaluating the compliance timeline at some interim point to evaluate the status of testing of location technology. For example, a year after the rules go into effect, the Commission could require the test bed administrator to report to the Commission on the results of technology testing, at which point the Commission could consider whether any adjustments to the timeline are necessary based on how technologies have performed in the test bed. Such an approach would enable the Commission to evaluate progress made during testing while retaining control over implementation timeframes and ensuring that testing efforts proceed in a timely manner. We seek comment on this alternative.

56. We invite parties who disagree with this proposed timeframe to provide specific reasons why more time is necessary, including the steps necessary to implement horizontal requirements and the time necessary to satisfy each step. We also seek comment on whether there have been sufficient advancements in location technology since the CSRIC test bed results. We also understand that additional capital investment may be necessary to meet any new proposed indoor testing requirements. We seek detailed and concrete data regarding the costs of implementing horizontal indoor location accuracy requirements within a two-year timeframe. We also seek comment on alternative reliability standards, as well as on whether we should phase in different reliability standards in conjunction with staged implementation timeframes, or different requirements for specific types of mobile devices (*e.g.,* only 4G-capable devices). Alternatively, would likely development timetables and cost considerations warrant a longer implementation timeframe that would permit integration of the vertical location capability proposed below on the same schedule?

57. *Facilitating Network Migrations and NG911 Transitions.* Whether we adopt the proposed requirements or another approach, we seek to encourage CMRS providers to invest in the near-term as a pathway to achieving more precise indoor accuracy in the long term. We also believe that any near-term indoor location accuracy requirements should take into account long-term E911 and NG911 objectives to avoid requiring significant investment in technologies that could become stranded. In our view, a technology-neutral indoor accuracy requirement should allow CMRS providers flexibility to adopt an indoor location accuracy solution that best fits with their long-term business and technology plans.

58. We seek comment on how best to structure a near-term requirement so that it will promote our longer-term objectives. For instance, what approach would provide incentives to providers to leverage existing investments in implementing technologies in the near-term to facilitate their efforts to meet a long-term accuracy requirement? What effect if any would it have on their ability and incentive to accelerate deployment of the vertical location accuracy goals discussed below? On the transition to NG911? How would the adoption of a near-term 50-meter requirement affect the costs, deployment, and operation of the network upgrades that providers currently are making to deploy 4G technologies? Would the proposed near-term requirements have an adverse impact on current and future requirements work that could also serve to achieve meeting a long-term accuracy requirement? In this regard, we note that CSRIC concluded that more standards work will be required ''to allow practical implementation of many emerging location technologies for emergency services use.''

2. Vertical Location Information

59. *Background.* While horizontal location information is a critical element to locating a 911 caller, a third dimension of location information—a vertical, or ''z-axis'' component—would greatly enhance location accuracy. Vertical location information on a caller's floor height would substantially

benefit first responders trying to locate callers in multi-story buildings.

60. CSRIC II's Working Group 4C (WG4C) was responsible for examining E911 and public safety location technologies in use today, identifying current performance and limitations for use in next generation public safety applications, examining emerging E911 public safety location technologies, and recommending options to CSRIC for the improvement of E911 location accuracy timelines. Among other findings, WG4C identified several challenges with providing a vertical location data, noting in particular that ''[c]urrent data formats for sending location to a PSAP do not support transmission of Z-height, and therefore a change to the relevant standards is required.'' Finally, WG4C recommended that there be an in-depth analysis in the future of z-axis data and how it could be transmitted to PSAP securely.

61. The Commission later tasked CSRIC II with additional investigation of location accuracy. Subsequently, as discussed above, in 2012–2013, CSRIC III's WG3 conducted an indoor location test bed to explore further currently available and future indoor location technologies. Although it did not specifically focus on technologies that could provide z-axis information, one participating vendor, NextNav, tested its indoor location technology for vertical location accuracy in the CSRIC test bed. NextNav provided vertical location accuracy within 2.9 meters and 4.8 meters for the 67th and 90th percentiles, respectively. NextNav's second-generation technology was tested again in 2013 and demonstrated improvements on the results reported in the 2012 test bed, including z-axis performance.

62. WG3 noted that ''[p]ublic safety recognizes that additional work remains before actionable altitude measurements can be broadly provided and utilized to aid first responders, including standardization, commercial availability, and deployment of such technologies.'' However, the record indicates that other vendors have been developing this capability, suggesting that z-axis technology has taken significant strides toward commercial viability since the Commission last considered it. For example, several commenters noted the feasibility of indoor and vertical location and have strongly urged the Commission to develop indoor location accuracy requirements.

63. *Discussion.* In light of advancements in indoor location technologies with vertical capabilities, and the growing use of smartphones with features such as barometric pressure sensors, we believe that vertical location technology has sufficiently matured to propose the near-term inclusion of z-axis location information for wireless 911 calls placed from indoors. Specifically, we propose to require CMRS providers to deliver z-axis location information within 3 meters of the caller's location, for 67 percent and 80 percent of indoor wireless 911 calls within three years and five years of the effective date of adoption of rules, respectively. By using a 3-meter measurement, we are effectively requiring floor level information. A vertical search ring greater than 3 meters from the caller could lead to mistaken floor identification.

64. We think a 3-meter vertical location accuracy requirement is technically feasible. Significantly, based on the test bed report and filings in the record to date, at least one vendor has developed vertical location technology that already can locate callers to within 2.9 meters at the 90th percentile, and others estimate having similar granular capabilities within three to five years. Below, we seek comment on whether an initial deployment requirement of three years from the effective date of our new rules would be achievable, including whether such a timeframe ensures that CMRS providers have sufficient competitive choices of vendors and time to incorporate, test, and deploy their technology of choice, and whether setting such a timetable would spur the advancement of vertical location solutions already in development.

65. We also seek comment on the potential costs associated with a vertical location requirement. If a provider were to modify handsets to incorporate barometers in handsets, for example, what would be the cost per handset? We seek comment on how best to structure a vertical location accuracy requirement to mitigate potential costs to providers while still ensuring PSAPs obtain useful vertical location information. We note that our proposed requirement is technology-neutral, and our proposed approach affords providers with the flexibility to choose the most cost-effective means of integrating vertical location technology into their networks.

66. We also seek comment on whether PSAPs are ready to make use of z-axis location information. In recent testimony before the Senate Commerce Committee, NENA stated that the existing location databases have data fields capable of capturing other location elements, such as z-axis readings. NENA opined that many PSAPs are prepared to accept an extended range of data, once the provider has the capability to capture such data. We note that elevation and floor level information have been an optional component of ALI standards for several years. Polaris Wireless, however, notes that ''PSAP call takers must be able to visualize vertical location information in computer-aided design (''CAD'') or other display formats in order to dispatch personnel to the correct place'' and that ''significant challenges lie ahead in designing and upgrading public safety equipment, databases, and procedures in preparing for future availability of vertical information.'' In addition, NextNav states that ''many PSAPs are not presently prepared to fully utilize Z-axis data in the emergency dispatch process because they do not have accurate mapping systems to convert Z-axis data into floor-level dispatchable information.'' To the extent that PSAPs must take additional measures to be capable of receiving z-axis information, we seek comment on what steps must be taken and any corresponding costs, as well as the timeframe in which these steps reasonably could be completed.

67. *Timeframe.* We seek comment on a reasonable timeframe for provision of vertical (z-axis) information. We recognize that the development of vertical location technology, the incorporation of these capabilities into a sufficient number of consumer handsets, and the development of any necessary industry standards, may take additional time. We therefore propose that CMRS providers must deliver z-axis information for 67 percent of calls within a three-year timeframe and for 80 percent of calls within a five-year timeframe. We seek comment on whether this would afford a sufficient implementation period. We seek comment on any necessary developments that must take place in order for the delivery of z-axis information would be feasible.

68. Commenters should explain what the path to implementation of a z-axis requirement would look like, including specific steps and corresponding timeframe estimates. We note that only one vendor participating in CSRIC's indoor location accuracy test bed provided location information with a z-axis component. In this regard, CSRIC states that, ''even the best location technologies tested have not proven the ability to consistently identify the specific building and floor, which represents the required performance to meet Public Safety's expressed needs. This is not likely to change over the next 12–24 months.'' Several commenters also argue that vertical

location technology is not yet sufficiently developed or widely enough available to reasonably require providers to support this capability at present.

69. At the same time, however, based on the CSRIC test bed results and on filings in the record to date, at least one vendor has developed vertical location technology that already can locate callers to a more granular degree than what we propose here, and others estimate having similar granular capabilities within three to five years. In addition, nearly all smartphones are now equipped with sensors that can determine speed, compass direction, and movement. Thus, many devices can now gauge direction, turns, speed, and height above sea level, and thereby generate a three-dimensional view of the user's location. We believe that this trend will continue. We seek comment on these developments, and how these trends should affect the ability of CMRS providers to provide z-axis information for 67 percent of calls within three years and 80 percent of calls within five years. As discussed above, we also seek comment on whether test bed certification should serve as a triggering date rather than the effective date of the adoption of rules. Alternatively, if the timeline is triggered by the adoption of rules, should the Commission consider reevaluating the compliance timeline at some interim point to evaluate the status of testing of location technology?

70. Finally, we seek comment on the timeframe in which a significant fraction of PSAPs would be capable of receiving and processing z-axis information, and how that should impact the timeframe in which a z-axis requirement could reasonably be imposed on CMRS providers, or whether PSAPs are ready to accept z-axis information today. In addition, we seek comment on any technical, operational, manufacturing, or other issues that may impact CMRS providers' ability to implement the proposed requirement in the near future.

3. Implementation Issues

a. Compliance Testing for Indoor Location Accuracy Requirements

71. *Background.* As noted above, our current Phase II location accuracy rules contain no requirement for testing compliance with the standards or for reporting the results thereof. Despite the acknowledged difficulties with indoor testing, the International Association of Chiefs of Police suggested that the Commission nevertheless formulate a testing regime that requires periodic indoor testing to verify compliance. NENA and APCO concurred. Location technology vendors also supported indoor location testing. Many commenters also urged the Commission to consider the standard developed by ATIS (ATIS–0500013), in collaboration with public safety entities, to assess the performance of indoor wireless location technologies. *See* ''Approaches to Wireless E9–1–1 Indoor Location Performance Testing,'' ATIS Technical Report 0500013.

72. *Discussion.* We believe that WG3 demonstrated the feasibility of establishing a test bed for purposes of evaluating the accuracy of different indoor location technologies across various indoor environments. Accordingly, we propose that a test bed approach, representative of real-life call scenarios, would be the most practical and cost-effective method for testing compliance with indoor location accuracy requirements. Specifically, we propose a rule requiring CMRS providers to participate in an independently administered test bed program that is representative of real-life call scenarios and that includes, but is not limited to, the following testing components:

- Testing in representative indoor environments based on standards adopted by an industry standards body group;
- Testing for the following performance attributes: location accuracy, latency (Time to First Fix), and reliability (yield);
- Requiring CMRS providers to show that the indoor location technology used for purposes of its compliance testing is the same technology (or technologies) that it is deploying in its network, and is being tested as it will actually be deployed in the network.

As an alternative, however, we also propose that CMRS providers may use other testing methods that may better suit their particular business plans or practices. In order to maintain the same level of test result reliability, however, CMRS providers must demonstrate that their alternative methodology and testing procedures are at least equivalent to the testing methodology and procedural standards used in the independently administered indoor location accuracy test bed. In using alternative testing methods, CMRS providers would need to provide the same information about the location technologies' effectiveness, and also show that the indoor location technology used in the test bed is the same technology deployed in their network.

73. Certification under either the proposed test bed or an alternative test methodology (of equivalent reliability) would provide a safe harbor to demonstrate that the CMRS provider meets the indoor location accuracy requirement Under our safe harbor proposal, a technology that meets the location requirements in the test bed, upon certification by the CMRS provider that it has been deployed in a manner consistent with the test bed parameters, would be presumed to comply with the Commission's rules, without the need for the provider to conduct indoor testing in all locations where the technology is actually deployed. We seek comment on the practical effect of this safe harbor. What factual showing would be necessary to overcome the presumption of compliance? If a compliance issue arises that overcomes the presumption, should we afford the provider an opportunity to resolve the issue before considering initiation of enforcement action? If the provider can demonstrate that it is using best efforts to meet the accuracy requirements, but is prevented from doing so by circumstances beyond its control, should we limit the scope of potential enforcement activity? We seek comment on these issues.

(i) Test Bed Methodology

74. We propose that CMRS providers may demonstrate compliance with indoor location accuracy requirements by participating in an independently administered test bed program. Certification by the test bed administrator would provide CMRS providers a ''safe harbor'' that they meet any indoor accuracy requirements we may adopt in this proceeding. As part of the test bed participation, CMRS providers must show that the indoor location technology used in the test bed is the same technology deployed in their networks, with similar parameters, such as beacon or cell tower density and topology. We believe that such an independently administered program would provide an objective platform for testing the accuracy of the provider's chosen indoor location technology in a variety of representative indoor environments and building types, without requiring ubiquitous in-building testing, and that such an approach would mitigate the potential costs of compliance testing.

75. Based on the record and the methodology used by WG3 for its test bed, we propose certain minimal test bed requirements. Specifically, the test bed must (1) include testing in representative indoor environments; (2) test for certain performance attributes (discussed in greater detail below); and (3) require CMRS providers to show that

the indoor location technology used for purposes of its compliance testing is the same technology (or technologies) that it is deploying in its network, and is being tested as it will actually be deployed in the network. We discuss each of these proposed requirements below. We also seek comment on which aspects of the testing process—administrative, technical, and operational—should be set forth in our rules and which are better left to the discretion of the test bed administrator.

76. *Representative Environment.* First, we propose that the test bed should reflect, to the extent possible, a representative sampling of the different real world environments in which CMRS providers will be required to deliver indoor location information. We seek comment on whether, by doing so, the test bed could provide reliable information about how location technologies perform in different circumstances, without necessitating ubiquitous testing in real-world environments. Both WG3 and commenters note that the industry standards body group, ATIS, has adopted indoor testing standards incorporating representative test environments rather than ubiquitous testing. The CSRIC WG3 test bed used dense urban, urban, suburban and rural morphologies, as defined by the ATIS–0500013 standard. We seek comment on whether these morphologies are sufficiently representative and inclusive of the variety of indoor environments in which wireless 911 calls are made, or whether there are different environments that should be included.

77. *Performance Attributes.* We propose that any location accuracy test bed must evaluate a CMRS provider's choice of location accuracy technology in light of several key performance requirements: Location accuracy, latency (TTFF), and reliability (yield). For purposes of determining compliance with the location accuracy and TTFF requirements, we propose to follow the methodology used by WG3 in its test bed. For location accuracy, the CSRIC test bed computed ''the error in estimating the location of the device under test by comparing each vendor's reported horizontal position . . . to the surveyed ground truth position of the test location (determined through a precise land survey).'' Further, ''[e]ach test call (or equivalent) was assumed to be independent from prior calls and accuracy was based on the first location delivered by the vendor after 'call initiation.' '' With regard to latency, the CSRIC test bed calculated TTFF by ''establishing the precise time for call initiation (or an equivalent initiation event if the vendor's test configuration did not support the placement of an emulated emergency test call).'' More specifically, we propose to measure latency from the time the user presses SEND after dialing 9–1–1, to the time the location fix appears at the location information center.

78. We propose that providers measure yield in the test bed for purposes of testing whether a location technology satisfies that proposed reliability requirement. With respect to yield, the CSRIC test bed defined the ''yield of each technology . . . as the [percentage] of calls with delivered location to overall 'call attempts' at each test point.'' As with indoor calls in real-world scenarios, however, not all test call attempts will actually connect with the testing network established for the test bed and therefore constitute ''completed'' calls. In view of the difficulties that WG3 encountered in testing indoor locations, we propose a modified definition of yield for purposes of determining compliance with the proposed 67 and 80 percent reliability requirements in the test bed. We therefore suggest that the yield percentage be based on the number of test calls that deliver a location in compliance with any applicable indoor location accuracy requirements, compared to the total number of calls that successfully connect to the testing network. We propose to exclude calls that are dropped or otherwise disconnected in 10 seconds or less, for which providers do not get a Phase II fix, from calculation of the yield percentage (both the denominator and numerator). We seek comment on this proposed calculation of yield.

79. For purposes of assessing yield, we propose that CMRS providers should satisfy the 67 and 80 percent reliability requirements for each individual indoor location morphology (dense urban, urban, suburban, and rural) in the test bed, and based upon the specific type of location technology that the provider intends to deploy in real-world areas represented by that particular morphology. We believe this approach is consistent with our proposal that providers must satisfy the location accuracy requirement at the PSAP- or county-level. We seek comment on this approach.

80. Finally, we seek comment on whether the foregoing metrics are sufficient for assessing each performance requirement and our proposed indoor location requirements as a whole. What other performance requirements, if any, should we require to determine compliance with our proposed location accuracy requirements?

81. *Testing to Emulate Actual Network Deployment.* We propose that a CMRS provider must show both (1) that the indoor location technology used for purposes of its compliance testing is the same technology that will be deployed in its network, and (2) that this technology is being tested as it will actually be deployed in the CMRS provider's network. The CSRIC test bed tested both commercially available technologies as well as new and emerging technologies. Accordingly, two of the three participating vendors could not test their technology as it would be deployed in a provider's network to provide an end-to-end E911 location solution. For this reason, technical performance in the test bed was necessarily different than what could be achieved in an actual production implementation. We seek comment on our proposal to require testing of the indoor location technology to be used as it will actually be deployed in CMRS provider's network. Moreover, we seek comment on the feasibility of establishing a test bed that addresses our concerns that any compliance test bed provide a close simulation of real-world indoor calling scenarios. Are there factors such as beacon or cell tower density and topology that may cause the test bed results to differ materially from performance for actual 911 calls outside the test bed? Should the test bed be constrained to a small geographic area, similar to the CSRIC IV example, or should the selection of test points change periodically or cover a larger geographic area?

82. *Test Bed Approach.* In order to accommodate a technology-neutral approach and to encourage advancements in indoor location technology, as well as to avoid the costs of unnecessary testing requirements in a given situation, we think it appropriate to allow for some flexibility in compliance testing procedures. For this reason, we propose allowing the indoor test bed administrator sufficient discretion to determine the actual test approaches to be used, *e.g.,* the number of test points, number of test calls, and the best combination of devices to test simultaneously per technology. We seek comment on this proposal.

83. *Test Bed Administration.* WG3 indicated that a competent and reliable administration is necessary in order to establish and operate an effective test bed. There are multiple administrative issues inherent in setting up any test bed for purposes of compliance testing, including (1) selecting an independent

test bed administrator; (2) establishing a test bed funding mechanism; (3) finding an acceptable third-party test house or houses; (4) establishing and maintaining the test bed, including maintenance of any data and data confidentiality, and (5) establishing and administering a certification process for CMRS providers to demonstrate compliance with the Commission's indoor location accuracy requirements. We seek comment on these views and on whether there are any other such administration issues that we should consider.

84. The Commission recently renewed the CSRIC charter for an additional two years, asking CSRIC IV WG1 to examine many of the foregoing issues. Its report on these issues is due in June 2014. While CSRIC IV WG1 is not considering requirements for the establishment and administration of an ongoing test bed for the specific purpose of assessing compliance with location accuracy requirements, we expect that its recommendations will be informative. As such, we direct the Bureau to seek further comment on them in this proceeding. These comments should address whether the test bed being developed by CSRIC IV WG1 would be sufficient for the purpose of compliance testing for indoor location accuracy.

85. We also note that the test bed CSRIC IV WG1 is developing would not include a certification component. Is such a certification requirement necessary or appropriate? Are there other Commission compliance regimes (such as for equipment authorizations pursuant to part 2 of our rules) that may serve as appropriate models? We seek comment on how any compliance certification process should work for the indoor location accuracy compliance test bed. We also ask commenters to provide us with cost estimates for the certification component of the indoor location accuracy compliance test bed.

(ii) Alternative Testing Methods

86. As an alternative to the test bed method outlined above, we propose to allow CMRS providers to demonstrate compliance with our indoor location accuracy requirements through alternative means. We believe this would serve the public interest by allowing CMRS providers the flexibility to test their indoor location accuracy solution in a manner that suits their particular business needs while, at the same time, maintaining the same level of test result reliability. We also propose that CMRS providers could combine resources to develop their own test methodology. We propose, however, that CMRS providers choosing an alternative approach must demonstrate in any certification requirement that their methodology and testing procedures are at least equivalent to the rigor and standards used in the independent location accuracy test bed approach discussed above. Thus, they would have to provide the same information about the technologies' effectiveness and also show that the indoor location technology used in the test bed is the same technology deployed in their network.

87. What is the feasibility of allowing CMRS providers to develop such an alternative mechanism for testing indoor location accuracy? For example, how should the Commission determine whether CMRS providers choosing to forego the test bed have demonstrated that their methodology and testing procedures are at least equivalent to the rigor and standards used in the test bed approach discussed above? Should we require providers electing to use an alternative testing approach to file their proposed approach with the Commission in advance, in order to allow us to review their proposed methodology? What further requirements, if any, are appropriate and necessary to ensure that a provider using an alternative testing approach is satisfying our accuracy requirements? Finally, should the Commission leave it to the industry to determine whether and how to establish any jointly used program in order to save costs?

(iii) Test Frequency

88. We seek comment regarding the extent to which CMRS providers should be required to re-test the accuracy of their indoor location technologies. For example, as CMRS providers make material upgrades to their networks and handsets to incorporate new or updated system and location technologies, further testing might be appropriate to show that the system continues to satisfy any indoor location accuracy requirements. What types of changes would be substantive enough to warrant re-testing? Alternatively, should we require periodic re-testing, regardless of whether a provider has made any significant updates to its network? We also seek comment on any alternative methods that might best ensure that indoor location technologies continue to comply with our requirements.

(iv) Confidentiality of Test Results

89. Under the WG3 test bed regime, all parties agreed that raw results would be made available only to the vendors whose technology was to be tested, participating wireless providers, and the third-party testing house. In order to protect vendors' proprietary information, only summary data was made available to all other parties. Should these restrictions be carried forward to the proposed indoor location accuracy test regime? Or should some or all test data also be made available to the Commission, or to requesting PSAPs and other 911 authorities? We note that APCO states that ''test results need to be shared with relevant PSAPs,'' and that ''PSAPs may also want to conduct independent tests to verify accuracy data.'' Moreover, given the extent to which mobile wireless communications services are becoming increasingly central to the day-to-day lives of Americans, should this data also be available, at least to some extent, to the public? Can and should the Commission's location accuracy requirements and enforcement of compliance therewith preempt any state or local determinations to the contrary, absent agreements between CMRS providers and PSAPs for more stringent requirements?

(v) Cost/Benefit Analysis

90. We also seek comment on the costs and benefits of all of our proposed compliance testing measures, as well as on additional ways to reduce the costs of compliance testing, without adversely impacting the reliability and accuracy of the test results. CSRIC reported that the 2013 test bed cost approximately $240,000. We anticipate that the costs of the proposed indoor test bed program may exceed that amount for several reasons. CSRIC noted that its test bed costs were for only the limited San Francisco Bay area, tested with a limited number of test points. If a single test bed remains sufficient for determining compliance with our indoor location accuracy requirements, we anticipate that costs will not increase substantially in this regard. However, larger or additional test beds may be necessary for purposes of compliance testing, which would increase costs. A larger number of test points and the participation of more CMRS providers and location technology vendors could also increase costs. Further, CSRIC noted that, in some instances, the test bed process did not include testing the end-to-end E911 solution as it would be deployed in a carrier's network, which may increase costs.

91. Nevertheless, we believe that the broader test bed approach proposed here, based on testing in representative environments, is likely to cost significantly less than ubiquitous in-building testing. Both the record and CSRIC's report indicate that ubiquitous in-building testing is likely to be both costly and impractical due to security

and permission issues that make it difficult to access private buildings. Based on CSRIC's recommendation to test in representative environments and on initial CMRS industry comments supporting CSRIC's and standards body processes, we find that, by avoiding the need for ubiquitous testing, our proposed test bed process would significantly lower costs. Moreover, it would reduce the costs of participation by CMRS providers, by providing them the opportunity to share costs for the test bed. We also propose that CMRS providers may choose an alternative testing means. This may afford a way for CMRS providers to test their indoor location technology in a more cost-effective manner, depending upon their particular business plans. We seek specific cost data, where available, and comment on all of the foregoing, and any other, factors related to the implementation costs of an indoor location accuracy compliance test bed.

b. Applicability of Indoor Location Accuracy Requirements

92. We propose to apply the indoor location accuracy requirements on a nationwide-basis, across all geographic areas. As noted earlier, one of our key objectives is to make indoor location as widely available as is technologically and economically feasible. While we recognize that certain indoor environments are more likely to present challenges in identifying a caller's location, other indoor environments may not present greater challenges than outdoor environments. Based on the CSRIC test bed results, as well as additional information regarding the ability of location-based technologies to perform indoors, we believe that existing location-based technology is sufficient to identify a caller's location in a number of indoor environments already, and that providers might be capable of satisfying indoor location requirements nationwide within a reasonable period of time. CMRS providers also confirm that A–GPS technology works well in most indoor locations, and U.S. Census data suggests that the majority of indoor environments are likely to be the types of structures that are suitable for A–GPS location-based solutions. A 2011 peer-reviewed journal article, which presented the results of a study evaluating the ability of GPS- and A–GPS-enabled mobile phones to identify reference locations with known coordinates in an indoor two-story structure, found that whenever a valid GPS position fix was obtained, the maximum positional error never exceeded 100 meters, even when considering the indoor tests. *See* P. A. Zandbergen and S. J. Barbeau, ''Positional Accuracy of Assisted GPS Data from High-Sensitivity GPS-enabled Mobile Phones,'' 64 *Journal of Navigation* 3, pp. 381–399 (July 2011). We anticipate that additional improvements in location technologies since that time, together with advancements that will take place over the new few years, will reduce this potential for error even further. For example, additional global navigation satellite systems are being deployed or activated, such as GLONASS, Galileo and Compass.

93. Given the ability of A–GPS to perform well across a large number of indoor environments, together with the fact that the majority of CMRS providers are already using handset-based, A–GPS solutions, we believe that only a limited number of environments would require additional infrastructure in order for CMRS providers to comply with our proposed indoor accuracy requirements. We therefore believe that indoor location across all areas is technologically feasible, as well as economically reasonable. We seek comment on this analysis.

94. Alternatively, we ask whether we should apply our proposed indoor location accuracy requirement in a more targeted fashion, and if so, how? For example, would it be more effective to phase in application of the indoor location accuracy requirements, by first focusing on areas throughout the nation with the largest volume of indoor calls? If so, should we limit the application of our horizontal indoor location accuracy requirements to urban areas? The Census Bureau defines ''urban'' as ''[c]ore census block groups or blocks that have a population density of at least 1,000 people per square mile (386 per square kilometer) and surrounding census blocks that have an overall density of at least 500 people per square mile (193 per square kilometer).'' ATIS also provides definitions of ''urban'' and ''dense urban'' areas. *See* ATIS, Define Topologies & Data Collection Methodology Technical Report (ATIS–0500011). We seek comment on whether the Census Bureau or ATIS definitions would provide a useful basis for defining and focusing the application of indoor location requirements.

95. As another alternative, we seek comment on whether we should allow certain exclusions from the indoor location requirements. For example, should we exclude certain geographic areas from the indoor location requirements and if so, what areas should be excluded and why? What other potential distinctions might be appropriate? Should, for example, different considerations apply in with respect to vertical accuracy? Rather than establishing exclusions, should any exclusions be reported on a case-by-case basis? Our current E911 regulatory framework currently allows providers to file reports noting certain exclusions, such as areas with dense forestation. We also seek comment on how compliance based on one or more test beds, as discussed above, would affect the definition of areas to exclude. We also seek comment on whether we should establish any exceptions for smaller wireless providers and, if so, why. Rather than excluding certain areas from indoor location requirements, would it be more appropriate to apply a different accuracy threshold (for example, 100 meters instead of 50 meters) in certain indoor environments?

96. As noted above, we anticipate that the z-axis requirement should be applied co-extensively, in the same geographic areas, with any x- and y-axis indoor requirements. In the alternative, we seek comment on whether we should apply the z-axis requirement to only a subset of those environments where we apply the horizontal indoor location requirement, or otherwise apply the z-axis requirement in a manner that is independent from the application of horizontal indoor location requirements.

97. Finally, we seek comment on any other alternative approaches that would enable us to focus the application of indoor location requirements in the most effective and cost-efficient way possible. We recognize that the implementation of any indoor location accuracy requirements will impose costs on CMRS providers, and seek comment on the ways in which any implementation requirements could be designed to mitigate those costs to the extent possible, without sacrificing our important public safety objectives. We seek detailed comment on the costs associated with each of the proposed alternatives. We also seek comment on how we these different approaches may affect smaller CMRS providers and whether there are particular measures we should take to minimize the potential burdens on these smaller providers.

c. County/PSAP-Level Measurements; Enforcement Tied to PSAP Readiness

98. Under § 20.18(h) of the Commission's rules, 47 CFR 20.18(h), licensees subject to § 20.18(h) must satisfy the existing E911 Phase II requirements at either a county-based or PSAP-based geographic level. We propose to adopt this standard here, and

require CMRS providers to satisfy the proposed indoor location accuracy requirements on a PSAP-level or county-level basis. This geographic requirement has been in place since 2010, and we believe that it continues to provide a sufficient degree of accuracy to PSAPs in most cases. We also believe that extending this requirement to indoor location accuracy requirements would be most efficient and cost-effective for CMRS providers, by allowing them to choose which requirement best meets their needs based on individualized factors like natural and network topographies. We recognize, however, that a county- or PSAP-based requirement may be difficult to verify if testing is performed within a more geographically constrained test bed, as proposed above. We seek comment on this proposal.

99. We intend that CMRS providers' investment in and deployment of improved indoor location capabilities are targeted towards those PSAPs or counties that are capable of utilizing this location information. In this regard, PSAPs would be entitled to seek Commission enforcement of these requirements within their jurisdictions, but as a precondition would be required to demonstrate that they have implemented bid/re-bid policies that are designed to obtain all 911 location information made available to them by CMRS providers pursuant to our rules. In this manner, we also intend to ensure we receive consistent and reliable E911 call tracking data, based on all available E911 information, in connection with any claims for enforcement action. We note that the accurate and reliable delivery of E911 location information depends upon the willingness and readiness of PSAPs and CMRS providers to work together. We seek comment on this proposal.

d. Liability Protection

100. *Background.* In general, liability protection for provision of 911 service is governed by state law and has traditionally been applied only to LECs. However, Congress has expanded the scope of state liability protection by requiring states to provide parity in the degree of protection provided to traditional and non-traditional 911 providers, and more recently, to providers of NG911 service.

101. *Discussion.* We recognize that adequate liability protection is needed for CMRS providers to proceed with implementation of the indoor location accuracy requirements. The recent NET 911 Act and Next Generation 9–1–1 Advancement Act have significantly expanded the scope of this liability protection, and we believe this provides sufficient liability protection for CMRS providers. Nevertheless, we seek comment on whether there are additional steps the Commission could or should take—consistent with our regulatory authority—to provide additional liability protection to CMRS providers. Do CMRS providers have sufficient liability protection under current laws to implement our proposed indoor location accuracy requirements, or is additional protection still necessary or desirable? Have there been instances where this liability protection has proven to be insufficient?

102. More specifically, we seek comment on liability concerns that may be raised in conjunction with the possible adverse effect on indoor location accuracy from signal boosters. At the time of the *Signal Booster Report and Order,* 28 FCC Rcd 1663 (2013), the Commission noted that its existing E911 location accuracy requirements do not apply to calls placed indoors, where we expect the vast majority of multiple dwelling unit calls will be placed. Because we now propose to apply location accuracy requirements to indoor calls, we seek comment regarding any liability concerns with regard to the operation of signal boosters, and in satisfying our proposed indoor location accuracy requirements. CMRS providers commenting in the *Signal Booster Report and Order* were especially concerned about liability for location accuracy when those capabilities are affected by signal booster use. Have these liability concerns abated in any way, in light of technological developments that might improve location accuracy or based on liability protection afforded by existing laws? If not, what position, if any, could and should the Commission take regarding potential liability for interference with location accuracy technology from signal booster use, whether in the multiple dwelling unit context or otherwise?

e. Waiver Process

103. We seek comment on whether we should adopt a specific waiver process for CMRS providers who seek relief from our indoor location accuracy requirements. As discussed above, we seek to adopt cost-efficient, technology-neutral rules that are easy to understand and administer. In doing so, we intend to allow CMRS providers flexibility to comply with any indoor location accuracy requirements in a manner that suits their particular business plans and technology choices. At the same time, however, we recognize that there may be instances where a provider may require limited relief. In general, the Commission's rules may be waived for good cause shown. In the context of its E911 Phase II requirements, the Commission recognized that technology-related issues or exceptional circumstances could delay providers' ability to comply with the requirements, and that such cases could be dealt with through individual waivers as these implementation issues were more precisely identified.

104. We seek comment on whether our existing waiver processes are sufficient for purposes of any indoor location accuracy requirements, or whether we should adopt a waiver process that is specific to indoor location accuracy. In the event that commenters believe a specific waiver process would serve the public interest, we seek comment on how such a specific waiver process would be implemented. Furthermore, should we establish criteria for a streamlined process for waiver relief? For example, under one potential approach, providers who believe they cannot comply with a particular indoor location accuracy benchmark, despite their good faith efforts, may submit a certification to this effect six months prior to the applicable benchmark. The certification must include an alternative timeframe for satisfying the benchmark, as well as an explanation of how they will achieve compliance within this alternative timeframe. In the event a provider submits such a certification, and provided the certification is not false and the alternative timeframe is not unreasonable, should we defer enforcement action during the pendency of the alternative timeframe? What additional criteria, if any, might be warranted to justify a waiver or extension of time to satisfy an indoor location accuracy benchmark? We seek comment on how best to structure a waiver process that ensures providers take their obligation to satisfy indoor location accuracy requirements seriously, while at the same time acknowledging that unforeseeable circumstances might arise that would justify limited relief.

C. Long-Term Indoor E911 Location Accuracy Requirements

105. In developing a framework for E911 location accuracy, we seek comment on how any potential near-term requirements would operate in a NG911 environment, as well as how these requirements could facilitate the Commission's long-term location accuracy objectives. The accuracy requirements discussed above only provide for a ''rough'' approximation of

a wireless 911 caller's location. The proposed requirements for horizontal location within 50 meters and z-axis information within 3 meters could still result in building misidentification, and are insufficiently granular to provide room or apartment-level location. We agree with commenters who assert that public safety would be best served through the delivery of a dispatchable address. Commscope, however, notes that delivering location information in the form of a civic address may be better addressed in the context of NG911, because NG911 architecture allows for the explicit communication of floor and building address information, rather than conventional Phase II E911.

106. Over the long term, we seek comment on how to formulate requirements that would require sufficiently granular location information to provide PSAPs with ''dispatchable'' address information, which would include a building address as well as specific floor and suite/room number information for indoor calls. We seek comment on this goal, including its costs and benefits. We also seek comment on what technologies might facilitate the delivery of dispatchable address information, and within what timeframe. We also seek comment on what future location-based solutions and NG911 technologies may make the provision of dispatchable address information easier. In the following sections, we seek comment on ways in which we can take steps towards achieving our long-term indoor location objectives.

1. Leveraging Indoor Network Access Technologies

107. We seek comment on ways in which we can take steps towards achieving our long-term indoor location objectives by leveraging measures that CMRS providers are already taking to expand and enhance their networks. For instance, to account for technical difficulties of urban and indoor environment, CMRS providers are already deploying both small cells and DAS to improve and expand their network coverage and speed. In its report on leveraging location-based services for E911 purposes, CSRIC noted that ''[a]s cell sizes shrink, the location of the serving cell itself may suffice for a position estimate for both E9–1–1 call routing and first responder dispatch [because] the base station itself can be a Phase II positioning technology.'' *See* CSRIC III WG3, Leveraging LBS and Emerging Location Technologies for Indoor Wireless E9–1–1 (March 14, 2013) (*CSRIC LBS Report*).

108. We seek comment on whether small cells and DAS could be leveraged to provide critical location information for public safety entities responding to emergencies located indoors, and if so, how. In particular, we seek comment on whether, as part of a long-term indoor location solution, CMRS providers should be subject to a requirement to program all small cell and geographically identifiable DAS extensions of their CMRS networks with address information at the time of installation and/or prior to the commencement of commercial service using the small cell or DAS. We also ask whether wireless providers should also program existing small cell and DAS deployments with location information whenever those sites and system are upgraded or replaced.

109. We seek comment on the technical feasibility of programming both small cells and DAS with location information, as well as the feasibility of installing A–GPS chips within small cell nodes and DAS antennae. We note that Navanu, a location technology vendor, submits that its technology incorporates a passive RF analyzer that can also be ''embedded within . . . a DAS system . . . or any wireless broadband access point'' and ''can isolate a signal from a mobile [device] and map the device location.'' Can CMRS providers currently configure small cells, DAS, and industrial signal boosters to provide this information? If not, what additional developments must be made? Would additional work be necessary to develop industry standards? We also seek comment on whether configuring DAS and industrial signal boosters to identify the address of the building from which the 911 call originated might compensate for any potential adverse effect on determining location information through network-based methods that otherwise might arise from the use of signal boosters and DAS. Finally, we seek comment on whether CMRS providers could retroactively program existing small cells, DAS, and industrial signal boosters to contain specific address information.

110. We seek comment on the potential costs to CMRS providers to program small cell nodes with dispatchable address information. We also seek comment on the potential costs of configuring DAS to perform the same function. We believe that leveraging actions that CMRS providers are already undertaking should lower the potential costs for providers to achieve more granular location information that is consistent with our long-term E911 objectives.

111. We also seek comment on what steps, if any, PSAPs would need to take to incorporate and use this additional information. Could existing information fields be used to display additional address information, like floor and apartment number? If not, what additional upgrades would be necessary to PSAP equipment? What modifications to PSAP operating procedures would be necessary to accommodate any additional information from small cell deployments?

2. Differentiating Between Indoor and Outdoor Calls

112. CMRS providers generally have indicated that it is not possible to differentiate between indoor and outdoor calls to 911. We seek comment on whether technology has evolved such that CMRS providers are able now, or will be able in the foreseeable future, to determine whether a call originates from indoors and make this information available to PSAPs. If not, what additional technological advancements need to take place in order to differentiate between calls that originate indoors versus outdoors? In what timeframe would these advancements likely take place?

113. We suggest that one way in which indoor and outdoor calls could be differentiated is by using location information provided by small cell and DAS infrastructure. If dispatchable address information from a small cell or DAS node is available to the PSAP, this information would include the floor and suite/room number, thereby signifying the call originated indoors. Similarly, to the extent that providers convey z-axis information that indicates that a call originated above a certain height above ground, it could be reasonable to infer that a wireless call originated indoors. Furthermore, consistent with the observations in the *CSRIC LBS Report,* CMRS providers may be able to use certain commercial location-based services on a device to provide a reasonable estimate of the device's location and whether the device is located indoors. We seek comment on these methods, as well as on any other ways that CMRS providers could use to determine whether a call originates from indoors. In addition, what costs would be associated with developing this capability? What steps would CMRS providers have to take, if any, to make information on whether a call originated from indoors available in its location information center?

114. We also seek comment on whether identifying a wireless 911 call as originating indoors versus outdoors,

by itself, would be useful information to public safety entities. Would it be sufficient to provide public safety entities with more granular location information, which presumably would identify whether a call originated indoors within a certain search radius? We also seek comment on whether existing PSAP equipment could readily make use of this information. What costs could be associated with a PSAP's ability to use this kind of information?

3. Leveraging Commercial Location-Based Services, Emerging Technologies, and other Sources of Location Information

115. Commercial location-based services (LBS) are applications that CMRS providers load, or consumers download, onto their phones, and are independent of any solutions that CMRS providers might be required to adopt to comply with our location accuracy requirements. Such applications, which typically combine GPS and Wi-Fi, are currently implemented in all major commercial mobile operating systems. In a prior proceeding, the Commission noted that these commercial LBS could potentially permit service providers and applications developers to provide PSAPs with more accurate 911 location information, and sought comment on whether it should encourage mobile service providers to enable the use of commercial LBS for emergency purposes. It also sought comment on the value of operational benchmarks to assist consumers in evaluating the ability of carriers to provide precise location information for emergency purposes based on the location-based capabilities of devices. The Commission tasked WG3 with investigating how commercial location-based services might be leveraged for indoor wireless E911 service.

116. Numerous commenters supported investigation by CSRIC of the use of commercial LBS by public safety, though some commenters suggested that further study beyond the CSRIC report—then pending—would be necessary. CTIA and AT&T urged the Commission to allow the industry to come up with best practices for using location-based services. Several commenters noted that industry standards work would be necessary before commercial LBS would be a viable option for 911 purposes. Several commenters cautioned against using commercial LBS.

117. WG3's final report in March 2013 investigated commercial LBS and emerging location technologies for indoor wireless E911 use, and made recommendations on how they could be best leveraged for E911 purposes. While the report concluded that few of these technologies are presently available for indoor E911 use, it found that ''good progress is being made'' in addressing challenges to such use. At the same time, the *CSRIC LBS Report* highlights several concerns with regard to leveraging commercial LBS for 911. The *CSRIC LBS Report* recommends further evaluation of LBS.

118. Since the Commission last sought comment on leveraging commercial LBS for 911 purposes, considerable developments have been made. Industry bodies have already created wireless E911 standards that support a range of technologies that can provide indoor location information. Moreover, there is increasing commercial interest in developing LBS, particularly services that rely on indoor location, for a range of different applications. Indeed, indoor location technology has become such a large market that it is bigger than its outdoor counterpart, if commercial buildings are included.

119. Indoor location solutions are also being developed that use Wi-Fi and similar in-building technology to locate calls. Cisco's technology, for example, uses RF fingerprinting to determine location over a Wi-Fi network using signal strength and time of arrival lateration techniques. Cisco indicates that, with respect to indoor environments, ''location data today is generally available in enterprise [Wi-Fi] networks and is technologically feasible in residential Wi-Fi networks.'' At the same time, however, Cisco acknowledges that ''significant work remains'' on generating civic addresses (including floor numbers) and location data for Wi-Fi enabled devices that are not authenticated to the Wi-Fi access points. Also, Cisco noted that current standards efforts should be ready for Wi-Fi Alliance certification some time in 2015. Cisco indicated that implementation of Wi-Fi protocols will provide 10 feet of accuracy on a horizontal x/y axis 90% of the time.

120. Location-based technologies are also already being rolled out in conjunction with consumer application and device offerings. Indeed, commercial location technologies, typically combining GPS and Wi-Fi, currently are implemented in all major commercial mobile operating systems, with multiple independent Wi-Fi access location databases, maintained by Google, Apple, and Skyhook, among others. The use of Bluetooth beacon technology is also potentially attractive for indoor location although, at present, such technology is less developed than that for Wi-Fi. At a recent consumer electronics trade show and the 2014 Super Bowl, Bluetooth low energy (LE) beacons were demonstrated. Moreover, essentially all smartphones now sold have Wi-Fi and Bluetooth network interfaces. As noted earlier, these capabilities also provide a means of determining indoor location. In fact, indoor location applications are now mainstream for iPhone and Android devices, which together cover about 80 percent of the smartphone market.

121. Furthermore, almost all smartphones sold today are equipped with multiple sensors that can determine acceleration, magnetic fields (compass direction) and movement (gyroscope), which also provide a means of determining the operating environment. In addition, a number of large mobile device vendors have started to include barometric pressure sensors in their devices, which can calculate z-axis information. In light of the fact that 61 percent of CMRS subscribers owned a smartphone as of May 2013, the majority of wireless subscribers already have access to some form of indoor location-based technology. Moreover, the performance reached by such indoor location technologies has now surpassed GPS for the outdoors, with an average accuracy of a few square feet compared to several tens of square feet for GPS. We seek comment on these developments and on how they may relate to potential location accuracy requirements.

122. Recent data shows that adults are increasingly using location-based services and data networks. We seek comment on how providers could use commercial LBS to provide or enhance E911 location information, assuming CMRS providers can obtain usable location information from commercial LBS applications. To what extent can CMRS providers access and provide this supplemental information, where available, to the location information center for retrieval by the PSAP, now or in the foreseeable future? Could smart phones be programmed in such a manner that, when the phone initiates a voice call to 911, a separate and additional query within the handset is made for information on the device's last known location, with all location information then being sent to the provider's location information center? Moreover, what technical and operational challenges, if any, do PSAPs face in receiving location accuracy information from LBS services, and in what timeframe could they be addressed? What are the associated costs, if any, to meeting those challenges?

123. What privacy concerns, if any, might be implicated by sharing location information obtained through commercial LBS with CMRS providers, in order to enhance the accuracy of E911 location information? Many commercially deployed location information systems have privacy settings to restrict the amount of information shared by a smartphone user. CSRIC noted, however, that despite user privacy controls over location data, ''for 9–1–1 calls, GPS or other location methods are activated regardless of the user's privacy setting.'' CSRIC added that ''[i]t is therefore imperative that any new location technology . . . adhere to the same privacy principles,'' and that ''location technology cannot be downloaded in the form of an application, which would be subject to the user's privacy settings.'' Could location software application programming interfaces (APIs) be more tightly integrated into the user equipment's lower level services, such that location capabilities remained activated despite user privacy settings or create a separate privacy setting for ''911-only'' restricted-use location data, or would it be necessary to require that smartphone users affirmatively ''opt in'' to permit the disclosure of this information? What other privacy issues should the Commission take into account?

124. We recognize that commercial LBS may present trade-offs. For example, location information from LBS applications on the phone may be inaccurate and untimely, as the user could have terminated any active location-based services session well before that user dials 911. Furthermore, continuously maintaining active sessions with location-based applications could have practical implications for users, including a negative effect on the battery life of a user's device and increased data usage fees. Nevertheless, given the increasing usage of commercial LBS and the importance of determining a 911 caller's location, we believe it should be considered as a potential resource for E911 purposes.

125. *Institutional and Enterprise-based Location Systems.* We also seek comment on how institutional and enterprise location systems could be leveraged to provide location data for E911. For example, Cisco Systems has demonstrated possible use cases for its location technologies for hotels, hospitals, higher education campuses, and large enterprise settings. Cisco indicates that it ''will be capable of producing 10 feet of accuracy on a horizontal X/Y axis 90% of the time although more accurate data is possible depending upon implementation and the use of 'angle of arrival' data.'' Cisco also states ''the client can query the network for its own location for use in applications such as emergency services,'' but that ''the architecture that would allow the delivery of location data to a PSAP is still being studied by industry.'' Furthermore, in 2013, Guardly released its Indoor Positioning System, a subscription-based mobile security system for businesses, school campuses, apartment buildings and parking garages which Guardly states can provide ''the building name, floor, and room number of the wireless caller in less than 5 seconds'' to emergency and/or security personnel.

126. Because of the numerous commercial and operational incentives for location technology in these settings, we anticipate that the number of deployed institutional and enterprise-based location systems will increase in the near future. We seek comment on whether location information from these systems could be provided to CMRS providers and, ultimately, made available to public safety entities together with other E911 location information. Cisco states that per existing standards, ''the client can query the network for its own location for use in applications such as emergency services,'' but that ''the architecture that would allow the delivery of location data to a [PSAP] is still being studied by industry.'' Today many such location systems can only interact with—and therefore provide emergency location information for—devices that have Wi-Fi or Bluetooth capabilities. Do any indoor location systems already make this information available to CMRS providers, and if so, what are they? What modifications to Wi-Fi hotspots, location beacons, or devices with location information would be necessary to enable the transmission of location information to CMRS providers?

127. *Smart Building Technology.* Indoor location positioning is in high demand for commercial uses, and major industry stakeholders are investing in the development of indoor positioning technologies for applications in retail, health, gaming, entertainment, and advertising. Many of these systems are designed to assist smartphone users in finding specific locations and estimating walking time, as well as to assist retailers with precise marketing and advertising based on a customer's movement. Though some ''smart building'' technology is already commercially available, its deployment has been largely limited to public settings, given the cost of the necessary in-building supporting infrastructure. Nevertheless, some residential ''smart building'' technologies are available today, which could potentially be registered with dispatchable address information, including Wi-Fi-enabled home security systems, door locks, and thermostats. We seek comment on how Bluetooth or Wi-Fi-enabled locks, thermostats, smoke detectors, lighted exit signs, security systems and other residential ''smart building'' technologies could be registered with dispatchable address information and, if so, how it could be achieved.

IV. Improving the Delivery of Phase II Location Information

128. In the following sections, we seek comment on measures to ensure that PSAPs receive Phase II information in a swift and consistent format. We also seek comment on whether CMRS providers should differentiate between the type of location technology used to generate a location fix. Further, we seek comment on whether recent technological developments, including the proliferation of GPS-enabled smartphones capable of providing more granular location information, warrants strengthening our current E911 Phase II requirements to provide location information within 50 meters for all wireless 911 calls. We also propose periodic Phase II call tracking requirements, measures to facilitate the swift resolution of PSAP Phase II concerns, and compliance testing requirements to ensure that we can monitor and ensure compliance with our E911 rules. Through these measures, we seek to ensure that PSAPs receive the full breadth of information they need to respond swiftly and effectively to emergency calls, and that this information is provided in a way that is clear and useful.

A. Time to First Fix (TTFF)

129. *Background.* The Commission's current E911 location accuracy rules do not require CMRS providers to test for and meet a specific Time to First Fix (TTFF). Previously, the Commission tasked CSRIC with the making recommendations concerning cost-effective and specific approaches to testing requirements, methodologies, and implementation timeframes, including appropriate updates to OET Bulletin 71. In response, CSRIC WG3 noted that, while the OET Bulletin No. 71 ''suggests an acceptable time limit [Time to First Fix] for delivering the location estimate of 30 seconds,'' the OET guideline is ''generally accepted as

the *de facto* standard for maximum latency in E9–1–1 location delivery.''

130. The record shows that with current location technologies, there is a trade-off between the accuracy of the location information and the time to complete a location fix. This trade-off depends in part on the location technology a carrier employs. For instance, the time for A–GPS technologies to generate a location fix is typically longer than the time needed for network-based location solutions. However, while CMRS providers using A–GPS technologies acknowledge that the time to generate an initial location fix based on GPS satellite signals may take longer than five seconds, they submit that, generally, they can deliver Phase II location fixes within 12–15 seconds.

131. *Discussion.* We propose that, as part of our existing Phase II E911 requirements as well as our proposed indoor requirements, CMRS providers must deliver E911 location information, with the specified degree of accuracy, within a maximum period of 30 seconds to the location information center. We believe this proposal is consistent with the record, both in terms of addressing a need for the Commission to take action regarding latency, as well as what is technically feasible. Public safety commenters call for improvements in TTFF. Similarly, Mission Critical Partners emphasizes that ''[a]ny improvements to the yield, accuracy, and time to first fix (TTFF) of locations would be welcomed by PSAPs nationwide.'' The E911 Location Accuracy Workshop also shed light on the need for CMRS providers to deliver Phase II location fixes with a level of accuracy and within a short time frame, *e.g.,* 30 seconds, in order to be useful to PSAPs, depending on the re-bidding practices of each jurisdiction.

132. The record evidences trends and technological developments that may reduce the time in which CMRS providers can obtain and transmit location fixes. First, as CSRIC notes and as discussed above, there are ongoing developments in hybrid location technologies. As CMRS providers refine and deploy hybrid technologies to achieve better location accuracy indoors, is it technically feasible for providers to leverage those hybrid deployments for wireless 911 calls from outdoor environments to achieve improved yield and TTFF? On the one hand, the record indicates that implementing hybrid or ''fall-back'' location technologies may result in longer TTFFs and less accuracy. TruePosition asserts that in challenging environments, whether outdoors or indoors, fall-back technologies are unlikely to deliver Phase II compliant information as quickly as PSAPs need it. Typically, however, providers using A–GPS have built their networks to deliver a location fix using hybrid location or ''fall-back'' technologies only if their systems cannot obtain an A–GPS fix within a TTFF of 30 seconds. For example, Verizon indicates that it has taken ''steps . . . to improve the location information delivered to PSAPs,'' such as ''[m]aking caller location information available within an average of 12–15 seconds, and within 25 seconds for 99 percent of all calls for which the information is available.'' Will hybrid technologies, complemented by beacon technologies, DAS networks, and small cells, make it possible to achieve improvements in TTFF in challenging environments?

133. The second major factor that is likely to improve the delivery of location information is the migration by CMRS providers to 4G VoLTE networks, which the record indicates can achieve swifter times to first fix. Consequently, we seek comment on how the migration to 4G VoLTE might affect a requirement for the specific TTFF level that we propose as well as timetables for compliance.

134. Further, we recognize that wireless 911 calls may terminate after a short period of time, before CMRS providers' networks can generate a location fix. Therefore, we propose to exclude wireless 911 calls that are dropped or disconnected in 10 seconds or less, and in which CMRS networks have not yet delivered a location fix to the location information center, for purposes of determining compliance. We seek comment on whether 10 seconds is the right cut-off for an exclusion for short calls. Alternatively, should we base the exclusion on some other timeframe (*e.g.,* should we instead exclude calls shorter than 15 seconds, 20 seconds, or 30 seconds)? If we were to adopt an exclusion for short calls, are there other measures to provide the best available information, even if the location information is not a full Phase II fix? For instance, should CMRS providers share with PSAPs Class of Service (COS) information, *e.g.,* whether the location fix is Phase I- or Phase II-compliant, in order to alert PSAPs of information that might not be Phase II-compliant but may be helpful in the emergency? For example, the record indicates that with wider deployment of micro-cells, Phase I may be more helpful than PSAPs have recently viewed it.

135. Additionally, we propose that, based on the outdoor testing procedures recommended by WG3, CMRS providers should implement periodic testing procedures to ensure that they meet a TTFF requirement. We seek comment on both the costs of implementing a 30-second TTFF, as well as for compliance testing. We would expect providers to measure and test for such compliance with the proposed TTFF at the appropriate point in their E911 networks. The record shows that CMRS providers already test for and collect data on yield and TTFF. We seek comment on whether this would mitigate any potential costs of compliance testing. We recognize that WG3 found that costs for testing can be high. We seek comment on whether this magnitude of costs is accurate. How would the cost ranges in WG3's data be affected by the transition to 4G VoLTE networks? Would the cost of TTFF improvements likely be incorporated into the 4G network upgrades and the roll-out of 4G VoLTE? Would costs decrease after providers have fully deployed such networks? Additionally, what would the cost burdens be for the regional and smaller CMRS carriers who are also planning to migrate to 4G VoLTE networks using A–GPS technologies, to meet and test for the proposed TTFF of 30 seconds?

136. Alternatively, we seek comment on whether voluntary efforts are sufficient to improve latency, such that it is unnecessary to impose any additional regulations at this time. For instance, would more frequent coordination between CMRS providers and PSAPs be sufficient to address concerns regarding TTFF performance levels, without regulatory metric or testing requirements for TTFF?

B. Confidence and Uncertainty Data

137. *Background.* Our current rules require CMRS providers presently subject to the Commission's E911 requirements to provide confidence and uncertainty (C/U) data on a *per-call* basis upon PSAP request. *See* 47 CFR 20.18(h)(3). C/U data reflects the level of confidence that a specific 911 caller is within a specified distance of the location that the carrier provides. Confidence data is expressed as a percentage, indicating the statistical probability that the caller is within the area defined by the ''uncertainty'' statistical estimate, while uncertainty is expressed as a radius in meters around the reported position.

138. Public safety entities have indicated that C/U data play a meaningful role in assessing the quality of the location information that accompanies a wireless 911 call. The record also suggests, however, that C/U

data is not always perceived as useful by PSAPs. The record suggests that, to the extent public safety entities do not request or use C/U data, it may be due to the variable way in which such information is generated or presented.

139. Given this lack of uniformity in the delivery of C/U data, NENA states that it is ''critical that the Commission establish a *uniform* standard for the delivery of such information to PSAPs and for the meaning of the data delivered.'' NextNav suggests that ''the Commission may wish to follow the guidance of the ATIS Emergency Services Interconnection Forum (ESIF), which recommends 90 percent be used as a standard required confidence level.'' T-Mobile likewise indicates that this ''90% confidence level is recommended by ESIF and public safety.''

140. *Discussion.* We believe that C/U data is a critical component in helping PSAPs understand the quality of the location information they receive from providers, whether the 911 calls are made indoors or outdoors. We seek to develop a better understanding of why C/U data is not always utilized by PSAPs. What are the problems PSAPs have encountered with its use? How could C/U data be provided in a more helpful fashion?

141. We also seek comment on NextNav's suggestion to incorporate ESIF's recommended 90 percent confidence level as a requirement. Is it important that all CMRS providers subject to Commission's E911 requirements use the same confidence level when calculating C/U data? If a standard confidence level is desirable across Phase II data, is 90 percent the correct level? Why or why not? Moreover, if not, should the Commission nevertheless still require CMRS providers to use the same confidence level? If so, what should that level be and why? What potential costs would be associated with implementing this requirement? In the event we establish a uniform confidence level, should CMRS providers be required to demonstrate compliance with that confidence level to the FCC, and if so, how?

142. We seek comment regarding the format in which C/U data is provided to the PSAPs. What are the various formats in which this data is presently provided? Is the fact that horizontal uncertainty is expressed either as a circle or an ellipse problematic? Should the Commission require that C/U data be provided in a standard, uniform format? If so, what should that format be? What are the potential costs involved in standardizing C/U data for all stakeholders involved? What additional measures, if any, should the Commission take to increase the usefulness of C/U data for PSAPs?

143. Finally, we anticipate that any requirements we adopt regarding standardization of the delivery and format of C/U data would apply in conjunction with the delivery of both indoor and outdoor location information. Is there any reason why the format of C/U requirements should differ for indoor versus outdoor calls? We seek comment on this issue as well.

C. Identifying the Type of Technology Used to Deliver the E911 Location Fix

144. *Background.* Typically, when a wireless caller initiates a call to 911, CMRS providers first attempt to locate the caller using A–GPS. In the event that A–GPS fails to provide a sufficiently accurate location fix within the 30 second timeframe recommended in OET Bulletin 71, CMRS providers then rely on ''fall-back'' technologies, which provide location information that may be less accurate. The record shows that providers using network-based location solutions also first attempt to locate callers with GPS-capable handsets using A–GPS, but then ''fall back'' if necessary to a hybrid of A–GPS and Round Trip Time (RTT), which calculates the distance between the handset and the nearest base station, and subsequently, will attempt a location fix using RTT only.

145. Each location technology presents a trade-off between accuracy and latency. For example, though A–GPS can locate wireless 911 callers within 10–20 meters, it is dependent on whether the device can reach four or more satellites, and it often takes 30 seconds or more to generate a precise location, though shorter times are possible. On the other hand, a location fix via RTT may provide location information within a short period of time, but is significantly less accurate.

146. *Discussion.* To ensure that PSAPs can understand and make educated assessments regarding the quality of Phase II location information, we seek comment on whether to require CMRS providers to identify the technology used to determine a location fix and to provide this information to PSAPs that have the capability to receive this information. We seek comment regarding the technical feasibility of determining the type of technology used to identify a caller's location on a call-by-call basis. What potential costs might a provider incur to implement a requirement that it differentiate between the types of technology used to provide a location fix?

147. We also seek comment on the usefulness of this additional information to PSAPs, and whether the benefits of this information would exceed any potential costs that might be necessary to make use of this information. If PSAPs were aware of the type of location fix received, would they be able to assess whether it is necessary to re-bid for better location information? To what extent would C/U data already reflect sufficient information on this score, since that data would generally reflect discounted certainty? Could existing information fields be used to display information on the type of location fix that? If not, would it be possible to add an information field to the PSAP console with a software update, or would more substantial upgrades of hardware or CPE be necessary? Could CPE be programmed to automatically rebid if it receives Phase II location information from a fall-back technology? We seek comment on whether and to what extent PSAPs might need to reconfigure their call-taking processes and console displays in order to make use of this information, and whether the benefits of receiving this information would outweigh any costs that might be entailed.

D. Updating the E911 Phase II Requirements Based on Outdoor Measurements

148. *Background.* Among other actions, in 2010 the Commission required CMRS providers to satisfy location accuracy requirements over an eight-year implementation period, ending in 2019, with interim benchmarks. At that time, certain CMRS providers exclusively used network-based location technology to identify Phase II location. Accordingly, the Commission established E911 requirements and exclusions specific to network-based providers, and provided a path by which these providers would eventually migrate to handset-based technologies. The Commission agreed with T-Mobile that as carriers transition to A–GPS, they will also transition from network-based accuracy standards to handset-based standards, moving toward a *de facto* unified standard. Because it had recently adopted the existing E911 benchmarks, however, the Commission decided that it was premature to seek comment on a sunset date, but tentatively concluded that the network-based standard should sunset at an appropriate point after the end of the eight-year implementation period.

149. *Discussion.* We seek comment on whether there have been sufficient advancements in technology and a sufficient number of handsets with A–

GPS capabilities in the consumer subscriber base to warrant modification of our existing Phase II requirements as they apply to outdoor calls. We note that CMRS providers are increasingly turning to handset-based technologies, namely A–GPS, to provide E911 Phase II information, which would support a more granular location accuracy requirement. When the current rules were adopted, the CMRS providers that used network-based location technology on their GSM networks had already begun to migrate to 4G and LTE networks, using handset-based location technologies. These CMRS providers have continued to migrate away from networks requiring network-based location technology. We also note that nearly all handsets are now GPS-enabled.

150. The record suggests that the migration to handset-based technologies can provide more accurate location fixes. In response to the E911 Phase II Location Accuracy Workshop, King County submits that ''[i]n particular, the wireless carriers that use a network-based location technology that have recently added A–GPS location technology to their Phase II solutions have shown dramatic improvement in accuracy since 2005.'' AT&T adds that the migration to A–GPS has resulted in ''increased accuracy in the Phase II location information provided, especially in rural areas where the number and location of cell sites made trilateration-based location data less reliable,'' as well as in lower costs. On the other hand, TruePosition contends that ''[t]here is no direct relationship between a carrier's transition from 2G to 3G or 4G network technology and . . . the E911 location accuracy that the same carrier can deliver.'' In any case, the record indicates that CMRS providers and technology vendors have been working steadily to improve A–GPS performance.

151. In particular, and in light of any recent improvements or advancements in A–GPS technology, we seek comment on whether all CMRS providers reasonably could comply with a 50-meter accuracy/67 percent reliability requirement within two years, such that we could adopt a unitary requirement for both indoor and outdoor calls. Establishing such a unitary requirement for all calls would help standardize the information afforded to public safety entities while raising the level of accuracy across all calls, both indoors and outdoors. Would it be feasible for all CMRS providers to comply with a 50-meter accuracy/67 percent reliability (single search ring) requirement in two years? Or is there a benefit in continuing to allow a dual search ring requirement? In the event we were to sunset network-based requirements in two years and require a 50-meter accuracy requirement (with either an 80 percent or 67 percent reliability requirement), should we adopt any exceptions for certain providers who might be adversely affected, such as smaller or rural CMRS providers, or allow them a longer implementation timeframe? Alternatively, would our existing waiver process be sufficient?

E. Monitoring E911 Phase II Call Tracking Data

152. *Background.* As discussed earlier in this *Third Further Notice,* CALNENA filed E911 call tracking data with the Commission that suggests there may be a decline in the percentage of wireless 911 calls that include Phase II location information. In addition, several other state and local public safety entities filed similar E911 call tracking data, also suggesting a potential decline in the percentage of wireless calls that include Phase II location information. As noted above, however, various providers responded that CALNENA's reports mischaracterized the E911 data, and suggest that PSAPs are not rebidding to obtain, or ''pull'' the location data.

153. *Discussion.* We seek comment on whether the Commission should require providers to periodically report E911 Phase II call tracking information, similar to the call data provided in conjunction with the recently held E911 Location Accuracy Workshop. Would such a requirement help promote the delivery of Phase II E911 information? In the event we were to require periodic reporting of Phase II E911 call tracking data, we seek to implement a requirement that provides meaningful data while minimizing the potential burden on providers. We seek comment regarding the scope of information required in the reports. What information should be provided in Phase II call tracking reports? How frequently should providers be required to report Phase II E911 call tracking data? We also seek comment on any alternative measures that could ensure that providers are delivering Phase II E911 information. Could we rely instead on periodic certifications of compliance with Commission requirements based on the test bed or alternative measurements described above? Are there other ways that the Commission could monitor Phase II E911 data without imposing a requirement on CMRS providers?

154. We realize that a reporting requirement would impose a cost on providers. We seek comment on the estimated costs of such a requirement. Could existing call monitoring mechanisms be leveraged for this purpose? We also seek estimates regarding how these costs might vary, depending on the nature of the reporting obligations and the size of the representative sample of the provider's coverage area that is subject to these requirements.

F. Monitoring and Facilitating Resolution of E911 Compliance Concerns

155. Our objective in proposing indoor location accuracy requirements, as well as testing metrics and reporting requirements, is to ensure that public safety providers have consistent and reliable access to accurate location information on a call-by-call basis, as well as for the Commission and public safety entities to have sufficient information to monitor E911 performance more generally. Filings submitted in conjunction with the E911 Location Accuracy workshop, as well as statements made at the workshop itself, indicate there have been instances in which public safety believes it is receiving inadequate location information and where the Commission can help foster a dialogue between CMRS providers and public safety entities to help address PSAP concerns and promote a better understanding of E911 practices. We seek comment on whether we should establish a separate process by which PSAPs or state 911 administrators could file an informal complaint specific to the provision of a CMRS provider's E911 service, and if so, how the complaint procedure should be structured in light of our existing informal complaint process. We propose that, in connection with the filing of any informal complaint, PSAPs would be required to demonstrate that they have implemented bid/re-bid policies that are designed to obtain all 911 location information made available to them by CMRS providers pursuant to our rules.

156. We also recognize that public safety organizations such as NENA or APCO might be well-suited to monitor and facilitate resolution of PSAP concerns. We seek comment on additional measures the Commission could take to help facilitate discussion and the swift resolution of public safety concerns, whether it is through establishment of an informal Commission process or through continued coordination with public safety organizations such as NENA or APCO.

G. Periodic Outdoor Compliance Testing and Reporting

157. *Background.* In 2010, the Commission held that once a wireless service provider has established baseline confidence and uncertainty levels in a county or PSAP service area, ongoing accuracy shall be monitored based on the trending of uncertainty data and additional testing shall not be required. In the 2011, however, the Commission found that periodic testing is important to ensure that test data does not become obsolete as a result of environmental changes and network reconfiguration. The Commission tasked CSRIC with the making recommendations concerning cost-effective and specific approaches to testing requirements, methodologies, and implementation timeframes, including appropriate updates to OET Bulletin 71, issued in 2000.

158. CSRIC's *Outdoor Location Accuracy Report* examined several issues concerning testing methodologies and procedures and concluded that technical reports issued by ATIS since the publication of OET Bulletin No. 71 provided more useful, updated methods for CMRS providers to conduct initial and periodic testing. *See* CSRIC III Working Group 3, E9–1–1 Location Accuracy Final Report—Outdoor Location Accuracy (Mar. 14, 2012) (*Outdoor Location Accuracy Report*). Based on the ATIS technical reports, CSRIC Working Group 3 (WG3) made several recommendations for both initial testing and periodic testing.

159. Further, WG3 found that several standards adopted by ATIS since the issuance of OET Bulletin No. 71 ''generally provide more current and relevant procedures and guidelines than are available in OET 71.'' WG3 made several recommendations for performance and maintenance testing, including ''key performance indicators'' (KPIs) that CMRS providers would routinely monitor and archive to assess system performance and determine when further testing and system improvements are needed at the local level. WG3 further indicated that, while the costs for empirical testing can be expensive, alternative techniques, such as monitoring KPIs, are more cost-efficient.

160. *Discussion.* Consistent with the Commission's prior reasons and conclusions, we believe that periodic testing is necessary as providers upgrade their networks and migrate to handset-based technologies. We seek comment on the recommendations in WG3's report. We also invite industry and public safety stakeholders to submit a consensus proposal that addresses WG3's recommendations, and that provides a technically feasible path forward for periodic compliance testing and reporting. The *CSRIC Outdoor Location Accuracy Report* identifies a suite of five ATIS technical reports, and we seek comment on whether these reports collectively represent the best practices for outdoor location accuracy. *See* ATIS Technical Report numbers 0500001 (High Level Requirements for Accuracy Testing Methodologies), 0500009 (High Level Requirements for End-to-End Functional Testing), 0500011 (Define Topologies & Data Collection Methodology), 0500010 (Maintenance Testing), and 0500013 (Approaches to Wireless Indoor Location). These ATIS standards will be available for review and download on the ATIS Web site during the pendency of the period for filing comments at *http://www.atis.org/fcc/locationaccuracy.asp*. Paper copies will also be available for review (but not photocopying) at Commission headquarters upon request by contacting Dana Zelman at 202–418–0546 or *dana.zelman@fcc.gov.* The *CSRIC Outdoor Location Accuracy Report* also identifies several alternative testing concepts developed in ATIS–05000010 to provide a useful technical foundation for maintenance testing. The record demonstrates that providers already have processes in place that are capable of testing for yield and TTFF. Should the Commission consider any other alternative testing concepts not included in ATIS–05000010? To the extent we adopt a rule specifying that a particular ATIS technical standard, methodology, or suite of ATIS technical standards should be used by CMRS providers for purposes of periodic maintenance testing of outdoor location accuracy, we propose to accommodate future updates of that standard by delegating rulemaking authority to the Chief of the Public Safety and Homeland Security Bureau. We seek comment on this approach.

161. In addition, WG3 recommends that ''[a]lternative testing methods replace full compliance testing every'' 24 months. We seek comment on whether 24 months is an appropriate timeframe for conducting periodic tests. We also invite comment on what enforcement mechanisms would be appropriate to ensure compliance with any required timeframe for periodic testing.

162. Finally, we recognize that our current rules allow the monitoring of ongoing accuracy based on the trending of uncertainty data. We propose to remove this provision, in light of our proposed periodic testing requirement. As NENA has noted, confidence and uncertainty trends are not sufficient proxies for location accuracy testing because ''[r]eported confidence and uncertainty data are themselves subject to systemic error.'' We seek comment on this proposal.

163. *Reporting Requirements and Confidentiality Safeguards.* We recognize that imposing reporting requirements may implicate CMRS providers' proprietary information. Accordingly, we seek comment on what safeguards should be implemented to ensure that confidential information is protected. Under the CSRIC indoor test bed regime, all parties agreed that raw results would be made available only to the vendors whose technology was to be tested, participating wireless providers, and the third-party testing house; only summary data was made available to other parties. Would it be sufficient for CMRS providers to report only summary data to the Commission, PSAPs within their service areas, and state 911 offices in the states or territories in which they operate, in order to demonstrate compliance with the Commission's requirements? If so, what data should be included in the summary? We seek comment on whether public safety's need for improvements in yield and TTFF components supports the inclusion of specific reporting metrics, such as those that WG3 described in its CSRIC *Outdoor Location Accuracy Report.* Given the extent to which mobile wireless communications services are becoming increasingly central to the day-to-day lives of Americans, should this data also be available, at least to some extent, to the public? If so, what data would be useful to the public? For instance, would public disclosure of location accuracy test results provide consumers with a reasonable ''yardstick'' regarding competing providers' abilities to provide Phase II location information in the counties or PSAP service areas where they are likely to make a wireless 911 call? Finally, should the confidentiality safeguards in this regard mirror those that we might adopt in relation to the indoor location accuracy compliance testing requirement?

H. Roaming Issues

164. In 2007, the Commission sought comment on location accuracy while roaming. The Commission expressed concern that a wireless caller whose carrier employs one type of location technology may not be provided Phase II service at all when roaming on the network of another carrier that relies on a different technology, or when there is

no roaming agreement between carriers using compatible technologies. In 2011, CSRIC II's Working Group 4C similarly noted that ''[t]he ability to support Phase II location for roamers may be limited in some carriers' networks.''

165. We seek comment on whether the provision of Phase II information for roamers continues to be a concern, or whether this concern has been addressed by the evolution of location technology since the Commission last examined this issue. In earlier comments, NENA noted that ''carriers are now migrating to network-assisted GNSS positioning solutions, though not all carriers have yet adopted this technology,'' and asked the Commission to ''seek input from carriers on how best to ensure that E9–1–1 calls in a roaming environment are completed.'' AT&T indicated that ''at least in the case of GSM carriers, there is no clear problem in locating roamers that requires a regulatory solution,'' and stated that it ''can support locating roaming handsets as long as the handsets support compatible spectrum.'' Verizon similarly stated that it can provide Phase II location for all Code Division Multiple Access (CDMA) roamers using location-capable handsets ''in the same manner as for our subscribers.'' However, Verizon also noted that it is unable to provide Phase II location capability to customers using handsets that are not location-capable (*i.e.,* without a GPS chip) or that use a different air interface.

166. The record suggests that in most cases, handset-based carriers and network-based carriers can support Phase II location for roamers on their networks because roamers typically use compatible technologies. In addition, potential incompatibility in location technology used by roamers may be reduced further as both handset and network-based carriers migrate to A–GPS and move forward with the planned implementation of VoLTE. We seek comment on this analysis. Notwithstanding these technology trends, are there circumstances in which accurate location of roamers could continue to be hindered by technological incompatibilities? Could implementation of our indoor location proposals create any challenges in the roaming context that the Commission should address?

V. Procedural Matters

A. Ex Parte Rules

167. The proceeding of which this *Third Further Notice* is a part is a ''permit-but-disclose'' proceeding in accordance with the Commission's *ex parte* rules. Persons making *ex parte* presentations must file a copy of any written presentation or a memorandum summarizing any oral presentation within two business days after the presentation (unless a different deadline applicable to the Sunshine period applies). Persons making oral *ex parte* presentations are reminded that memoranda summarizing the presentation must (1) list all persons attending or otherwise participating in the meeting at which the *ex parte* presentation was made, and (2) summarize all data presented and arguments made during the presentation. If the presentation consisted in whole or in part of the presentation of data or arguments already reflected in the presenter's written comments, memoranda or other filings in the proceeding, the presenter may provide citations to such data or arguments in his or her prior comments, memoranda, or other filings (specifying the relevant page and/or paragraph numbers where such data or arguments can be found) in lieu of summarizing them in the memorandum. Documents shown or given to Commission staff during *ex parte* meetings are deemed to be written *ex parte* presentations and must be filed consistent with rule § 1.1206(b). In proceedings governed by rule § 1.49(f) or for which the Commission has made available a method of electronic filing, written *ex parte* presentations and memoranda summarizing oral *ex parte* presentations, and all attachments thereto, must be filed through the electronic comment filing system available for that proceeding, and must be filed in their native format (*e.g.,* .doc, .xml, .ppt, searchable .pdf). Participants in this proceeding should familiarize themselves with the Commission's *ex parte* rules.

B. Comment Filing Procedures

168. Pursuant to §§ 1.415 and 1.419 of the Commission's rules, 47 CFR 1.415, 1.419, interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. Comments should be filed in PS Docket No. 13–75. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS). *See Electronic Filing of Documents in Rulemaking Proceedings,* 63 FR 24121 (1998).

- *Electronic Filers:* Comments may be filed electronically using the Internet by accessing the ECFS: *http://fjallfoss.fcc.gov/ecfs2/.*
- *Paper Filers:* Parties who choose to file by paper must file an original and one copy of each filing.

Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

1. All hand-delivered or messenger-delivered paper filings for the Commission's Secretary must be delivered to FCC Headquarters at 445 12th St. SW., Room TW–A325, Washington, DC 20554. The filing hours are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes and boxes must be disposed of *before* entering the building.

2. Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743.

3. U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12th Street SW., Washington, DC 20554.

C. Accessible Formats

169. To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an email to *fcc504@fcc.gov* or call the Consumer & Governmental Affairs Bureau at 202–418–0530 (voice), 202–418–0432 (TTY).

D. Paperwork Reduction Analysis

170. This document contains proposed new information collection requirements. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget (OMB) to comment on the information collection requirements contained in this document, as required by the Paperwork Reduction Act of 1995, Public Law 104–13. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107–198, see 44 U.S.C. 3506(c)(4), we seek specific comment on how we might further reduce the information collection burden for small business concerns with fewer than 25 employees.

VI. Initial Regulatory Flexibility Analysis

171. As required by the Regulatory Flexibility Act of 1980, as amended (RFA), the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact of the proposals described in the attached *Third Further Notice of Proposed Rulemaking (Third Further Notice)* on

small entities. Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments in the *Third Further Notice.* The Commission will send a copy of the *Third Further Notice of Proposed Rulemaking,* including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA). In addition, the *Third Further Notice* and IRFA (or summaries thereof) will be published in the **Federal Register**. The full text of the IRFA is available for public inspection during regular business hours in the FCC Reference Center, Room CY–A257, 445 12th Street SW., Washington, DC 20554, or online at *http://www.fcc.gov/document/proposes-new-indoor-requirements-and-revisions-existing-e911-rules*.

A. Need for, and Objectives of, the Proposed Rules

172. In this *Third Further Notice,* we propose rules that would update and expand the Commission's wireless Enhance 911 (E911) location accuracy requirements to include indoor environments and to reflect patterns in modern wireless usage and advancements in location-based technology. Specifically, we propose that all CMRS providers subject to § 20.18(a) of the Commission's rules must provide the caller's horizontal (x- and y-axis) location within 50 meters and vertical (z-axis) data within 3 meters for 67 percent of 911 calls placed from indoor environments, within two and three years of the effective date of the rules, respectively. Within five years of the effective date of the rules, all CMRS providers subject to § 20.18(a) of the Commission's rules must provide the caller's horizontal (x- and y-axis) location within 50 meters and vertical (z-axis) data within 3 meters for 80 percent of 911 calls placed from indoor environments. All CMRS providers would be required to meet these indoor requirements at either the county or PSAP geographic level. Over a longer period (to be determined), indoor requirements would be strengthened to provide for delivery of ''dispatchable'' indoor location, i.e., room-level identification. We propose that compliance with any indoor location requirements would be measured through testing in an independently administered test bed program, or through alternative testing mechanisms of equivalent reliability. Public Safety Answering Points (PSAPs) would be entitled to seek Commission enforcement of these requirements, provided they have implemented re-bid policies that are designed to obtain all 911 location information made available to them by CMRS providers. We also seek comment on whether we should adopt a specific waiver process for those providers who seek relief from our indoor location accuracy requirements.

173. Additionally, we seek comment on whether to implement various measures for modifying our existing E911 rules for indoor and outdoor 911 calls. Specifically, we seek comment on whether to adopt a metric for time to first location fix (in order to count towards compliance of the location accuracy requirements, a location fix must be generated within 30 seconds). We note that our proposal would exclude short calls (*i.e.,* calls lasting 10 seconds or less) that may not provide sufficient time to generate a fix. We also seek comment on whether to standardize the content and delivery of confidence/uncertainty data generated for wireless 911 calls. We seek comment on whether CMRS providers should inform PSAPs of the specific location technology used to generate location information for each call. We also seek comment on whether to require CMRS providers to inform PSAPs of their specific location technology, accelerate the currently established timeframe for establishing a unitary compliance requirement for measuring location accuracy for outdoor calls, and require CMRS providers to track and periodically report aggregate data on E911 performance. We also seek comment on whether to establish a process by which PSAPs can report concerns regarding the provision of E911 services and whether CMRS providers should be required to conduct periodic compliance testing for indoor and outdoor calls.

174. In proposing an indoor location regulatory framework, as well as measures to ensure that our existing E911 requirements continue to keep pace with technological developments and changing consumer and public safety needs, we emphasize that our ultimate objective is that all Americans—whether they are calling from urban or rural areas, from indoors or outdoors—receive the support they need in times of an emergency. Recent data reveals that overall wireless usage has increased significantly since the Commission's adoption of E911 location accuracy rules, and further, that the majority of 911 calls also are now placed from wireless phones. Additionally, current trends indicate that a significant percentage of Americans resides in urban areas where there are high concentrations of multi-story buildings. Therefore, improvements to indoor location accuracy have become increasingly important. At the same time, we seek comment on whether our proposals in this notice are the best way to achieve this objective, and we encourage industry, public safety entities, and other stakeholders to work collaboratively to develop alternative proposals for our consideration.

B. Legal Basis

175. Sections 1, 2, 4(i), 7, 10, 201, 214, 222, 251(e), 301, 302, 303, 303(b), 303(r), 307, 307(a), 309, 309(j)(3), 316, 316(a), and 332, of the Communications Act of 1934, 47 U.S.C. 151, 152(a), 154(i), 157, 160, 201, 214, 222, 251(e), 301, 302, 303, 303(b), 303(r), 307, 307(a), 309, 309(j)(3), 316, 316(a), 332; the Wireless Communications and Public Safety Act of 1999, Pub. L. 106–81, 47 U.S.C. 615 note, 615, 615a, 615b; and section 106 of the Twenty-First Century Communications and Video Accessibility Act of 2010, Pub. L. 111–260, 47 U.S.C. 615c.

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Would Apply

176. The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules. The RFA generally defines the term ''small entity'' as having the same meaning as the terms ''small business,'' ''small organization,'' and ''small governmental jurisdiction.'' In addition, the term ''small business'' has the same meaning as the term ''small business concern'' under the Small Business Act. A small business concern is one which: (1) Is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).

177. *Small Businesses, Small Organizations, and Small Governmental Jurisdictions.* Our action may, over time, affect small entities that are not easily categorized at present. We therefore describe here, at the outset, three comprehensive, statutory small entity size standards. First, nationwide, there are a total of approximately 27.9 million small businesses, according to the SBA. In addition, a ''small organization'' is generally ''any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.'' Nationwide, as of 2007, there were approximately 1,621,315 small organizations. Finally, the term ''small governmental jurisdiction'' is defined generally as ''governments of cities,

towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.'' Census Bureau data for 2011 indicate that there were 89,476 local governmental jurisdictions in the United States. We estimate that, of this total, as many as 88,506 entities may qualify as ''small governmental jurisdictions.'' Thus, we estimate that most governmental jurisdictions are small.

1. Telecommunications Service Entities

a. Wireless Telecommunications Service Providers

178. Pursuant to 47 CFR 20.18(a), the Commission's 911 service requirements are only applicable to Commercial Mobile Radio Service (CMRS) ''[providers], excluding mobile satellite service operators, to the extent that they: (1) Offer real-time, two way switched voice service that is interconnected with the public switched network; and (2) Utilize an in-network switching facility that enables the provider to reuse frequencies and accomplish seamless hand-offs of subscriber calls. These requirements are applicable to entities that offer voice service to consumers by purchasing airtime or capacity at wholesale rates from CMRS licensees.''

179. *Wireless Telecommunications Carriers (except satellite).* This industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves. Establishments in this industry have spectrum licenses and provide services using that spectrum, such as cellular phone services, paging services, wireless Internet access, and wireless video services. The appropriate size standard under SBA rules is for the category Wireless Telecommunications Carriers. The size standard for that category is that a business is small if it has 1,500 or fewer employees. The Commission estimates that the majority of wireless telecommunications carriers (except satellite) are small entities that may be affected by our proposed action. In addition, the SBA has developed a small business size standard for wireless firms within the two broad economic census categories of ''Paging'' and ''Cellular and Other Wireless Telecommunications.'' Under both categories, the SBA deems a wireless business to be small if it has 1,500 or fewer employees. For the census category of Paging and associated small business size standard, the majority of firms can be considered small. For the census category of Cellular and Other Wireless Telecommunications, the majority of firms can, again, be considered small.

180. *Incumbent Local Exchange Carriers (Incumbent LECs).* Neither the Commission nor the SBA has developed a small business size standard specifically for incumbent local exchange services. The appropriate size standard under SBA rules is for the category Wired Telecommunications Carriers. Under that size standard, such a business is small if it has 1,500 or fewer employees. The Commission estimates that most providers of local exchange service are small entities that may be affected by the rules and policies proposed in the Notice. Thus under this category and the associated small business size standard, the majority of these incumbent local exchange service providers can be considered small.

181. *A Competitive Local Exchange Carriers (Competitive LECs), Competitive Access Providers (CAPs), Shared-Tenant Service Providers, and Other Local Service Providers.* Neither the Commission nor the SBA has developed a small business size standard specifically for these service providers. The appropriate size standard under SBA rules is for the category Wired Telecommunications Carriers. Under that size standard, such a business is small if it has 1,500 or fewer employees. The Commission estimates that most providers of competitive local exchange service, competitive access providers, Shared-Tenant Service Providers, and Other Local Service Providers are small entities that may be affected by rules adopted pursuant to the Notice.

182. *Broadband Personal Communications Service.* The broadband personal communications services (PCS) spectrum is divided into six frequency blocks designated A through F, and the Commission has held auctions for each block. The Commission initially defined a ''small business'' for C- and F-Block licenses as an entity that has average gross revenues of $40 million or less in the three previous calendar years. For F-Block licenses, an additional small business size standard for ''very small business'' was added and is defined as an entity that, together with its affiliates, has average gross revenues of not more than $15 million for the preceding three calendar years. These small business size standards, in the context of broadband PCS auctions, have been approved by the SBA. No small businesses within the SBA-approved small business size standards bid successfully for licenses in Blocks A and B. There were 90 winning bidders that claimed small business status in the first two C-Block auctions. A total of 93 bidders that claimed small business status won approximately 40 percent of the 1,479 licenses in the first auction for the D, E, and F Blocks. On April 15, 1999, the Commission completed the reauction of 347 C-, D-, E-, and F-Block licenses in Auction No. 22. Of the 57 winning bidders in that auction, 48 claimed small business status and won 277 licenses.

183. On January 26, 2001, the Commission completed the auction of 422 C and F Block Broadband PCS licenses in Auction No. 35. Of the 35 winning bidders in that auction, 29 claimed small business status. Subsequent events concerning Auction 35, including judicial and agency determinations, resulted in a total of 163 C and F Block licenses being available for grant. On February 15, 2005, the Commission completed an auction of 242 C-, D-, E-, and F-Block licenses in Auction No. 58. Of the 24 winning bidders in that auction, 16 claimed small business status and won 156 licenses. On May 21, 2007, the Commission completed an auction of 33 licenses in the A, C, and F Blocks in Auction No. 71. Of the 12 winning bidders in that auction, five claimed small business status and won 18 licenses. On August 20, 2008, the Commission completed the auction of 20 C-, D-, E-, and F-Block Broadband PCS licenses in Auction No. 78. Of the eight winning bidders for Broadband PCS licenses in that auction, six claimed small business status and won 14 licenses.

184. *Narrowband Personal Communications Services.* To date, two auctions of narrowband personal communications services (PCS) licenses have been conducted. For purposes of the two auctions that have already been held, ''small businesses'' were entities with average gross revenues for the prior three calendar years of $40 million or less. Through these auctions, the Commission has awarded a total of 41 licenses, out of which 11 were obtained by small businesses. To ensure meaningful participation of small business entities in future auctions, the Commission has adopted a two-tiered small business size standard in the Narrowband PCS Second Report and Order. A ''small business'' is an entity that, together with affiliates and controlling interests, has average gross revenues for the three preceding years of not more than $40 million. A ''very small business'' is an entity that, together with affiliates and controlling interests, has average gross revenues for the three preceding years of not more

than $15 million. The SBA has approved these small business size standards.

185. *AWS Services (1710–1755 MHz and 2110–2155 MHz bands (AWS–1); 1915–1920 MHz, 1995–2000 MHz, 2020–2025 MHz and 2175–2180 MHz bands (AWS–2); 2155–2175 MHz band (AWS–3)).* For the AWS–1 bands, the Commission has defined a ''small business'' as an entity with average annual gross revenues for the preceding three years not exceeding $40 million, and a ''very small business'' as an entity with average annual gross revenues for the preceding three years not exceeding $15 million. In 2006, the Commission conducted its first auction of AWS–1 licenses. In that initial AWS–1 auction, 31 winning bidders identified themselves as very small businesses. Twenty-six of the winning bidders identified themselves as small businesses. In a subsequent 2008 auction, the Commission offered 35 AWS–1 licenses. Four winning bidders identified themselves as very small businesses, and three of the winning bidders identified themselves as a small business. For AWS–2 and AWS–3, although we do not know for certain which entities are likely to apply for these frequencies, we note that the AWS–1 bands are comparable to those used for cellular service and personal communications service. The Commission has not yet adopted size standards for the AWS–2 or AWS–3 bands but has proposed to treat both AWS–2 and AWS–3 similarly to broadband PCS service and AWS–1 service due to the comparable capital requirements and other factors, such as issues involved in relocating incumbents and developing markets, technologies, and services.

186. *Rural Radiotelephone Service.* The Commission has not adopted a size standard for small businesses specific to the Rural Radiotelephone Service. In the present context, we will use the SBA's small business size standard applicable to Wireless Telecommunications Carriers (except Satellite), i.e., an entity employing no more than 1,500 persons. There are approximately 1,000 licensees in the Rural Radiotelephone Service, and the Commission estimates that there are 1,000 or fewer small entity licensees in the Rural Radiotelephone Service that may be affected by the rules and policies adopted herein.

187. *Wireless Communications Services.* This service can be used for fixed, mobile, radiolocation, and digital audio broadcasting satellite uses in the 2305–2320 MHz and 2345–2360 MHz bands. The Commission defined ''small business'' for the wireless communications services (WCS) auction as an entity with average gross revenues of $40 million for each of the three preceding years, and a ''very small business'' as an entity with average gross revenues of $15 million for each of the three preceding years. The SBA has approved these definitions. The Commission auctioned geographic area licenses in the WCS service. In the auction, which commenced on April 15, 1997 and closed on April 25, 1997, there were seven bidders that won 31 licenses that qualified as very small business entities, and one bidder that won one license that qualified as a small business entity.

188. *700 MHz Guard Band Licenses.* In the *700 MHz Guard Band Order,* the Commission adopted size standards for ''small businesses'' and ''very small businesses'' for purposes of determining their eligibility for special provisions such as bidding credits and installment payments. A small business in this service is an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding $40 million for the preceding three years. Additionally, a ''very small business'' is an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than $15 million for the preceding three years. SBA approval of these definitions is not required. An auction of 52 Major Economic Area (MEA) licenses commenced on September 6, 2000, and closed on September 21, 2000. Of the 104 licenses auctioned, 96 licenses were sold to nine bidders. Five of these bidders were small businesses that won a total of 26 licenses. A second auction of 700 MHz Guard Band licenses commenced and closed in 2001. All eight of the licenses auctioned were sold to three bidders. One of these bidders was a small business that won a total of two licenses.

189. *Upper 700 MHz Band Licenses.* On January 24, 2008, the Commission commenced Auction 73 in which several licenses in the Upper 700 MHz band were available for licensing: 12 Regional Economic Area Grouping licenses in the C Block, and one nationwide license in the D Block. The auction concluded on March 18, 2008, with 3 winning bidders claiming very small business status (those with attributable average annual gross revenues that do not exceed $15 million for the preceding three years) and winning five licenses.

190. *Lower 700 MHz Band Licenses.* The Commission previously adopted criteria for defining three groups of small businesses for purposes of determining their eligibility for special provisions such as bidding credits. The Commission defined a ''small business'' as an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding $40 million for the preceding three years. A ''very small business'' is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than $15 million for the preceding three years. Additionally, the lower 700 MHz Service had a third category of small business status for Metropolitan/Rural Service Area (MSA/RSA) licenses—''entrepreneur''—which is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than $3 million for the preceding three years. The SBA approved these small size standards. An auction of 740 licenses (one license in each of the 734 MSAs/RSAs and one license in each of the six Economic Area Groupings (EAGs)) was conducted in 2002. Of the 740 licenses available for auction, 484 licenses were won by 102 winning bidders. Seventy-two of the winning bidders claimed small business, very small business or entrepreneur status and won licenses. A second auction commenced on May 28, 2003, closed on June 13, 2003, and included 256 licenses. Seventeen winning bidders claimed small or very small business status, and nine winning bidders claimed entrepreneur status. In 2005, the Commission completed an auction of 5 licenses in the Lower 700 MHz band. All three winning bidders claimed small business status.

191. In 2007, the Commission reexamined its rules governing the 700 MHz band in the *700 MHz Second Report and Order.* An auction of A, B and E block 700 MHz licenses was held in 2008. Twenty winning bidders claimed small business status (those with attributable average annual gross revenues that exceed $15 million and do not exceed $40 million for the preceding three years). Thirty three winning bidders claimed very small business status (those with attributable average annual gross revenues that do not exceed $15 million for the preceding three years).

192. *Offshore Radiotelephone Service.* This service operates on several UHF television broadcast channels that are not used for television broadcasting in the coastal areas of states bordering the Gulf of Mexico. There are presently approximately 55 licensees in this service. We are unable to estimate at this time the number of licensees that would qualify as small under the SBA's small business size standard for the

category of Wireless Telecommunications Carriers (except Satellite). Under that SBA small business size standard, a business is small if it has 1,500 or fewer employees. Under this category and the associated small business size standard, the majority of firms can be considered small.

193. *Wireless Telephony.* Wireless telephony includes cellular, personal communications services, and specialized mobile radio telephony carriers. As noted, the SBA has developed a small business size standard for Wireless Telecommunications Carriers (except Satellite). Under the SBA small business size standard, a business is small if it has 1,500 or fewer employees. According to *Trends in Telephone Service* data, 413 carriers reported that they were engaged in wireless telephony. Of these, an estimated 261 have 1,500 or fewer employees and 152 have more than 1,500 employees. Therefore, more than half of these entities can be considered small.

194. The second category, *i.e.,* ''All Other Telecommunications,'' comprises ''establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation. This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems. Establishments providing Internet services or Voice over Internet Protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry.'' The Commission estimates that the majority of All Other Telecommunications firms are small entities that might be affected by rules proposed in the *Third Further Notice.*

b. Equipment Manufacturers

195. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* The Census Bureau defines this category as follows: ''This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.'' The SBA has developed a small business size standard for Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing which is: all such firms having 750 or fewer employees. Under this size standard, the majority of firms can be considered small.

196. *Semiconductor and Related Device Manufacturing.* These establishments manufacture ''computer storage devices that allow the storage and retrieval of data from a phase change, magnetic, optical, or magnetic/optical media. The SBA has developed a small business size standard for this category of manufacturing; that size standard is 500 or fewer employees storage and retrieval of data from a phase change, magnetic, optical, or magnetic/optical media.'' The majority of the businesses engaged in this industry are small.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities

197. The *Third Further Notice* proposes a regulatory framework to require delivery of accurate location information to PSAPs for wireless 911 calls placed from indoors. Our proposal includes both near- and long-term components. In the near term, the Commission proposes that CMRS providers subject to § 20.18 of the Commission's rules provide horizontal location information within 50 meters for 67 percent of 911 calls placed from indoor environments within two years of the effective date of the rules and provide vertical location information within 3 meters for 67 percent of 911 calls placed from indoor environments within three years. Within five years of the effective date of the rules, the Commission proposes that all CMRS providers subject to § 20.18(a) of the Commission's rules must provide the caller's horizontal (x- and y-axis) location within 50 meters and vertical (z-axis) data within 3 meters for 80 percent of 911 calls placed from indoor environments. These standards would apply nationwide. For the long term, we propose to develop more granular indoor location accuracy standards, consistent with the evolving capabilities of indoor location technology and increased deployment of in-building communications infrastructure that would provide for delivery to PSAPs of in-building location information at the room or office/suite level. Additionally, the *Third Further Notice* proposes that CMRS providers demonstrate compliance with indoor location accuracy requirements through a test bed or through other testing methods, provided that the methodologies are equivalent to the test bed approach. The *Third Further Notice* seeks comments on whether CMRS providers should certify compliance with the indoor location accuracy requirements.

198. The *Third Further Notice* also addresses several ways to improve the delivery of Phase II location information. The *Third Further Notice* proposes to require CMRS providers to deliver location information within 30 seconds to the location information center (but with a provision to exclude short calls of 10 seconds or less that may not provide sufficient time to generate a location fix) and identify the technology used to determine a location fix and to provide this information to the PSAP. The *Third Further Notice* seeks comment on whether the Commission should standardize the content and process for delivery of confidence and uncertainty data generated for each wireless 911 call. Additionally, the *Third Further Notice* seeks comment on whether it would be feasible to expedite the timeframe for implementing a unitary location accuracy standard for outdoor calls. The *Third Further Notice* also seeks comment on whether CMRS providers should track and periodically report information regarding the percentage of wireless calls to 911 that include E911 Phase II information, and conduct periodic compliance testing for both indoor and outdoor calls. The *Third Further Notice* also seeks comment on whether CMRS providers should track and periodically report E911 call information also seeks comment on what safeguards should be implemented to ensure that CMRS providers' confidential information is protected in relation to reporting requirements. The *Third Further Notice* also seeks comment on whether to adopt a process by which PSAPs or state 911 administrators could raise complaints or concerns regarding the provision of E911 service. Many of the foregoing requirements will likely require the use of professionals for compliance, *e.g.,* engineers and attorneys.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

199. The RFA requires an agency to describe any significant, specifically small business alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): ''(1) The establishment of differing compliance or reporting requirements or timetables that take into

account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) and exemption from coverage of the rule, or any part thereof, for small entities.''

200. The *Third Further Notice* analyzes a variety of possible means of implementing various near- and long-term E911 location accuracy requirements, without imposing undue costs or regulatory burdens. The *Third Further Notice* recognizes that the implementation of any indoor location accuracy requirements will impose costs on CMRS providers and seeks comment on the ways in which any implementation requirements could be designed to mitigate those costs to the extent possible, without sacrificing important public safety objectives. The *Third Further Notice* seeks comment on how we different approaches may affect smaller CMRS providers and whether there are particular measures the Commission should take to minimize the potential burdens on these smaller providers. The *Third Further Notice* seeks comment on a wide range of questions that will enable the Commission to weigh the costs and benefits of its proposals, including whether to establish any exceptions for smaller wireless providers. The *Third Further Notice* suggests that costs of compliance are likely to be mitigated by the fact that providers are already undertaking various indoor location technology research and development efforts for their own commercial, non-911 related purposes.

201. The *Third Further Notice* proposes to offer CMRS providers flexibility in implementing the indoor location requirements. For example, the *Third Further Notice* proposes to allow CMRS providers to implement whatever location technology it chooses, and foresees that providers may implement different solutions to determine a caller's indoor location, each of which may present unique costs. The *Third Further Notice* seeks comment on the technical feasibility and specific challenges of its various proposals. The *Third Further Notice* also seeks comment on whether, in order to increase flexibility for CMRS providers, the Commission should adopt a specific waiver process for those providers who seek relief from our indoor location accuracy requirements. In addition, the *Third Further Notice* seeks comment on any other alternative approaches that would enable the Commission to focus the application of indoor location requirements in the most effective and cost-efficient way possible, and asking for possible voluntary approaches agreed upon between CMRS providers and public safety as an alternative to regulation. These or other alternatives in the comment record can help to reduce the compliance burden on small businesses.

202. The *Third Further Notice* also seeks comment on various Phase II E911 delivery issues. For example, the *Third Further Notice* seeks comment on requiring CMRS providers to satisfy a unitary E911 location accuracy standard (for outdoor calls) within an expedited timeframe. In doing so, the *Third Further Notice* seeks comment on how expediting the timeframe towards more granular location accuracy standards may affect smaller CMRS providers, and specifically seeks comment on the implementation timeframe, as well as the sufficiency of the Commission's existing waiver process to provide relief.

203. The *Third Further Notice* also invites industry and public safety stakeholders to collaborate to identify alternative proposals for improving indoor location accuracy, including a consensus-based, voluntary proposal to address the public safety goals detailed in this proceeding. Finally, the proposals in the *Third Further Notice* do not become effective until after the Commission seeks comment and adopts an order implementing them. We seek comment on the effect of the various proposals described in the *Third Further Notice,* as summarized above, will have on small entities, and on what effect alternative rules would have on those entities.

F. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rules

204. None.

VII. Ordering Clauses

205. *It is further ordered,* pursuant to sections 1, 2, 4(i), 7, 10, 201, 214, 222, 251(e), 301, 302, 303, 303(b), 303(r), 307, 307(a), 309, 309(j)(3), 316, 316(a), and 332, of the Communications Act of 1934, 47 U.S.C. 151, 152(a), 154(i), 157, 160, 201, 214, 222, 251(e), 301, 302, 303, 303(b), 303(r), 307, 307(a), 309, 309(j)(3), 316, 316(a), 332; the Wireless Communications and Public Safety Act of 1999, Public Law 106–81, 47 U.S.C. 615 note, 615, 615a, 615b; and section 106 of the Twenty-First Century Communications and Video Accessibility Act of 2010, Public Law 111–260, 47 U.S.C. 615c, that this *Third Further Notice of Proposed Rulemaking* is hereby *adopted.*

206. *It is further ordered* that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, *shall send* a copy of this *Third Further Notice of Proposed Rulemaking,* including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

List of Subjects in 47 CFR Part 20

Communications common carriers, Communications equipment, Radio.

Federal Communications Commission.

Marlene H. Dortch,

Secretary.

Proposed rules

For the reasons set forth in the preamble, the Federal Communications Commission proposes to amend 47 CFR Part 20 as follows:

PART 20—COMMERCIAL MOBILE SERVICES

■ 1. The authority citation for Part 20 is revised to read as follows:

Authority: 47 U.S.C. 151, 152(a), 154(i), 157, 160, 201, 214, 222, 251(e), 301, 302, 303, 303(b), 303(r), 307, 307(a), 309, 309(j)(3), 316, 316(a), 332, 615, 615a, 615b, 615c.

■ 2. Section 20.18 is amended by removing paragraph (h)(3), redesignating paragraphs (i) through (n) as paragraphs (l) through (q), adding new paragraphs (i) through (k), and revising newly redesignated paragraph (m)(l) to read as follows:

§ 20.18 911 Service.

* * * * *

(i) *Indoor Location Accuracy for 911 and testing requirements.* CMRS providers subject to this section must provide to the designated Public Safety Answering Point the location of 911 wireless calls, based on indoor measurements, within 50 meters (by longitude and latitude) no later than two years from [the effective date of the adoption of this rule], and, within 3 meters (vertical height) no later than three years from [the effective date of the adoption of this rule], for 67 percent of all such calls. No later than five years from the [effective date of the adoption of this rule], CMRS providers must comply with the 50 meter (by longitude and latitude) accuracy requirement and the 3 meter (vertical height) accuracy requirement, for 80 percent of all such calls. CMRS providers shall satisfy these indoor location accuracy standards on a PSAP-level or county-level basis, and may demonstrate compliance by either:

(1) Participating in an independently administered test bed program that includes a sampling of different

environments that is representative of real-life indoor call scenarios, employs the same technology or technologies actually employed in their networks, and relies on tests of how the technology or technologies will actually be so employed; or

(2) Using alternative testing methods, provided that CMRS providers demonstrate that their methodology and testing procedures are at least equivalent to the testing methodology and procedure standards used in the independently administered indoor location accuracy test bed under paragraph (i)(1) of this section.

(j) *Latency (Time to First Fix).* For purposes of measuring compliance with the outdoor location accuracy standards of paragraph (h) of this section and the indoor location accuracy standard of paragraph (i) of this section, a call will be deemed to satisfy the standard only if it provides the specified degree of location accuracy within a maximum period of 30 seconds (''Time to First Fix''), as measured at the location information center of the E911 network. For such purposes, CMRS providers may exclude 911 calls of a duration of 10 seconds or less.

(k) *Confidence and uncertainty data:* CMRS providers subject to this section shall provide for all wireless 911 calls, whether from outdoor or indoor locations, x- and y-axis (latitude, longitude) confidence and uncertainty information (C/U data) on a per-call basis upon the request of a PSAP. Such C/U data shall specify

(1) The caller's location within a specified confidence level, and

(2) The radius in meters from the reported position at that same confidence level. All entities responsible for transporting confidence and uncertainty between wireless carriers and PSAPs, including LECs, CLECs, owners of E911 networks, and emergency service providers, must enable the transmission of confidence and uncertainty data provided by wireless carriers to the requesting PSAP.

* * * * *

(m) * * *

(1) *Generally.* The requirements set forth in paragraphs (d) through (k) of this section shall be applicable only to the extent that the administrator of the applicable designated PSAP has requested the services required under those paragraphs and such PSAP is capable of receiving and utilizing the requested data elements and has a mechanism for recovering the PSAP's costs associated with them.

* * * * *

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