FCC MPE TEST REPORT

47 CFR FCC Part 2 §2.1091

Report Reference No.....:	**LCS1511070542E-03**
FCC ID.....:	**WXLRAMV**
Date of Issue. .....:	**Nov 09, 2015**
Testing Laboratory Name .....:	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address .....:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Applicant's name.....:	**Capricorn Electronics Ltd**
Address .....:	SUITE 1011, 10/FL., METRO CENTRE 1, 32 LAM HING STREET KOWLOON BAY, KOWLOON, HONG KONG
Test specification .....**:**	
Standard .....:	**47 CFR FCC Part 2 §2.1091** **KDB447498D01**
Test Report Form No .....:	LCSEMC-1.0
TRF Originator.....:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF.....:	Dated 2011-03

Test item description .....:	**RAMV CELLULAR GATEWAY**
Trade Mark .....:	N/A
Manufacturer.....:	**Capricorn Electronics Ltd**
Model/Type reference.....:	RAMV
Listed Models .....:	/
Operation Frequency.....:	From 910MHz to 924.7MHz
Rating .....:	DC 3.70V/DC 12V from Battery
Hardware version .....:	RAM-HV-FCC-V001
Software version .....:	RAM-SV-FCC-V001
Exposure category .....:	General population/uncontrolled environment
Software version .....:	Production Unit
Device Type .....:	Mobile Device
Result.....:	**PASS**

Compiled by:	**Supervised by:**	**Approved by:**
Kyle Yin/ File administrators	Glin Lu/ Technique principal	Gavin Liang/ Manager

T E S T R E P O R T

Test Report No. :	**LCS1511070542E-03**	Nov 09, 2015 Date of issue

Equipment under Test	:	**RAMV CELLULAR GATEWAY**
Model /Type	:	RAMV
Listed Models	:	/
Applicant	:	**Capricorn Electronics Ltd**
Address	:	SUITE 1011, 10/FL., METRO CENTRE 1, 32 LAM HING STREET KOWLOON BAY, KOWLOON, HONG KONG
Manufacturer	:	**Capricorn Electronics Ltd**
Address	:	SUITE 1011, 10/FL., METRO CENTRE 1, 32 LAM HING STREET KOWLOON BAY, KOWLOON, HONG KONG

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revison History

Revision	Issue Date	Revisions	Revised By
00	2015-11-09	Initial Issue	Gavin Liang

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

KDB447498 D01 General RF Exposure Guidance v06: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
FCC Part 2.1091 Radiofrequency Radiation Exposure Evaluation: Mobile Devices
KDB865664 D02 RF Exposure Reporting v01r02: RF Exposure Compliance Reporting and Documentation Considerations

2 . SUMMARY

2.1. Product Description

The **Capricorn Electronics Ltd's** Model: RAMV or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	RAMV CELLULAR GATEWAY
FCC ID	WXLRAMV Contains FCC ID:R5Q-LISAC200A
Model number	RAMV
Modilation type	GFSK
Antenna type	Internal and maximum antenna gain is 0dBi for HFSS modular
Hardware version	RAM-HV-FCC-V001
Software version	RAM-SV-FCC-V001
Power supply	DC 3.70V / DC 12.0V from battery
Exposure category :	General population/uncontrolled environment
Software version :	Production Unit
Device Type :	Mobile Device

2.2. Equipment under Test

Power supply system utilised

Power supply voltage	:	○	120V / 60 Hz	○	115V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 3.70V / DC 12.0V from Battery

2.3. Short description of the Equipment under Test (EUT)

2.3.1 General Description

RAM-V is RAMV CELLULAR GATEWAY with CDMA modular (FCC ID: R5Q-LISAC200A) and 910-924.7MHz Frequency Hopping transmit modular, RAM-V can connect PC to update software by USB port.

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

2.4. EUT operation mode

The EUT has been tested under engineer mode control by software (software name: CP210x_VCP_Win7 or win8) provided by application to control hopping frequency modular stay in continuous transmitting and receiving mode for testing. The EUT supports 50 channels and channel separation is 300 KHz, test carried out at the lowest channel, middle channel and highest channel.

Test frequency list

Test Channel	Lowest	Middle	Highest
Frequency (MHz)	910	917.5	924.7

2.5. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: WXLRAMV** filing to comply with FCC Part 2.1093 Rules.

2.6. Modifications

No modifications were implemented to meet testing criteria.

2.7. Note

1. The EUT with 910-924.7MHz hopping frequency transmitter modular and CDMA modular (FCC ID: R5Q-LISAC200A), the functions of the EUT listed as below:

	Test Standards	Reference Report
910-924.7MHz Hopping Frequency	FCC Part 15 C 15.247	LCS1511070542E-01
USB Port	FCC Part 15 B	LCS1511070542E-02
MPE	FCC Part 2.1091(d)	LCS1511070542E-03

3. TEST ENVIRONMENT

3.1. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS Registration Number. is L4595.
FCC Registration Number. is 899208.
Industry Canada Registration Number. is 9642A-1.
VCCI Registration Number. is C-4260 and R-3804.
ESMD Registration Number. is ARCB0108.
UL Registration Number. is 100571-492.
TUV SUD Registration Number. is SCN1081.
TUV RH Registration Number. is UA 50296516-001

3.2. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.3. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to ETSI TR 100 028 " Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics" and is documented in the Shenzhen LCS Compliance Testing Laboratory Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen LCS Compliance Testing Laboratory Ltd. is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	3.10 dB	(1)
Radiated Emission	1~18GHz	3.80 dB	(1)
Radiated Emission	18-40GHz	3.90 dB	(1)
Conducted Disturbance	0.15~30MHz	1.63 dB	(1)
Conducted Power	9KHz~18GHz	0.61 dB	(1)
Spurious RF Conducted Emission	9KHz~40GHz	1.22 dB	(1)
Band Edge Compliance of RF Emission	9KHz~40GHz	1.22 dB	(1)
Occuiped Bandwidth	9KHz~40GHz	-	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4. MPE Evaluation

4.1. Evaluation method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.
In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.
In accordance with KDB447498D01 for 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 the calculated/estimated, numerically modeled 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.

4.2. Limits for General Population/Uncontrolled Exposure

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic 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

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

4.3. Calculation Method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01
$S=PG/4\pi R^2$
Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to an isotropic radiator
R=distance to the center of radiation of the antenna
From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the maximum gain of the used antenna is 0dBi, the RF power density can be obtained.

4.4. Conducted Power Results

Test Mode	Channel	Frequency (MHz)	Measured Output Peak Power (dBm)
GFSK	Lowest	910.0	19.63
	Middle	917.5	19.45
	Highest	924.7	19.30

4.5.Manufacturing tolerance

Frequency (MHz)	910.0	917.5	924.7
Target (dBm)	19.0	19.0	19.0
Tolerance ±(dB)	1.0	1.0	1.0

4.6.Measurement Results

Mode	Frequency (MHz)	Output power (Including tune-up tolerance) (dBm)	Output power (mW)	Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
GFSK	910.0	20.0	100.0000	0	1.0000	0.0199	0.6067
	917.5	20.0	100.0000	0	1.0000	0.0199	0.6117
	924.7	20.0	100.0000	0	1.0000	0.0199	0.6165

4.7.Simultaneous Transmission

As the sample with 2 transmitter modular (CDAM modular and 910-925MHz Hopping Frequency modular) and share difference antennas, the 2 transmitter modular can simultaneous transmission; CDMA modular MPE information from FCC ID: R5Q-LISAC200A (CDMA modular FCC Single Modular Approval) that maximum MPE values at CDMA800 was 0.091 (mW/cm^2) and 0.083 (mW/cm^2) at PCS1900;

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;
∑ of MPE ratios ≤ 1.0

Maximum MPE Ratio		∑ MPE ratio	Limit	Results
CDMA Modular	Hopping Frequency Modular			
0.1631	0.033	0.1961	1.0	Compliance

4.8.Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

.....End of Report.....