ATIS-0500031.v002

ATIS Standard on -

TEST BED AND MONITORING REGIONS DEFINITION AND METHODOLOGY

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Test Bed and Monitoring Regions Definition and Methodology

Alliance for Telecommunications Industry Solutions

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Abstract

This document describes and provides the technical details of the approach of characterizing wide scale indoor wireless location performance, for the purposes of E911, through representative testing in a test bed and subsequently applying its results to live wireless network emergency call statistics gathered from a number of diverse monitoring regions.

Foreword

The Alliance for Telecommunications Industry Solutions (ATIS) serves the public through improved understanding between carriers, customers, and manufacturers. The Emergency Services Interconnection Forum (ESIF) provides a forum to facilitate the identification and resolution of technical and/or operational issues related to the interconnection of wireline, wireless, cable, satellites, Internet, and emergency services networks.

The mandatory requirements are designated by the word *shall* and recommendations by the word *should*. Where both a mandatory requirement and a recommendation are specified for the same criterion, the recommendation represents a goal currently identifiable as having distinct compatibility or performance advantages. The word *may* denotes an optional capability that could augment the standard. The standard is fully functional without the incorporation of this optional capability.

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, ESIF, 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time of consensus on this document, ESIF, which was responsible for its development, had the following leadership:

S. Sherwood, ESIF Chair (Verizon Wireless)

R. Hixson, ESIF 1st Vice Chair (NENA)

R. Marshall, ESIF 2nd Vice Chair (Comtech)

J. Green, ESIF ESM Co-Chair (Sprint)

K. Springer, ESIF ESM Co-Chair (AT&T)

The **Emergency Services & Methodologies [ESM]** Subcommittee was responsible for the development of this document.

Revision History

Date	Document Number	Description
6/16/2016	ATIS-0500031	Document approved.
2/13/2017	ATIS-0500031.v002	Document updated to include new Appendix B, additional supporting materials, and supporting text in Clause 4.

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1 Scope, Purpose, & Application

1.1 Scope

This document describes and provides the technical details of the approach of characterizing wide scale indoor wireless location performance, for the purposes of E911, through representative testing in a test bed and subsequently applying its results to live wireless network emergency call statistics gathered from a number of diverse monitoring regions.

This document provides the definition of the six wireless network monitoring regions across the U.S. and the detailed definition of the test bed with its two test areas in and around the San Francisco and Atlanta metropolitan regions. The document describes in detail the test bed morphologies and their boundaries in the test areas, the test building types, the test cases within the test buildings, and the general test methodology. The detailed mathematical procedures to apply the benchmark results from the test bed to the live emergency call statistics in the monitoring regions are also presented.

1.2 Purpose

It is intended that through the application of the concepts and techniques defined in this document, the wireless industry and public safety will have a uniform consensus methodology that is both sound and efficient, that can be used in establishing wireless E911 indoor location performance in a consistent and repeatable manner.

1.3 Application

All stakeholders involved in indoor wireless E911 location performance characterization will find the contents of this document applicable to their efforts. It defines for wireless carriers, location technology vendors, test services vendors, and experts in the field the network monitoring regions to be used in establishing compliance with FCC location accuracy requirements, the test bed with its two distinct regions and characteristics, the test methodology, and the mathematical procedures to apply the test bed results to the live network call statistics obtained from the monitoring regions. It is anticipated that technical teams involved in planning, performing, and overseeing field testing related to the test bed and analyzing its results, as well as wireless carrier technical personnel involved in applying the results of the test bed to their networks, will make frequent use of the techniques described in this document.

2 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

FCC 15-9, PS Docket No. 07-114, 4th Report and Order, *Fourth Report and Order In the Matter of Wireless E911 Location Accuracy Requirements*[1]

ATIS-0500013, *Approaches to Wireless E911 Indoor Location Performance Testing*[2]

ATIS-0500022, *Test Plan Input for a Location Technology Test Bed*[3]

ATIS-0500027, *Recommendations for Establishing Wide Scale Indoor Location Performance*[4]

ATIS-0500030, *Guidelines for Testing Barometric Pressure-Based Z-Axis Solution*[5]

3 Acronyms & Abbreviations

For a list of common communications terms and definitions, please visit the *ATIS Telecom Glossary*, which is located at < http://www.atis.org/glossary >.

3.1 Acronyms & Abbreviations

AGNSS	Assisted Global Navigation Satellite System
A-GPS	Assisted-Global Positioning System
AP	Access Point (i.e., Wi-Fi Base Station)
ATIS	Alliance for Telecommunications Industry Solutions
BLE	Bluetooth Low Energy
CMRS	Commercial Mobile Radio Services
CMA	Cellular Market Areas
CSRIC	Communications Security, Reliability and Interoperability Council
CTIA	Cellular Telephone Industries Association, now known as CTIA-The Wireless Association
DL	Dispatchable Location
E911	Enhanced 911
ESIF	Emergency Services Interconnection Forum
ESM	Emergency Services & Methodologies
FCC	Federal Communications Commission

[1] This document is available from the Federal Communications Commission, 445 12th Street, SW, Washington, DC 20554: < http://www.fcc.gov >.

[2] This document is available from the Alliance for Telecommunications Industry Solutions, 1200 G Street, NW Suite 500 | Washington, DC, 20005: < https://www.atis.org/docstore/product.aspx?id=25009 >.

[3] This document is available from the Alliance for Telecommunications Industry Solutions, 1200 G Street, NW Suite 500 | Washington, DC, 20005: < https://www.atis.org/docstore/product.aspx?id=27856 >.

[4] This document is available from the Alliance for Telecommunications Industry Solutions, 1200 G Street, NW Suite 500 | Washington, DC, 20005: < https://www.atis.org/docstore/product.aspx?id=28219 >.

[5] This document is available from the Alliance for Telecommunications Industry Solutions, 1200 G Street, NW Suite 500 | Washington, DC, 20005: < https://www.atis.org/docstore/product.aspx?id=28274 >.

FIPS	Federal Information Processing Standard (A FIPS Code is a 5 digit code assigned to each county)
GDOP	Geometric Dilution of Precision
GPS	Global Positioning System
ISP	Internet Service Provider
OS	Operating System
OTDOA	Observed Time Difference of Arrival
PSAP	Public Safety Answering Point
RF	Radio Frequency
RTT	Round Trip Time
TBS	Terrestrial Beacon System
TTFF	Time to First Fix
Wi-Fi	Wireless Fidelity

4 Approach to Indoor Location Performance Establishment

ESIF ESM has provided recommendations for indoor location performance characterization based on representative indoor testing and monitoring in select regions in ATIS-0500027. That document outlines the key parameters that need to be characterized for a wide selection of existing and emerging indoor location technology solutions. It also identifies six market regions as candidates for indoor test bed implementation. Those regions are Metropolitan San Francisco, Denver, Chicago, Atlanta, and Philadelphia, in addition to Manhattan in New York City because of its unique dense urban environment.

The FCC, in its 4th Report and Order, adopted the approach of representative evaluation and testing of indoor location technology performance for wireless E911. In the Order, the FCC placed indoor location performance benchmarks to be met by wireless carriers (CMRS providers) over a multi-year time frame. It also required that CMRS providers certify at certain timeframes that they have deployed compliant technology throughout their network “consistent with the compliant technology’s performance in an independent test bed”. Moreover, “to demonstrate further compliance with these metrics, CMRS providers must submit aggregated live 911 call data from the six cities recommended for indoor testing by the Alliance for Telecommunications Industry Solutions Emergency Services Interconnection Forum (ATIS ESIF).”

Accordingly, through the regulatory process, the six market regions identified in ATIS-0500027 have been used interchangeably, either as candidate areas for establishing a test bed to represent the entire U.S., or as areas to monitor live E911 location performance across the U.S., when coupled with the appropriate representative test bed data.

Subsequent to the 4th Report and Order and in response to its requirements, ESIF re-examined and refined the test bed locations for representative testing. It also began work to define blending methodologies for assessing accuracy compliance. Through technical contributions to ESM and extensive dialogue within it related to the resolution of this issue, convergence was reached on using a two-region test bed, with one region in the eastern U.S. and one on the West Coast, to capture the representative indoor location test data. Metropolitan San Francisco and Metropolitan Atlanta as well as the areas surrounding them were selected as the two test bed regions. Each of these two test regions would have good, albeit distinct, representation of the four basic morphologies (environments) where wireless calls are placed, namely, the dense urban, urban, suburban, and rural morphologies.

The rationale for selecting Metropolitan San Francisco as a test bed region is obvious, since it served very well as a representative area with diverse morphologies and building types during the CSRIC III testing. The rationale for selecting Atlanta, for example over Philadelphia (which was used as an example in ATIS-0500027), is that Atlanta