TESTING
No. L2264

Part 22

TEST REPORT

Product Name	LMU-200C CDMA
Model Name	LMU-200-DEI
Brand Name	CalAmp
FCC ID	APV-200C
Applicant	CalAmp
Manufacturer	AsiaTelco Technologies Co.
Date of issue	January 14, 2015

TA Technology (Shanghai) Co., Ltd.

GENERAL SUMMARY

Reference Standard(s)	**FCC CFR47 Part 2 (2013)** Frequency Allocations And Radio Treaty Matters; General Rules And Regulations **FCC CFR 47 Part 22H (2013)** Public Mobile Services(850MHz) **ANSI/TIA-603-C(2004)** Land mobile FM or PM Communications Equipment Measurements and Performance Standards. **KDB 971168 D01 Power Meas License Digital Systems v02r01** Measurement Guidance for Certification of Licensed Digital Transmitters
Conclusion	This fixed equipment has been measured in all cases requested by the relevant standards. Test results in Chapter 2 of this test report are below limits specified in the relevant standards. General Judgment: **Pass**
Comment	The test result only responds to the measured sample.

Approved by Kai Xu
Kai Xu
Director

Revised by Lingling Kang
Lingling Kang
RF Manager

Performed by Changxu Wan
Changxu Wan
RF Engineer

TABLE OF CONTENT

1. General Information

1.1. Notes of the test report

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L2264.

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 428261.

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 8510A.

TA Technology (Shanghai) Co., Ltd. guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

TA Technology (Shanghai) Co., Ltd. is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. The sample under test was selected by the Client.This report only refers to the item that has undergone the test.

This report standalone dose not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of **TA Technology (Shanghai) Co., Ltd.** and the Accreditation Bodies, if it applies.

If the electrical report is inconsistent with the printed one, it should be subject to the latter.

1.2. Testing laboratory

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City:	Shanghai
Post code:	201201
Country:	P. R. China
Contact:	Xu Kai
Telephone:	+86-021-50791141/2/3
Fax:	+86-021-50791141/2/3-8000
Website:	http://www.ta-shanghai.com
E-mail:	xukai@ta-shanghai.com

1.3. Applicant Information

Company:	CalAmp
Address:	2177 Salk Ave Suite 200 Carlsbad Califonia/United States

1.4. Manufacturer Information

Company:	AsiaTelco Technologies Co.
Address:	#289 Bisheng Road, Building-8, 3F, Zhangjiang Hi-Tech Park, Pudong, Shanghai-201204, China

1.5. Information of EUT

General information

Permissive Change:	Class II		
MEID :	A100004430047D		
Hardware Version:	P2		
Software Version:	2.1.6		
Antenna Type:	Internal Antenna		
Device Operating Configurations:			
Test Mode(s):	CDMA Cellular		
Support mode:	1x RTT		
Test Modulation:	QPSK		
Maximum E.R.P.	22.10 dBm		
Rated Power Supply Voltage:	12V		
Extreme Voltage:	Minimum: 10V Maximum: 36V		
Extreme Temperature:	Lowest: -40°C Highest: +85°C		
Test Channel: (Low - Middle - High)	1013 - 384 - 777 (tested)		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	CDMA Cellular	824.7 ~ 848.31	869.7 ~ 893.31

LMU-200-DEI is a variant model of LMU-200C. RF values duplicated from LMU-200C for LMU-200-DEI, the report number of LMU-200C is RXA1409-0217RF01R1. The detailed product change description please refers to the ANNEX B.

1.6. Test Date

The test is performed on November 26.2014.

2. Test Information

2.1. Summary of test results

Number	Test Case	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Effective Radiated Power	22.913(a)(2)	PASS
3	Radiates Spurious Emission	2.1053 / 22.917 (a)	PASS

PASS: The EUT complies with the essential requirements in the standard.

FAIL: The EUT does not comply with the essential requirements in the standard.

2.2. RF Power Output

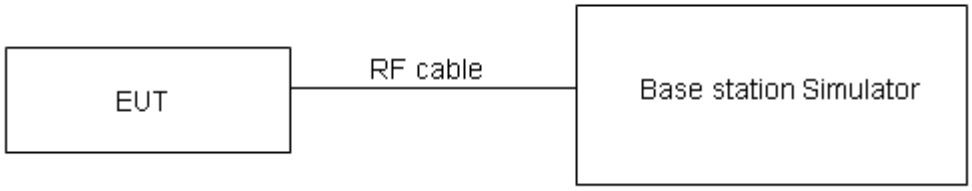
Ambient condition

Temperature	Relative humidity
21°C ~25°C	40%~60%

Methods of Measurement

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

Limits

No specific RF power output requirements in part 2.1046.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the

normal distribution is with the coverage factor k = 2, U= 0.4 dB.

Test Results

Original

CDMA Cellular			Conducted Power(dBm)		
			Channel 1013	Channel 384	Channel 777
			824.7(MHz)	836.52(MHz)	848.31(MHz)
1x RTT	RC1	SO55(Loopback)	24.18	23.84	23.53
		SO2(Loopback)	24.19	23.83	23.55
	RC3	SO55(Loopback)	24.14	23.82	23.51
		SO2(Loopback)	24.15	23.84	23.54

Variant

CDMA Cellular			Conducted Power(dBm)		
			Channel 1013	Channel 384	Channel 777
			824.7(MHz)	836.52(MHz)	848.31(MHz)
1x RTT	RC1	SO55(Loopback)	23.15	23.43	23.02
		SO2(Loopback)	23.23	23.35	23.11
	RC3	SO55(Loopback)	22.96	23.23	22.78
		SO2(Loopback)	23.04	23.21	22.80

2.3. Effective Radiated Power

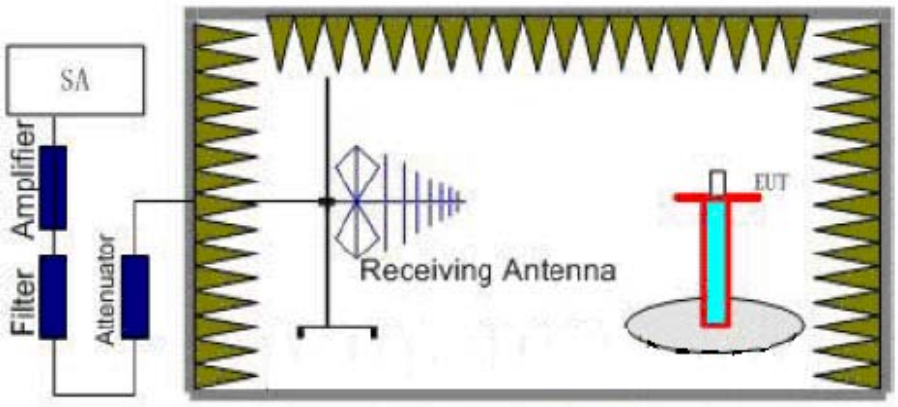
Ambient condition

Temperature	Relative humidity
21°C ~25°C	40%~60%

Methods of Measurement

The measurement procedures in TIA- 603C are used.
1. The EUT was placed on a turntable with 1.5 meter height in a fully anechoic chamber.
2. The EUT was set at 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. GSM operating modes: Set RBW= 1MHz, VBW= 3MHz, RMS detector over burst;
UMTS operating modes: Set RBW= 100 KHz, VBW= 300 KHz, RMS detector over frame, and use channel power option with bandwidth=5MHz, per section 4.0 of KDB 971168 D01.
4. The table was rotated 360 degrees to determine the position of the highest radiated power.
5. The height of the receiving antenna is adjusted to look for the maximum ERP/EIRP.
6. Taking the record of maximum ERP/EIRP.
7. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
8. The conducted power at the terminal of the dipole antenna is measured.
9. Repeat step 3 to step 5 to get the maximum ERP/EIRP of the substitution antenna.
10. ERP/EIRP = Ps + Et – Es + Gs = Ps + Rt – Rs + Gs
Ps (dBm)：Input power to substitution antenna.
Gs (dBi or dBd)：Substitution antenna Gain.
Et = Rt + AF
Es = Rs + AF
AF (dB/m)：Receive antenna factor
Rt：The highest received signal in spectrum analyzer for EUT.
Rs：The highest received signal in spectrum analyzer for substitution antenna.

Test Setup



Limits

Rule Part 22.913(a) specifies that "Mobile/portable stations are limited to 7 watts ERP”.

Limit	≤ 7 W (38.45 dBm)

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 1.19 dB

Test Results:Pass

Original

	Channel	Polarization	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	E.R.P. (dBm)
CDMA Cellular	1013	Vertical	-25.02	-46.19	0	1.06	20.08
	384	Vertical	-24.75	-45.96	0	1.24	20.40
	777	Vertical	-24.89	-45.69	0	1.68	20.43
	1013	Horizontal	-22.74	-46.03	0	1.06	22.30
	384	Horizontal	-22.45	-45.88	0	1.24	22.52
	777	Horizontal	-22.49	-45.57	0	1.68	22.61

Note: 1. EIRP= E.R.P+2.15

Variant

	Channel	Polarization	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	E.R.P. (dBm)
CDMA Cellular	1013	Vertical	-25.47	-46.19	0	1.06	19.53
	384	Vertical	-25.20	-45.96	0	1.24	19.95
	777	Vertical	-25.35	-45.69	0	1.68	19.97
	1013	Horizontal	-23.16	-46.03	0	1.06	21.88
	384	Horizontal	-22.90	-45.88	0	1.24	22.07
	777	Horizontal	-23.00	-45.57	0	1.68	22.10

Note: 1. EIRP= E.R.P+2.15

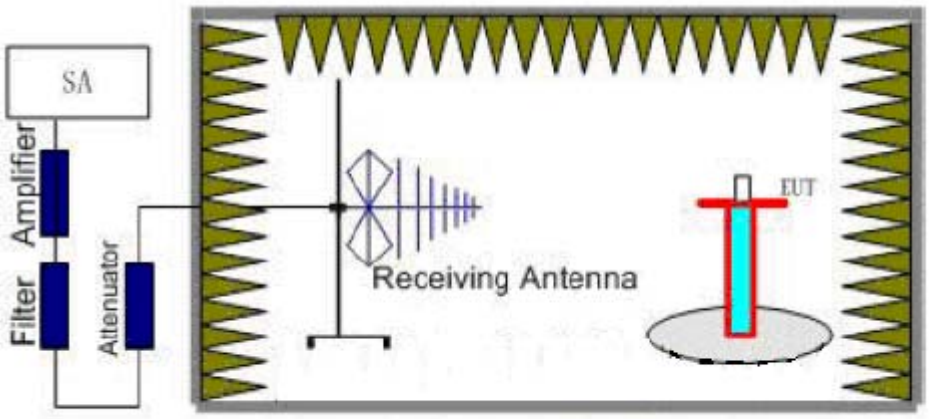
2.4. Radiates Spurious Emission

Ambient condition

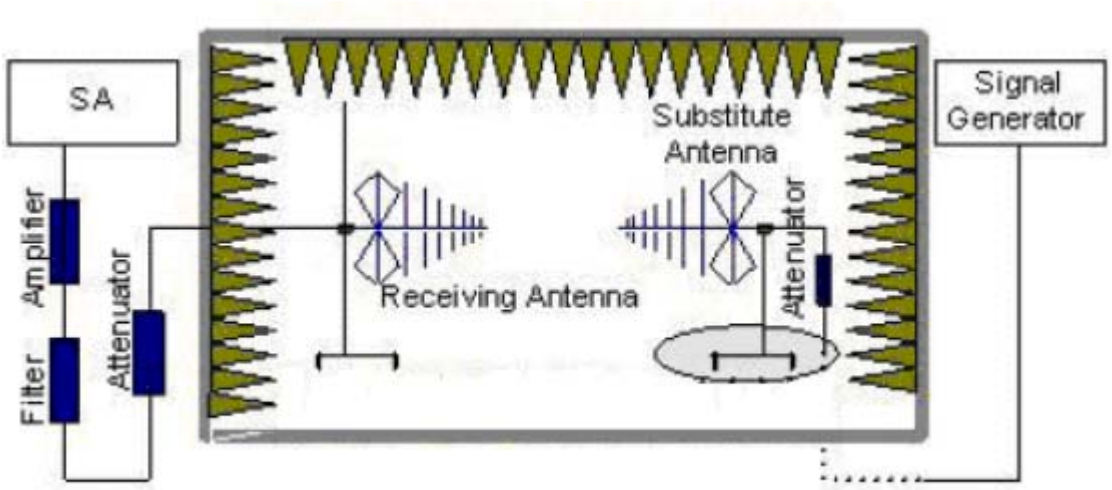
Temperature	Relative humidity
21°C ~25°C	40%~60%

Method of Measurement

The measurements procedures in TIA -603C are used.
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment.
The procedure of Radiates Spurious Emission is as follows:
Step 1:
The measurement is carried out in the semi-anechoic chamber. EUT was placed on a 1.5 meters high non-conductive table at a 3 meters test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. A radio link shall be established between EUT and Tester. The output power of the cell signal of the tester will be decreased until the output power of the EUT reach a maximum value. A peak detector is used while RBW and VBW are both set to 3MHz. During the measurement, the highest emission was recorded from analyzer power level (LVL) from the 360 degrees rotation of the turntable and the test antenna moved up and down over a range from 1 to 4 meters in both horizontally and vertically polarized orientations. The test setup refers to figure below.



Step 2:
A dipole antenna shall be substituted in place of the EUT. The antenna will be driven by a signal generator with a adjustable S.G. applied through a Tx cable. Adjust the level of the signal generator output until the value of the receiver reach the previously recorded analyzer power level (LVL).Then The E.R.P. /E.I.R.P. of the EUT can be calculated through the level of the signal generator, Tx cable loss and the gain of the substitution antenna. The test setup refers to figure below.



E.R.P（peak power）=S.G. - Tx Cable loss + Substitution antenna gain – 2.15.
EIRP= E.R.P+2.15

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the antenna is vertical.

Of those disturbances below (limit – 20 dB), the mark is not required for the EUT

Limits

Rule Part 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.”

Limit	-13 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95％ confidence level for the normal distribution is with the coverage factor k = 1.96, U= 3.55 dB.

Test Result

CDMA Cellular CH1013 (Original)

Harmonic	TX ch.1013 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1649.3	-47.01	2	10.15	Vertical	-41.01	-13	34.01	180
3	2473.7	-45.12	2.51	11.35	Vertical	-38.43	-13	32.12	90
4	3298.8	-64.45	4.2	10.85	Vertical	-59.95	-13	46.95	180
5	4123.5	-62.89	5.2	11.35	Vertical	-58.89	-13	45.89	90
6	4948.2	-63.43	5.5	11.95	Vertical	-59.13	-13	46.13	0
7	5772.9	-61.76	5.7	13.55	Vertical	-56.06	-13	43.06	270
8	6597.6	-61.10	6.3	13.75	Vertical	-55.80	-13	42.80	180
9	7422.3	-61.08	6.8	13.85	Vertical	-56.18	-13	43.18	0
10	8247	-61.86	6.9	14.25	Vertical	-56.66	-13	43.66	180

CDMA Cellular CH384 (Original)

Harmonic	TX ch.384 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1672.3	-52.28	2	10.75	Vertical	-45.68	-13	39.28	0
3	2509.56	-62.78	2.51	11.05	Vertical	-56.39	-13	43.39	0
4	3346.08	-64.61	4.2	11.15	Vertical	-59.81	-13	46.81	180
5	4182.6	-62.67	5.2	11.15	Vertical	-58.87	-13	45.87	90
6	5019.12	-61.23	5.5	11.95	Vertical	-56.93	-13	43.93	0
7	5855.64	-62.70	5.7	13.55	Vertical	-57.00	-13	44.00	270
8	6692.16	-61.77	6.3	13.75	Vertical	-56.47	-13	43.47	180
9	7528.68	-60.26	6.8	13.85	Vertical	-55.36	-13	42.36	0
10	8365.2	-61.88	6.9	14.25	Vertical	-56.68	-13	43.68	90

CDMA Cellular CH777 (Original)

Harmonic	TX ch.777 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1695.9	-55.04	2	10.15	Vertical	-49.04	-13	36.04	0
3	2544.93	-56.6	2.51	11.05	Vertical	-50.21	-13	37.21	0
4	3393.24	-64.16	4.2	11.15	Vertical	-59.36	-13	46.36	0
5	4241.55	-61.50	5.2	11.15	Vertical	-57.70	-13	44.70	180
6	5089.86	-62.89	5.5	11.95	Vertical	-58.59	-13	45.59	90
7	5938.17	-63.04	5.7	13.55	Vertical	-57.34	-13	44.34	0
8	6786.48	-60.84	6.3	13.75	Vertical	-55.54	-13	42.54	270
9	7634.79	-60.52	6.8	13.85	Vertical	-55.62	-13	42.62	180
10	8483.1	-62.22	6.9	14.25	Vertical	-57.02	-13	44.02	0

CDMA Cellular CH1013 (Variant test in the worst case of original)

Harmonic	TX ch.1013 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1695.9	-55.03	2	10.15	Vertical	-49.03	-13	36.03	0
3	2544.93	-56.52	2.51	11.05	Vertical	-50.13	-13	37.13	0
4	3393.24	-64.10	4.2	11.15	Vertical	-59.3	-13	46.30	0
5	4241.55	-61.54	5.2	11.15	Vertical	-57.74	-13	44.74	180
6	5089.86	-62.87	5.5	11.95	Vertical	-58.57	-13	45.57	90
7	5938.17	-63.10	5.7	13.55	Vertical	-57.40	-13	44.40	0
8	6786.48	-60.93	6.3	13.75	Vertical	-55.63	-13	42.63	270
9	7634.79	-60.46	6.8	13.85	Vertical	-55.56	-13	42.56	180
10	8483.1	-62.34	6.9	14.25	Vertical	-57.14	-13	44.14	0

3. Main Test Instruments

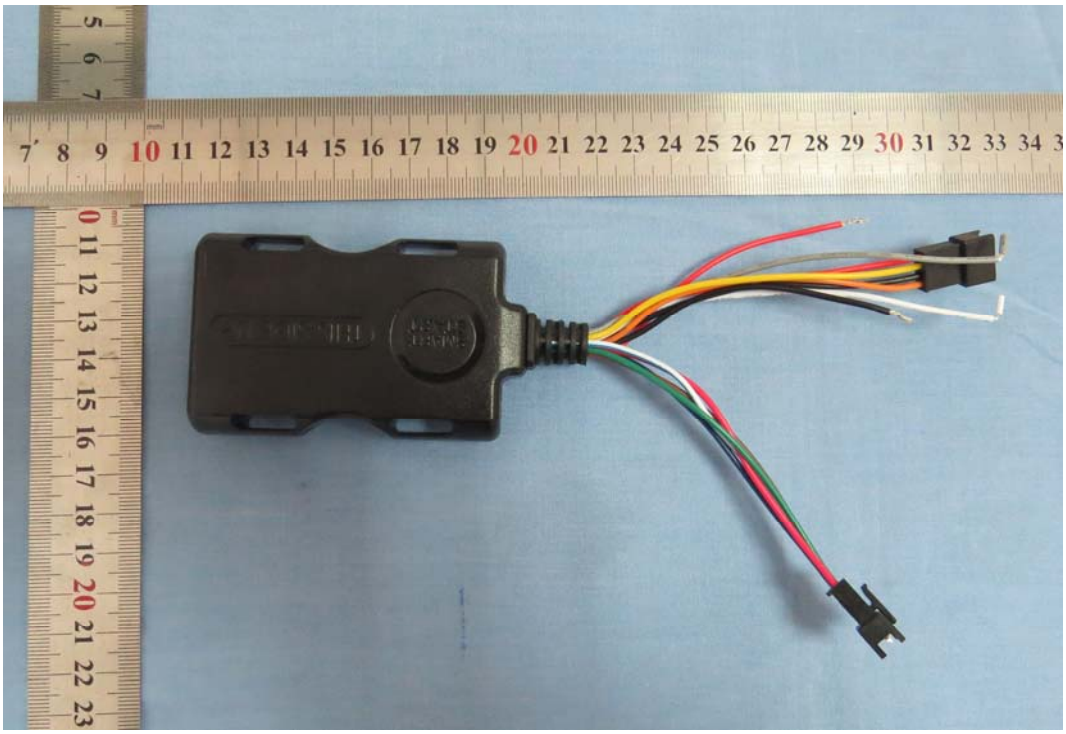
No.	Name	Type	Manufacturer	Serial Number	Calibration Date	Valid Period
01	Base Station Simulator	CMU200	R&S	118133	2014-06-29	One year
02	Power Splitter	SHX-GF2-2-13	Hua Xiang	10120101	NA	NA
03	Spectrum Analyzer	E4445A	Agilent	MY46181146	2014-05-26	One year
04	Trilog Antenna	VUBL 9163	SCHWARZBECK	9163-201	2012-06-19	Three years
05	Horn Antenna	HF907	R&S	100126	2012-07-01	Three years
06	Climatic Chamber	PT-30B	Re Ce	20101891	2013-09-09	Three years
07	RF Cable	/	/	/	2014-11-03	Two months

*******END OF REPORT *******

ANNEX A: EUT Appearance and Test Setup

A.1 EUT Appearance

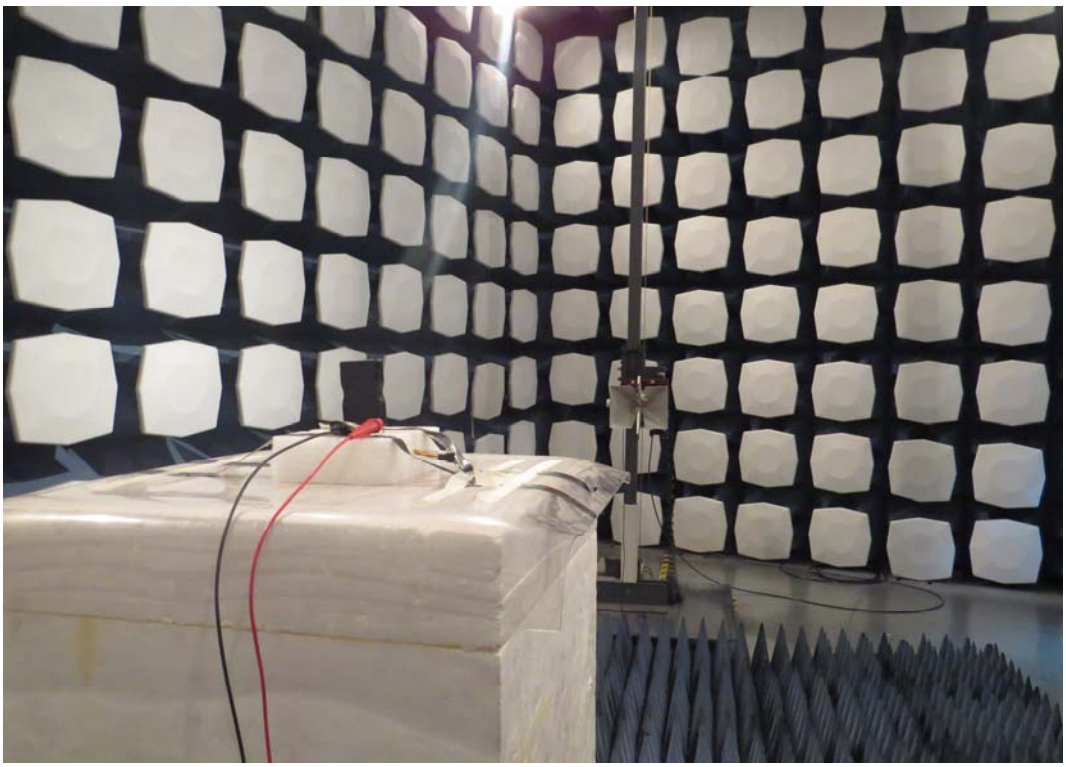
Original



Variant

Picture 1 EUT and Auxiliary

A.2 Test Setup



Variant

Picture 2: Radiated Spurious Emissions Test setup

ANNEX B: Product Change Description

CalAmp / Mobile resource Management
MRM/M2M Products
2177 Salk Ave, STE 200
Carlsbad, CA 92008
PH: (760) 438-9010 – Fax: (760) 438-5835

Product Change Description

We, [CalAmp], declare on our sole responsibility that the product,

[Variant Model name: LMU-200-DEI]
is the variant of the initial certified product,

Initial Model name LMU-200C

Except the following changes on the latest MODEL: [Variant Model name: LMU-200-DEI]

SOFTWARE MODIFICATIONS:
Protocol Stack changes: /
MMS/STK changes: /
JAVA changes: /
Other changes detailed: /

HARDWARE MODIFICATION:
Band changes: /
Power Amplifier changes: /
Antenna changes: /
PCB Layout changes: /
Components on PCB changes:

a. Due to no battery, so delete charge circuit.
b. Delete accelerator circuit

LCD changes: /
Speaker changes: /
Camera changes: /
Vibrator changes: /
Bluetooth changes: /
FM changes: /
Other changes: /

MECHANICAL MODIFICATIONS:
Use new HOUSING front/back cover:
Mechanical shell changes: only change the shape and size of the casing.
Other changes detailed: /

ACCESSORY MODIFICATIONS:
Battery changes: remove internal battery
AC Adaptor changes: /
Earphone changes: /

January 5th 2015

Product Certification Manager	Imad Rizk
Phone number:	(760) 814-9697
Email:	irizk@calamp.com