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Report On

Maximum Permissible Exposure Evaluation for
AnyDATA
ACT233L 4G Vehicle Tracker with Hotspot

OET Bulletin 65 Edition 97-01 including Supplement C

Report No. SC1304495G_Rev2.0

Jan 2014



REPORT ON Maximum Permissible Exposure Evaluation for
AnyDATA
4G Vehicle Tracker with Hotspot

TEST REPORT NUMBER SC1304495G_Rev2.0

PREPARED FOR AnyDATA
5 Oldfield
Irvine, CA 92618

CONTACT PERSON Kevin Kim
Principal Engineer
(949) 900-6040 x306
kevinkim@anydata.com

PREPARED BY


Ferdinand S. Custodio

Name
Authorized Signatory
Title: EMC/Wireless Test Engineer

APPROVED BY


Chip R. Fleury

Name
Authorized Signatory

DATED

Jan 21, 2014



Revision History

SC1304495G_Rev2.0 AnyDATA ACT233L ACT233L 4G Vehicle Tracker with Hotspot					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
05/22/13	Initial Release				Ferdinand Custodio
11/20/13	Initial release	1.0	Update MPE Calculation on BT	14,16	Fleury Chip
1/21/14	1.0	2.0	Update MPE Calculation on BT (Use Peak value instead Av value)	14,16	Fleury Chip



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SECTION 1

REPORT SUMMARY

Maximum Permissible Exposure Evaluation for
AnyDATA
4G Vehicle Tracker with Hotspot



1.1 INTRODUCTION

The information contained in this report is intended to show compliance of AnyDATA 4G Vehicle Tracker with Hotspot to the requirements of OET Bulletin 65 Edition 97-01 including Supplement C.

Objective	To perform verification to determine the Equipment Under Test's (EUT's) compliance with FCC §1.1307 Subpart I.
Manufacturer	AnyDATA
Model Name	ACT233L
Model Number(s)	ACT233L
FCC ID Number	P4M-ACT233
IC Number	4594B-ACT233
Test Specification/Issue/Date	OET Bulletin 65 Edition 97-01 including Supplement C (June 2001)
Name of Engineer(s)	Ferdinand S. Custodio
Related Document(s)	<ul style="list-style-type: none"> • Report No: SC1304495A AnyDATA ACT233L FCC IC Part 15.247 RSS210 WLAN BT LE Test Report • Report No: SC1304495B AnyDATA ACT233L FCC Part 15.247 RSS210 BT FHSS Test Report • Report No: SC1304495C AnyDATA ACT233L FCC Part 15.231 RSS210 Test Report • Report No: SC1304495D AnyDATA ACT233L FCC IC Part 27 Test Report • Report No: SC1304495E AnyDATA ACT233L FCC IC Part 22 and 24 Test Report • 447498 3 D01 General RF Exposure Guidance v05 (Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies).

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of verification carried out in accordance with OET Bulletin 65 Edition 97-01 including Supplement C is shown below.

Transmitter	Description of Evaluation	Evaluation Type	Result
FCC Part 15.247 (WLAN)	Individual MPE evaluation	MPE calculated	Compliant
FCC Part 15.247 (BT)	Individual MPE evaluation	MPE calculated	Compliant
FCC Part 15.231	Individual MPE evaluation	MPE calculated	Compliant
FCC Part 22 and 24 (CDMA)	Individual MPE evaluation	MPE calculated	Compliant
FCC Part 27 (LTE)	Individual MPE evaluation	MPE calculated	Compliant
All transmitters (co-located)	Sum of the MPE ratios	Calculated	Compliant

1.3 PRODUCT INFORMATION

1.3.1 EUT General Description

The Equipment Under Test (EUT) was an AnyDATA ACT233L 4G Vehicle Tracker with Hotspot as shown in the photograph below. The EUT connects to a vehicle's OBD2 port; it enables remote functions and vehicle tracking through a Smartphone app.



1.3.2 EUT General Description

EUT Description	ACT233L 4G Vehicle Tracker with Hotspot
Model Number(s)	ACT233L
Rated Voltage	13.5 VDC Nominal voltage.
Capability	800/1900 CDMA2000 1xRTT and 1xEV-DO Release 0 Revision A, Band 4 and 13 LTE, 802.11 b/g/n WLAN, BT and Part 15.231 Transmitter

1.3.3 Antenna Details

- Main Antenna (Tx/Rx for LTE B13/4 and CDMA BC0/1) Integral custom PIFA type
- Diversity Antenna (Rx for LTE B13/4 and CDMA BC0/1) Integral custom ILA type
- BT/WIFI Antenna (Tx/Rx for BT/WIFI) Integral custom ILA type
- RF Transmitter Antenna (Tx for Transmitter) Integral Chip antenna

Mode	Part 15.231 Transmitter		
Frequency (MHz)	300	319	434
Antenna Gain (dBi)	-6	-6	-8
Mode	LTE B13		
Frequency (MHz)	782		
Antenna Gain (dBi)	-6		
Mode	LTE B4		
Frequency (MHz)	1710	1732	1755
Antenna Gain (dBi)	-5	-4	-3.5
Mode	CDMA BC0		
Frequency (MHz)	824	836	849
Antenna Gain (dBi)	-4	-4	-4
Mode	CDMA BC1		
Frequency (MHz)	1850	1880	1910
Antenna Gain (dBi)	-3.5	-5	-4.5
Mode	WiFi/BT		
Frequency (MHz)	2400	2440	2480
Antenna Gain (dBi)	-6	-5.5	-6.5

1.4 REQUIREMENTS FROM THE STANDARD

As stated in the FCC rules, mobile and portable transmitting devices that operate in the Cellular Radiotelephone Service, the Personal Communications Services (PCS), the Satellite Communications Services, the General Wireless Communications Service, the Wireless Communications Service, the Maritime Services (ship earth stations only) and Specialized Mobile Radio Service authorized, respectively, under Part 22 (Subpart H), Part 24, Part 25, Part 26, Part 27, Part 80, and Part 90 of the FCC rules are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use. Portable devices operating in the Wireless Medical Telemetry Service (WMTS) and the Medical Implant Communications Service (MICS), authorized under Subparts H and I of Part 95 are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use. Unlicensed PCS, U-NII and millimeter wave devices authorized under Part 15 of FCC rules are also subject to routine environmental evaluation for RF exposure prior to equipment authorization or use. All other mobile and portable devices are categorically excluded from routine environmental evaluation for RF exposure.

MOBILE DEVICES

The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR §2.1091. For purposes of RF exposure evaluation, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. In this context, the term "fixed location" means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Examples of mobile devices, as defined above, would include cellular and PCS mobile telephones, other radio devices that use vehicle-mounted antennas and certain other transportable transmitting devices. Transmitters designed to be used by consumers or workers that can be easily re-located, such as a wireless modem operating in a laptop computer, are considered mobile devices if they meet the 20 centimeter separation requirement. These devices are normally evaluated for exposure potential with the MPE limits given in Appendix A. Mobile devices may also be evaluated with respect to the SAR limits given in Appendix A for RF exposure compliance, but in such cases it is usually simpler and more cost-effective to evaluate compliance with respect to MPE limits based on field strength or power density.

PORTABLE DEVICES

The FCC rules for evaluating portable devices for RF exposure compliance are contained in 47 CFR §2.1093. For purposes of RF exposure evaluation, a portable device is defined as a transmitting device designed to be used with any part of its radiating structure in direct contact with the user's body or within 20 centimeters of the body of a user or bystanders under normal operating conditions. This category of devices would include hand-held cellular and PCS telephones that incorporate the radiating antenna into the hand-piece and wireless transmitters that are carried next to the body. Portable devices are evaluated with respect to SAR limits for RF exposure.⁶ The applicable SAR limit for portable transmitters used by consumers is 1.6 watts/kg, which is averaged over any one gram of tissue defined as a tissue volume in the shape of a cube.

EXPOSURE CATEGORIES

With respect to field strength, power density and SAR requirements, both the 1992 ANSI/IEEE standard and the NCRP exposure criteria (See References [1] and [30]), upon which the FCC guidelines are based, recommend limits with respect to both occupational/controlled and general population/uncontrolled exposures. The compliance requirements for each category are based on a person's awareness and ability to exercise control over his or her exposure.

OCCUPATIONAL / CONTROLLED EXPOSURE

In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.

GENERAL POPULATION / UNCONTROLLED EXPOSURE

The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

SECTION 2

TEST DETAILS

Maximum Permissible Exposure Evaluation for
AnyDATA
4G Vehicle Tracker with Hotspot

2.1 MPE CALCULATIONS FOR INDIVIDUAL TRANSMITTER

2.1.1 Specification Reference

OET Bulletin 65 Edition 97-01 including Supplement C

2.1.2 Limit Applicable

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Electric Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time [E] ² , [H] ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

*f = frequency in MHz *Plane-wave equivalent power density*

NOTE : The averaging time for General Population/Uncontrolled exposure to fixed transmitters is not applicable for mobile and portable transmitters. See 47 CFR §§2.1091 and 2.1093 on source-based time-averaging requirements for mobile and portable transmitters.

2.1.3 Equipment Evaluated

Please refer to individual corresponding test report (Section 1.1)

2.1.4 Date of Evaluation

Please refer to individual corresponding test report (Section 1.1)

2.1.5 Additional Observations

Calculation is based from the following equation (page 18 of OET Bulletin 65, Edition 97-01):

$$S = \frac{PG}{4\pi R^2}$$

where: S = Power Density
P = Power Input To The Antenna
G = Power Gain Of The Antenna In The Direction Of Interest Relative To Isotropic
R = Distance To The Center Of Radiation Of The Antenna

2.1.6 Part 15.231 Transmitter Test Results (calculation based from radiated measurement)

Maximum radiated output power:	70.8	(dB μ V/m)
Maximum peak output power - radiated:	0.0000036	(W)
Antenna gain(typical):	-6.0	(dBi)
Maximum antenna gain:	0.25	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	319	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	0.21267	(mW/cm ²)
Power density at prediction frequency:	0.0000001	(mW/cm ²)
Margin of Compliance:	-60.7	(dB)

2.1.7 WiFi Test Results (calculation based from conducted antenna port measurement)

Maximum peak output power at antenna input terminal:	20.82	(dBm)
Maximum peak output power at antenna input terminal:	120.78	(mW)
Antenna gain(typical):	-6.1	(dBi)
Maximum antenna gain:	0.245	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2462	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0059	(mW/cm ²)
Power density at prediction frequency:	0.059	(W/m ²)
Margin of Compliance:	-22.29	(dB)

2.1.8 Bluetooth Test Results (calculation based from conducted antenna port measurement)

Maximum peak output power at antenna input terminal:	9.21	(dBm)
Maximum peak output power at antenna input terminal:	8.34	(mW)
Antenna gain(typical):	-5.5	(dBi)
Maximum antenna gain:	0.282	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2440	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0005	(mW/cm ²)
Power density at prediction frequency:	0.005	(W/m ²)
Margin of Compliance:	-33.30	(dB)

2.1.9 CDMA Test Results (calculation based from conducted antenna port measurement)

Maximum output power at antenna input terminal:	24.98	(dBm)
Maximum output power at antenna input terminal:	314.77	(mW)
Antenna gain(typical):	-4	(dBi)
Maximum antenna gain:	0.398	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	824.7	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	0.550	(mW/cm ²)
Power density at prediction frequency:	0.0249	(mW/cm ²)
Power density at prediction frequency:	0.249	(W/m ²)
Margin of Compliance:	-13.43	(dB)

2.1.10 LTE Test Results (calculation based from conducted antenna port measurement)

Maximum output power at antenna input terminal:	24.55	(dBm)
Maximum output power at antenna input terminal:	285.10	(mW)
Antenna gain(typical):	-6	(dBi)
Maximum antenna gain:	0.251	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	782.0	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	0.521	(mW/cm ²)
Power density at prediction frequency:	0.0142	(mW/cm ²)
Power density at prediction frequency:	0.142	(W/m ²)
Margin of Compliance:	-15.63	(dB)

2.2 WORST CASE CO-LOCATED EXPOSURE CONDITIONS

2.2.1 Specification Reference

OET Bulletin 65 Edition 97-01 including Supplement C and 447498 3 D01 General RF Exposure Guidance v05 (Section 7.2)

2.2.2 Limit Applicable

The FCC's MPE limits vary with frequency. Therefore, in mixed or broadband RF fields where several sources and frequencies are involved, the fraction of the recommended limit (in terms of power density or square of the electric or magnetic field strength) incurred within each frequency interval should be determined, and the sum of all fractional contributions should not exceed 1.0, or 100% in terms of percentage.

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on calculated or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance

2.2.3 Test Results

Transmitter	MPE (mW/cm ²)	Evaluation Distance (cm)	Limit (mW/cm ²)	MPE ratio (MPE/Limit)
Part 15.231	0.00000018	20	0.21267	0.00000084
WLAN (WiFi)	0.0059	20	1.0	0.0059
Bluetooth	0.0005	20	1.0	0.0005
CDMA (Part 22/24)	0.0249	20	0.550	0.0453
LTE (Part 27)	0.0142	20	0.521	0.0273
Sum of the ratios (should be <1.0)				0.07900084

SECTION 3

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

3.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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